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Community Resources Series

An Entrepreneurial Initiative for Distributing Energy Efficient Products in Low Income Communities

Alexander Church, Tatiana Huet de Bacellar,
Rachel Kennedy, Jinghan Wu

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Abstract

Almost half the households in South Africa are regarded as energy poor, spending more than 10% of their income on energy. We developed an entrepreneurial initiative to help community members support themselves by selling energy efficient products in low income areas, expanding access to safe and energy efficient products while increasing livelihood opportunities. Our team collaborated with the City of Cape Town Office of Sustainable Livelihoods and product distributors to evaluate current distribution methods and possible locations. Together, we concluded that crèches, or preschools, are promising distribution locations to start distribution businesses in low income communities as they reach the target market, are established businesses within the community, and have crèche leaders who already lead entrepreneurial efforts. We developed a Business Model around crèches as the distribution location and provided business start-up resources in an Entrepreneurial Support Packet. We started pilot programs using the efficient Wonderbag cooking product at two crèches, one in a middle income neighborhood and one in a low income township, to evaluate and refine our Entrepreneurial Initiative so it can be replicated at other crèches. Additionally, we interviewed community members in the informal settlements of Langrug, Nyanga, and Flamingo Crescent to assess energy practices and needs. Based on this information, we developed savings-payment plans that are suitable for low income communities and created a product catalog. The crèche leader has an opportunity to expand their distribution business and improve the livelihoods of their community by bringing products needed to address health and safety risks. The project was developed as part of an educational experience extending over four months: two on campus in the United States followed by two in Cape Town.

Authors: Energy Team – Alexander Church, Tatiana Huet de Bacellar, Rachel Kennedy, Jinghan Wu

WPI Project Advisors: Stephen McCauley and Scott Jiusto

Series Editor: Scott Jiusto

Project Partners: City of Cape Town Office of Sustainable Livelihoods

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About the WPI CTPC Community Resources Series

Community Resources publications are designed to assist residents, community-based and non-profit organizations, local government, students, educators and others working toward sustainable community development in disadvantaged communities in South Africa and elsewhere.

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The Cape Town Project Centre (CPTC) is part of the Worcester Polytechnic Institute (WPI) Global Projects Program offering WPI students project opportunities in two dozen centers around the world. Each year, about 26 CTPC third-year undergraduate students from our US university work closely in small groups with local Cape Town organizations and communities on issues posed by our local partners. This report is one of a number of project outcomes produced during two months of fieldwork in Cape Town. See the CTPC website for more information: http://wp.wpi.edu/capetown.

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Table of Contents

Table of Figures

1. Introduction

In South Africa, 47% of households spend more than 10% of their income on energy, and therefore, are classified as energy poor ("A Survey of Energy-Related Behaviour and Perceptions in South Africa," 2012). While national programs like Free Basic Electricity (FBE) and Free Basic Alternative Energy (FBAE) have been developed to subsidize energy costs, electricity prices in the country continue to increase. Through a survey conducted by the Residential Sector of the Department of Energy, 44% of South Africans revealed their desire to reduce electricity consumption because of anticipated future increases in cost ("A Survey of Energy-Related Behaviour and Perceptions in South Africa," 2012). The survey also concluded that low income community members were open to new sources of energy, provided they are cheaper; however, spreading awareness and increasing investments in energy-saving products has been a challenge for many organizations. For groups concerned with distributing energy efficient products, such as the City of Cape Town Office of Sustainable Livelihoods and the social enterprise company EnerGcare, the biggest difficulty has been developing a sustainable way to distribute the products to communities with high energy poverty.

There have been a number of initiatives aimed at increasing access to affordable energy products that improve livelihoods in low income communities. For example, the Wonderbag Programme, led by the City of Cape Town Environmental Resource Management Department and Electricity Services Department, donated Wonderbags to new Reconstruction and Development Programme (RDP) homeowners throughout Cape Town. While the program has helped over 350 recipients so far, the distribution method relies on government financial support and resources for the free handouts of the products. Donations and trainings are beneficial since they provide the community with products; however, once the products are successfully implemented and the outside organizations leave the community, few livelihood opportunities remain for community members. An opportunity exists to create a new strategy that will bring energy products and services to low income communities while also supporting entrepreneurs in these areas.

This project focused on developing an entrepreneurial initiative for community members to support themselves by effectively selling energy efficient products that improve livelihoods in low income areas. Five main objectives of the project were developed to achieve this goal:

1. Connect with co-researchers and community members to build the business network
2. Conduct market research to understand energy practices and needs in low income communities
3. Develop a business model for the prospective entrepreneurial initiative
4. Create an entrepreneurial packet to explain the business model and associated responsibilities
5. Evaluate and adapt the business model and entrepreneurial packet through pilot programs

An entrepreneurial initiative was developed throughout the project to effectively sell Wonderbags and other energy efficient products. The initiative is comprised of a business model and an entrepreneurial packet, and was tested in pilot programs. In the Business Model, crèches are the distribution locations because they reach the target market, are established businesses within the community, and can provide trust, accountability, and product confidence. Additionally, crèche leaders who have experience running a business making them ideal candidates as energy product

entrepreneurs. The Entrepreneurial Support Packet contains business start-up resources and conveys the different aspects of the Business Model to emerging entrepreneurs. The Pilot Programs were started using the efficient Wonderbag cooking product at two crèches: Kiddies College Preschool in the middle income neighborhood of Observatory and Gege's Crèche in the low income township of Langa. Through these pilots, we evaluated and refined our Entrepreneurial Initiative so it can be replicated at other crèches.

2. Research Approach and Methods

During our project, we adopted the Shared Action Learning (SAL) philosophy as our guiding principle. SAL is an approach developed by the Worcester Polytechnic Institute (WPI) Cape Town Project Centre to foster effective engagements with partners. The five main components to SAL are: connecting, planning, enacting, observing, and reporting. These principles guided our work with partners and helped us successfully test our Entrepreneurial Initiative.

2.1 Building Networks

We held meetings and in-depth interviews to create a collaborative network with our key partners including the City of Cape Town Office of Sustainable Livelihoods (OSL), Business Bridge, and community members from Langrug, Flamingo Crescent, Langa, and Observatory. We began to form a working relationship with our partners by sharing our project ideas and personal experiences. Hearing their stories helped us understand the project from their point of view and gave us a clearer perspective on the opportunities for the project.

We established a weekly report meeting with our sponsors, OSL, to update them on our latest findings and discuss how to move forward. With our co-researcher, Maxwell Dingaan from OSL, we initiated more personal interactions including lunches and historical center visits. To the various community members, we demonstrated our willingness to help and provide our findings.

2.2 Researching the Market

The team talked to a variety of groups, spanning different informal settlements and professions, to gain a deep understanding of the energy efficient product market. We conducted four in-depth interviews, on-site in communities, and roughly a dozen short discussions to get more information regarding energy practices around heating, cooking, and lighting. Interviews provided valuable information about our target customers, 'the poorest of the poor,' and their energy practices and perspectives to help us move onto the next step of developing an entrepreneurial initiative.

Figure 1: Interviewing Community Members in the Flamingo Crescent Informal Settlement

2.3 Developing the Business Model

The five main components of our Business Model, detailed in Key Aspects of the Business Model section below, are the end client, distribution location, distributor, business start-up resources, and affordability.

A critical task was to identify the possible distribution locations to serve the target market. We established criteria for distribution locations: are trusted within the community, have the ability to provide affordable products, can demonstrate the products' abilities, and have an additional source of income. From these criteria, we believed crèches might be effective distribution points and proposed the idea to various groups to get feedback. We discussed the potential market for Wonderbags and distribution locations with crèche leaders attending a Business Bridge class that expands their money management. We also participated in an Early Childhood Development forum, where 45 crèche leaders from different communities gathered to discuss crèche developments, to receive feedback on the Wonderbag price and crèches as distribution locations. These interactions gave us confidence to move forward with the crèche as the distribution location and provided us with a list of other possible distribution locations.

Our next step in the process was creating a sustainable supply chain involving distributors and products. To accomplish this, we met with the local Wonderbag distributor again and reached out to In2Brands, a company selling energy efficient products, to explore finance methods and inventory delivery options.

2.4 Piloting the Entrepreneurial Initiative

We aimed to help entrepreneurs start businesses by implementing Pilot Programs to gain insights that otherwise may be obscured. We also worked to initiate some of the social infrastructure for carrying this initiative forward. To find potential entrepreneurs, we visited six crèches that varied in size, number of students, monthly fee, and location. In every visit, we brought a Wonderbag to explain how it works. If anyone had previously cooked with a Wonderbag, we first asked them to explain the benefits. Then, we used our Entrepreneurial Support Packet to further describe the uses of the Wonderbag, as well as the potential for a distribution business and the entrepreneurial responsibilities.

Two crèches partook in a two week Pilot Program, allowing us to begin evaluating the Business Model and Entrepreneurial Support Packet and get valuable feedback from the crèche leaders. The effectiveness of the Pilot Program was evaluated based on whether the crèche leader was able to sell Wonderbags and took the next step to call the distributor for more inventory. Due to the project duration, we were unable to analyze the long-term program sustainability. Throughout the pilots, the team monitored their progress and gathered information. The feedback helped us modify the Entrepreneurial Initiative for replication at other crèches.

Additionally, we presented our Entrepreneurial Initiative to the Cape Town Low Income Energy Services Task Team (LIESTT), comprised of stakeholders from government, civil society, and academia, developing a business network to deliver safe, reliable energy products to low income communities in a sustainable way, to gain insights from their previous experiences. Their questions helped us address other considerations important in reevaluating our Business Model.

Afterwards, we were invited by a member of the LIESTT to present for three departments within the City of Cape Town: the Social and Early Childhood Development Department, Economic Development Department, and Energy Resource Department, to further promote our Entrepreneurial Initiative and gain more feedback to improve the Business Model. Along with the Pilot Programs, these presentations helped us refine our Entrepreneurial Initiative for future implementation.

3. Key Aspects of the Business Model

The City of Cape Town Office of Sustainable Livelihoods has a goal of providing energy efficient products to the 'poorest of the poor.' In order to effectively distribute such products to this market, we developed an Entrepreneurial Initiative that can continue with little outside funding and support. At the core of the initiative is a business model that addresses the end client, distribution location, distributor business start-up resources, and affordability. The following sections describe each aspect of the Business Model, which we feel is appropriate for low income communities throughout South Africa.

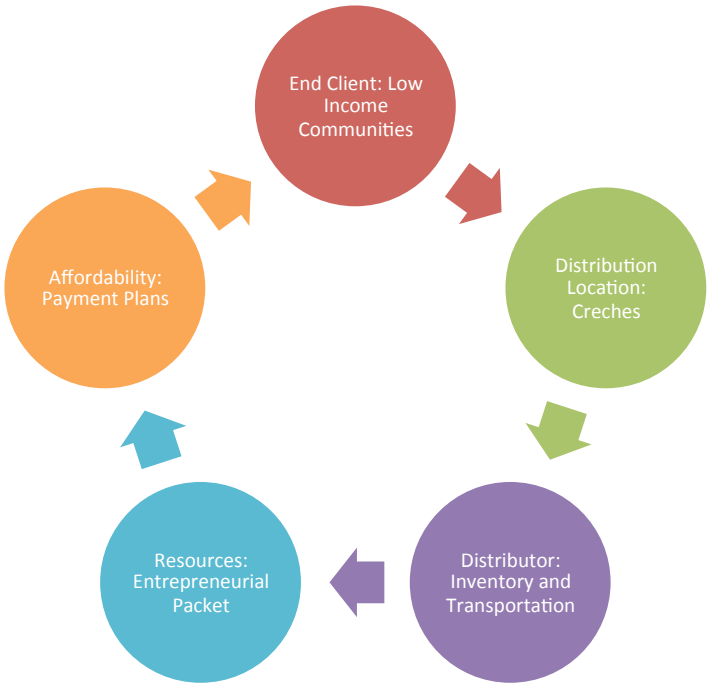

Figure 2: Business Model Overview

3.1 End Client: Understanding the Low Income Energy Product Market

Energy practices in low income communities produce a variety of safety risks, health concerns, and economic strain. One of the biggest problems is shack fires caused by candles, paraffin, and other makeshift energy practices, like gulleys. Shack fires can burn down a household in less than a minute, spreading rapidly through a community (Town, 2014). This happened three years ago in the Flamingo Crescent informal settlement, a community where we held interviews. Health implications also arise from the current energy practices, specifically cooking and heating. When paraffin stoves are used inside the shack, smoke builds up as there is limited ventilation. This indoor air pollution results in respiratory illness as community members in two different informal settlements shared with us. Lastly, cost is an important factor when it comes to energy. Low income community members continue to use these unsafe energy methods since they are the cheapest. For example, a liter of paraffin costs R13.50 and is only enough to cook a household about two meals, but is most commonly used in non-electrified houses. This led us to realize that a market for safer energy efficient products does exist in informal settlements. Therefore, our

Business Model aims at bringing to this market energy efficient products that can address the health and safety risks associated with the current energy practices, as well as help reduce the economic burden on low income community members.

3.2 Distribution Location: Selling Energy Efficient Products through Crèches

Crèches are a promising location to sell Wonderbags and other energy efficient products because they have fee-paying customers, are respected places within the community, can demonstrate the products' capabilities, and are already established businesses. A crèche attracts parents looking out for the safety and best interest of their kids; therefore, the parents, specifically mothers, are more likely to purchase products that can give their children a better future. Additionally, a crèche is a trusted, central location in the community. Since customers are more willing to buy products from someone they trust, guardians are more likely to buy products from crèche leaders that care for their children. Community members whose children do not attend the school also know where the crèche is located and can purchase products there. The crèches can also use the products, which demonstrates its benefits and capabilities, a key part of making a sale. Finally, the crèche is an established business. In most cases, selling energy efficient products cannot be the entrepreneurs sole business because of the investments needed and unsteady rate of sales; therefore, incomes from the crèche and distribution business can supplement one another. The crèche leaders have experience running a business making them ideal candidates as energy product entrepreneurs.

3.3 Distribution: Delivering Inventory and Utilizing Microconsignment

A first step in developing this business model was understanding possible ways to finance sales in low income communities in South Africa. We began by researching different finance methods used by small businesses in developing countries – microcredit, microfiance, and microconsignment – during our preparatory term. Once we arrived in Cape Town, we held meetings with the local Wonderbag distributor and potential entrepreneurs to collaboratively determine the best finance model for distributing energy efficient products.

The methods of paying for and obtaining inventory are critical considerations for entrepreneurs. Both must be tailored to fit the needs of entrepreneurs in low income communities to prevent economic strain. Since many entrepreneurs in these areas do not have the financial means to front the money to purchase products, providing the inventory on microconsignment is attractive because there is no initial investment as payment is instead made after products are sold. Also, community members do not always have access to transportation, so it is difficult to get the inventory if the products are not delivered. Therefore, the product distributor must be able to bring the products to the crèche to fill the transportation gap. The financing and delivery of inventory is an essential part of making the business model work in low income communities.

3.4 Business Start-up Resources: Entrepreneurial Support Packet

An Entrepreneurial Support Packet further develops the crèche leaders' business skills through a variety of resources that are graphic-based to facilitate understanding across literacy levels and language barriers. These provide the support for managing inventory, recording sales, and advertising, as detailed in Section 5 below.

3.5 Affordability: Payment Plans for the Target Market

Energy efficient products can have high initial costs. In order to make them affordable to the end clients and aid the entrepreneurs with their sales, payment plans were created. These allow the customers who did not have the means to pay in full upfront to pay in two smaller payments within two weeks.

Figure 3 below depicts the two Payment Plan options available during the Pilot Programs. The customer had the option of either paying all R210 for the Wonderbag at once, as seen in the top row, or making two payments of first R110, when they received the Wonderbag, and then R100, show in the bottom row. Most people used the Payment Plans to help offset the high initial cost of the Wonderbag.

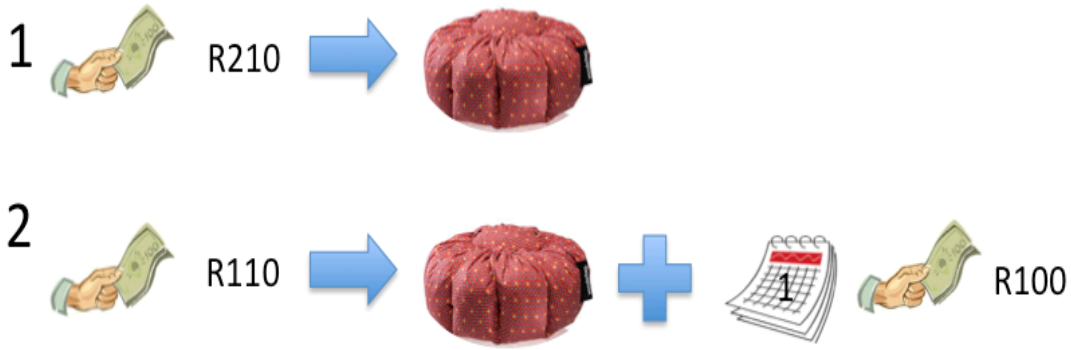

Figure 3: Two Payment Plan Options for the Target Market

4. Entrepreneurial Support Packet

The team created an Entrepreneurial Support Packet to convey the different aspects of the Business Model to emerging entrepreneurs. This packet includes documents describing how the business works and the entrepreneurs' responsibilities. These documents are described below and the full packet can be found in Appendix 11.2.

1. **Entrepreneurial Support Packet Overview** summarizes the contents of the Entrepreneurial Support Packet and the Pilot Program.
2. **Wonderbag Business Guide** outlines the supply process, selling and profit, and payment plans using pictures and diagrams. This is a reference brochure for entrepreneurs when restocking inventory and helping customers reduce high up front product costs.
3. **Wonderbag Safety Tip Flyer** provides an overview of how to use a Wonderbag properly and safely. It is a tool the entrepreneurs can use when demonstrating the product.
4. **Wonderbag Sales Log** is a record keeping sheet that assists in monitoring sales. This formalizes the paying process in low income communities, increasing accountability and responsibility, and creating the opportunity for payment plans.
5. **Energy Savings Poster** pictorially shows the paybacks of the Wonderbag, so community members see the value of investing in energy efficient products.
6. **Pilot Program Contract** details the expectations and responsibilities of the entrepreneurs and WPI Energy Team.
7. **Wonderbag Seed Capital** gives five Wonderbags to the crèche at no cost.
8. **Wonderbag Advertisements** are flyers to be displayed by the entrepreneurs in the community to market Wonderbags and where they are sold.
9. **Pilot Program Log** records interest in Wonderbags and reasons someone did or did not purchase a Wonderbag.

Since the contents of the Entrepreneurial Support Packet depicted the complex business concepts with simple graphics and pictures (Figures 4 and 5), it was well received by the crèche leaders, as they understood what was being portrayed and required to maintain the business. It proved to be a successful, valuable resource for starting up more distribution businesses in other locations.

Figure 4: Supply of Inventory

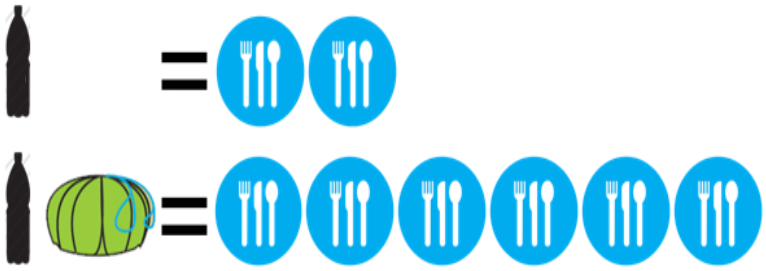

Figure 5: Depicting Savings and Paybacks from the Wonderbag

An Energy Efficient Product Catalog was created to sustain the distribution business and further the Entrepreneurial Initiative. The catalog has products the crèche leader can choose to sell based on what they believe the community needs and wants. It also provides benefits, price, payback

time, and distributor contact information of each product. Once the crèche leader wants to start selling a different item, she can call the distributor for her next product and use the same business model as before. We believe this catalog will give crèche leaders an opportunity to improve the livelihoods of their communities by bringing products needed to address health and safety risks, but further pilot testing, learning, and support for entrepreneurs will be required as they expand product lines.

5. Pilot Program

The Pilot Program was designed to evaluate the Business Model and the Entrepreneurial Support Packet and to gather feedback from crèche leaders to adapt the Entrepreneurial Initiative for future implementation. We were able to test the initiative at two crèches: Kiddies College Preschool in the middle income neighborhood of Observatory and Gege's Crèche in the low income township of Langa.

Kiddies College Preschool sold the five initial Wonderbags in the first week. They then took the initiative to contact the Wonderbag distributor for more inventory as was described in the Entrepreneurial Support Packet. In the second week, they were able to sell two more Wonderbags and are continuing to grow their business. This was very encouraging as it showed that the Business Model has potential for getting energy efficient products into the community.

Figure 6: Kiddies College Preschool Energy Product Entrepreneurs

Gege's Crèche also had success during the program selling the Wonderbags despite the concern of whether they were capable of supporting the business in their community, selling two Wonderbags in the two weeks before holiday recess. Although this is lower than Kiddies College Preschool, the ratio of Wonderbags sold to number of students was roughly the same, about 5%. This suggests that there may be a market for Wonderbags in the community of Langa, and the Business Model may work effectively for crèches in low income communities. When Gege's Crèche continues its distribution business in the upcoming school year, it will be seen whether they are able to sell their initial supply and contact the distributor.

Figure 7: Gege's Creche Energy Product Entrepreneurs

Various departments within the City of Cape Town will be working together, coordinated by the Office of Sustainable Livelihoods and with the help of our co-researcher, Max Dingaan, to conduct longer Pilot Programs in 2015. These pilots will help determine if the model is effective at crèches of different income levels and evaluate the long-term sustainability of the model. Early signs suggest that the model does support distribution businesses in low income communities and may be a suitable model for expanding to a wider range of communities throughout South Africa.

6. Findings

Based on learning through all phases of this project – from meetings with departments within the City of Cape Town and interviews with low income community members – we offer the following findings for creating a sustainable, effective entrepreneurial initiative to sell energy efficient products in low income communities. These findings were strengthened through a variety of meetings with product distributors, crèche leaders, and departments within the City of Cape Town.

Finding #1: Selling Energy Efficient Products cannot be the Entrepreneurs Sole Business and Income

Through meetings with the Wonderbag distributor in the Western Cape and In2Brands, a company that distributes energy efficient products in South Africa, we learned that it is unlikely that selling energy efficient products alone will sustain an individual due to the investments needed and unsteady rate of sales in low income communities. This is especially the case for low income community members who rely on daily income to feed themselves as they have little savings.

In our Pilot Program at Kiddies College Preschool, there was initial excitement for the Wonderbag, so the crèche leaders sold five the first week, but only two the second week. The inconsistency in sales per week makes it hard for someone living on 'survival mode,' or day-to-day with the money they have, to have this business as their sole income.

We also found from discussions with crèche leaders that their customers are only likely to buy products at certain times. According to them, people receive their paychecks towards the end of each month and will then be more likely to spend money, but during the middle of the month money is tight so few products will be sold. At the end of the school year and near the holidays, they related that guardians have to pay remaining school fees and new ones for the upcoming school year so little money is spent on additional products. For an energy product entrepreneur selling products, this inconsistent market results in times with little to no income.

Therefore, this entrepreneurial effort needs to be an addition to a preexisting business to support the finances of the business and the entrepreneur. This became one of the criteria for determining what kind of distribution location might be suitable for selling energy efficient products, whether a location has existing business or supplemental income.

Finding #2: Distribution Location must be able to Provide Trust, Affordability, and Product Confidence

We learned from the Wonderbag distributor that three reasons an individual buys an energy efficient product are trust, affordability, and product confidence.

If the customer does not trust the individual selling the product, they will likely not purchase it. Therefore, the entrepreneur must share personal experiences they have using the product to show its value and that it works. At Kiddies College Preschool, Mama, the cook for the children, has become the energy product entrepreneur because she uses the Wonderbag everyday when cooking and can explain to customers how to properly use it and its benefits. Since guardians trust her to cook for their children, they trust that she is selling a product that is beneficial to them.

The customer will also not be interested if the product is too expensive for the amount of money it will save. Thus, it is important to depict the energy-savings paybacks and find a market that can afford the initial cost. A community member we interviewed from the Nyanga informal settlement is connected directly to the pole to receive electricity for his household. While the pole trips less than other informal methods of obtaining electricity, it causes appliances to frequently burn out from having too many people connected to one electrical source. He has three incandescent light bulbs, normally R10 each, in his shack that must be frequently replaced because they keep burning out. However, he recently decided to start buying the more expense CLF bulbs for R30 from a store further away. Despite the higher cost and the distance, he saw the value in having bulbs that last longer and do not have to consistently be replaced.

Figure 8: Informal Electrical Connections to the Pole

Lastly, the customer must believe the product works and see its potential or else they will not buy it. To achieve product confidence, the vendor must use the product and show how it works because "seeing is believing." In addition to cooking for the children with the Wonderbag everyday, Mama took the opportunity to keep the donuts warm during the graduation ceremonies to demonstrate its ability to retain heat. Afterwards, guests had the donuts and saw that the Wonderbag worked. This demonstration increased the interest in the product and the number of sales.

Trust, affordability, and product confidence were thus three criteria that informed our thinking about distribution locations and marketing strategies.

Finding #3: Crèches are Effective Distribution Centers with a Regular Market for Energy Efficient Products

Based on our preparatory research, we anticipated that spaza shops, established businesses that sell food and other daily necessities in the low income community, can be a good distribution location. However, after visiting spaza shops in informal settlements, we realized this location was not particularly feasible. Most spaza shops had iron bars in front of the door, as seen in Figure 9,

and customers get their products through the holes between each bar. Although this made spaza shops a safe place to store the products, a spaza shop owner cannot demonstrate Wonderbags and other energy efficient products well. Therefore, they often do not inherently fulfill the criteria of trust and confidence noted above.

Figure 9: Spaza Shop in the Langrug Informal Settlement

During our meeting with our sponsors, the City of Cape Town Office of Sustainable Livelihoods and Tom Parry, CEO of the South Africa Business Bridge branch, we considered other places that are commonly visited by people in low income communities and evaluated each location based on trust, affordability, product confidence, and supplementary income source. Together, we decided to pursue crèches during our project duration because they are respected places within the community, have potential customers with fee-paying guardians, can demonstrate the products capabilities when cooking for the children, and are already an established business. Additionally, the crèche leaders have experience running a business making them an ideal energy product entrepreneur.

Table 1: Below shows our analysis of the different distribution methods and how we decided to start with crèches.

Distribution Method	Trust	Affordability	Product Confidence	Outside Business	Comments
Spaza Shops	A business that is already used by the community	If they are going to purchase goods, they could have enough to purchase products	There is no way to demostrate the use of products and the owner will not have time to explain them in depth	Yes, from spaza shop	This is not the best option since people going to it are going to just buy food; not the target audience we want. The owner would not have time to explain what the products are or demonstrate their use
Direct Sales	If they are going to friends and family members in the community	Variable, depends on who they talk to. There would be no way of measuring since there is a wide range of income in a low income community	Distributor would be able to make a sales pitch and demostrate	No, sole source of income	Would not be effective since the distibutor would not have an outside source of income to help with the business and the end clients would not be consistent
Churches	A place that is well respected in the community. Strengthened if the distributor is known among community members	Variable, depends on who goes to the location. However, community members look after other members and could purchase products for others. There would be no way of measuring since there is a wide range of income in a low income community	Distributor would be able to make a sales pitch and demostrate. Could be used during church events to strengthen confidence	Possible sole source of income	Trusted by the community, however the frequency of gatherings is variable. The income of the attendees is also variable. This would not be the most effective way of distributing products
Creches	Location where parents already trust the owner enough to leave their kids at	If the creche is fee based, the parents must of a steady income to pay for this monthly. Therefore, would have an income to purchase products	The employees would be able to explain and possibly demonstrate the product at child pickup and dropoff. Could be used for lunches at the creche to strengthen confidence	yes, from creche	Respected location that is visited daily by members with an income. Location also known among the community that is accessible to anyone, not just parents. Could be used by the creche owners daily for children food. Also, strengthens Wonderbag kid safety factor

A = Excellent	B = Good	C = Fair	D = Fail

Table 1: Evaluating Locations for Energy Efficient Product Distribution

We discovered a desire for Wonderbags among mothers when we were interviewing in the Flamingo Crescent informal settlement. As we talked to the person who had a Wonderbag about electricity savings, the other community members with us asked where to get one to save electricity too.

From visits with crèche leaders, we found there was a personal, trusting relationship. At one of our visits to Gege's Creche, older children from the community were spending time at the crèche because it is safer and they, and their parents, trust Lungiswa Gege, the owner. Also, crèche

leaders mentioned they knew which parents were likely to buy Wonderbags based on family financial situations and how children are transported to school each day.

When we visited the crèches we saw how they cook for the children in large pots making common meals like curry and rice. Therefore, even though most crèches had heard of the Wonderbag benefits, the cooks did not buy it because the pots did not fit. One crèche had been given two Wonderbags and used them together to keep one pot warm, placing one on the bottom half and the other on the top. We told the crèches about the large, Catering Wonderbag and this gained immediate interest; multiple crèches asked how much it cost. We found that most of the crèches were looking for an opportunity to reduce cooking time and energy usage, and thus, were eager to demonstrate the uses of the Wonderbag when cooking.

Since monthly crèche fees are the main source of income, any money made from the distribution business can assist with additional costs or new purchases. At Gege's Crèche, Lungiswa was using the additional income to help support the teachers for the month of December since fewer students attend the crèche but she still had to pay all the teachers.

Through our interactions, we realized all the necessary characteristics of an effective distribution location do exist at a crèche.

Finding #4: Product Inventory must be Provided by a Distributor on Microconsignment and Delivered to the Location

Meeting with product distributors from Wonderbag, In2Brands, and Fluoresave established two important aspects of the business model: finance and transport. We found since many entrepreneurs in low income areas do not have the financial means to front the money to purchase products, providing the inventory on microconsignment is essential to starting the business. We also realized community members have limited access to transportation, so it is very difficult to get the inventory if the products are not delivered. Therefore, the product distributor must be able to bring the energy products to the crèche in order to fill the transportation gap. The financing and delivery of inventory is an essential part of the business model in order to reach the lower income communities.

We developed our Entrepreneurial Initiative using the Wonderbag since our sponsor, the City of Cape Town Office of Sustainable of Livelihoods, had seen the largest potential impact in the Wonderbag with their available budget. Working with the Wonderbag distributor helped establish the criteria of the distributor for our Business Model since he provided product inventory on microconsignment and delivered to the locations. We found that these were necessary for a crèche leader to also be an energy product entrepreneur and wanted to find these characteristics in other product distributors.

We were trying to seek other energy efficient products to sustain the distribution business and build our product catalog. Once everyone in the community who wants a Wonderbag has one, the crèche leader needs to expand their business either to a new customer market or with a new product. Therefore, we reached out to In2Brands and Fluoresave Lighting to get more information about other products and their distribution methods, specifically finance and transport.

In2Brands is the local distributor of Waka Waka products in South Africa. Their products focus on solar powered lights and small generators and their current market is mid to upper income customers, though they are trying to reach the lower income market. The company agreed microconsignment was a strong financial model to use; however, when asked if they can deliver products in the informal settlements, the employees explained that In2Brands is a small startup and is unable to deliver inventory. Therefore, they have not been able to reach the lower income communities effectively.

When we talked to a product distributor from Fluoresave Lighting, we discussed his role as a distributor of energy efficient products. Similar to In2Brands, his small start up company's main product is a solar powered light that also charges a cell phone and, while he wants to sell in informal settlements, his current market is mid income level customers. However, Fluoresave Lighting's difficulty of reaching customers in low income communities is finding a distribution location that has the financial ability to purchase the inventory as he does not provide on consignment, but can deliver the products to the different locations.

This illustrated that in the entrepreneurial business model the distributor must provide inventory on microconsignment and deliver the product to successfully reach the low income communities. One huge advantage of the business model with crèches as distribution locations is that crèche leaders are among the most strongly networked institutions in informal settlements and other poor communities. They meet regularly in Early Childhood Development forums, which means distributors can reach many entrepreneurs at once on a nearly monthly basis. This can provide a cheap and efficient distribution scheme, not only for products, but for information and mutual support about the business model. This is critical because distribution to crèches located throughout different communities will be nearly impossible for most suppliers.

Finding #5: Entrepreneurial Responsibilities Need to be Conveyed in Simple Graphics

Since the Entrepreneurial Support Packet provides a set of business start-up resources to help emerging entrepreneurs, it needed to be understood across different literacy levels and language barriers.

We started our first Pilot Program at Gege's Crèche. Although Lungiswa has business experience from owning a crèche, she was unfamiliar with the concepts of resupplying, microconsignment, and payment plans. In addition, her native language is not English so we had to be clear and concise when describing the Business Model and associated responsibilities. For this reason, we used simple diagrams and pictures to depict the complex business concepts. The Entrepreneurial Support Packet helped her understand each aspect, as she was able to see what we were talking about as we described it. We found it to be a valuable packet when explaining the distribution business and useful resources for the entrepreneur to reference.

Figure 10: Explaining the Entrepreneurial Support Packet

Finding #6: High Initial Cost of Energy Efficient Products Reduces their Market

The City of Cape Town Office of Sustainable Livelihoods has been distributing Wonderbags in many different informal settlements. However, they did not know what was an appropriate price to sell the Wonderbags in order not to limit potential customers. The Wonderbag distributor for the Western Cape sells them at R210. Since many low income workers in Cape Town make perhaps R100 a day when they can find work at all, this initial cost seemed high. Therefore, we considered lowering the price, but that can cause confusion in the market, negatively influencing Wonderbag sales elsewhere and reducing profit. In an interview with a community member from Nyanga, they mentioned that low income community members are only willing to buy an expensive product if they like its benefits and functionality; our co-researchers and sponsors confirmed this notion in South Africa. This perspective helped us decide to market the Wonderbag at R210, the same price as the distributor. From discussions with potential customers at a Business Bridge class, an Early Childhood Development forum, and in the community, we found that there was still a desire for Wonderbags even at R210. This determined a starting price point to sell energy efficient products in low income communities.

After another discussion with an aftercare leader in the informal settlement, Khayelitsha, we realized that there are still some people who cannot afford the products and have difficulty paying these high upfront costs. We designed payment plans to make the product more affordable by decreasing the upfront cost for customers. Working with co-researchers and potential entrepreneurs, we developed incremental payment plans, yet ensured the time between payments was short enough to continue the business. We found these payment plans are applicable for products that are too expensive upfront to increase the market that can be reached. Since crèches generally operate on monthly payments, adding payment plans for energy efficient products seemed particularly feasible there, as opposed to at spaza shops and other potential distribution options.

Despite these payment plans, we realized part of the 'poorest of the poor' market cannot be reached. While the ultimate goal is developing a sustainable way to reach these people, there are

some people that are unable to feed or house themselves and cannot realistically spend money on energy efficient products. We found this to be a limitation in our Entrepreneurial Initiative.

We also discovered that there is a cap on how expensive an energy efficient product can be and still sell in low income communities. Some products can cost more than R1000, and while they have large energy savings, people need to see the value to pay the high initial cost. To determine the upper price range for energy efficient products, we conversed with product distribution companies, the City of Cape Town, and community members. We gathered that there is a reduced market when trying to sell a product at R799 from a meeting with In2Brands. The company has been distributing the Waka Waka Power which provides light and a cell phone charger, and even though this product can improve energy usage in low income communities, the customers have mostly been middle to upper income classes. When looking into other potential products, our sponsors, the City of Cape Town Office of Sustainable Livelihoods, explained that energy efficient products need to cost around R500 or less to successfully sell in the low income communities. Finally, through interviews with community members, we realized that the initial cost is the biggest deterrent from buying a product. As we demonstrated the Wonderbag, people asked about other sizes and its price; when we talked about the Catering Wonderbag costing R750 people expressed their concern with the cost. Therefore, through our discussions, we found that the market for energy efficient products reduces if the price of the product is between R500-700 due to the high initial cost.

However, we learned that energy efficient products above this price can sell if the energy-savings paybacks are depicted well. According to representatives from the City of Cape Town Economic Development Department, community members will invest in products if in three months they are seeing savings. We realized at this price point, energy savings become the most important factor in determining whether someone will purchase an energy efficient product.

7. Recommendations

We have created a list of recommendations for researchers and product distributors involved in the low income entrepreneurial business development and alternative energy product distribution efforts, as well as for our sponsors, the City of Cape Town Office of Sustainable Livelihoods. These recommendations are based on our research, findings, and the positive Pilot Program results throughout the project.

7.1 Additional Pilot Programs

We recommend that longer Pilot Programs be implemented at various crèches throughout Cape Town using the Entrepreneurial Support Packet to evaluate the long-term sustainability of the Business Model and its viability in different income communities.

Both Pilot Programs were successful in preliminary operations. Crèche leaders were enthusiastic energy product entrepreneurs and sold Wonderbags in their communities without continuous outside resources and support. When the initial supply was sold, they contacted the distributor on their own. This demonstrated that the Business Model was self-sustaining and the Entrepreneurial Packet was helpful in starting the distribution business. For the departments within the City of Cape Town collaborating to implement more Pilot Programs in 2015 and future groups interested in conducting similar pilot programs, we have evaluated our Pilot Program and see the following areas for improvement.

The two crèches that took part in the Pilot Program varied in size, location, number of students, and monthly fees. This allowed us to test whether the Entrepreneurial Initiative was successful in different communities for selling energy efficient products. Based on the Wonderbags sold to student ratio, both Pilot Programs had similar results, each selling around 5%. While it was promising to see that the income level of the community did not affect the percentage of sales, this was a small sample size.

Due to our limited project duration, we were also not able to evaluate the long-term sustainability of the Business Model. The duration of the Pilot Program was only two weeks, so there is not significant data to validate that this model is sustainable in the long-term. To address the concern of how the distribution business will continue, we developed the Energy Efficient Product Catalog for crèche leaders to choose other products from to introduce into the community, but this was not tested during the programs. Therefore, we recommend longer Pilot Programs be implemented at various crèches to evaluate the long-term sustainability of the Business Model.

There are some limitations that restrict the crèches that can be used as a distribution point. We found in Finding 6 that the market is heavily influenced by the initial cost of alternative energy products. Thus, we suggest that fee-based crèches be used to increase the sales as the guardians have the ability to pay the fees and potential means to buy products. The fees are also the crèches' additional source of income satisfying that criteria for a distribution location in our Business Model. While we did not focus on non-fee based crèches and there is research to be explored, we found that at non-fee based crèches, there is not a regular source of income and guardians generally do not have the means to pay for energy efficient products. Therefore, products either need to be subsidized or an alternative method of paying for the products needs to be developed, such as work-for-pay, where if something needs repaired someone can donate

their expertise in exchange for monetary payment. The crèche also needs a place to store the inventory safely and, as mentioned in Finding 3, demonstrate the usages of the product.

7.2 Expanding the Entrepreneurial Effort to Include Other Energy Products

We recommend that a catalog of energy efficient products be presented to the crèches to encourage distribution of various products that can improve the livelihoods of low income communities.

From our research, we have come to see that there are a variety of safety concerns and health risks associated with the current energy practices in low income communities. Various organizations have addressed these issues by creating energy efficient products that improve the current methods of utilizing energy as well as reducing the amount of energy required for everyday tasks. These products have the potential to improve energy practices; therefore, we compiled them into a catalog. This Energy Efficient Product Catalog provides benefits, price, payback time, and distributor contact information as seen in Appendix 11.3.

We recommend presenting a list of energy efficient products endorsed by the City of Cape Town to the crèche leaders in the Entrepreneurial Support Packet when proposing the Business Model. Then, crèche leaders have more control and opportunity with their distribution business and can choose products that will fit the needs and wants of their community at the beginning. The Entrepreneurial Initiative was created and tested by distributing Wonderbags, but we suggest that the Office of Sustainable Livelihoods provide crèche leaders with the Energy Efficient Product Catalog so they can distribute various products into low income communities to improve their livelihoods.

As mentioned above in Finding 6, there is a limit to the energy efficient products that can be introduced. They must be within the price range that is affordable for those in the communities. Therefore, crèche leaders must choose products well suited for the community and do not have a high initial cost.

7.3 Testing Additional Distribution Locations

We recommend that the concept of the Entrepreneurial Initiative be tested at different distribution locations within low income communities in Cape Town.

Through our discussions with crèche leaders, the Business Bridge, and other partners we have created a list of other possible distribution locations for energy products such as churches and schools. We also connected with the Langa Environment Action Force (LEAF) during our stay in Cape Town and they are interested in promoting the sales of energy efficient products in community centers. As there are other locations that may be able to effectively and sustainably distribute products, we encourage that these locations be researched and tested to see if they are viable options based on the criteria established in Findings 2 and 3. These locations are all commonly visited in communities and increase the number of people that can be reached.

However, there are locations that are not suitable to fit within the Entrepreneurial Initiative. As stated in Finding 1, the location must provide an additional income to the entrepreneur. Direct sales are not a very plausible method of distribution since the business model does not provide a primary method of financial support for the distribution business. Finding 2 also limits the

possible distribution locations as they must be able to provide trust, affordability, and product confidence. For example, we found that spaza shops do not fit these criteria since they cannot demonstrate the product's capabilities and benefits. Additionally, the location must be able to reach the target market as stated in Finding 3. The location must be accessible to the community members so the products are sold quickly.

7.4 Further Develop Energy Savings Graphics

We recommend that researchers continue to gather energy cost and usage information and develop visual means of representing the long-term savings associated with investing in energy efficient products to low income consumers.

Communicating long-term savings is a challenge for organizations attempting to distribute energy efficient products. There has been little research in low income communities on how to convey the idea of paying a high upfront cost in order to receive energy and money savings benefits in the future. For those in low income communities, investing in energy efficient products is a hard concept to grasp as they want to see the effects of their purchase very soon after, since they live on 'survival mode,' or spend the money they have to make it through that day.

From the information we gathered from interviews with community members, we made energy savings posters that show the savings energy products provide as seen in the Entrepreneurial Support Packet (Appendix 11.2). To effectively communicate the concept of energy savings to a wide range of literacy levels and languages, limited words were used on the posters. These posters do not give savings in terms of money but rather in meals and time to show how it can help the household on a daily basis. Comparing the amount of meals or time without the product and with the product showed the benefits in a visual manner that was easy to comprehend. However, we believe other graphics can be created to strengthen the idea of savings and paybacks. We recommend that further research be done, especially in cooking, lighting, and heating, to further develop effective ways to convey the benefits of energy efficient products.

8. Conclusion

Energy poverty is a widespread issue in South Africa as almost half the households are classified as energy poor. Currently, there are a number of organizations trying to address this problem by donating energy efficient products to communities. However, these distribution methods are not sustainable as livelihood improvements stay at a standstill once the organization has successfully distributed the product with training and leave the community. We partnered with the City of Cape Town Office of Sustainable Livelihoods to fulfill this opportunity by finding a sustainable solution to these current efforts. This project focused on improving these distributions methods by developing an entrepreneurial initiative to effectively sell energy efficient products to low income communities that improve their livelihoods.

Throughout our time in Cape Town, we collected information on business methods and energy practices and perspectives of those in low income communities. An Entrepreneurial Initiative, that includes a business model and entrepreneurial packet, was created based on these insights. This initiative allows crèche leaders to take on an entrepreneurial role and sell energy efficient products they feel best improve the lives of those in their community. The crèche leaders are able to select other energy efficient products from the product catalog we compiled to expand their distribution business. This initiative was tested with two crèches that volunteered to participate in our project using the Wonderbag as the first product. The results and feedback from the crèche leaders allowed us to improve and adapt the initiative for future implementation in other communities.

The Entrepreneurial Initiative can hopefully be replicated in additional crèches and be self-sustaining after being established. It provides a method for energy efficient products to be distributed to a wide range of community members. We believe this Entrepreneurial Initiative may be a valuable step in addressing the persistent problems of energy access and livelihood opportunities in South Africa.

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11. Appendix

11.1 Relevant Background Research

In the seven weeks prior to our arrival in Cape Town, we conducted extensive background research about important themes to our project. Our team explored past Interactive Qualifying Projects (IQPs) completed by Worcester Polytechnic Institute students, researched case studies on energy product implementation and distribution methods, and sought advice from researchers and practitioners.

Issues Resulting from Energy Practices in Informal Settlements

Despite the country being ranked sixth in the world for producing hard coal, a majority of the population in the informal settlements of South Africa cannot afford to use the electricity the country produces (Department, 2006). When electricity is not used, other less safe sources are used, the most common being paraffin, candles, and firewood. The uses of energy sources in low income households in Cape Town are depicted below in the figure. Based on HESASA's research, the figure illustrates that traditional energy practices are commonly used in the houses regardless of electrical connection ("Household Energy Sources Fact Sheet," 2012). Given the varied nature of energy sources, communities struggle to secure safe and dependable sources of energy.

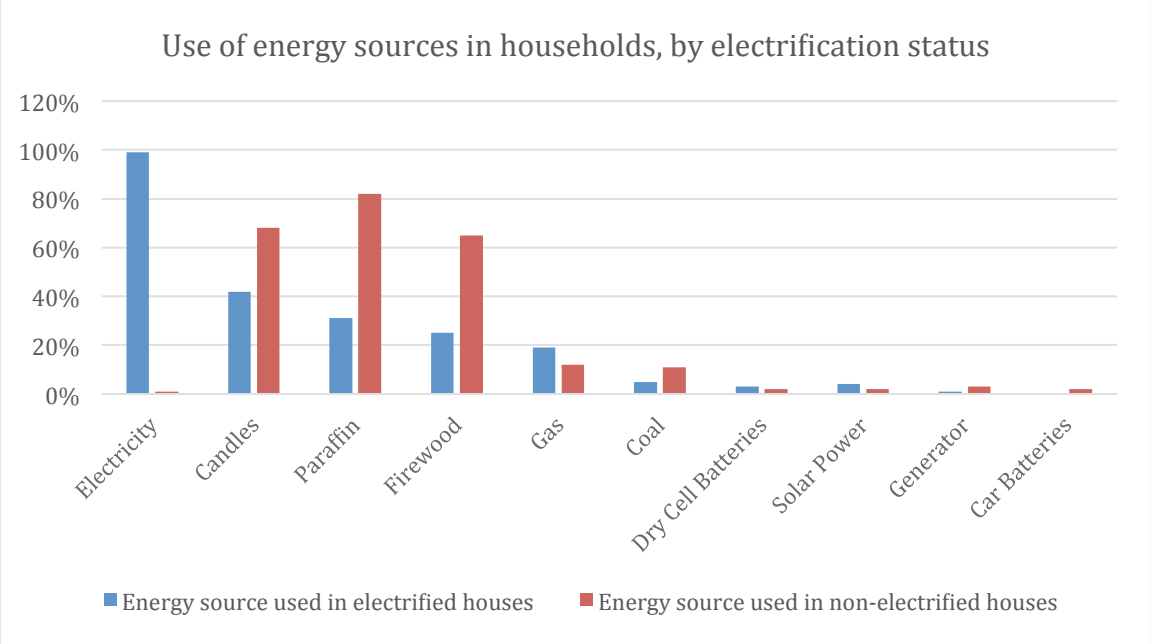


Figure 11: Use of Energy Sources in Low Income Households in Cape Town (Adapted from "Household Energy Sources Fact Sheet," 2012)

Dangers of Shack Fires

Shack fire related deaths affect one out of every seven people in the world today physically, mentally, or socially (Raphela, 2011). In South Africa, the heart of this problem is poverty. Shack fires usually happen in informal settlements, where most houses are built with extremely flammable and conductive materials, including iron sheets, wood planks, or bamboo. This problem is exacerbated by the common use of paraffin for cooking fuel and prominent use of

candles, which causes about 45% of fires in the informal settlement context ("Household Energy Sources Fact Sheet," 2012). It takes less than one minute to burn down a house (Town, 2014). Since the distance between homes is small, the whole neighborhood can catch on fire very rapidly. Around 4,000 shack fire incidents occur in informal settlements in South Africa every year ("Fire Statistics of South Africa," 2014). Although the government provides emergency supplies on hand to help the affected people, there are many lasting effects unmitigated by the local emergency services.

On New Year's Day in 2013, Khayelitsha, the largest informal settlement in Cape Town, caught on fire. In one hour, five people died and over 4,000 people lost their homes (IRIN, 2013). According to the South African National Fire Department's statistics, shown in the figure below, in 2011 there were 4,046 fires in informal settlements. This number rose to 4,516 in 2012 ("Fire Statistics of South Africa," 2014). The most vulnerable people are women and children. Compared to men, women spend most of their time doing housework, including cooking on open fires.

Figure 12: Annual Fire Deaths in South Africa, 2000-2011 (Adapted from "Fire Statistics of South Africa," 2013)

Health Effects of Energy Practices

Many cheap energy sources have serious health implications. The leading health issues come from paraffin lamps and stoves, the smoke of which can cause respiratory infections and lung cancer. The dangers of paraffin fumes are compounded by their use in informal settlements. The poorly ventilated shacks are small, which causes the toxic fumes to accumulate. According to the World Bank, over 750 million women and children inhale paraffin fumes equivalent to smoking two packs of cigarettes a day (RPC, 2011). This is a major contributor to female lung cancer cases; in developing nations 65% of adult female lung cancer victims do not smoke (RPC, 2011). This highlights how dangerous the constant use of paraffin lamps and stoves can be.

Although South Africa's annual paraffin use has been decreasing for the past 15 years, 83% of non-electrified households and 31% of electrified households still use paraffin (Walsh, Wesselink,

& Janisch, 2011). The fumes from paraffin cause indoor air pollution problems, which are exacerbated by insulation. The easiest method to insulate a shack is to block the flow of air both inside and outside. Although this is vital when heating a room, the lack of airflow greatly increases the danger of airborne pollutants. When the airflow is restricted, airborne pathogens and toxic fumes accumulate rapidly. The United States has a $77 billion industry dedicated to ensuring buildings have safe heating, ventilation, and air-conditioning (IBIS, 2014); informal settlements in Cape Town do not have this ability. Although insulation is important, it increases the dangers of indoor air pollutants.

Not only are the fumes dangerous, consuming paraffin is highly toxic. Children are at a high risk for paraffin poisoning since they are likely to accidentally ingest it. The World Health Organization found that 75% of households in South Africa kept paraffin within easy reach of children (Organization, 2004). This is very dangerous for young children, as consuming paraffin can be fatal if not treated quickly. Paraffin has the same appearance and consistency as water, adding to the risk of child consumption. In fact, it is the leading cause of childhood food poisoning: the WHO estimates that 16,000 children are hospitalized each year due to consuming paraffin (Organization, 2004). Furthermore, many South Africans are exposed to paraffin starting at a young age; chronic exposure can affect the central nervous system causing: irritability, restlessness, ataxia, drowsiness, convulsions, coma, and death (Chilcott, 2006). Health is one of the issues major caused by current energy sources.

Social Issues Associated with Energy Practices in South Africa

South Africa, especially Cape Town, has an extremely high crime rate. Over 130 out of 100,000 South African citizens reported that they had been raped in 2010 (NationMaster, 2013). Cape Town was ranked as the 34th most violent city in the world in 2011, with 46 murders per 100,000 residents. Furthermore, violence is higher in informal settlements than wealthier areas (Barnes, 2012). Although most crime is not directly related to energy or energy products, the application of energy products can reduce crime rates. Adequate lighting at night has been shown to reduce violence. In areas of the United Kingdom where streetlights were introduced, crime rates reduced by 38% (Welsh & Farrington, 2008). Informal settlements without effective lighting will generally have a higher crime rate than those with adequate lighting.

Lighting also increases the academic performance of students. A project conducted by students at Worcester Polytechnic Institute found that increasing a student's access to light increases the chance that they will stay in school, improve their test grades, and have higher graduation rates (Konicki, Korpacz, Russell, & Yilmaz, 2014). On the other hand, high lighting costs deter students from studying at night, and dangerous sources of light negatively affect their health if they choose to use them. Increased violence and limited access to light to study are two of the major issues perpetuated by energy practices in informal settlements.

Interactive Qualifying Project Center Context

The Cape Town Project Center (CPTC) was founded in 2007 as a part of Worcester Polytechnic Institute's Global Perspective Program as an opportunity for students to complete their Interactive Qualifying Project (IQP). During a fourteen week project period, students confront and solve issues that lie at the intersection of humanity, technology, and society while working with locals to improve the community in a sustainable way. Our project's main goal is to support entrepreneurs in developing a method to effectively sell and implement sustainable, practical,

and affordable energy efficient products to low income communities. We worked to understand the community needs and find possible products to improve the areas of health, safety, and environment. Through study of past projects and discussions with our sponsors and partners in Cape Town, we gathered ideas for training entrepreneurs, choosing retail centers, building relationships, and understanding community needs.

Importance of Understanding Community Needs

One WPI team worked in the informal settlement of Khayelitsha, Cape Town in 2009 to complete their IQP. Their project, Alternative Cooking Solutions for Monwabisi Park, focused on cooking options that were sustainable, inexpensive, safe, accessible, and socially acceptable (Arnold, Bass, & Clark, 2009). They looked at alternatives including wood burning and paraffin stoves and presented their findings to the community to get feedback and raise awareness.

There have been initiatives made in the past by the City of Cape Town to reduce the use of paraffin stoves and increase the use of gas stoves. However, these efforts were not well received by the community members because the gas containers were difficult to transport. In order to create a more successful outcome, the WPI project team established relationships with their co-researchers which then helped them interact with the community members. This allowed the project team to better understand the needs and current methods used in the informal settlement through their conversations and interviews. Based on the information gathered, they were able to find several cooking alternatives that satisfied the community.

This IQP project provided us with great insight on how to overcome obstacles and approach the community. It showed that there were many different options to solve a problem, but the most successful was the one that the community wants and feels best fit their lifestyle. It also demonstrated the importance of creating good relationships in order to have a positive outcome. This approach used in Khayelitsha to promote and implement sustainable cooking methods was useful in other low income communities. Since a major focus of our project was on developing an entrepreneurial aspect of selling products in a community, we also needed to build relationships with business partners and community members. Part of understanding their needs was finding a market to sell the products and looking for other products that met these needs.

Business Recommendations for Product Distributors

In an IQP project completed at the Namibia Project Center in 2010, Evaluating 'Business Opportunities with Solar Energy in Un-Electrified Areas', the 'Off-Grid Energisation Master Plan' (OGEMP) looked into installing solar powered energy shops in areas where there is no electricity (Robertson, Sandbrook, & Sheehan, 2010). A large portion of Namibia's population gets their energy off the grid which is hindering the economic and social growth of the country. Desert Research Foundation of Namibia (DRFN) created a program that is similar to the OGEMP. This WPI IQP team's goal was to analyze the success of the program and make recommendations to improve it.

The team looked into many factors such as economics, social implications, technical capacity, and customer satisfaction to assess the program. Their method of data collecting included shop owner interviews, residential surveys, and personal observations. From the data collected, the energy shops were seen as a viable option based on the fact that the solar systems can be paid back from their sales of energy products.

This project came up with a wide range of recommendations for the DRFN program. For example, they suggested that shop owners use an energy profiling survey to see where the most useful areas are to distribute energy products. A survey, or similar market research approach, may be valuable in our project to determine the best locations to sell the products. Additionally, the team evaluated a significant amount of recommendations for the program on different training topics. These recommendations included technical aspects of the product, the products' capabilities, and the entrepreneurs' involvement in the sessions. This showed the importance of proper education on the use of the product and how the energy shop owners have an influence on the success of implementation.

For our project, one thing that was important to consider was how to train the members of the community that will be selling the products. The seller has to have a good understanding of financial responsibility and how to use the product. The recommendations and methods of this project were important to consider and adapt for our project.

Developing Community Research Relationships

An IQP project conducted at the Thailand Project Center in 2013, Promoting Renewable Energy Use Through Community Based Education: Powering and Empowering Rural Thailand, offered valuable lessons about the importance of community education in promoting renewable energy technologies and their applications (Darcy, Marcinkowski, Olson, & Willer, 2013). Barriers such as technical, informational, economic, political, and knowledge obstacles make it difficult to successfully implement renewable energies. The team and their sponsor, the Population of Community Development Association (PDA), specifically looked into the knowledge barriers that caused a lack of access to information about new technologies and the social issues associated with product acceptance.

The team looked into how to best utilize and develop learning centers in the community they worked in, Mae Mo. They used a community-based approach by connecting with the residents to understand the problems the community is facing. More specifically, the team looked into energy consumption and the physical and social feasibility of the energy products.

The method of getting information consisted of visits and interviews. The interviews with target community members helped the group gain an understanding of the best design for the learning center and what ideas the community members wanted. An important part of their process was integrating the ideas of the residents with the goals of the PDA to make sure the learning center addressed both groups' needs. The interviews allowed the team to see what the community's energy needs were and what products are useful for them.

The most important lessons from these interviews for our work in Cape Town are: (1) it was important to understand the level of knowledge the community members had on renewable energy and (2) it was necessary to come up with a few options for products to be implemented. The team recommended that the PDA increase communication about the learning centers and educate residents about the savings and benefits of using renewable energy products. This was something we shared with the outside organizations and entrepreneurs we collaborated with in order to come up with a business model that is tailored to low income communities.

The first important lesson we learned from their project was to understand all aspects of the community where the work is being done. Some things to focus on are the communities' economic needs, culture and social lives, ideas, and knowledge. The residents' understanding of

the products is key to being successful. Interviews were an effective way to collect data; however, it was important to have a specific group of people to interview. Lastly, a learning center can be a great way for the community to learn about the products being brought to the low income communities, allowing them to understand and see the benefits of the new technologies. Despite this project being in Thailand and less business oriented, there was a lot of information that we used to help us have a successful outcome.

Methods for Financing Businesses in Low Income Communities

Poverty and inequality stem from lack of access and opportunity, a problem deeply ingrained in the community. A common approach to poverty alleviation is making donations, which creates access. However, this is often a short-term solution as supply runs out and goods are not responsive to consumer desires. Furthermore, donations severely limit the capacity for large-scale distribution due to the restricted quantities. In areas where distribution channels are underdeveloped and profit margins are low, large corporations are resistant to enter markets. While donations are ineffective, finance models like microfranchise, microcredit, and microconsignment are successful in supporting entrepreneurs in poorer areas through initial capital support. Our research concluded microconsignment is the most effective business model for low income communities in South Africa.

Microfranchise

Microfranchises are established companies with working operating systems and known brands. It is a franchise scaled down to an affordable price, which allows low income people to purchase a branch. In developing countries, the price for a microfranchise branch ranges between $5,000 to $15,000 USD ("What is Microfranchising?," 2010). Local entrepreneurs, or microfranchisees, use a microcredit model as a finance mechanism for the financing of the microfranchise, and organizations, or microfranchisors, create the access to products that empower these local entrepreneurs to get started and grow. An example is VisionSpring; it is a social enterprise that uses a microfranchising model to reduce poverty and generate opportunity by selling reading glasses at an affordable price (Sireau, 2011).

Since a large majority of low-income individuals in developing countries do not have the necessary skills to develop their own business, microfranchises provide the benefits of being "ready-made." It removes the need to set up a financial model, supply chain, relevant technologies, business partnerships, and communication systems because they are already established within the franchise. The entrepreneur also does not have to deal with the legal issues, licensing, and real estates – all other hindrances to starting businesses from scratch ("What is Microfranchising?," 2010).

The microfranchise model provides both financial capital and product access with the benefit of little start up needed. However, an individual is still required to use credit for the initial investment.

Microcredit

In a credit model, entrepreneurs buy products on credit and sell them. They then use the revenue from the sales to pay back the loan and ideally buy more products to sell ("The MicroConsignment Model," 2010). The microcredit system is similar to the credit system; however, it operates on a much smaller scale. This model provides access to capital for local entrepreneurs and solves the problem of not having financing for their business. Grameen Bank in Bangladeshi, founded by

Muhammad Yunus, was the first to begin the system of microcredit by offering loans to poor women, which provided them an opportunity to help themselves (Kowalik & Martinez-Miera, 2010).

Microcredit is a suitable financial mechanism for entrepreneurs with low start-up costs. However, the best customer for the microcredit model is the end clients. This is because existing businesses with known suppliers can benefit from credit by buying bulk goods at a lower cost ("The MicroConsignment Model," 2010). This is similar to US businesses that borrow commercial loans, sell stocks, and voluntarily enter debt to gain the working capital they need to grow.

Established businesses are better situated to sustain scheduled loan repayments and high transaction costs associated with the microcredit model. An entrepreneur's success is measured by their ability to make regular loan payments. In order to achieve the supply and demand, entrepreneurs have to quickly learn and start to sell immediately and consistently without fail. They are unsuccessful when they are left with an outstanding loan. However, entrepreneurs often use all or most of their earnings for personal or family needs leaving them with very little to pay down the loan or restock inventory, stunting their growth ("The MicroConsignment Model," 2010).

The microcredit model provides the financial capital entrepreneurs need, but it may not be appropriate for new entrepreneurs because regular loan payments begin immediately. It also fails to provide access to local distributors and create a safety net for entrepreneurs if they are unable to sell their products.

Microconsignment

A microconsignment model requires no initial financial investment from entrepreneurs. Instead, the organizations provide products to entrepreneurs at no cost. The entrepreneurs then sell the products, pay back the supporting organization, and earn some profit. After the inventory is restocked again at no cost and the cycle continues ("The MicroConsignment Model," 2010). This reduces negative outcomes by eliminating the need for start-up capital and avoiding financial failure since the goods are cosigned. The capital is tied up in the organization's products being sold instead of in a loan that the entrepreneur must pay back. Therefore, the only upfront cost is training; afterwards, costs are variable since they are connected to revenues.

Unlike loans, consignment allows entrepreneurs to "test drive" a product without fear of failure. This enables local entrepreneurs to use a trial and error method to evaluate the market needs and provide access to new, essential products and services that address their needs (Smith, 2011). Microconsignment creates access to key technologies, products, and services by developing new opportunities for entrepreneurs.

To provide the products and services to the people, entrepreneurs and organizations must be partnered together. Even though the organization provides the products, it is not successful without the knowledge and distribution of the local entrepreneurs who understand the needs of the communities. This model empowers the entrepreneurs, who usually have little education and no business experience ("The MicroConsignment Model," 2010). Through the training program, entrepreneurs are given new skills and taught how to make informed decisions in exchange for their time. As a result, products and services reach the villagers, entrepreneurs earn money and respect in the community, and organizations help the area in need and earn a profit. Success is measured in sales to villagers, not sales to entrepreneurs. The microconsignment model can best

be depicted below:

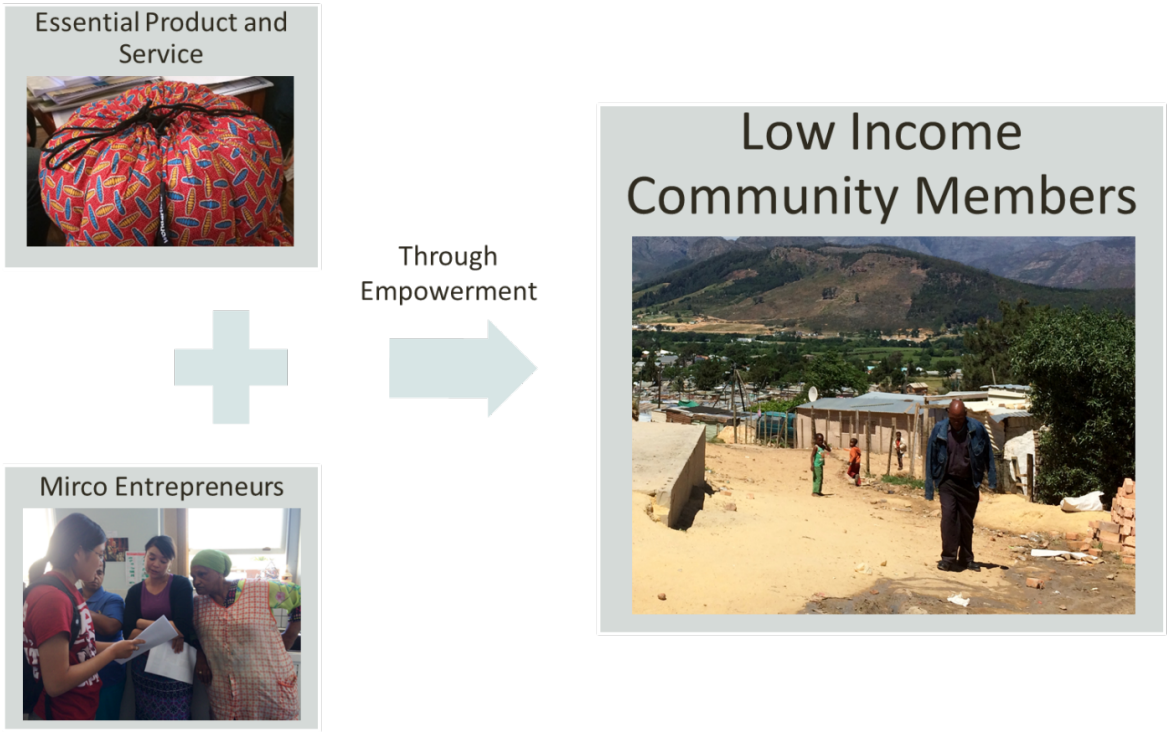


Figure 13: Microconsignment Concept (Adapted from "The Microconsignment Model", 2010)

Overall, microconsignment provides entrepreneurs with the opportunity to service their communities without the initial financial investment. The partnership between the organization and entrepreneurs also provides continuous access to goods for community members. In a microconsignment project in Guatemala, local entrepreneurs were given the materials on consignment to build the concrete stoves. They then sold the stoves to villages at an affordable cost and developed an income-generating opportunity for themselves ("Our Story,").

11.2 Entrepreneurial Support Packet

Entrepreneurial Support Packet Overview

Wonderbag Support Entrepreneurial Packet Overview

Provided by: The WPI Energy Team

1. Business Guide Brochure
2. Buyers Safety Tip Brochure
3. Wonderbag Advertisements
4. Wonderbag Sales Log
5. Savings Advertisement Poster

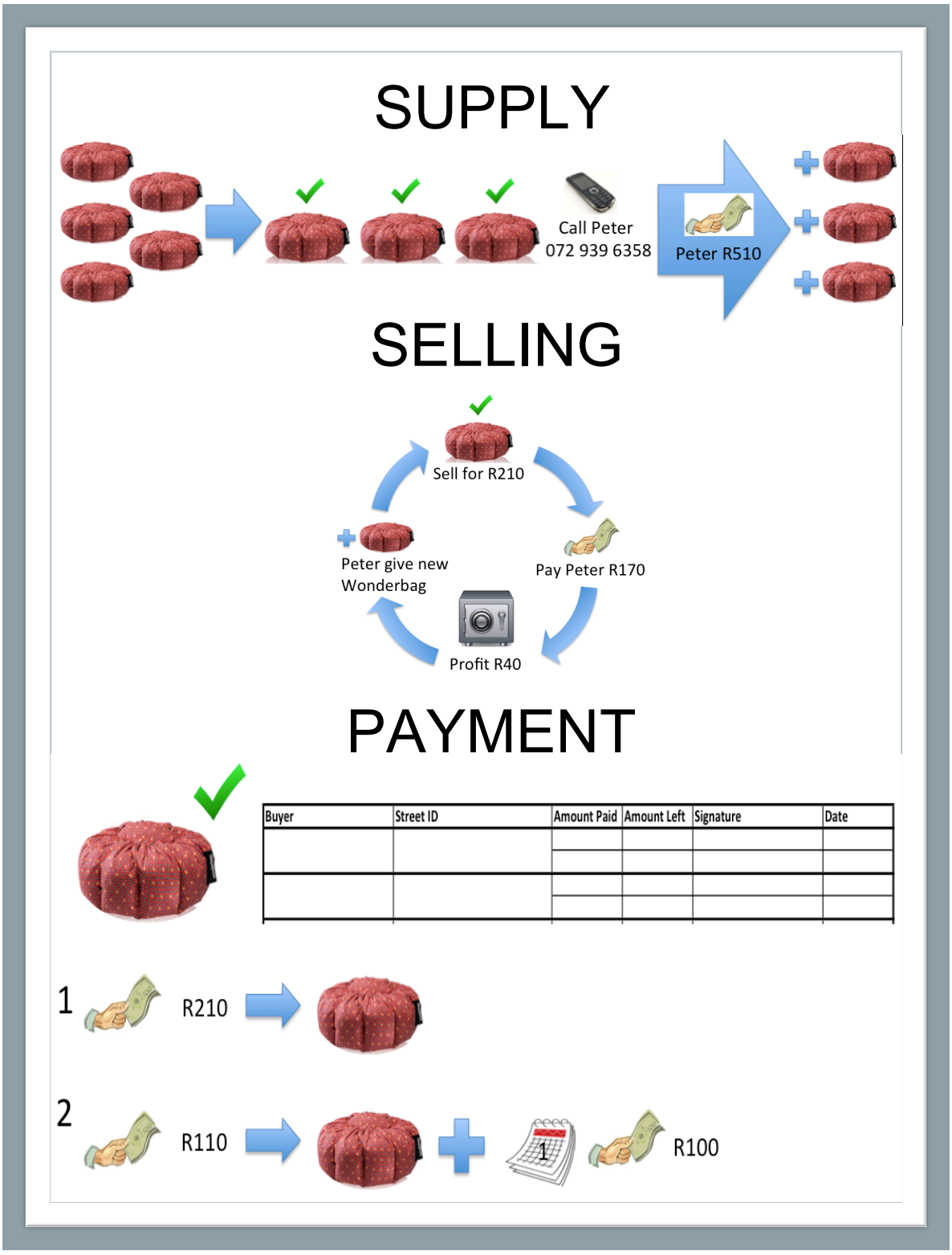
Pilot Program

Partnered with: The WPI Energy Team

1. Five Initial Wonderbags
2. Partnership Contract
3. Pilot Program Log

WPI

THE ENERGY TEAM


SUPPLY
Call Peter
072 939 6358
Peter R510
SELLING
Sell for R210
Pay Peter R170
Profit R40
Peter give new
Wonderbag
PAYMENT
Buyer
Street ID
Amount Paid
Amount Left
Signature
Date
1
R210
2
R110
R100

Wonderbag Safety Tip Flyer

Wonderbag

A recipe for change

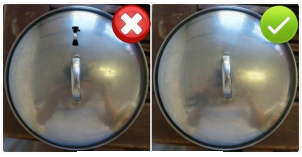
USAGE TIPS

Saves

and

Peter Sharples
072-939-6358
wonderbag.
a recipe for change

Type of Pot



Tightly seal

Do not use washing machine, just wipe dirty spot

Protect the Wonderbag with a cloth

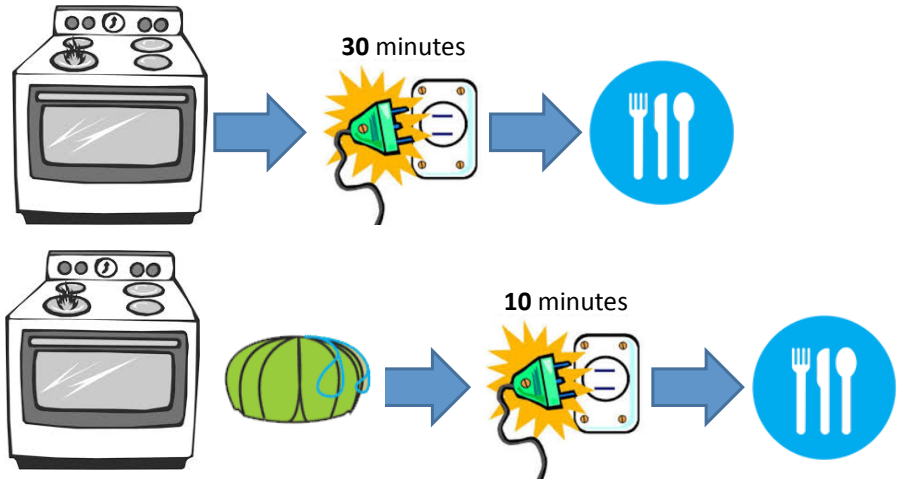
Do not let Wonderbag touch flame

Wonderbag Sales Log

Buyer	Street ID	Wonderbag ID	Amount Paid	Amount Left	Signature	Date

Energy Savings Poster

Wonderbags Save Electricity



Pilot Program Contract

WPI CAPE TOWN PROJECT CENTRE BUSINESS PARTNERSHIP

Date:

Congratulations _____, and thank you for agreeing to participate with the WPI Energy Team in our Pilot Program. We look forward to working with you and sharing an exciting opportunity to learn and grow together. This Letter briefly describes the Pilot Program and our partnership.

PURPOSE OF PARTNERSHIP

We are exploring the strategy of promoting crèches as a distributing center for energy efficient products. The purpose of the partnership is to identify crèche leaders who are willing to participate in a pilot study and work together to improve the strategy. The document describes the responsibilities and expectations of the Energy Team and the crèche leader.

EXPECTATIONS

The crèche leader will perform the following actions:

1. Exchange contact information (email, phone number, etc.) and define the best way to be reached.
2. Attend all scheduled meetings and arrive on time. If something should come up and you are unable to attend the meeting, phone the other partners in advance (preferably 24 hours) so the meeting can be rescheduled.
3. Make an active effort to sell Wonderbags.
4. Record all transactions related to Wonderbag sales, including number of sales and sale prices, using the Wonderbag Sales Log.
5. Present Pilot Program Log and Wonderbag Sales Log at each weekly meeting.

The WPI Energy Team will offer the following:

1. Five initial Wonderbags at the beginning of our partnership as the capital money
2. Sales and Wonderbag training
3. An Entrepreneurial Packet

The Entrepreneurial Pack includes the following documents:

1. Business Guide
2. Buyers Safety Tip
3. Wonderbag Sales Log
4. Wonderbag Advertisements
5. Savings Advertisement Poster
6. Pilot Program Log
7. Recipe Book

Should all of the Wonderbags be sold, the WPI Energy Team will provide the crèche leader with the contact information of a Wonderbag distributer, Peter Sharples, who has agreed to provide additional Wonderbags.

VALIDATION

Our partnership will start on the date listed above and will continue for two (2) months after the date it is signed. Both you and WPI have the right to end participation in this program at any time, for any reason.

Once the Pilot Program is completed, the WPI Energy Team will provide the crèche with a formal letter of participation and a catering Wonderbag.

Again, congratulations and thank you for your participation. We look forward to working together!

Signed:

_____	_____	_____
Partner Name	Partner Name	Partner Name
_____	_____	_____
Partner Signature	Partner Signature	Partner Signature

Wonderbag

Sold at [insert creche name]

Pilot Program Log

Name	Interest		Bought a bag? (Yes/No)	If Yes, why?		If No why?		Signature/Date	Additional Comment
	Purchase today			Save Energy		Expensive			
	Wants to purchase			Save Money		Doesn’t believe in product			
	Not sure			Safety		Not needed			
	Doesn't like it			Other:		Other:			
	Purchase today			Save Energy		Expensive			
	Wants to purchase			Save Money		Doesn’t believe in product			
	Not sure			Safety		Not needed			
	Doesn't like it			Other:		Other:			
	Purchase today			Save Energy		Expensive			
	Wants to purchase			Save Money		Doesn’t believe in product			
	Not sure			Safety		Not needed			
	Doesn't like it			Other:		Other:			
	Purchase today			Save Energy		Expensive			
	Wants to purchase			Save Money		Doesn’t believe in product			
	Not sure			Safety		Not needed			
	Doesn't like it			Other:		Other:			
	Purchase today			Save Energy		Expensive			
	Wants to purchase			Save Money		Doesn’t believe in product			
	Not sure			Safety		Not needed			
	Doesn't like it			Other:		Other:			
	Purchase today			Save Energy		Expensive			
	Wants to purchase			Save Money		Doesn’t believe in product			
	Not sure			Safety		Not needed			
	Doesn't like it			Other:		Other:			
	Purchase today			Save Energy		Expensive			
	Wants to purchase			Save Money		Doesn’t believe in product			
	Not sure			Safety		Not needed			
	Doesn't like it			Other:		Other:			
	Purchase today			Save Energy		Expensive			
	Wants to purchase			Save Money		Doesn’t believe in product			
	Not sure			Safety		Not needed			
	Doesn't like it			Other:		Other:			

11.3 Energy Efficient Product Catalog

Cooking products

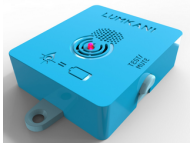
PRODUCT	PRICE	INVESTMENT RETURN	UESES/PROS	DISTRIBUTOR
WONDERBAG 	R210	If used once per day, will start saving money after 23 days	• Reduced energy use when cooking • Pot is safe when in bag • Keeps food warm or cold for prolonged periods of time • Distributer will deliver product • R40 profit per bag sold	Peter Sharples
ZOOM VERSA 	R505		• Stove designed to maximize efficiency • Fewer emissions from burning • Works with wood, charcoal, or solid biomass fuels • US EPA certified	Restio Energy
ROCKET WORKS STOVE 	R575		• Efficient wood stove • Safe to touch outer casing • Can accommodate multiple fuels	Restio Energy
PROTOSTAR 	R200 + Fuel		• Paraffin replacement • Alcohol based burner • Designed so fuel won't spill if knocked over • Operates at only 35° C so it's safe • Fuel can be sold at shop, so repeat customers	Proto-Energy
ZOOM JET STOVE 	R785		• Charcoal stove that uses both convection and radiation • More efficient use to save fuel • US EPA certified	Restio Energy
SUNSTOVE 	R635		• Mirrors trap light • Slow cooker • Can boil water in one hour	Sunstove organization
MBAULA GREEN 	R449		• A clay cooking stove designed to optimize heat • Reduces fuel needed to heat food	Mbaula Green
PARASAFE 	R250		• Paraffin stove designed to self-extinguish • Shuts off if lifted 5mm or tilted 10° • 40% more efficient than standard stoves • Cooking elements are covered to prevent burns • 2009 WPI team recommended its use	Distributer seems to be out of business

Lighting Products

PRODUCT	PRICE	INVESTMENT RETURN	UESES/PROS	DISTRIBUTOR
WAKA WAKA LIGHT 	R390	231 hours	• Rechargeable LED • Solar power charger • 80 hours of light per charge	In2Brands
WAKA WAKA POWER 	R790	468 hours – cell phone	• Rechargeable LED • Solar powered charger • Power source for multiple devices • 150 hours of light per charge	In2Brands
DUAL POWER STIX 	R202	120 hours	• Two candle shaped lights • Solar recharger • Battery life is 25 hours per light • Built in phone charger	Solarway
EVERLITE 	R93.65	108 hours – cell phone	• LED rechargeable light • Solar powered recharger • Built in phone charger • 50 hours of light per charge	Solarway
HOMEWORK LIGHT 	R265	157 hours	• LED rechargeable light • Solar powered recharger • 60 hours of light per charge • Water resistant	Restio Energy
G1 LANTERN 	R610	305 Hours – cell phone	• LED rechargeable lantern • Solar powered recharger • Full charge in 1 hour • 20 hours of light per charge • Very bright light • Built in Cellphone charger	Restio Energy
G2 LANTERN 	R830	415 hours – cell phone and Radio	• LED rechargeable lantern • Solar powered recharger • Full charge in 1 hour • 20 hours of light per charge • Very bright light • Built in Cellphone charger • FM Radio with speakers	Restio Energy
WORLD PANNEL 500 SOLAR CHARGER 	R896	– cell phone	• Solar powered cell phone charger • Capable of charging 6 phones per day • Impact resistant	Restio Energy
FIREFLY MOBLE 	R420	249 hours – cell phone	• Solar LED lamp • Up to 50 hours of light per charge • Built in Cellphone charger	Restio Energy

SUN KING ECO 	R260	154 hours	• Solar LED light • 30 hours of light per charge • Twice as bright as a paraffin light	Restio Energy
SUN KING SOLO 	R415	98 hours	• Solar LED light • 24 hours of light per charge • Five times as bright as paraffin light • Variable light settings	Restio Energy
SUN KING MOBILE 	R540	80 hours – cell phone	• Solar LED light • 36 hours of light per charge • Eight times as bright as a paraffin light • Built in cellphone charger	
LITTLE SUN 	R175	104 hours	• Solar LED Light • 3 hours of light per charge	Restio Energy
CONSOL 	R179.99	107 hours	• Solar LED light	Consol
NURU LIGHT 	R80	47 hours plus cost to recharge	• Rechargeable LED • Lasts 28 hours per charge • Can be charged with POWERCycle • POWERCycle service can be provided at crèche for sustained income	Nuru Energy
NOKERO N200 SOLAR BULB 	R130	77 hours	• Solar LED light • Hook for celling mount • 6 hours of light per charge	Restio Energy

Other Products

PRODUCT	PRICE	UESES/PROS	DISTRIBUTOR
FR COATINGS	R17.50 per m^2	• Paint is applied to existing structure • Reduces flammability of structures	FR Coatings
LUMIKANI 	R90	• Detects heat to sense fires • Devices connect to other Lumikani	Lumkani

Name	Contact number	Email	Website
Peter Sharples	072 939 6358	peter@nb-wonderbag.com	http://nb-wonderbag.com/
Restio Energy	021 850 0771	wikus@restio.co.za	www.restio.co.za
Proto-energy	011 440 4299	leroux@proto-energy.co.za	http://proto-energy.co.za/
Mbaula Green	021 438 6003	sales@mbaula.co.za	http://mbaula.co.za/
Promethea	N/A (Out of Business)	N/A	N/A
In2Brands	021 447 6849 (Talana Cole)	talana@in2brands.co.za	http://In2brands.co.za
Solarway	011 894 7826	sales.za@solarway.com	http://solarway.com/
Console	+27 (11) 874 0000	information@consol.co.za	http://www.consol.co.za/for-you/products/innovations/consol-solar-jar
Nuru Energy	083 408 3722	vijay@shaktienergy.net	http://www.shaktienergy.net/
FR Coatings	0798778777 (Lynne Prigge)		
Lumkani		info@lumkani.com	http://lumkani.com/