Household Water Filter Evaluation

Supply Chain Scalability Report

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Massachusetts Institute of Technology
Comprehensive Initiative on Technology Evaluation

Massachusetts Institute of Technology

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List of Acronyms

CITE	Comprehensive Initiative on Technology Evaluation
DOI	Days of inventory
EMI	Equal Monthly Installments (EMI)
EWS	Economically Weaker Section
GNE	Gravity Non-Electric
HUL	Hindustan Unilever Limited
IIM-A	Indian Institute of Management-Ahmedabad
IIT-Gn	Indian Institute of Technology-Gandhinagar
INR	Indian Rupee
LIG	Low-Income Group
MIT	Massachusetts Institute of Technology
NGO	Non-Governmental Organization
RO	Reverse Osmosis
TCO	Total Cost of Ownership
USAID	United States Agency for International Development

Introduction

In summer 2014, a research team from the Comprehensive Initiative on Technology Evaluation (CITE) at MIT evaluated household water filters available on the market in Ahmedabad, India. The team worked closely with students and faculty at local universities to assess water filter products' suitability—do filters perform their intended purpose, scalability—do the filters' supply chain effectively reach consumers, and sustainability—are filters used correctly, consistently, and continuously by users over time. The findings of CITE's scalability research are presented here.

Supply Chain Scalability

Water filters are among the most widely used household devices in India, where water quality is uncertain and often poor. Several manufacturers have engaged in developing, manufacturing, and distributing water filters in India, using different technologies and targeting different price points. The supply chains that enable manufacturing and distribution of water filters, and the extent the supply chains are "scalable," play a critical role in determining success of products in the market and have an impact on improving water quality for Indian households.

The purpose of this evaluation is threefold: (1) to inform institutional buyers of water filters, public and private, about manufacturer and distributor capabilities; (2) to provide consumers with market information about various water filter brands; and (3) to further refine our supply chain evaluation methodology.

Definition

The term scalability is broadly understood in the international development community. Some key aspects in scaling up a product are covered elsewhere in the CITE evaluation: the design and performance of the product (suitability) and the needs and preferences of consumers (sustainability). We define scalability as the capability of the supply chain to reach consumers and impact society, taking into account issues of supply chain configuration, manufacturing, distribution, sales channels, and aftermarket support. Three key aspects characterize the scalability performance of an OEM supply chain for a product:

- **Availability:** the product's market presence and stock levels for consumer purchase.
- **Affordability:** the product's total cost of ownership, combining initial purchase and ongoing maintenance, and availability of financing across the supply chain.
- **Aftermarket:** the support system to maintain the product after purchase by the consumer, including service and repairs.

Our research engages with actors at various stages of the supply chain to evaluate scalability for water filters in India. Scalability is evaluated by the extent to which each Original Equipment

Manufacturer (OEM) or brand supply chain makes its product available to consumers, affordable for them to purchase, and with an aftermarket system to support the product over its lifetime. Hence, we determine a composite scalability score based on attributes characterizing these key aspects: Availability, Affordability, and Aftermarket. Empirical data from field surveys and semi-structured interviews provide the evidence base to analyze and score each attribute.

Audience

The target audience for this evaluation is institutional buyers of household water filters, private and public. Since most Indian households access water filters through the private sector, our primary audience are wholesalers and retailers, ranging from national chains to local chains to single owner outlets. The evaluation provides information about manufacturer and distributor capabilities that inform strategic brand and product line selection and operational purchasing decisions. Beyond buyers, the private sector audience also includes entrepreneurs anywhere along the supply chain from manufacturing through sales and service that seek market entry.

The institutional buyers audience also includes procurement groups of government agencies and non-government organizations (NGOs) that might use these products in development programs. The evaluation provides guidance on product selection to increase the likelihood of a successful program implementation.

The evaluation also provides consumers with market information about various water filter brands. They can use information about the availability of products and manufacturer ability to provide service in narrowing their brand selection. Critically, they can use information about purchase price, total cost of ownership, and financing options to plan for their purchase and to negotiate with retailers where necessary.

Finally, the evaluation is useful to investors, ranging from financial investors for profit or social good to government donors and foundations. The supply chain is a key part of any organization's business plan, and our evaluations help investors determine the best opportunities for scalable impact.

This evaluation is specific to the Ahmedabad region in India. However, some of the information would be useful to buyers, institutional and consumer, in other states in India and potentially other parts of the world.

Context and Products

CITE's evaluation focused on the state of Gujarat, located on the northwestern coast of India. It is bounded by the Arabian Sea to the west and southwest and Pakistan to the north. It has a population of approximately 60.3 million people, which is about 5% of the total population of India. Gandhinagar is the capital city and Ahmedabad is the key commercial center. Ahmedabad is the most populated district of the 26 districts in the state, with a population of 7.2 million.

Though the state has limited natural resources, it has emerged as India's most industrialized state and has developed a reputation for entrepreneurial success (Government of Gujarat, 2014).

CITE categorizes water filters into three groups: conventional particle filters (CPF), gravity non-electric (GNE) filters, and reverse osmosis (RO) filters. The market for conventional filters, such as cloth and *jali* mesh, is very fragmented. Many products lack clear branding and marking to identify the OEM. Furthermore, given their extremely low price and wide availability at small shops and local kiosks, there does not appear to be an economic or supply chain barrier to scale. Hence, the Scalability evaluation focuses on brands for the GNE and RO categories.

The four nationally recognized Brands with the largest market share in Ahmedabad are Tata, Hindustan Unilever Limited (HUL), Eureka Forbes, and Kent. The field research team encountered multiple models for each brand within the GNE and RO categories, resulting in small sample sizes by model. Hence, CITE analyzed data by brand within the categories.

Finally, we immediately observed a notable market share for non- or locally-branded products that are assembled by distributors and/or retailers from a combination of locally manufactured, India-manufactured and imported components. We combine this fragmented set of market players under a brand name that is commonly used by numerous local companies: Dolphin.

METHODOLOGY

DATA COLLECTION

CITE's scalability evaluation is based on data collection from OEMs, distributors, and retailers. We conducted semi-structured interviews with OEMs supplemented with data collection to more extensively incorporate their customers: distributors and retailers. We developed a detailed survey for retailers to obtain primary data and also to identify distributors and OEM representatives whom we could contact for interviews. The multi-layered approach to data collection allowed CITE to cross-validate information for each brand across independent sources, resulting in more reliable data.

The first primary data source was a survey of retailers that carry GNE and/or RO household water filters. We gathered data regarding general business information (e.g., name, location, hours of operation, number of employees), product selection (e.g., brands and models offered, inventory levels, sales volume, prices, and costs; for both the complete device and for replacement parts), financing (customer credit given and supplier credit offered), warranty terms, service plans, supplier lead times (OEM and/or distributor), and market potential (barriers and opportunities to scale).

Based on two days of pilot runs in Ahmedabad, we refined the survey terminology to reflect market terms and context. The survey was also streamlined to take less than 20 minutes to

complete, as we discovered that most retailers were not able to speak with us longer. In cases where a retailer was able to take more time, we referenced an appendix of questions in the form of a semi-structured interview. The interviewer transcribed all supplemental notes.

CITE researchers conducted the surveys in teams of two, with students from partner universities in the region serving as translators. Occasionally a retailer knew enough English so that the CITE researcher could communicate directly. Occasionally, the respondent would decline to answer, as information was considered confidential. In larger stores, we asked to speak with the manager who would have better knowledge of the overall business.

Semi-structured interviews with local distributors and OEM representatives provided the second primary data source. We adapted the questionnaire used in previous evaluations, which were focused on OEMs, to fit the context of water filters in India and to better explore the role of various actors in the supply chain (e.g., distributors, wholesalers, transporters) that provide service to retailers.

As before, we found it quite difficult to collect data from OEMs. Our inquiries started as soon as the broader CITE team determined which products and brands to include in the study. In spring 2014, prior to our field visit, we sought contacts in various ways such as emailing publicly available customer service addresses and making contacts through professional and academic networks such as LinkedIn and MIT Alumni. We were clear about the purpose of our study – comparative evaluation of various products – while highlighting that they could benefit from our analysis of their supply chain to improve operations. During the course of this study, we received preliminary responses from individuals at all OEMs, except Kent, but that did not result in contact with the appropriate individuals at the headquarter level having knowledge of the sourcing and production processes. We did have some success engaging with some OEM representatives at the regional and local level. As we had hoped, several retailers we surveyed were willing to share their contacts. Through networking, calls and office visits during our field visit, we met with representatives from Eureka Forbes and Hindustan Unilever Limited (HUL). It is important to note that Eureka Forbes also offers direct door-to-door sales, which is a channel not captured by retailer surveys. The analysis could have been more comprehensive if OEMs had shared more information.

In addition to OEMs, we sought to conduct interviews with local distributors to capture an important stage of the supply chain. We were not able to identify distributors through market research prior to arriving in Ahmedabad, but based on information shared by retailers during our field survey, we were quite successful at identifying distributors and making contact. The distributor market is quite concentrated for major brands in the Ahmedabad district, with HUL having a single main distributor and Tata, Kent and Eureka Forbes using two distributors. The locally-branded Dolphin products had multiple wholesalers and distributors, which in turn sourced components from various manufacturers and importers throughout India. We

interviewed several Dolphin distributors and wholesalers and some of their suppliers: an importer, a plastics manufacturer, and an electrical components manufacturer. We spoke with distributors for all major brands as well. Interviews from this concentrated set of distributors provided useful data on sales volumes, product margins, inventory, and lead times for the region. Aggregate estimates helped to validate data collected from retailers. Also, as the distributors are the link between OEMs and retailers, they offered useful insights into qualitative market factors such as brand reputation, product satisfaction and the cost-benefit tradeoffs.

Sample Definition

Each state in India is divided into districts; districts are further subdivided into talukas. Our study focused on the Ahmedabad district in the state of Gujarat. The retailer sample was stratified geographically: retailers from the urban Ahmedabad taluka, including some from the neighboring district of Gandhinagar, and retailers from peri-urban and rural areas in five surrounding talukas (Figures 1 and 2). Though Gandhinagar is outside our intended geographic scope of the Ahmedabad district, conversations with retailers and distributors indicated that Ahmedabad and Gandhinagar are essentially a single market for business purposes. Our sample was purposive, and while not directly proportional to population for each taluka, the majority of our data were collected in the densely populated Ahmedabad City and adjacent Gandhinagar talukas.

There was no list of retailers in the Ahmedabad district to form a precise sampling frame. Thus, we used cluster sampling from starting points purposively selected in consultation with students from the Indian Institute of Management – Ahmedabad (IIM-A) and the Indian Institute of Technology – Gandhinagar (IIT-Gn), who identified areas on the map that were likely to have retail stores. A team consisting of one or two MIT students and one Indian student drove to the center of each identified area and began walking in search of retailers selling water filters. A comprehensive sweep of the main streets was conducted, and periodically the accompanying Indian student would ask other shopkeepers or passersby if they knew of stores that sold water filters.

To analyze availability of water filters in rural markets, we visited six surrounding talukas: Sanad, Bavla, Dholka, Viramgam, Dhandhuka, and Ranpur. Our sample was limited to nearby talukas because of accessibility and driving time limitations. Google Maps and census data were used to identify the 2-3 most populated towns in the taluka for our sample. We drove to a market or area of town with many people present and asked passersby where water filters were sold. Only after searching for stores in addition to receiving multiple negative responses from the local people would we leave without conducting a survey.

We conducted retailer surveys in late June and early July 2014. In total, we collected responses from 108 unique retailers with answers to 33 questions for each water filter brand/model that is sold by the retailer. Figure 1 and Figure 2 show maps with locations of the retailers surveyed.

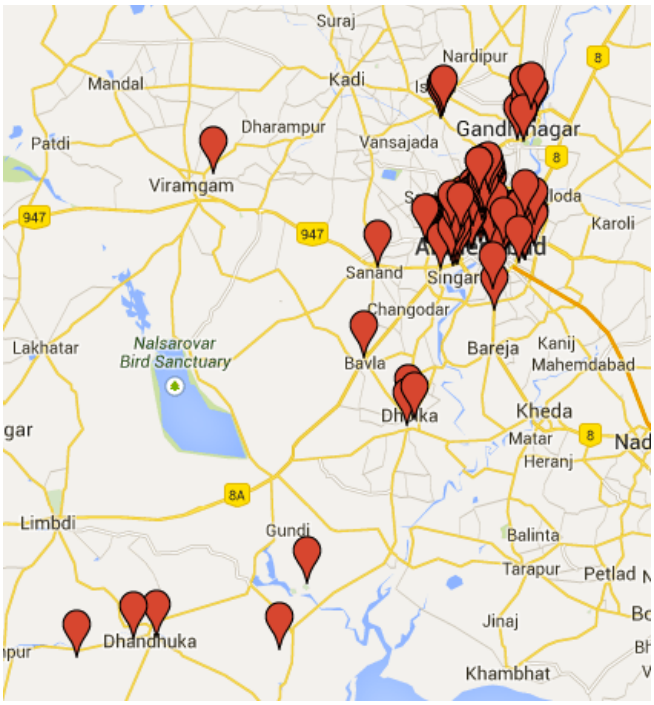

FIGURE 1: MAP OF RETAILERS SURVEYED IN THE AHMEDABAD DISTRICT

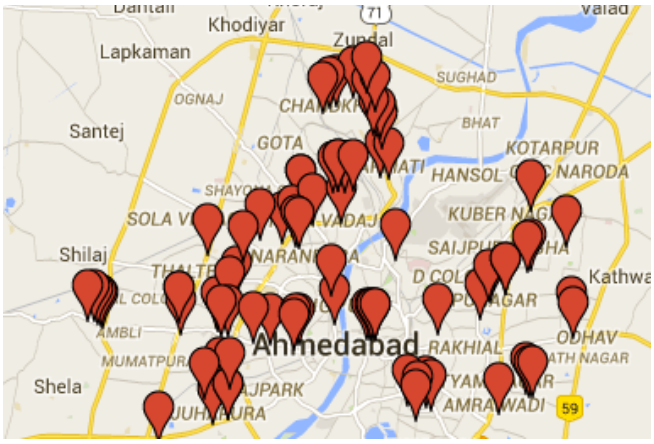

FIGURE 2: ZOOMED MAP OF RETAILERS SURVEYED IN THE AHMEDABAD CITY

The total sample for original equipment manufacturer and distributor interviews comprised 17 company representatives. The snowball sample approach is described in the data collection section above.

Data Cleaning

We created a master data file that transcribed all information gathered from the field surveys. Columns represented identifying factors (i.e. retailer name, location, etc.) and question responses; rows represented retailers with a distinct row for each brand and type of water filter carried by the retailer. For example, if a store carried both Kent GNE and RO items, it would

appear as two separate rows in the master data file, keyed to a unique retail survey. Each team member validated responses for the surveys they conducted. Further, the team created guidelines to ensure consistency and facilitate analysis. These guidelines and the master data file were given to two IIM-A students, who had worked with us in the field, for a second round of cleaning. Finally, one member of the team conducted the third round of cleaning, in order to comprehensively ensure consistency.

ANALYSIS

Three key aspects characterize our evaluation of scalability performance: Availability, Affordability, and Aftermarket. For each key aspect, we developed a set of attributes based on the nature of the product and the market context; they are described in Table 1. Attributes are analyzed for several brands of household water filters that are prevalent in the Ahmedabad district. Further, within a brand, attributes are analyzed by the category: Reverse Osmosis (RO) and Gravity Non-Electric (GNE). Given the high number of models offered by a brand within each category, we did not have enough data samples to analyze attributes at the model level.

Attribute values are based on the empirical data collected and analyzed by the team. Attribute scores are based a linear relationship with the underlying attribute value as defined by two reference points. Weights used to combine individual attribute scores into an overall score. Scores for the individual attributes are categorized as Excellent, Very Good, Good, Fair, and Poor and the overall score value is reported.

We did not have extensive market research of consumer preferences or expert opinions to utilize in defining the attribute scoring basis or the overall scoring weights. Hence, the scoring basis and weights are based on judgments of the research team that spent weeks of time in the marketplace interacting with consumers and commercial providers. For transparency, the scoring basis is described in the analysis and the weights are provided with the results.

TABLE 1: SCALABILITY ATTRIBUTES

Key Aspect	Attribute
Availability	Selection Availability
	Shelf Availability
	Rural Availability
Affordability	Initial Investment
	Total Cost of Ownership
	Financing
Aftermarket	Parts Availability
	Maintenance Plans
	Service Experience

AVAILABILITY

Availability to the consumer is a combination of having sales outlets nearby that carry water filters and having a device in stock when needed. The following three attributes are used to evaluate availability of household water filters: selection availability, shelf availability, and rural availability. Component values for these attributes are provided in **Error! Reference source not found.**.

TABLE 2: AVAILABILITY ATTRIBUTE COMPONENTS

		Selection Availability		Shelf Availability			Rural Availability
Brand	Category	Brand Prevalence	Category Prevalence	Average Inventory (units)	Average Inventory (days)	Average Replenishment Time (days)	Category Prevalence
Tata	GNE	31%	17%	9	8	1.5	0%
HUL	GNE	20%	10%	6	46	1.0	0%
Eureka Forbes	GNE	36%	17%	6	15	1.2	7%
Kent	GNE	41%	6%	4	14	0.9	0%
Prestige	GNE	2%	2%	3	31	1.3	0%
Dolphin	RO	52%	52%	18	55	1.5	60%
Tata	RO	31%	18%	3	32	0.8	20%
Eureka Forbes	RO	36%	25%	5	12	1.1	27%
Kent	RO	41%	34%	8	47	1.1	40%

SELECTION AVAILABILITY

Selection availability measures the market presence of the product in retail stores. Selection availability was comprised of two components: the percent of retailers that offer a model for the brand within the category and the percent of retailers that offer the brand in general (either category). General brand availability is indicates a business relationship between retailer and OEM that could be leveraged even if a model in the category is not present. Selection availability is the average of the two component values.

Prevalence above 40% is determined to be Excellent. Based on our field experience, retailers tend to be clustered in districts with more than one store. Prevalence above 40% means that there is a good chance that a consumer will be able to find the product by shopping in a district they often visit. Prevalence below 10% is considered Poor because it indicates that a consumer is unlikely to find the product among several districts where they shop.

SHELF AVAILABILITY

Shelf availability indicates the likelihood that a consumer will be able to purchase a product when entering a store. Shelf availability depends on the inventory typically stocked by the retailer and the replenishment times from suppliers when they are out of stock. Component values are based on direct answers to survey questions about average sales and average inventory, which together determine days of inventory, and average replenishment time in days.

$$Days\ of\ Inventory = \frac{Inventory}{Total\ sales\ per\ month} * \frac{30.4\ days}{month}$$

Results show a high number of days of inventory relative to the very short replenishment times reported. We suspect that respondents may have provided the mode for replenishment time, which is typically within 1-3 days, rather than the mean that incorporates long periods when the manufacturer or distributor is out of stock. Retailers' inventory levels more likely reflect lead-time performance than the reported replenishment time. Thus, we report replenishment time but do not incorporate it into the score. Days of inventory can be inflated for products with low sales. Hence, we calculate a score for shelf availability as a combination of actual stock count and sales coverage in days of inventory; each is weighted 50%. Excellent shelf availability is a score above 16 and a Poor is below 4.

Rural Availability

In addition to retailers in Ahmedabad City, we wanted to characterize the brand and category penetration in the largest towns of surrounding talukas, which are primarily rural. Rural Availability is the percentage of retailers outside of the city that sell the water filter category. As with selection availability, prevalence above 40% is Excellent and below 10% is Poor. Rural availability is different because of the diffuse nature of the stores in the surrounding talukas. The rural equivalent of the urban definition of "shopping in a district they often visit" is traveling to their primary market. Hence, prevalence above 40% indicates that a consumer could find products when traveling to their primary market, while a consumer may never encounter products with prevalence below 10% given the travel distance to the next market. Indeed, we did not encounter any water filter retailers while canvassing some towns. In general, the availability of the products outside Ahmedabad was low.

Affordability

Affordability encompasses the financial requirements to invest in a water filter and to maintain it over its lifetime. Initial investment considers the price along with the financing options to enable the purchase. Total cost of ownership (TCO) is key since proper maintenance is critical to ensuring safe water. The attributes are discussed in more detail below. Component values for these attributes are provided in Table 3.

For the affordability attribute, we use common standards. The UNDP defines affordable water as no more than 3% of household income (United Nations, 2010). The Government of India defines four income categories to determine beneficiaries for certain government programs, with Economically Weaker Section (EWS) as the lowest. As of 2012, a household earning an annual income of 100,000 INR (1 lakh) was defined as EWS and between 100,001 INR and 200,000 INR (1 to 2 lakhs) as Low-Income Group (LIG) (Government of India, 2012).

For household usage, we assume five liters per person per day for a household of five people. This household amount should be sufficient for usage, such as drinking and cooking, for which filtered water is critical. We assume the device lasts five years before replacement, which is the average length of ownership as determined by CITE's sustainability user surveys. Hence, the consumption parameters driving replacement frequency and the overall product lifetime are:

> Annual consumption = 5 liters/person/day * 5 people/household * 365 days/year * = 9125 liters
> Lifetime of the product = 5 years, or 45,625 liters

TABLE 3: AFFORDABILITY ATTRIBUTE COMPONENTS

			Initial Investment (MRP)		Total Cost of Ownership (25 liters per day for 5 years)		Financing			
Brand	Category	Model	Rupees (INR)	Dollars (USD)	Rupees (INR)	Dollars (USD)	Monthly Installment	Short Term Credit	Credit Unspecified	Retailer Credit
Tata	GNE	Swach Smart	₹ 1,199	$ 20	₹ 15,143	$ 252	5%	9%	9%	100%
HUL	GNE	PureIt Compact	₹ 1,000	$ 17	₹ 32,238	$ 537	15%	0%	8%	100%
Eureka Forbes	GNE	Aquasure Amrit with Kitanu Magnet	₹ 2,499	$ 42	₹ 29,364	$ 489	63%	5%	0%	62%
Kent	GNE	Gold+	₹ 2,600	$ 43	₹ 11,006	$ 183	13%	13%	13%	100%
Prestige	GNE	Vestergaard	₹ 2,995	$ 50	₹ 8,076	$ 135	N/A	N/A	N/A	N/A
Dolphin	RO	Dolphin	₹ 5,900	$ 98	₹ 22,149	$ 369	13%	33%	12%	52%
Tata	RO	Swach Platina Silver	₹ 13,999	$ 233	₹ 40,091	$ 668	45%	10%	5%	86%
Eureka Forbes	RO	Aquasure RO + UV	₹ 17,499	$ 292	₹ 34,568	$ 576	48%	26%	0%	58%
Kent	RO	Pearl	₹ 16,900	$ 282	₹ 38,014	$ 634	29%	43%	4%	61%

Note: the converstion rate is assumed to be 1 USD = 60 INR.

Initial Investment

The initial investment is based on the Maximum Retail Price (MRP) as determined by CITE's survey data or OEM product sheets or website. We include this attribute since consumers are directly exposed to price information and it is a critical factor in consumer adoption of the technology. However, since it is also incorporated into the TCO, a minimal weight of 5% is assigned to this component. Using the income standards defined above, initial investment below 2,000 INR is Excellent and above 8,000 INR is Poor. Note that many but not all models include an Annual Maintenance Contract with the purchase price, which means that the initial investment is also the total cost of water treatment for the first year. Given the variation in what is included in the initial price, our affordability analysis focuses on TCO, which amortizes this purchase price over a period long enough for a common cost basis.

Total Cost of Ownership

We calculate the TCO as being equal to the initial purchase price plus the cost of the replacement filters over the lifetime of the device. This attribute is especially important for water filters with parts that must be replaced continually for effectiveness. Our assumption is that the consumer pays for replacement parts separately rather than enroll in an Annual Maintenance Contract, which is evaluated distinctly as an Aftermarket attribute. As the product lifetime is dictated more by usage than by time, and the durability of various models may vary, the attribute value is the total cost of ownership per 1000 Liters, or the TCO divided by the useful lifetime of a device,

using assumptions above. For parts replacement, we use information provided by the OEM for the frequency that the component needs to be replaced. More detailed lab testing results about the durability of the overall device and the critical replacement parts would enhance the TCO calculation. Using the income standards defined above, TCO per 1000 Liters below 219 INR (corresponding to 1% of maximum LIG income and 2% of maximum EWS income) is Excellent, above 658 INR (3% of maximum LIG income) is Fair or Poor. With this scale, it also means that 3% of the maximum EWS annual income (329 INR) is the midpoint of the Very Good range. This is appropriate as such a filter provides safe water for the lowest income group within the UNDP guidelines.

Financing

This variable captures whether financing and credit purchase are offered to consumers by retailers as well as offered to retailers by distributors and/or OEMs. Thus, the financing attribute value combines two components: Consumer Credit and Retailer Credit. The Consumer Credit component accounts for 75% of the attribute score since it is most critical for product adoption. It is comprised of three factors:

- Monthly Installment (weight 1.5): Percent of stores carrying brand that offer an Equal Monthly Installments (EMI) option to customers.
- Storm Term Credit (weight 1.0): Percent of stores carrying brand that offer a short-term credit option to customers. Usually a set number of days. Five points was added to brands that had greater than 30 days of credit.
- Credit Unspecified (weight 0.5): Percent of stores that said they offered credit to their customers, but did not provide information on what type of credit was offered

Monthly installment receives the highest weight since it carries no interest. Unspecified credit receives the lowest weight since it is more informal. Retailer Credit accounts for 25% of the attribute value since this is an enabling factor in further offering credit to consumers in the future. The component value is the percent of retailers carrying the brand that use credit offered to them by the distributor. Excellent is defined as a score above 80; Poor is a score below 20.

Aftermarket

Aftermarket support for household water filters is critical given the ongoing maintenance required to ensure safe water. A water filter used on a daily basis will require replacement of components – primarily the various types of filters that become clogged – multiple times per year. As many products combine a series of filters, part replacement often requires disassembly of the unit and reassembly of several components and hoses. Many consumers rely on a service technician to complete this process properly. OEMs, retailers and third party providers offer annual maintenance contracts (AMC) that include in-home servicing and parts replacement. Some providers offer multiple service levels and price points for AMCs that vary terms such as the parts included, number of scheduled technician visits, and response time for repairs. For cost

comparison purposes we use the OEM's basic service plan, which typically includes one year of replacement parts and three in-home visits. All RO units encountered in our retailer visits included a one-year AMC with the initial purchase. The only GNE unit we encountered with a bundled one-year AMC was the Eureka Forbes Amrit. After the first year, the consumer can purchase an extended AMC.

The nature and level of service provided varies by OEM and seems to be influenced by the company's business model. Eureka Forbes has dedicated technicians that are employed by franchisees throughout the city and exercises direct control over service, with specialized information management to track performance by customer. Dolphin retailers often employ technicians directly, or do the work themselves, since service often represents a significant revenue stream. Tata and Kent outsource service to licensed, third party providers as their revenue stream is driven by initial purchases.

We analyze the availability of replacement parts for consumer purchase, the attractiveness of maintenance plan options offered by the brand, and perceptions of retailers and consumers about aftermarket service. Component values for the attributes are provided in Table 4.

TABLE 4: AFTER -MARKET ATTRIBUTE COMPONENTS

		Parts Availability		Maintenance Plans	Brand Service Experience			
Brand	Category	Selection Availability	Shelf Availability	AMC Savings	Retailer Sample	Retailer (pos/neg)	Consumer Sample	Consumer (pos/neg)
Tata	GNE	81%	75.2	No AMC	34	35% / 6%	0	0% / 0%
HUL	GNE	70%	28.6	No AMC	22	32% / 9%	5	0% / 0%
Eureka Forbes	GNE	31%	13.7	72%	39	28% / 8%	25	28% / 16%
Kent	GNE	33%	13.6	No AMC	44	30% / 7%	16	25% / 19%
Prestige	GNE	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dolphin	RO	54%	47.3	20%	56	14% / 0%	54	24% / 9%
Tata	RO	6%	15.7	22%	34	35% / 6%	0	0% / 0%
Eureka Forbes	RO	15%	75.2	-19%	39	28% / 8%	25	28% / 16%
Kent	RO	21%	26.9	4%	44	30% / 7%	16	25% / 19%

PARTS AVAILABILITY

Parts Availability indicates the ability of a consumer to purchase replacement parts when needed. Ease of access to replacement parts could encourage consumer behavior toward proper maintenance, which is critical for safe water. We consider the same factors described above for the initial device purchase: selection availability and shelf availability.

Since consumers have already selected the category by purchasing the device, category prevalence alone is the measure for aftermarket parts selection availability. This measures the percent of retailers that stock replacement parts given that they carry that brand and category of device. For example, only Tata GNE retailers are used to calculate the prevalence of retailers stocking parts for that category.

As with devices, the aftermarket parts shelf availability is an equally weighted combination of actual stock count and sales coverage in days of inventory. Evaluation is also the same as device availability: selection availability above 40% is Excellent and below 10% is Poor; shelf availability above 16 is Excellent and below 4 is Poor. Selection and shelf availability are each weighted 50% to determine the Parts Availability value.

Maintenance Plans

The Maintenance Plan attribute analyzes the added value that an OEM's AMC offers compared with the annual cost of consumers purchasing and installing components themselves. Based on the same usage assumptions used for TCO, we determine the annual cost for consumer maintenance. We then compare this cost with the brand's AMC price to determine the savings value of the plan. Note that the AMC also includes the technician labor.

$$\text{Consumer Maintenance Annual Cost} = \frac{\left(\text{Total Cost per 1,000 L} * \frac{45{,}625\ \text{L}}{1{,}000\ \text{L}}\right) - \text{Initial Investment}}{5}$$

$$\text{AMC Savings} = 1 - \frac{\text{AMC Cost}}{\text{Consumer Maintenance Annual Cost}}$$

We consider 40% or greater savings with AMC over individual parts purchases as Excellent. Lower levels of savings are considered Very Good (20-40%) or Good (0-20%). We still consider an AMC cost that is between 0-20% more expensive as Good because it also includes a regularly scheduled technician visit. Without the regular visit, consumers may not be able to identify issues or remember when to change filters. An OEM is rated as Poor if it does not offer an AMC or prices the plan more than 20% higher than consumer maintenance.

Service Experience

The Service Experience attribute value is based on survey data from retailers and consumers about positive and negative experiences with a brand's warranty and service. Note that these data were only available by brand, not by category. For retailer experience we count the following responses: (1) when "service/reputation" was selected from a list of options in response to the question "What made you decide to carry these brands versus others?" and (2) when service or reputation was given in response to the open question "What change would have to happen to sell more water filters?" Positive counts combine responses from both questions; negative counts only include low quality service in response to the open question. As a result, retailer experience subtracts twice the percent of negative experiences from the percent of positive responses.

Consumer service experience uses data collected by CITE during household interviews. We considered responses to questions where consumers described their overall experience with the brand and described why they would or would not recommend it. We combined the number of times service was given as a positive or negative factor for these questions. The consumer experience subtracts the percent of negative experiences from the percent of positive responses.

A difference in positive and negative response rates above 20 is excellent. A difference below 0, where negatives begin to outweigh positives, is fair. A negative response rate that exceeds pthe positive response rate by more than 10 is poor. The overall Service Experience equally weighs the retailer and consumer experience.

RESULTS

The values of the nine attributes are combined in a weighted sum to determine the overall scalability score. As mentioned earlier, weights are based on judgments of the research team and are listed above each attribute in the table. Overall, Affordability comprises 50% of the score, with Availability and Aftermarket each contributing 25%. Total Cost of Ownership is the most important attribute for Affordability since it captures all relevant costs; Financing is a key factor in initial adoption and has a weight of 15%; Initial Investment is weighted only 5% since that value is also incorporated in the TCO. Selection and Shelf Availability for the device are equally weighted with Parts Availability. Rural Availability has a lower weight since the urban market contributes more to scalability. Aftermarket attributes characterizing Maintenance Plan options and Service Experience are equally weighted.

TABLE 5: SCALABILITY EVALUATION RESULTS

			AFFORDABILITY			AVAILABILITY			AFTERMARKET		
			5%	30%	15%	10%	10%	5%	10%	7.5%	7.5%
Category	**Brand**	**Scalability Score**	**Initial Investment**	**Total Cost of Ownership**	**Financing**	**Selection Availability**	**Shelf Availability**	**Rural Availability**	**Parts Availability**	**Maintenance Plans**	**Service Experience**
RO	Dolphin	73	◑	◑	◑	●	●	●	●	◕	◕
	Kent	57	○	◔	●	◕	●	◕	◕	◑	◕
	Tata	50	○	○	●	◑	●	◔	◑	◕	●
	Eureka Forbes	50	○	◔	●	◕	◑	◑	◕	◑	◕
GNE	Eureka Forbes	60	◕	◑	●	◑	◑	○	◕	●	◕
	Tata	57	●	◕	◑	◑	◑	○	●	○	●
	Kent	56	◕	◕	◑	◑	◑	○	◕	○	◕
	HUL	50	●	◔	◑	◔	●	○	●	○	◕
	Prestige	N/A	◕	●	N/A	○	●	○	N/A	N/A	N/A

Excellent	●
Very Good	◕
Good	◑
Fair	◔
Poor	○

The scalability score differentiates brands and categories, and in doing so highlights inherent tradeoffs in business models. For example, RO products with better availability are also more expensive, with lower ratings on initial investment and total cost of ownership (TCO); yet these products perform well on financing that enable consumer investment and offer better maintenance plans to reduce ongoing costs. The Dolphin RO offers excellent availability while remaining reasonably affordable with good aftermarket support, especially in comparison with other RO brands. Eureka Forbes GNE offers the best combination of affordability and maintenance plans but low availability, notably in rural areas.

Tradeoffs also exist within an aspect, such as the after market. Retailers with working capital constraints may keep lower stock of the more costly replacement parts on high-end models. In addition, high-end models are often serviced by third-party companies that may carry significant replacement parts inventory, but this would require further research.

Prestige GNE is included as a promising product even though it has a small sample size and insufficient data to conduct a complete evaluation. Prestige is new to the water filter market, having recently released a GNE product using Lifestraw technology licensed from Vestergaard Frandsen. The team encountered very few retail outlets with Prestige GNE products, resulting in poor selection availability; this should increase as they further enter the market. However, the product launch shows promise with high stock levels in those few outlets and a very affordable product, especially when considering the long term Total Cost of Ownership. If Prestige is effective in promoting its product with retailers and develops a robust after market service, then this product line should scale well.

Conclusions

This evaluation offers insights into the household water filter market in Ahmedabad and general insights into scaling up technology deployment for international development.

1. Several models are affordable over the long term for consumers in the lowest income categories defined by the Government of India, though financing the initial purchase may still be a barrier.

It was surprising and encouraging to discover a range of outcomes regarding affordability for the total cost of ownership in a household consuming 25 liters per day. Although high-end models are not affordable for the Economically Weaker Section (EWS) and Low-Income Group (LIG) demographics, as defined by the government, some models are economically accessible for these groups. The recently launched Prestige GNE products has a total cost of ownership (TCO) that is Excellent, i.e. below 1% of the maximum LIG income; along with the Tata GNE and Kent GNE, which are rated Very Good, these three product lines are affordable by UN standards for the weakest economic demographic in having a TCO less than 3% of the maximum EWS income.

Further, Dolphin RO products have a TCO that is 2.2% of the maximum LIG annual income, making the more advanced technology affordable for a broader spectrum of Indian households.

Although this is encouraging, consumers can only benefit from affordable lifetime cost when able to finance the initial purchase. The purchase price for even the most affordable water filters may amount to several months of income for Ahmedabad's poorest families. Monthly payment options or interest-free financing for lower cost GNE products are offered by less than 20% of retailers for most OEMs, with the only exception being Eureka Forbes. In addition, the purchase price for these products is below the minimum amount for third-party creditors. Financing the initial purchase may be a serious barrier to product adoption for users with limited or no savings.

2. Postponed assembly at the retail level for certain products can be very effective in scaling the supply chain.

The locally branded Dolphins assembled by distributors and retailers received the highest scalability score in our sample. While we expected to discover locally assembled products in the Ahmedabad market, we had underestimated the prevalence of such models, which are not tracked by market research. The strategy to postpone final production, assembling products closer to demand instead of upstream, allows the supply chain to be more responsive. In this case it is also more efficient, since shipping components (e.g. filters) is less expensive than transporting the bulky housing of the finished good. A product is particularly suitable for this strategy if its critical components are off patent and produced by several manufacturers. Also, given that the assembly process is fairly straightforward, requiring about 20 minutes and few technical skills (wiring the pump, connecting hoses, etc.), the barrier to entry in this market is low. Finally, the consumable filters and membranes, which are a significant part of the overall reverse osmosis filter cost, provide an ongoing revenue stream for retailers.

These results prompt deeper study of the Dolphin supply chain in particular and similar products more generally to determine the effectiveness of the postponed assembly strategy. One aspect for future study is the transparency of cash flows, and whether informal transactions that avoid taxation contribute to the reduced cost. In addition, though our preliminary evaluation of suitability of these products is high, their assessment over a more extended time may reveal bigger differences in performance when compared to centrally manufactured products.

3. Manufacturers and retailers can utilize a portfolio of options, including contracts with third parties exchanging some profit margin to reduce risk, to offer interest-free consumer financing that drives sales volume and enables user access to technology.

There were two prevalent Equal Monthly Installments (EMI) financing schemes in the Ahmedabad market: one offered by a financing company, Bajaj, for several OEMs and one offered by Eureka Forbes, exclusively for their products. Bajaj offers a variety of financing options and services that are negotiated with manufacturers for certain appliances and offered to retailers. For the EMI water filter option, Bajaj reimburses the retailer at a slight discount from

the list price in return for assuming the risk of collecting the full price through monthly installments from the consumer; the average length of a loan is eight months. This scheme is more commonly found in larger "Modern Trade" stores offering a variety of products, e.g., Sales India, Croma, and Vijay Sales. It is a good option for the consumer as the loan is interest-free, with the only upfront cost being a one-time fee of approximately 500 INR. The program does present two barriers: (1) a consumer must finance a minimum loan amount of 15,000 INR, making this scheme ineffective for low-cost models unless combined with other approved purchases, and (2) Bajaj screens applicants by looking at past financial statements, bank history, and employment status.

Eureka Forbes takes the financial risk directly offering an interest-free EMI scheme for all of its products, including the only EMI available for a GNE product that we encountered. Only the first installment is due at the time of a GNE purchase while a 3500 INR deposit is required for RO models. This loan is given to any consumer, in contrast with Bajaj. Eureka Forbes is a clear front-runner on OEM financing; other brands have created good options by partnering with Bajaj. The Dolphin RO models have a disadvantage in financing because most of these retailers are owner-operated and lack the scale to partner with Bajaj or take on the risk of credit directly. Beyond these two examples, we encountered very few EMI options, and the highest interest rate reported in our survey was 2%. The ability to broaden the business model of OEMs by either directly financing or by shifting financial risk in exchange for a portion of profit margin merits further exploration.

4. Lower-priced products are not sufficiently reaching rural populations where they may be needed most; investment in the supply chain is critical.

One of the most surprising findings is that the more affordable GNE models are not readily available in rural areas, where they may be needed most, while the RO models are prevalent. The reasons are not clear, though interviews provided some evidence that OEMs for high-end models invest in promotional efforts among retailers aiming to reach moderately affluent consumers in rural areas. In addition, the most prevalent models in rural outlets – Dolphin RO models either branded by the local retailer or promoted by a small-scale distributor – have a low barrier to entry that encourages entrepreneurial investment in specific markets such as rural towns. In both cases – national brands with capital and entrepreneurs with time – investment in the supply chain was required to reach the rural population. The low prices of other products were not sufficient to reach rural towns without investment in the supply chain.

In summary, in addressing the needs of the bottom of the pyramid, several water filter options offer the potential to reach more households, but none are excellent in all aspects of availability, affordability, and aftermarket support. The study did identify several promising business models that could be expanded to increase water filter scalability in India, particularly in rural areas. Moreover, the examples point to scalability principles that could be studied further for other technologies and in other markets.

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