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SUPPLY CHAIN SOLUTIONS FOR WATER FILTERS IN INDIA

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ABSTRACT

India is currently struggling to provide access to clean and safe drinking water to its citizens. The lack of such an essential element has created widespread health concerns and threatens to stunt India's ability to advance as an economy. It has greatly increased an already growing demand for water filtration technology and products. By conducting extensive Internet research and interviews with both company executives and field experts, opportunities to penetrate the market for water filters in India are explored. Supply chain solutions are given to address both the urban and rural market settings. It was found that a larger concentration on distribution and sales will improve performance in the urban market, while the rural market will require heavier efforts in product development. A more innovative strategy consisting of the use of microfinance institutions and self-help groups is necessary to market to the large and widespread rural population. It involves an untraditional approach of partnering with outside organizations for innovation, distribution, and strategic planning. The state of Karnataka is used as a case study to provide specific examples of how these solutions should be carried out. The lessons learned from Karnataka are applicable across India and help to demonstrate that small changes to Company A's current water filtration device could provide a proper water filtration solution for various regions of the country. The recommended solutions not only provide a viable business opportunity, but they also serve as guidelines to acting on a humanitarian issue in a socially responsible and ethical manner.

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Chapter 1

Introduction

Water is an essential aspect of life for all individuals on earth. It plays an important role in public health, the economy, food production, development, and the environment. Of these, access to clean and safe drinking water is by far the most important. It is vital for the human body to function properly, yet there are many problems associated with providing clean drinking water to people around the world. Contaminated water is a main concern for developing counties. It causes widespread disease and various public health issues. Despite these severe consequences, one billion people worldwide are denied access to clean water supplies, and half of the world's population lacks adequate water purification systems (United Nations Population Fund 2013). Water is a finite natural resource, and it is becoming even more valuable as the global population climbs. As consumption and birth rates both rise steadily, the availability and access to clean and safe drinking water will become a top priority for the international community.

One country that is seeing these effects in profound ways is India. As the second most populous country in the world, it is home to 1.237 billion people. India already contains more than a sixth of the world's population, and its growth rate is at a steady 1.41 percent. That puts it on track to be the world's most populous country by 2025 and contain 1.6 billion individuals by 2050 (BBC 2004). India has seen extensive negative effects from its inability to provide its citizens with clean drinking water. The lack of technology for treating water has caused widespread sickness and disease. Waterborne illnesses and bacterial contamination affect 37.7 million Indians each year. These public health concerns are commonly the root cause of even

more severe problems; but with the proper products to treat water, many of these issues could be quickly eliminated. It is clear that a strong demand for clean drinking water in India exists, and this paper will attempt to investigate possible solutions. In response to an inquiry from a Fortune 500 multinational chemical company to the Pennsylvania State University Center for Supply Chain Research, it will evaluate their current water filtration technology and propose new supply chain techniques to penetrate the growing Indian market. For confidentially reasons, the company will be referred to as Company A, and its current water filtration product will be referred to as Filter X.

First and foremost, the current market will be profiled to ensure that a demand for water filters exists. It will be demonstrated by looking at the current situation and the various negative effects citizens are enduring due to the lack of this basic necessity. Profiling the current market will include looking at factors such as size, growth rates, consumer preferences, demographics, and economic conditions. It will look at how the current market operates and which other companies and products are playing in the same space. Once it is clear that India provides the right market conditions for Company A to penetrate, a business case will be built detailing supply chain suggestions and improvements.

Research will conclude that urban residents require a different solution than rural residents. The supply chain suggestions centering on urban residents will be based on the current Filter X technology, distribution, and retail channels. Recommendations to serve the rural population will concentrate on developing a new product for lower income residents. It will require a new thought process and incorporate innovative marketing, finance, and distribution methods. In order to provide a more tangible explanation of how solutions might be implemented, the state of Karnataka will be used as a case study. Lessons learned in that state should be applicable over various regions of the country. Lastly, other organizations working in the field will be discussed for potential partnerships. The recommended solutions will aim to

provide both a realistic customer solution and a profitable business initiative. Clean water solutions not only have the ability to positively impact Company A's bottom line, but they also align with the company's ethics and sustainability initiatives.

Chapter 2

Background

The Market

Located in Southeast Asia, and covering an area of 1,269,346 square miles, India is home to 1.237 billion people. As previously mentioned, India already accounts for more than a sixth of the world's population and is growing at a steady rate of 1.41 percent. It will be the world's most populous country by 2025, and contain 1.6 billion individuals by 2050 (Princeton University 2014). Providing clean drinking water to such an enormous population is challenging. India encompasses fifteen different ecological regions which each provide unique difficulties. In addition, there are non-uniform levels of awareness, socio-economic development, education, poverty, practices, and rituals, which add to the complexity of providing clean water (Khurana and Romit 2).

According to The Guardian, only 30.1 percent of Indians lived in urban areas in 2010 (2014). The methods in which individuals gain access to water differ greatly by their living location. In 2001, the census reported that only 68.2 percent of households in India had access to safe drinking water. That leaves about 393,366,000 people without it. These affects are seen even more heavily in rural areas where the overwhelming majority of the population lives. In fact, seventy-five percent of India's rural population does not have access to safe drinking water. Eighty percent of all disease and thirty-three percent of all deaths can be attributed to unsafe drinking water in those areas. Even in urban areas, it is estimated that eighty percent of dwellers do not purify their drinking water (Analytique Private Limited 2011). This presents a massive

market opportunity, as water is an essential element of life and millions of Indians are left without it.

More recent estimates note that ninety-four percent of the rural population and ninety-one percent of the urban population have access to drinking water. These numbers may sound more comforting, however, data available with the Department of Drinking Water Supply shows that 130,000 rural habitations are only partially covered, and 15,917 are not covered at all (Khurana and Romit 2). Each of those habitations is a community of many more people. To make matters worse, coverage only refers to installed capacity, and not average actual supply overtime or proper water quality. These two aspects are the most important parts. Just because a community may have installed capacity, does not guarantee that its water supply is continuously running. In fact, in most cases it is not. Furthermore, access to water does not guarantee clean drinking water. Ensuring that individuals with access to water can clean it in preparation for consumption is key. This presents the opportunity for water filters to be used all over the country, and even more specifically in rural areas. With such a large population unable to gain access to proper drinking water, there is an opportunity to develop a solution.

A report published by Research and Markets titled India Water Purifier Market Forecast & Opportunities, 2018 in July of 2013 outlines the strong demand for water filters in the country. It includes extensive research and conversations with purifier manufactures, distributors, and industry personnel. The report has shown tremendous growth opportunities in the last couple of years. Considering the water availability in India, it created a large opportunity for companies to make an entry into the water filters market. The water purifier market revenues in India are expected to grow at the compound annual growth rate of twenty-four percent until 2018. This translates into a seven hundred and sixty million dollar market opportunity by 2015. Rising awareness about water borne disease, increasing disposable income, growing urbanization, and

low penetration levels are exceedingly contributing to those predictions (Research and Markets 2013).

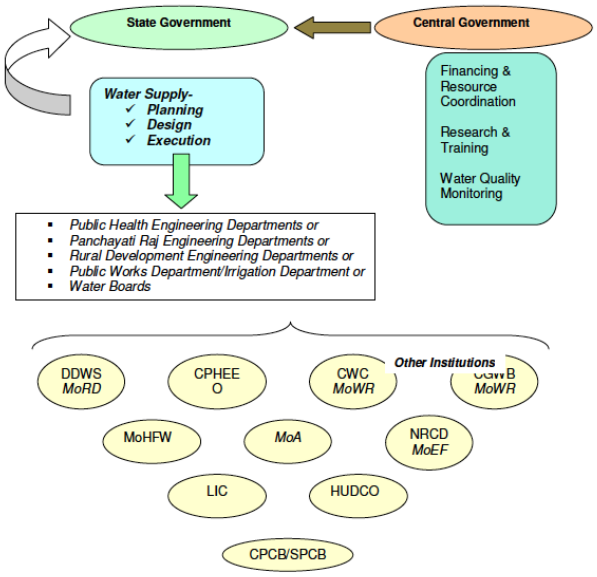
History

Although the current state of clean water supply is weak, India has taken many steps throughout its history to attempt providing the resource for its people. In 1951 the first program addressing a clean water supply was introduced as part of the government health plan. The states built up the Public Health Engineering Department to address this issue. It soon became apparent that the majority of clean water efforts were only being taken in easily accessible villages, and remote or rural villages were being neglected. To address this issue, the Central Government requested that each state take responsibility for its own territories. In the 1970s, the Accelerated Rural Water Supply Program gave each state government the responsibility of developing specific water supply solutions for its own remote or rural villages. The second major push for water reform came with the establishment of the National Drinking Water Mission that was later renamed as the Rajiv Gandhi National Drinking Water Mission in 1991 (Ahluwalia 14). The mission set forth guidelines that helped to formulate the National Water Policies and adopt a community based demand-driven approach to water supply. Although previous efforts saw some progress in certain villages, it was extremely limited. The Indian government currently gives each state the responsibility of providing clean drinking water to its citizens. The task is given in Article 47 of the Constitution of India. With the 73rd and 74th Constitutional Amendments, the responsibility can be divided between larger government efforts and local government institutions.

The states can give the responsibility to the Panchayati Raj Institutions in rural areas or to municipalities called Urban Local Bodies in urban areas. The Panchayati Raj is an old system of

local government in which elders and respected community members form assemblies to govern individual or village issues. Most states plan, design, and execute water supply systems through their State Departments of Public Health Engineering or State Water Boards. The system is traditionally highly centralized with decisions being made at the state level. The role of the central government is to allocate funds and guide investments, encourage research, develop human resources through training, promote water quality monitoring, provide guidelines for programs, and ensure the implementation of water supply programs (Khurana and Romit 14). Shown below, Figure 1 displays a flow chart of both the government and outside organization's responsibilities.

Figure 1: Organization Responsibilities



In 1993, the Indian Constitution and state legislation were amended to decentralize some of those responsibilities including giving water supply and sanitation to local municipalities. In order to ensure sustainability, recent years have seen an increased effort to transfer government responsibility of water supply to lower community levels. However, because of a lack of sufficient resources such as money, technology, and knowledge, a lot of villages are not able to

meet those responsibilities. The necessary operations and maintenance on current ineffective systems is weak.

There are a few more recent efforts that the government has taken in attempt to providing clean water. In 2002 the Ministry of Water Resources established the National Water Policy to emphasize the importance of clean drinking water. It states, "adequate safe drinking water facilities should be provided to the entire population both in urban and rural areas. Irrigation and multipurpose projects should invariably include a drinking water component, wherever there is no alternative source of drinking water. Drinking water needs of human beings and animals should be the first charge on any available water" (Gujarat Institute of Development Research 2005). Although this policy is a direct statement from the government and has been published with the best of intentions, the accessibility of clean water has not drastically improved. That same year, in 2002, India committed to the United Nation's Millennium Development Goals to halve the proportion of people without sustainable access to safe drinking water by 2015. In 2005, the government launched an overall rural development initiative called the Bharat Nirman Programme. It aims to strengthen housing, roads, electricity, phone connectivity, irrigation, and drinking water infrastructure. From 2005 to 2009 the program addressed many water quality issues such as excess arsenic, fluoride, iron, nitrate, and other contaminants in the supply. It worked to enable decentralized demand driven community village water management. In order to make the efforts more sustainable, the National Rural Drinking Water Quality Monitoring and Surveillance program was launched in February of 2006. It takes five people in each Gram Panchayat, or small self-government village, and trains them to carry out regular surveillance of drinking water sources (National Portal Content Management Team 2011). Full funding of financial assistance including water-testing kits was provided. Although the program was successful, it was a small-scale trail for only fourteen villages. Much larger initiatives would be

necessary to properly address the needs of one hundred and twenty eight million others without clean water in India.

The government's responsibility of providing clean water to each state has not been met. Running a clean water supply remains a major obstacle. Because the government lacks the necessary financial resources as well as operation and maintenance services to provide clean water, it is necessary for the private sector to become involved in order to find a solution.

Current state

India is currently home to sixteen percent of the world's population, but it only has access to four percent of the world's freshwater. The primary sources of drinking water in India currently include surface water and groundwater. Groundwater is the predominate source, supplying over eighty-five percent of the population with water. Current estimates indicate that one thousand eight hundred and sixty nine billion cubic meters of water are available from the two sources, however, forty percent of that is not available for use due to geographical or topographical reasons (Khurana and Romit 4). Precipitation brings in four thousand billion cubic meters of water, the majority of which flows into rivers and seas. In addition, ninety two percent of groundwater extracted is currently used in the agricultural sector. Five percent is used in the industrial sector, and only three percent goes to the domestic sector. The distribution of surface water is similar, with eighty-nine percent used for agricultural production, two percent for the industrial sector, and nine percent for the domestic sector (Khurana and Romit 6).

There are multiple issues with the current consumption of both ground and surface water in India. Both sources are constantly contaminated by a variety of different impurities and lead to extensive health issues. The supply of clean water is constantly challenged by a variety of factors. The increasing population, pollution, and over-exploitation all play a role. More

importantly, development, industrialization, and agricultural growth have increased at a rapid pace. These factors combined with limited technological abilities have complicated the situation. Agricultural and industrial waste as well as underground chemicals and minerals are commonly found in drinking water. In addition, sewage discharge and urban run off can also find its way into the water sources. Untreated sewage remains the number one cause of water pollution in the country. Lastly, water quality can also be affected by floods and droughts (Khurana and Romit 9).

In addition to contamination issues, water availability is also on the decline. In 1955, the per capita availability was five thousand three hundred cubical meters per person per year. In 1996 it decreased to two thousand two hundred cubic meters, and was one thousand five hundred forty five cubic meters during the 2011 census. According to the Falkenmark Water Stress Indicator, a country is said to experience "water stress" when annual water supplies drops below one thousand seven hundred cubic meters per person per year. India has already seen consequences of being a 'water stressed' nation; and as the population expands, the risk of water scarcity will only increase. It is a pressing concern. Because water is a finite resource and availability is decreasing, it makes treating available units even more important. Failure to treat water for consumption will result in major negative outcomes.

Health Issues

Poor water quality has already led to enormous health burdens. It is estimated that around 37.7 million Indians are affected by waterborne disease each year. One and a half million children are estimated to die of diarrhea, and seventy three million working days are lost. This economic burden has been estimated to cost Indians six hundred million dollars a year (Khurana and Romit 18).

The health concerns resulting from untreated and contaminated water in India are extensive. Bacterial contamination is the major cause of illness in the country. It causes major illnesses and even deaths, affecting 37.7 million people annually. In India, the major pathogenic organisms responsible for water borne diseases are bacteria, viruses, and parasites. Most common are bacteria such as E Coli, V Cholera, and Shigella. Viruses such as Hepatis A, Polio, and Rota are also widespread along with parasites such as Hookworm and E histolytica. Excess elements contained in the water supply can also have a huge impact on consumers. The type of water filtration technology used to clean water is essential in killing these organisms. The different options are explained in Appendix B below.

Diarrhea is the most common and important health problem caused by a variety of microorganisms such as viruses and bacteria. It causes a person to lose both water and electrolytes, which leads to dehydration, and in some cases death. Ninety percent of deaths caused by diarrhea occur in children under five years of age (UNICEF 2003). Among the other most common diseases due to excess elements are flourosis and arsenicosis. Immediate symptoms of flourosis include digestive disorders and skin disease. Arsenicosis causes acute poisoning such as vomiting and abdominal pain. Both diseases have very serious long-term effects such as cancers, changes in skin, or crippling. According to the United Nations, Gujarat, Rajasthan, and Karnataka are the three worst affected states. Just in those three states alone, sixty five million people have been suffering from fluorosis and an additional five million are suffering from arsenicosis.

In addition to physical sickness and the threat of death, the health concerns discussed above have rippling effects on both the sick individual and the larger community. They hamper socio-economic progress. Disease negatively affects education and results in lost working days. It is estimated that one hundred and eighty million person days are lost annually due to disease (Khurana and Romit 18). One cannot be productive without his or her health. Development is

limited. Disease puts an economic burden on both one's personal household and the nation's economy. On the most basic level, the cost is of treatment and the wage lost during sickness. An individual's absence will also put stress on his or her family to pick up his or her responsibilities. In addition, lost working days will eventually affect national productivity. The government also spends a lot of time and money on treatment for the sick and to provide other supportive services (Khurana and Romit 18).

It should be noted that clean water alone will not solve every issue. The solution to a healthier population will involve an integrated approach including education. India's population must understand the risks of dirty water, the importance of clean water, and the technology behind the proposed solutions.

Economic Growth

With an expanding population, India has also seen economic growth. With a nominal gross domestic product (GDP) of 1.842 trillion United States Dollars in 2012 (World Bank Group 2014), India has the tenth-largest economy in the world. Its GDP has been on the rise, increasing by higher margins in the past few years than in previous decades. From 1951 until 2013, India's GDP Annual Growth Rate averaged 5.8 percent. In 1991, India liberalized its economy by allowing international trade under the guidance of the government. With new liberal and free-market principles in place, the economy saw immediate expansion with relatively large increases in per-capita incomes. Since then, India's GDP has grown at an average of seven percent per year. Much of this growth is due to development in specific sectors and the availability of services. Improvements in both the agricultural and manufacturing sectors as well as the service industry have been the biggest contributors to the expansion.

India has shown to be developing quickly with an expanding population and economy. These factors are beginning to create new demands, none as important as the need for clean drinking water. As the most essential component of human life, water is an important element to all. As the population continues to expand, the issue of ensuring that drinking water is clean will become of upmost importance. Increasing awareness about the dangers of waterborne disease and increasing disposable income will help market conditions. The need for clean drinking water in India therefore provides a huge market opportunity for Company A to penetrate.

Karnataka

Located in the south west of India, Karnataka is one of India's largest states by both area and population. Its demographics are representative of the country, and it will therefore be used as the sample state to build the case for the water filters market in India. The lessons learned by examining Karnataka will be applicable over various regions of the country. By using Karnataka as a sample, it will allow the opportunity to assess more specific past water initiatives and a more tedious investigation of supply chain challenges.

Covering an area of 74,122 square miles, or just under six percent of India's total landmass, it is the eighth largest state by area and the ninth largest state by population. According to the 2011 census of India, the total population is 6,1095,297 people and like the rest of the country, it is growing at an extremely fast pace. From 2001 to 2011, the population grew an incredible 15.6 percent (Census Info India 2011). Similarly, thirty four percent of Karnataka's citizens live in rural areas as opposed to the thirty one percent national average. That leaves the other sixty-six percent in more rural areas with limited access to the same amenities as the urban population.

Karnataka has seen the same drinking water challenges as the rest of the country. With more than ninety percent of habitations depending on groundwater, it sees the same deteriorating water quality as many other states. Governance and management has not been able to provide adequate drinking water or make much progress in rural areas. In addition to inadequate coverage, measurement of those systems already created and functioning is challenged. A study of the rural water supply done by the government's Directorate of Economics and Statistics in 2001 found that the small percentage of rural areas with installed capacity does not actually see sufficient water supplied. Often claims are made based on installed capacity rather than the actual service provided to villagers. Ninety two percent of hand pumps, ninety four percent of mini water supply schemes, and eighty six percent of piped water schemes were found to supply less than fifty five liters per capita per day (Puttaswamaiah 10). Bangalore, the capital city of Karnataka, has also seen these increasing demands for clean drinking water as its population is also growing at an increased pace. Drawing from the two main rivers in the state, the Cauvery River and the Arkavathy River, Bangalore represents the need for filtration systems in urban areas. Excess elements such as fluoride, iron, and nitrate have adversely affected drinking water quality for those in both the urban and rural settings. A survey conducted by the High Power Committee of seventy-six towns found that twenty nine percent of the water supply was unfit for drinking, salty, or contaminated (Puttaswamaiah 10). Gastroenteritis, viral hepatitis, and malaria were also commonly found in these regions. Tables 1 and 2 below display the exorbitant number of incidences of these cases throughout the state.

Table 1: Incidence of Water-Borne Diseases and Deaths

Year	Gastroenteritis		Cholera		Malaria		Viral Hepatitis		Typhoid	
	Cases	Deaths	Cases	Deaths	A	B	Cases	Deaths	Cases	Deaths
1997	23665	307	741	10	7726512	181450	1714	4	2880	5
1998	26832	501	434	2	7568155	26776	3824	2	8242	4
1999	17743	126	134	3	7405711	93651	4792	2	23946	2
2000	31132	265	354	3	131	NA	3077	10	8	NA
2001	23893	198	342	1	NA	NA	5438	28	33346	6

Source: Department of Health and family Welfare, GoK

A: Total Blood smear collected and examined B: total positive cases

Table 2: Status of Water Quality by Habitations in Karnataka State (2002)

Sl No	District	No. of habitations affected by				Total No. of habitations affected	% of Affected habitations	Total No. of Habitations
		Excess fluoride	Brackishness	Excess Nitrate	Excess Iron			
1	Bagalkote	135(21.29)	158(24.92)	33(5.21)	88(13.88)	414	65.30	624
2	Bangalore (U)	262(20.39)	224(17.43)	0(0.00)	318(24.75)	804	62.57	1285
3	Bangalore (R)	406(11.96)	148(4.36)	411(12.1)	189(5.57)	1154	34.00	3394
4	Belgaum	134(8.9)	159(10.56)	1(0.07)	419(27.82)	713	47.34	1506
5	Bellary	489(41.87)	91(7.79)	38(3.25)	26(2.23)	644	55.14	1168
6	Bidar	37(4.56)	56(6.90)	123(15.2)	1(0.12)	217	26.72	812
7	Bijapur	200(21.55)	241(25.97)	19(2.05)	113(12.18)	573	61.75	928
8	C.R.Nagar	34(4.10)	27(3.25)	425(51.20)	173(20.84)	659	79.40	830
9	Chikkmagalore	51(1.52)	77(2.29)	136(4.04)	524(15.57)	788	23.41	3366
10	Chitradurga	519(37.91)	345(25.20)	126(9.20)	87(6.36)	1077	78.67	1369
11	D.Kannada	2(0.06)	4(0.13)	0	294(9.37)	300	9.56	3137
12	Davangere	358(33.03)	156(14.39)	288(26.57)	1(0.09)	803	74.08	1084
13	Dharwad	49(9.92)	115(23.28)	1(0.20)	74(14.98)	239	48.38	494
14	Gadag	127(36.29)	42(12.00)	0	0	169	48.29	350
15	Gulbarga	443(19.29)	59(2.57)	3(0.13)	148(6.45)	653	28.44	2296
16	Hassan	159(4.08)	181(4.64)	39(1.00)	323(8.28)	702	18.00	3900
17	Haveri	77(12.22)	113(17.94)	130(20.63)	198(31.43)	518	82.22	630
18	Kodagu	3(0.52)	0(0.00)	6(1.05)	306(53.40)	315	54.97	573
19	Kolar	509(13.60)	319(8.52)	1005(26.86)	109(2.91)	1942	51.90	3742
20	Koppal	477(67.28)	50(7.05)	0	4(0.56)	531	74.89	709
21	Mandya	158(8.44)	518(27.66)	51(2.72)	684(36.52)	1411	75.33	1873
22	Mysore	105(5.43)	434(22.44)	121(6.26)	288(14.89)	948	49.02	1934
23	Raichur	322(26.42)	195(16.00)	129(10.58)	51(4.18)	697	57.18	1219
24	Shimoga	89(2.01)	87(1.97)	2(0.05)	362(8.18)	540	12.21	4424
25	Tumkur	658(12.00)	585(10.67)	976(17.8)	1490(27.17)	3709	67.63	5484
26	Udupi	11(0.20)	2(0.04)	1(0.02)	218(3.87)	232	4.11	5640
27	Uttara Kannada	24(0.62)	74(1.90)	13(0.33)	145(3.72)	256	6.56	3901
	TOTAL	5838(10.30)	4460(7.87)	4077(7.19)	6633(11.70)	21008	37.06	56682

Note: Figures in parenthesis are percent to total number of habitations

Source: Rural Development and Engineering Department

Even those charts are still gross underestimates as the data on incidence of water borne disease is from the Department of Health and Family Welfare, which does not include cases reported in private health centers (Puttaswamaiah 25).

Karnataka's Rural Development and Panchayat Raj Department is the agency responsible for planning, implementing, monitoring, and evaluating all rural development water activities. A lack of funding, education, and manpower has restricted the department from accomplishing its goal of providing clean water to all rural habitations. In addition, there is no well-defined agency responsible for monitoring the water quality in rural areas. The Rural Development Engineering Department is supposed to test water quality in newly installed systems such as bore wells, but once it passes the initial test, it is no longer monitored. Other institutions such as the Public Health Institute, District level Health Laborites, the Department of Mines and Geology, as well as the Zilla Panchayats should also be playing a part, but inadequate staff and equipment have prevented them from getting the job done. It is therefore both necessary and beneficial to involve companies in the solution to provide clean water.

Chapter 3

Methodology

In order to identify specific strategies for Company A to penetrate the Indian market for water filters, extensive research was conducted. It consisted of both gathering information from the Internet and interviews with experts in the field. Internet research consisted of government and private agency studies and reports. Documents from international organizations such as WaterAid and The World Bank were closely examined. Reports from the Gujarat Institute of Development Research and the Karnataka Government's Infrastructure Development Department also offered data, research, and strategies. GRASP Analytique Private Limited, a local Indian consultant group provided consumer data and preferences as well as local market conditions. Competitor's websites were also profiled for alternative product offerings.

Interviews took place with employees of Company A, United States Agency for International Development (USAID) officials, and local Indian townspeople. Company A provided interviews with individuals from different areas of the business. For confidentially reasons their names will be abbreviated. D. Franklin came from a very strategic and high-level supply chain operations position, while T. Gulati worked on the ground in India as a local marketing manager. From USAID, Trevor White was able to provide insight on how residents in underdeveloped and developing countries react to new practices. Lastly, Julie Muncy, an Indian born and raised Marine Corp member was able to provide a firsthand account of growing up in the rural country and highlight complications of operations in the area.

A case study was also conducted for the background, findings, and recommendations. In order to make the supply chain strategy more tangible, the state of Karnataka was used to examine current efforts and provide an example of how the strategies might be implemented.

Chapter 4

Findings

Operations

Interviews with Company A employees provided great information on how its business model and supply chain operates for the Filter X in the Indian market. First-hand experience from a Company A Supply Chain Operations Director, D. Franklin, and regional marketing manager, T. Gulati, revealed exactly how Company A currently operates. Although it is doing many things very well, a detailed examination of the market and competitor's products revealed that Company A may have to make some changes to its current business if it wishes to grow its market share in the future. The current Filter X product uses reverse osmosis technology and is designed for installation in the pipes of a home plumbing system. It is a great solution for individuals in urban areas with installed plumbing; however, many competitors have developed non-electric stand-alone filters that are becoming increasingly popular. Company A must look into developing a similar product if it wishes to stay relevant, especially with the rural population.

An interview with T. Gulati revealed major cultural and societal differences between retail in the Unites States and India. Although the backend or internal side of the Filter X supply chain is running smoothly, major challenges exist with the selling channels in India. An overview of the internal supply chain is given followed by a more detailed description of the external marketing and distribution challenges.

The internal supply chain for the Filter X product is well established and has been operating rather smoothly in the recent past. All filters are produced at Company A's

manufacturing plant in Edina, Minnesota. Once a forecast is established, the purchasing department determines the necessary inventory of raw material and places orders with domestic suppliers. Both Company A and its suppliers hold safety stock of raw materials in order to overcome supply variability. Replenishment quantities are reviewed quarterly, and multiple suppliers may be used for the same item. This system runs smoothly and does not need any adjustments. The product can then either be shipped via ocean or air depending on urgency. Once it arrives in India, the filters will go to one of two third party distribution centers. One is located in the west close to Mumbai and the other is up north in New Delhi. Company A rents space from the distribution centers, but does not own or operate them. Distributors are then used to provide the product to regional sellers that transport the product to stores. At this point, Company A loses its tight control over operations and becomes subject to complicated selling channels.

Gulati's description of the market can help provide an explanation of those loose selling channels. He describes the market for water filters as being forty percent 'organized' and sixty percent 'unorganized'. The 'organized' market refers to quality brand owners selling directly to technicians and customers in retail outlets. These are filters that must be installed by a skilled technician. Customers will often times call a technician directly to install a water filter. The technician then has the responsibility of purchasing the filter, and in turn can become Company A's customer. Homeowners can also purchase replacement filters on their own. Companies therefore have to sell their products both to technicians and the homeowner or end customer. Currently, Kent and Forbes are dominating this market, but many other established companies are trying to break in. The 'unorganized' market consists of smaller companies attempting to build a brand name. These companies do not advertise or take part in promotions. They sell their products in small shops mainly in cities. Many of the staff have worked for larger companies in the past and now buy their own supplies and manufacture the product independently.

A lack of control exists in both markets. Even in the 'organized' market, retailers have the final say in pricing. There are no laws governing maximum prices. This makes it difficult for Company A to establish itself. There is tight competition from well-established brands and retailers in India do not operate in the same fashion as in the United States. Retail stores are more representative of 'mom and pop' shops than they are large retail chains. Employees are rarely educated on the products being sold in their shops. They only care about their own margins, and not which products move. Product information is therefore rarely passed onto the customer. This makes it difficult for Company A because customers often do not know what they are buying or which product is best for their needs. There are also regional gaps in both markets where distribution is limited, and the Filter X product is unavailable.

It should also be noted that budget constrains have prevented Company A from mass marketing or setting up online purchasing. Although Company A is currently working with technicians to push its product, it is not advertising on a large scale. Online purchasing of the Filter X product is another option that may be explored in the future. It would require too large of an investment at this time.

Urban Setting

The current Filter X can serve as a great solution for those families located in more urban areas with plumbing and the necessary funds to pay a technician. Demand for the filter will continue to be strong in urban areas. As GDP rises and urban city residents become wealthier, they are able to spend more on water systems. In addition, the government has demonstrated that more frequent or continuous water supply is possible in urban areas. This fact will only continue to increase demand for the filter as it becomes more useful.

An example can be seen with The Karnataka Urban Water Sector Improvement Project. The project was a collaboration between the Karnataka state government and The World Bank. It served as a pilot to prove that a continuous water supply is possible in Indian urban homes. The project was successful, and brought constant water supply to three cities in Karnataka. However, even with a more continuous supply possible, unexpected intermittent service will unavoidably occur from time to time. During the intermittent service, when pressure in the pipes drops, water that had been leaking out of faulty joints or holes can be sucked back in. It is possible that the water could be polluted by wastewater seeping from toilets, septic tanks, domestic drains, and road drains (Water and Sanitation Program 2010). A filter such as the Filter X product is thus necessary to ensure safe drinking water in those urban areas with installed pipes.

In the past, urban residents may not have been as likely to invest in a filter if the water supply was very low or inconsistent. Because recent government efforts have proven more effective in bringing a more constant supply to cities, residents are now more likely to invest in a filter. The Filter X serves as a solution for these urban residents.

Alternative Markets

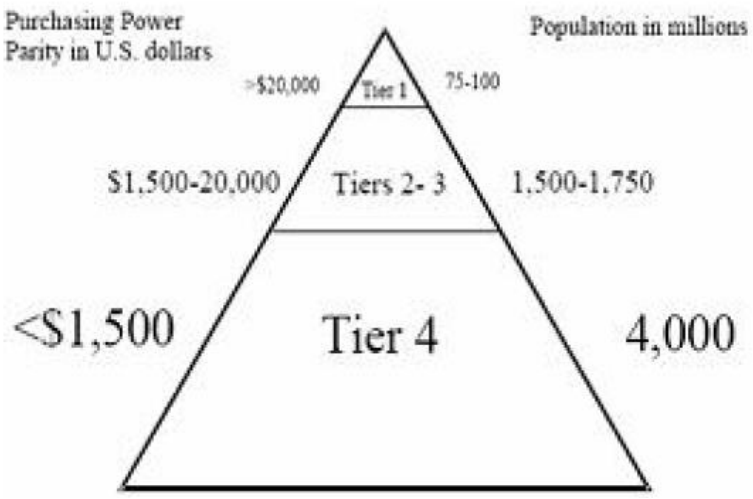
Apart from the market opportunities presented with the current Filter X technology, there is another section of the Indian market that presents a big opportunity. A review of competitor's products reveals a huge gap in Company A's presence in the Indian water filtration market. Many competitors such as Eureka Forbes, Kent Health Care Products, Tata Chemical Limited, and Hindustan Unilever Limited are selling non-electric and stand-alone filters. A more detailed description of competing companies and their product offerings can be found in Appendix A. Company A does not offer a similar product at this time. These water filtration units are based on a rather new method of product development. They target rural areas where lower income

individuals reside. The term 'bottom of the pyramid' has been coined to refer to this market. Company A's competitors have invented new product lines specifically to fit the desires of this market. Their efforts are based on an untraditional business model. They use different marketing forces and even participate in helping customers finance their purchases. A close examination of Company A's product offering against its competition's new products reveals that there is room for immense growth. A few small innovations in product development will reveal a whole new set of potential buyers.

Bottom of the Pyramid

Coimbatore Krishnarao Prahalad was a very accomplished academic and professor, often being referred to as one of the most prominent business thinkers in the world. He coined the term 'bottom of the pyramid' to describe the poor and underserved section of the market. He said "if we stop thinking of the poor as victims or as a burden and start recognizing them as resilient and creative entrepreneurs and value-conscious consumers, a whole new world of opportunity will open up" (Analytique Private Limited 2011). C.K.Prahalad's philosophy can provide a new way of thinking and can expose huge market opportunities. His writings should be closely examined to provide a thought process for product innovation. In economics, the bottom of the pyramid (BoP) represents the largest but poorest socio-economic group. Using this new business model, Company A can tap into an expanded customer base. In India, the BoP market represents about 1.205 trillion dollars in purchasing power parity terms, which makes up 84.8 percent of the total 1.42 trillion dollar national household market. This encompasses a huge piece of the global BoP market. In the World Economic Pyramid, shown below in Figure 2, the base of the pyramid is defined as having a purchasing power parity of less than one thousand five hundred dollars.

Figure 2: The World Economic Pyramid



It includes four billion people across the world and represents an economic opportunity of thirteen trillion dollars per year, just in the water filtration business alone. C.K.Prahalad writes that companies need to re-engineer their products and marketing strategies to reflect the different economics of the BoP and enter into this market. It involves small unit packages and low margins per unit, but very high volume. Innovations could improve the lives of millions and greatly expand economics in India and possibly at the global level.

Product Development

A local Indian market research company, Grasp Analytique Private Limited, recently evaluated the market potential for water purifiers specifically for the BoP market. Under the name Project Jal, the firm published a summary report detailing its findings. It evaluated several companies and best practices to both fulfill commercial agendas and effectively serve the market.

Through many market surveys, the project identified three key aspects that every consumer looks for in a water filtration solution. They are that the system or filter must be non-electric, contain a storage facility, and have low maintenance costs. Company A's current product is missing one of those three components. It lacks a storage facility. This major difference between their product and the customer's requirements is a major concern. Examples of solutions are provided by the current competition. As seen below Figures 3 and 4, both Forbes and Unilever have attached plastic storage units to their filters.

Figure 3: Eureka Forbes Xtra Tuff

Figure 4: Unliever Pureit Compact

Because other companies offer a product providing all three requirements, Company A must develop a way to include a storage facility attached to their filter if it wishes to be competitive in the market. Innovation and product development are therefore necessary.

Finance

There are a few other strategies that should be examined when reaching the BoP market. Project Jal highlights the use of microfinance institutions as a key tool in serving the BoP

customers. Microfinance institutions play a role not only in helping customers to finance their purchase, but also in marketing and distributing the filters. They have been extremely successful in the recent past.

Microfinance institutions serve as a connection between rural populations and companies. By working with self-help groups in rural communities, these institutions gain a great understanding of customer needs and are able to market the water filters effectively. They serve as a marketing tool by going to communities and households to sell the filters face to face. Their presence can also help to generate more demand because they bring greater awareness to the issue of clean water. They have a huge reach, currently accessing fifty million clients. Many Indians strive for status symbols instead of products that may be more beneficial to their health, and these groups are able to stress the importance of clean water, in turn generating more customers. They use loan officers who link the company and the rural populations, providing customer intelligence while also simultaneously marketing the purifiers to the self-help groups. The self-help groups are created by the microfinance institutions and are made up of a group of around twelve individuals. The group meets regularly to pool savings, seek income-generating loans, and make repayments. They act as retailers on the ground in each village and receive a percentage of each sale. Joining a self-help group is a form of employment and benefits the participants by providing a source of extra income. The companies and microfinance institutions benefit from having a physical sales force working close to the customers.

The self-help groups are not only a business opportunity, but also can be looked at through a humanitarian lens as a socially responsible act. Many self-help groups set up by the microfinance institutions are comprised of all women. The groups train each woman to become an entrepreneur. By educating women in the business world, many institutions hope that self-help groups will not only help their profitability, but also bring about more long-term community benefits. Some of these include increased nutritional benefits, literacy, family planning, and help

containing the population growth. For example, one of the biggest NGO microfinance institutions in the area is Swayam Shikshan Prayog. Founded by Prema Gopalan, Swayam aims to empower women as leaders and entrepreneurs by acting as a learning and development organization to build competencies, collaborative platforms, and partnerships. Under its Sakhi Unique Rural Enterprise (SURE) focus, the group develops retail businesses for its members and its company partnerships (Swayam Shikshan Prayog 2014). When explaining the benefits of microfinance institutions and self-help groups, Prema Gopalan said, "companies value the fact that we are a social network." This system benefits both the rural communities and each company's bottom line.

A variety of companies are using microfinance institutions to sell their goods to the rural Indian population. Godrej & Boyce is using them to sell seventy-dollar mini refrigerators, Nokia uses them for mobile phones, and Metro uses them for a large selection of its household merchandise. Household water treatment and storage companies are the next industry to put them to use. Forbes, the producer of the Aqua Sure filter, has teamed up with the microfinance institution Basix. Their sales for the product have increased twenty percent since the partnership began. Another highly talked about rural micro-enterprise project is Shakti, commissioned by Hindustan Unilever. Unilever has partnered with microfinance company Village Financial Services Pvt Ltd. to sell their Pureit water filter. The targeted beneficiaries are offered loans at a zero percent interest rate to buy the purifier. The loan is then repayable weekly over a period of eight months. Started in 2000, the project employed forty eight thousand entrepreneurs by 2012. They were spread out across one hundred and thirty five thousand villages and able to reach over 3.3 million households. The average income for a woman in the project is five hundred Rupees per month. In fact, thirty percent of these entrepreneurs earn more than the rural per capita income (Hindustan Unilever Company Website 2014). Projects such as this do require significant resources in the form of employee's time and company funds and should therefore be approached

with caution. However, these unique marketing strategies and distribution methods do hold much promise.

By using microfinance institutions with self-help groups, many companies have eliminated the traditional model of using retailers, and have created a new distribution chain. Their initial goal of gaining more customers by providing a method of financial assistance also translates into a marketing strategy and distribution system. The use of self-help groups is emerging as a newly established retail channel. This package deal has proven very effective and should be considered as a major strategy for Company A to penetrate more areas of rural India.

Chapter 5

Recommendations

The Filter X currently serves as a great solution for urban residents with an installed plumbing system. As the government works to improve urban water supply, demand for the filters will only increase. Demand for water filters will also increase in more rural areas as the national GDP increases and Indians have more disposable income to spend on necessities. However, as previously stated, the water filtration units needed in rural areas differ greatly from the water filters that urban residents can install. Rural communities need stand alone and non-electric filters with storage capabilities. It is recommended that Company A develop a water filtration unit to specifically meet their needs.

In order to compete with other companies, it is recommended that Company A look into adopting the 'bottom of the pyramid' methodology. It needs to design a filtration unit that specifically meets customer's needs at a reasonable price point. In order to do so, steps must be taken in product development. New marketing, finance, and distribution methods are also necessary. Strategic actions for each function are discussed below in more detail.

As detailed in the previous chapter, rural residents require that their filters are non-electric, contain a storage facility, and have low maintenance costs. The current Filter X is not attached to a storage unit. Company A must develop a new design to attach a storage unit to its current water filter. This aspect is necessary to compete in rural areas. Rural dwellers do not have pipe connectivity or a constant water supply. The storage tank allows individuals to gather water from a variety of sources such as bodies of water, wells, or community pipes, and pour it through the unit to ensure that it is safe for consumption. Customers in rural areas would have no

use for the current Filter X without the addition of the storage facility. The development and production of a new product can extensively complicate the current supply chain. When asked about product innovation, D. Franklin was quick to point out that a partnership would be necessary. Company A's concentration is on the water filtration technology and not plastic storage construction. He is open to the idea of developing a product using the current Filter X with a storage tank, but did point out that Company A would not develop or manufacture the tank itself. In order to penetrate the BoP market, Company A is tasked with working with another company to develop the storage unit. The final product would be the result of a partnership as opposed to an independent product development project. Identifying and working with the necessary partner to construct the final product will be a main challenge for Company A. It will include the development of compatible parts, cost negotiations, production and assembly discussions, and many other aspects. In addition, it may be beneficial for Company A to revisit pricing on its current components for the filter. Because the BoP requires a lower price point, if Company A can lower or readjust component pricing, it would help their strategy greatly. Qualifying less expensive suppliers that still ensure excellent quality should also be considered.

Innovative marketing and finance strategies should be accomplished by working with microfinance institutions. As detailed above, these groups have proven to be extremely effective by working with self-help groups. The agencies are able to market directly to the targeted customers and help them make the purchase. Company A should seriously consider working with a microfinance institution to penetrate the market. There are numerous institutions currently in business, but some of the most popular are Swayam Shikshan Prayog, Basix, and Village Financial Services Pvt Ltd. These organizations have an extensive reach into rural communities and will ensure sustained long-term growth.

Distribution

Distribution is the last main operation that could use reform. Although Company A is currently working with third party partners, the details of its operations could not be released for confidentially reasons. Therefore, recommendations are provided without specific knowledge of current operations and should be taken as possible improvements to an already existing system.

Customer accessibility in a large country such as India is extremely challenging, but the use of more warehouses can cover additional regions and extend accessibility to more end customers and technicians. This strategy can be used for the urban areas where the current Filter X is sold and in rural areas where a newly invented product might be sold. Because India is such a large country, the state of Karnataka is used as an example of how additional distribution methods might work state or countrywide. The goal of the examination is to provide opportunities for improved regional accessibility through distribution. Lessons learned from Karnataka should be applied countrywide to give Company A more control over the final point of sale.

In order to expand distribution to more customers, three warehousing companies were found with various locations in Karnataka. They are the Central Warehousing Corporation (CWC), Karnataka State Warehousing Corporation (KWSC), and Karnataka State Food and Civil Supplies Corporation Limited (KSFCS). By renting space from each company, Company A can have its product in additional locations. This would make it easier for self-help groups, end customers, and technicians to access the product.

The Central Warehousing Corporation was established in 1957 and is currently one of the biggest public warehouse operators in the country offering logistics services to a variety of clients. It handles more than four hundred commodities, many of which are agricultural products

or related finished goods. Partnering with the CWC would allow Company A to store its product across the state. Out of the thirty districts that make up Karnataka, the CWC has warehouses in twenty-three of them. Some districts even contain more than one warehouse, such as Bangalore, which has seven. Table 3 displays a breakdown of each district, its warehouses, and their capacities (Infrastructure Development Dept. Government of Karnataka 2010).

Table 3: Warehouse Capacities by District

District	Name of the warehouse	Total capacity in '000 Tonnes
Bangalore	Bangalore I	25.54
	Bangalore II	5.93
	Bangalore V	5.02
	Bangalore X	1.66
	Whitefield	5.90
	Hoskote	4.28
	Bangalore MSIL premises	
Bellary	Amarapura	22.39
Bidar	Bidar	10.00
Chitradurga	Chitradurga	27.52
Davangere	Davangere	25.93
Dharwad	Dharwad	13.33
Gadag	Gadag	48.25
Gulbarga	Gulbarga I	9.78
	Gulbarga II	35.00
Dharwad	Hubli I	11.44
	Hubli II	9.31
Koppal	Koppal	1.48
Mandya	Maddur	4.67
	Mandya	5.19
Dakshin Kannada	Mangalore I	18.72
	Mangalore II CFS	14.70
Gadag	Nargund	10.69
Raichur	Raichur	4.68
Gulbarga	Sedam	3.60
Shimoga	Shikaripur	8.02
	Shimoga II	13.75
	Shimoga III	19.13
	Shimoga IV	68.23
	Shimoga V	17.34
Belgaum	Soundatti	9.00
Tumkur	Tumkur	23.93
Bellary	Toranagallu	121.83
	Hospet	12.22
	Bellary	15.30
Raichur	Munirabad	6.01
Chikmagalur	Chikmagalur	29.52
Hassan	Hassan	8.66
Coorg	Kushalnagar	12.06

Source: CWC

The second agency that Company A should consider working with is the Karnataka State Warehousing Corporation. The KWSC is officially a wing of the CWC, but it functions independently with respect to warehousing in the state. The KWSC operates one hundred and

twenty three warehouses in Karnataka in seven regions: Bangalore, Mysore, Shimoga, Gulbarga, Davangere, Hubli, and Raichur. Its locations can be seen in Figure 5 below.

Figure 5: Karnataka State Warehousing Corporation Locations

The average capacity utilization of all one hundred and twenty three warehouses is 74.8 percent (Infrastructure Development Dept. Government of Karnataka 2010). Being that this is an average, some warehouses are at a much higher capacity while some are at a much lower capacity. Although some warehouses may already be too full for Company A's product at this time, there are upwards of eighty warehouses that could store the filter.

The last organization that Company A could consider working with is the Karnataka State Food and Civil Supplies Corporation Limited. The KSFCS is different from the previous two organizations in that it is a government undertaking and aims to sell agricultural products to poor citizens at reasonable prices. It is not a business based on running large distribution centers, but rather running a Public Distribution System to ensure that all families of Karnataka have access to affordable food. It has a far reach, with one hundred and eighty-seven wholesale points

and about one hundred and ninety-four retail points in twenty-six districts of the state. Although not an agricultural product itself, water filters do fit into the mission of the KSFCS as a tool for clean water. The KSFCS aims to provide all individuals in Karnataka with the bare necessities of life, and clean water fits into that profile. It is recommended that Company A work with the KSFCS differently that the first two agencies. With the CWC and KWSC, Company A would still own or at least have control over the filters in the warehouses. The filters would be kept in those locations to give Company A a farther reach across the state to retail its product. However, with the KSFCS, Company A should sell their water filters directly to them as a customer. The KSFCS could then sell the filters to its final customers, just as it sells any other products. This method would take advantage of the advanced distribution system that the KSFCS already has established. Once again, because the KSFCS works with lower income families, Company A will have to watch its price carefully.

Other organizations

Along with the potential partnerships described above, there are many other organizations that Company A could partner with to more effectively sell their water filtration units. In addition to microfinance and self-help groups, there are many governmental and non-governmental organizations that can help. Started by the World Bank, one example is the Village Water Supply and Sanitation Committee (VWSSC). Having worked in the area for many years, it has learned how to most effectively work in many communities. Company A could explore the possibility of working with the VWSSC to introduce its technology and spread knowledge of its existence and use throughout rural communities. Perhaps the VWSSC could work to set up community outlets in which the product is sold. They could facilitate a purchasing point, such as a station set up in community, or help spread word of the technology by engaging in door-to-door

visits. By using demand-driven based approaches and bringing decision making down to the village level where users can decide the type of technology, location of facilities, terms of use, and charges, the VWSSC has been able to facilitate numerous projects. It has identified transparency, participation, inclusion, and ownership as the four key features to any project's success. Company A can use the VWSSC's previous experience as a catalyst to selling its technology in those locations. The VWSSC is also aware of fundamental social and cultural differences in Karnataka that may affect the market. For example, in the south and along the coast, women's status is relatively high. Girls and boys receive equal levels of education and women are relatively mobile and confident. In contrast, in the north, girls' education levels fall well below boys, and women are less mobile (Why Some Village and Sanitation Committees Are Better than Others 5). The VWSSC has also worked with local governments, NGOs, and the Public Health Engineering Department. Their history and experience working with these partners can help Company A know which resources would be most effective.

Company A Ethics

By engaging in internal changes such as product development, and making adjustments to marketing, finance, and distribution along with forming new partnerships, Company A can see an increase to its bottom line. Not only will these actions earn an additional profit, but more importantly, they also align with Company A's sustainability efforts in India.

Company A's Multiply The Message campaign concentrates on environmental education in India. Many of its lessons are based on water and conservation. By educating teachers on water quality issues and correct practices, Company A is able to reach many communities. Those teachers each go back to his or her local school and spread the message. Understanding the risks associated with drinking untreated water will prompt residents to use the new technology. As

Trevor White from the United States Agency for International Development explained, individuals will not adopt new practices if there is no immediate risk presented with the old methods. Continuing to educate residents aligns philanthropic efforts with creating product demand. Aligning business goals with company ethics is a win-win situation.

Concluding Remarks

The absence of clean water can have severe consequences on an Indian's health and livelihood, and it hinders socio-economic progress. However, as India's population grows and its economy continues to expand, market conditions will continue to improve. With a national population over 1.2 billion people, India represents a massive market opportunity. The hard part of designing the filtration technology is already done, and the challenge remaining is tweaking it to serve both segments of the Indian population. The importance of clean water is now at the forefront of company initiatives. Water filters are no longer only a luxury good designed for affluent households. They are now being developed at low prices and becoming increasingly popular in rural households. Company A has the opportunity to serve both markets by continuing the sale of its current Filter X to urban residents and updating its design to serve the rural population. By redesigning the Filter X product and adopting a few supply chain suggestions, Company A can break into this evolving market.

As discussed above, the design of a non-electric filtration system with a storage facility is key. Innovation and product development should become the focus to serve rural residents. In addition to the product itself, other strategies such as the use of microfinance institutions and self-help groups should be used. These forces have allowed companies to reduce their reliance on the traditional retail model and engage in new marketing tactics and distribution methods. Self-help groups provide education to customers by stressing the importance of clean water and therefore

create additional demand. Their marketing methods have been extremely effective. Their ability to help customers pay for the purchase allows for a larger number of qualified buyers. Lastly, because these groups travel on the ground and take the product with them when meeting face to face with customers, Company A can give them responsibility for the last leg of distribution. As these groups become more popular for the sale of goods, the household water treatment business will be the next to put it to use. Company A should be actively engaging with these organizations to form partnerships and get ahead of the competition.

Company A should continue to monitor the flow of both its Filter X and BoP product throughout the country. Dangers exist in both the organized and unorganized markets, but working with local sales forces to place the products in the proper stores with educated employees is key. Monitoring the product flow through each part of the supply chain is necessary to ensure that corrupt practices do not take place. As always, price point will still remain a major focus for Company A. Although selling to the BoP market involves lower profit margins, the high volume of customers will ensure that company efforts are profitable.

Moving forward Company A should also look into producing its water filters at more than location. Restricting production to only one plant in Minnesota is high risk. Bad weather has the potential to stop the flow of supplies, production, and shipments for unlimited time periods. A second area of importance is through the online distribution channel. It is highly recommended that Company A develop a method of online retail for their product. As more and more customers gain Internet accessibility, the ease of ordering online will increase. Competitors are already taking action in developing this channel, and it is of upmost importance that Company A provides the option.

Overall, the market for water filtration units in India represents a huge opportunity for Company A. Strong efforts to continue the sale of the Filter X product should continue with improved distribution methods. Using the BoP methodology, a few changes in product

development can open up the rural population as a new customer segment. Both of these groups hold a huge promise for the growth of Company A's water filtration systems. Not only do they represent opportunities to make a profit, but also to positively contribute to society in an ethical manner.

Appendix A

Competition

Although the Indian water filter market presents an opportunity for growth, Company A must be careful in how it enters the market. There are already a few established companies attempting to gain market share in the playing field. There are currently four big players in the non-electric segment for water filters in India. They are Eureka Forbes, Kent Health Care Products, Tata Chemical Limited, and Hindustan Unilever Limited. Each of these companies is offering a few different products to accommodate various price points, capabilities, and additional features. Of the non-electric market, ultra filtration filters consume two-thirds of it, while one third is shared between reserves osmosis and chemical purifiers. Of the reverse osmosis market that Company A will be competing in, Eureka Forbes currently holds approximately sixty percent of the market share, and Kent Health Care Products holds close to the remaining forty percent. Although all competitors must be profiled in order for Company A to successfully enter the market, Eureka Forbes and Kent are of upmost importance, as they will be the closest competition with very similar product offerings. Below is a summary of all competitors including their product offerings, pricing, strategies, and more.

Eureka Forbes produces their non-electric water filters under the brand name AquaSure. With four different product offerings, ranging from one thousand three hundred and ninety-nine to six thousand nine hundred and ninety nine Rupees, it offers a variety of filtration systems with additional capabilities. Its two most popular products are the AquaSure Xrta and Aquqsure 3PCTi. Retailing for one thousand three hundred and ninety Rupees, the AquaSure Xrta is a portable tabletop filtration system with a built in storage tank. It has a sixteen-liter capability, and does not require boiling or running water. The unit is also noted to contain a tough plastic outer

body and contains U.S. E.P.A. registered technology. The Aquqsure 3PCTi is an upgraded filter providing extra features such as a twenty-liter storage tank and natural shut off. It is also suggested that the cartridges be replaced after every one thousand and five hundred liters. For a family of five, who uses an average of ten liters per day, the water filter will be good for five months. Eureka Forbes does not distribute their AquaSure line internally. They use third party providers such as home appliance and retail outlets. Although the company does display production information on its website, online purchasing is not an option.

Based in India, Kent Health Care Products is another major competitor. Kent specializes in reverse osmosis water purification. It currently holds forty percent of the reverse osmosis market share in India, selling more than two hundred twenty five thousand five hundred filters each year. Kent produces five versions of its basic water filtration system. The versions are the Kent Gold, Kent Gold Plus, Kent Gold Optima, Kent Gold Cool, and Kent Crystal. They are all storage filtration systems ranging in price from one thousand one hundred and fifty to two thousand nine hundred, and ranging in capacity from nine liters to twenty liters. The filters operate on a fully automatic non-electric ultra-filtration system and kill all bacteria and viruses.

Tata Chemicals is an Indian global company also competing in the Indian water filters market. It concentrates on price point. Its leading product, the Tata Swach, aims to serve low-income groups. The company's filters use a unique technology. Water purification is carried out by using rice husk ash impregnated with nano silver particles. Rice-husk ash, which is produced from heating rice husk in combination with pebbles and cement, provides activated silica and carbon to reduce the turbidity of the water and absorb non-polar impurities. The addition of the nano silver particles destroys disease causing bacteria, germs, and other organisms. Using the rice-husk ash base allows Tata Chemicals to start off with a very low cost model, resulting in a lower final price point. Tata Chemical produces a few variations of the product, each with additional capabilities. The Tata Swach Smart Magic retails for four hundred and ninety nine

Rupees, the Tata Swach Smart retails for seven hundred and forty nine Rupees, and the Tata Swach retails for nine hundred and ninety nine Rupees. They increase in water holding capacities from seven and a half, fifteen, and eighteen liters. The filter life is three thousand liters. Most filters in the industry expire after only one thousand five hundred liters. In addition, the Tata filter has an intelligent mechanism of measuring the amount of water passed through the bulb and the ability to shut off water flow after its purification capacity reaches three thousand liters. Having a low price point with a filter that lasts twice as long as the average gives Tata Chemicals an advantage in the market. In addition, being an in country company, consumers are able to purchase the filters directly through Tata Chemical's website and even receive free shipping.

Entering the market in 2005, Hindustan Unilever Limited is a new competitor in the Indian water filters market. Unilever took a unique approach to developing its water filters, one that started by working directly with consumers and nongovernmental organizations. Its research and development for the product line should not be overlooked, as it may provide a great case study for Company A to evaluate. By working backwards to achieve a specific price point, Unilever has succeeded in providing an affordable product and created its own marketing by word of mouth. All of its products contain three unique features. The first is an activated carbon filter, which removes dirt, harmful parasites, and pesticides. The second is a germ kill processor, which uses programmed chlorine release technology to remove viruses and bacteria. Lastly, a unique polisher removes other contaminants to ensure that the water is clean and odorless. As with the other non-electric filters, Unilever's products do not require running water or boiling. Under the brand name Pureit, Unilever offers four major water filtration systems ranging in price from one thousand to six thousand nine hundred Rupees. The most basic version, the Pureit Compact, has a capacity of fourteen liters with a purified storage of five liters. The second version, the Pureit Classic, retails for two thousand Rupees with a capacity of twenty-three liters, and purified storage of nine liters. The third version, the Pureit Autofill, retails for three thousand

two hundred Rupees. It can be connected to a kitchen tap and has an automated turnoff feature. The fourth version, the Pureit Marvell, comes with all of the features previously mentioned and an end of life indicator.

Each competitor offers similar products with only minor differences in its features. Company A's main challenge will be to adjust its filter to offer a price point in the same range. Both Pureit and AquaSure are currently very popular among consumers. They're both effective and affordable. In addition, Unilever and Tata both offer color choices in their filters. Although this has no effect on the functionality of the product, it may be an effective marketing tactic to draw in younger or trendier customers. Even minor details such as this should not be ignored.

Appendix B

Technology Options

There are various methods of home or residential water filtration systems. Many different technologies exist to provide clean drinking water to people all over the world. Each has its own benefits and advantages. It is estimated that two thirds of the water purification market belongs to ultraviolent water purifiers, while one third is shared between reverse osmosis (RO) purification systems and chemical purifiers (GRASP Analytique Private Limited 2011).

Ultraviolet germicidal irradiation, or UV water purification works by disinfecting drinking water using ultraviolent light at short wavelengths to kill microorganisms. The light rays become absorbed by the DNA of the pathogens in the water in a way such that they cannot reproduce and are efficiently killed. UV water treatment can be used for both well and surface water disinfection. The process is extremely effective, kills 99.99 percent of harmful organisms, and has many additional benefits. UV purification does not use any chemicals or leave any taste or odor in the water. Systems are easy to install, simple to upkeep, and require reasonably low costs (Trojan UV Water Confidence 2014). UV water purifiers currently hold over half of the market space. The reason that they will not work for providing clean water to other regions of India is simply the need for a reliable source of electricity to power the lamps. The majority of the 'bottom of the market' target audience does not have access to electricity, simply eliminating UV technology as a solution.

A reverse osmosis gravity filter is a much more efficient solution. In short, reverse osmosis purifies water of solutes by forcing it through a semi permeable membrane through which the solvent, but not the solute, may pass. The filter will remove many types of molecules, ions, impurities, and contaminates. RO also has the ability to remove unpleasant tastes, smells,

and color from the water, leaving its users with a clean taste. RO filters are also environmentally friendly, as they do not produce or use any harmful chemicals. Most importantly, they are ideal for rural residential units because they do not require electricity and are relatively small in size (ESP Water Products 2014). For families who are not located within a close proximity to water pipes, RO processors provide the perfect solution because they can filter river, ocean, or groundwater. Another advantage is that RO filters do not require a continuous water supply and are easy to maintain. Lastly, RO filters are reasonably priced which makes them a perfect solution for anyone in the market for clean water.

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ACADEMIC VITA

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EDUCATION

The Pennsylvania State University, Schreyer Honors College, Smeal College of Business — University Park, PA
Bachelor of Science – Supply Chain and Information Systems — Current Status: Senior, Class of 2014
Minor – Geography

Anglo American University — Prague, Czech Republic
Study abroad — February 2013 - May 2013

- Completed course work in a variety of subjects to further knowledge of international business and art
- Live and adapt to an unfamiliar environment, embrace Czech culture, and further communication and language skills

WORK EXPERIENCE

Johnson & Johnson – McNeil Nutritionals — Fort Washington, PA
Supply Chain and Operations CO-OP — June 2012 – January 2013

E-Commerce Supply and Demand Planner

- Lead the cross-functional Sales & Operations Planning (S&OP) process ensuring that accurate and up-to-date information is brought up for discussion, encouraging team member accountability, and building an accurate team-driven consensus forecast incorporating consumption and promotions
- Evaluated inventory, submitted replenishment orders, and monitored destructions, expiration, and short dating on 25 SKUs
- Successfully eliminated nine unprofitable SKUs from the SplendaStore.com, resulting in $5,000 of annual storage and supply chain savings and reduced complexity

Reporting and Analytics

- Interacted with team members and cross functional partners to provide reports and analysis on various aspects of customer service, shipments, inventory, and forecasts in addition to ad-hoc requests for system support and tracking shipments
- Developed and implemented new reports to monitor correct expiration dating on production and key worldwide planning metrics such as MAPE, BIAS, and UFR

Supply Chain Support and Improvement

- Engaged with 11 external manufacturing sites to perform cycle counts in order to identify variances for reconciliation in addition to monitoring and reporting on performance against purchase orders
- Worked with procurement to monitor production schedules and adjust minimum order quantities accordingly for components of 8 products
- Worked to align club volumes with consumer to generate an inbound forecast utilized by the club distribution center
- Utilized lean and six sigma techniques to perform a bias analysis project on over 50 SKUs which resulted in an inventory reduction of $425,000 and a storage reduction of 678 pallets
- Evaluated inventory levels of carton supplies as part of an international project team to ensure that an efficient graphics change was made brand wide
- Lead the initiative to tour J&J Distribution Centers and manufacturing sites as a chair on the Intern-CO-OP Association Board

Nordstrom — Seattle, Washington
Nordstrom Rack Merchandising Group Internship — June 2013 – August 2013

- Executed a national investigation on size analysis of top SKUs totaling over $5,000,000 in yearly revenue to reevaluate and improve the effectiveness of buying practices
- Tracked and analyzed sales and inventory levels of over 50 products across 110 stores in order to take corrective action
- Monitored the success rates of over 20 suppliers to determine areas of opportunity and maximize the effectiveness of resources
- Lead investigations, provided various recommendations, and enacted new reporting structures to the buy planning team
- Monitored and communicated the performance of top stores, suppliers, and products to the buying team

Anticipatory Learning for Climate Change Adaptation and Resilience — University Park, PA
Research Assistant — September 2011- May 2012

- Process and organization of interviews taken from field work in Ghana and Tanzania
- Prepared quantitative and qualitative data analysis to draw conclusions from research