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Master of Arts in International Affairs and Governance

Master Thesis

**Marketing solar lights to the base of the pyramid:
The case of India**

The challenge of rural distribution and affordability

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Table of content

List of abbreviations and figures	3
1. Introduction	4
2. Structure and research objectives	5
3. Bottom of the pyramid theory	7
3.1. Energy and poverty	8
3.2. Lighting needs	10
4. Solar off-grid lighting solutions	11
4.1. Solar lanterns	11
4.2. Solar home systems	11
4.3. Solar kits	12
4.4. SmartLight Project – OOLUX	12
4.4.1. Field testing	14
4.4.2. Research tools	15
5. Indian market environment	16
5.1. Socio-economic overview	16
5.2. Energy Market	17
5.2.1. The role of public authorities	18
5.2.2. Issues of renewable rural electrification	19
5.2.3. The off-grid lighting market	20
5.2.4. The solar lighting market	22
6. Marketing solar lighting solutions	24
6.1. Operational features of solar lighting solutions	24
6.2. Financing	25
6.2.1. Financing models	26
6.2.2. Practical examples	28
6.2.3. Obstacles in practice	29
6.3. Distribution	31
6.3.1. Models of domestic market players	32
7. BOP marketing strategies	36
7.1. OOLUX partners	36
7.1.1. TARA	36
7.1.2. Nidan	38
7.1.3. SELCO	38
7.2. Challenges of serving the BOP market	39
7.2.1. Applying the 4A-Framwork	39
7.2.2. Availability	40
7.2.3. Affordability	44
7.2.4. Acceptability	49
7.2.5. Awareness	51
7.2.6. Challenges in rural Bihar	54
8. Conclusion	58
9. References	60
10. Appendix	65

List of abbreviations and figures

Abbreviations

AC/DC	Alternating Current / Direct Current
ARE	Alliance for Rural Electrification
BOP	Bottom (Base) of the Pyramid
BRICS	Brazil, Russia, India and China
CFL	Compact Fluorescent Lamps
CoI	Census of India
EMI	Equated Monthly Installment
ESC	Energy Service Center
FOB	Freight on-board
GDP	Gross Domestic Product
HDI	United Nations Human Development Index
IEA	International Energy Agency
IFC	International Finance Corporation
INR	Indian Rupee
JNNSM	Jawaharal Nehru National Solar Mission
LED	Light-Emitting Diodes
mAh	Milliamp Hour
MFI	Microfinance Institution
MNC	Multinational Corporation
MNRE	Ministry of New and Renewable Energy
MPPT	Maximum Power Point Tracking
NABARD	National Bank for Agriculture and Rural Development
NAPCC	Nation Action Plan on Climate Change
NGO	Non-Governmental Organization
PV	Photovoltaic
RVSLP	Remote Village Solar Lighting Program
SHS	Solar Home System
SME	Small and Medium Enterprises
TARA	Society for Technology and Action for Rural Advancement
TV	Television
UNEP	United Nations Environment Programme
USD	United States Dollar
V	Volt
VLE	Village Level Entrepreneur
W (MW)	Watt (Megawatt)
Wp	Watt peak
4As	Framework of Distribution Challenges by Anderson and Billou (2007): Availability, Affordability, Acceptability and Awareness

Figures

Figure 1: OOLUX.....	13
Figure 2: Energy consumption in India 2011	18
Figure 3: Households using kerosene as lighting source or no lighting source at all	21
Figure 4: Solar radiation in India.....	22

1. Introduction

“When Thomas Edison worked late into the night on the electric light, he had to do it by gas lamp or candle. I am sure it made the work that much more urgent.”

– George Carlin (comedian)

What first appears like a humorous quote concerning past times, implies in fact a bitter truth even nowadays. More than one hundred and thirty years after Thomas Edison’s patented invention a significant part of the world’s population does still neither have access to electricity nor any benefit from advantages offered by modern lighting. This shortcoming has significant implications on their ability to pursue productive activities in the dark hours of the day. Traditional means of lighting such as oil and gas lamps as well as candles are not only costly substitutes to electric lighting – in many cases they also comprehend negative externalities affecting health conditions and the immediate living environment of marginalized communities (Lighting Africa, 2010). This thesis intends to contribute to the discussion evolving out of the urgent need to fight energy scarcity and promote poverty alleviation through private sector initiatives with focus on the solar off-grid lighting market. In accordance with the papers by Simon Moser and Bettina Naef covering the cases in Tanzania and Zambia respectively, this dissertation intends to provide practical insights on marketing solar lighting solutions in India. It will therefore encompass the most significant market features and challenges that affect ventures in serving low-income consumers effectively. The analysis more specifically concentrates on a recent product called OOLUX: A solar lighting solution that has been engineered to penetrate underdeveloped lighting markets around the globe. Eventually, the aim of this research is to identify and evaluate feasible business approaches that facilitate the introduction of new and innovative products such as OOLUX in the Indian market. Accordingly, scrutinizing and illustrating selected market challenges as well as sales opportunities will comprehend a considerable component of this paper. Finally, a comprehensive evaluation of the existing approaches will exemplify best practices for businesses and independent institutions that are eager to engage in improving the livelihood of marginalized communities. Living space and production venues of people with low incomes should not any further resemble Thomas Edison’s scarcely lit workroom a long time ago.

2. Structure and research objectives

This thesis is set to discuss solar lighting solutions in India and their potential to successfully penetrate this highly competitive market. First, we will assess the theoretical background of serving the world's poor. The so-called bottom (or base) of the pyramid (BOP) theory was mainly elaborated by C.K. Prahalad and his colleagues Stuart Hart (2002) and Allen Hammond (2002) and has until now provoked multiple reactions – both of affirmative as well as of dismissive nature.¹ For the purpose of this paper we will not enter the discussion in depth, but rather provide a general overview: we will mention the theory's main ideas and will subsequently attempt to exemplify the Indian BOP context. This dissertation will further identify practical challenges concerning energy poverty and lighting needs and eventually enter the field of sustainable lighting solutions by enumerating a series of different alternatives based on solar energy in chapter 4. The core of this section will encompass SmartLight Project, which was launched by Antenna Technologies Foundation (Antenna)². This project envisions placing an innovative solar lighting solution named OOLUX on BOP markets around the globe. To test the product's viability and market potential Antenna has subsequently arranged various pilots in different target countries, whereupon the field testing in India entailed the purpose for this thesis.³ We will then scrutinize the Indian market environment thoroughly in chapter 5 by providing information on the country's socio-economic status, its energy market as well as its off-grid market. Eventually, an examination of the solar lighting market and an assessment of the domestic potential for solar lighting solutions will follow in chapter 6. Consequently, we will discuss current business models with specific focus on financing and distribution issues. The first problem will be embraced by looking at existing financing models in theory and by analyzing applied solutions of different market players in this segment. The latter will be elaborated in similar manner by investigating practical distribution models from a different set of stakeholders. Both parts are based on findings from contemporary business reports and other secondary literature. We will then move to the practical part of this thesis in chapter 7, where Antenna's local partners for the pilot phase (namely TARA⁴ and SELCO⁵) answer a series of questions concerning distribution challenges that have been identified in a separate paper during field-test

¹ For example Aneel Karnani (2009) has been critical about many conceptions that the BOP theory takes for granted. See Meli (2012) for an extensive analysis of this discussion.

² For more information see www.antenna.ch (accessed on October 4th, 2013)

³ This paper's initial purpose was to thoroughly analyze the outcome of OOLUX field tests in India. However, due to insufficient competitiveness with regard to the price, the product did not enter the commercial testing phase in this highly contested market during the pilot period. Hence, the practical findings regarding the product's technical viability and marketability are almost inexistent. The focus of this thesis had therefore to be relocated to scrutinizing different approaches of existing BOP marketing strategies by various stakeholders and the subsequent necessities of effectively serving the poor. To sum up, this research rather embraces an assessment of OOLUX's market potential than an empirical examination of the product's commercial viability in India.

⁴ Society for Technology and Action for Rural Advancement. For more information see www.tara.in (accessed on October 8th, 2013)

⁵ For more information see www.selco-india.com (accessed on October 7th, 2013)

preparations (see Moser et al., 2013 in annex 2). These challenges are grouped according to the 4A-Framework proposed by Anderson and Billou (2007)⁶ and form the basis of a semi-structured questionnaire (see annex 1), which has been presented to different decision-makers working for TARA and SELCO as well as Nidan⁷. Thus, we will extensively illustrate their current business approaches to each of these challenges and elaborate possible implications for the potential marketing of OOLUX. This setup also directs us to the research questions, which we hope to answer through the extensive practical analysis:

- *What are the current business strategies of Antenna's partners (TARA and SELCO) to address the challenges named by the 4A-Framework of Anderson and Billou in the context of the Indian BOP market?*
- *What would be necessary prerequisites that enable TARA and SELCO to successfully market OOLUX with respect to each of the four challenges?*

The first question envisions determining current business approaches of Antenna's partners with regard to four different challenges that arise when serving poor customers in the Indian BOP market. These methods are not strictly limited to promoting solar lighting solutions, but can also encompass other sustainable products and services that these organizations market. Nevertheless, since both are active in procuring off-grid energy services to marginalized communities we will highlight the proceedings that are compatible with delivering solar lighting solutions to poor households. Hence, the second query considers appraising pertinent challenges that could hinder OOLUX from being marketed effectively on the one hand and how to possibly overcome these obstacles in the case of India on the other. Eventually, we will intend to provide answers to our research questions and sum up our findings in chapter 8.

⁶ The 4As are distribution challenges named availability, affordability, acceptability and awareness.

⁷ For more information see www.nidan.in (accessed on October 8th, 2013)

3. Bottom of the pyramid theory

C.K. Prahalad introduced the idea of multinational corporations (MNCs) engaging in the BOP market in the beginning of the new millennium together with his co-authors Stuart Hart (2002) and Allen Hammond (2002). "*Serving the world's poor, profitably*" became a credo that Prahalad and his colleagues started to propagate consistently to MNCs on a global basis (Prahalad and Hart, 2002). In their words: "*we have only begun to scratch the surface of what is the biggest potential market opportunity in the history of commerce*" (Idem, p.14). According to these scholars there was a common cause in developing the BOP market, because the emerging customer base of four billion people, who represent the low-income population in developing countries, would eventually represent a major market segment as well as a chance for business, government and civil society to work together (Ibid). The authors especially underlined the new business opportunities by stating that it was reasonable to tap the BOP market in order to get engaged in large, untouched markets that offer new clients and inexpensive possibilities for thorough innovation processes (Prahalad and Hammond, 2002, p.57). Prahalad later argued that this BOP market does not resemble a monolith, but rather multiple cultures, ethnicities, capabilities and needs that mingle together in a vast unorganized sector. The real challenge is to "*convert the unorganized and fragmented markets to an organized private sector market*" (Prahalad, 2012, p.6).

In India the rural BOP market is vast and heterogenic including people living in all kinds of settlements. Unlike for example in Brazil, where many BOP customers live in urban slums or favelas, a majority of the Indian poor lives in rural areas (Idem, p.6-7). These rural households have to focus on surviving and are therefore rather prone to risky cash flow management and risk taking concerning unknown investments and potential offerings. Furthermore, in the countryside there may be a strong seasonal impact on income as well as necessities and, hence, product demand in general. In India's north, cold winters differ significantly from the unbearable heat in May and June and the Monsoon rains in the late summer. Naturally, income and expenditure levels can also differ remarkably depending on the time of year. Even though weather does follow predictable patterns most of the time, the ever-present threat of crop failure keeps looming over farmers. A calamitous combination of insufficient harvests, lacking credit markets and deficient information exchange can lead to aggregate financial risks within a whole village (Jacoby and Skoufias, 1998).

According to Sachin Shukla and Sreyamsa Bairiganjan (2011, p.2) the BOP population, however, suffers not only because many basic needs such as healthcare, water, sanitation and financial services are still unmet, but also because – compared to members of the upper tiers in the socio-economic pyramid – they pay a higher price for the same products and services. Hammond et al. (2008) scrutinized this so-called BOP-Penalty and identified the same phenomenon when comparing access to electricity between the BOP and the mid-

market segments. It is mainly a result of local economic particularities, which include market domination by monopolies and traditional forms of financial intermediaries hampering adequate access to products and financial redistribution. As a result, rural areas in India are poorly served compared to the more prosperous urban regions (Idem, p.77-85).

In general, the BOP customer profiles are characterized by their heterogeneity. However, there are common issues that appear in most BOP segments such as the volatility of income levels, a characteristic linked to a lack of decent saving mechanisms as a result of missing access to contemporary financial institutions. Furthermore, there exists restricted mobility, which limits sharing experiences and best practices among different communities. Finally, expenditure is focused mainly on survival needs, namely food, which accounts for over three-quarters of total household expenses. The second-largest share of household spending is earmarked for energy requirements, but only represents 12% of total consumption. Subsequently, marketing BOP products is challenging due to a low rate of disposable income for necessities other than food on the one hand and due to limited market penetration resulting from a lack of product awareness on the other hand. The second issue can be rooted to varying languages as well as cultural beliefs in different regions and the associated demand for a high degree of product customization within the BOP segment (Shukla and Bairiganjan, 2011, pp.3-4). Nevertheless, BOP purchasers – especially women – are able to make smart market decisions depending on the offering, amount of money to spend and characteristics of a specific asset (Prahalad, 2012, p.7). Accordingly, the myth that rural communities are neither able to buy nor service innovative products has been busted: a series of thriving renewable energy projects in developing countries has proven that it is possible to launch and sustain commercial BOP businesses with a social impact. Especially in the fields of bioenergy and solar power, numerous programs trying to enhance livelihood and living conditions have been successfully implemented against the odds (WII, 2010).

3.1. Energy and poverty

Access to energy has been identified as one of the essential ingredients to fight human poverty. Even though it may not automatically enable poor people to profit from all forms of free choice and opportunity, it still depicts an important link to achieving the United Nations' Millennium Development Goals (Bhide and Rodriguez Monroy, 2011, p.1058). Accordingly, Kamil Kaygusuz (2011, p.937) states that “[t]he absence of commercially supplied energy in a society, especially electricity, tends to accentuate the existence of social asymmetry in conditions of living.” Among others, the author mentions issues such as increased poverty or a lack of opportunity to support the local development process. But also gender considerations need to be taken into account. It is mostly women – mainly responsible for running household activities that require energy – who suffer from an insufficient supply of

modern energy. This includes undertakings such as gathering and overseeing the supply of traditional biomass fuels, which are used for cooking, heating and lighting purposes. Such intensive labor activities are featuring an inefficient conversion process meaning that women not only deal with a relatively more challenging form of energy procurement, but along with their children they are also more prone to indoor pollution. The latter is likely to entail respiratory problems or lung diseases (Idem, p.937&945 ; Pode, 2010, p.1097).

Interestingly, in many rural communities energy transition⁸ does not depict an automatic process even if modern energy sources are available. Especially cooking and heating needs can continue to be met with traditional biomass fuels, whereas conventional forms of lighting are more likely to be substituted by modern devices. Nevertheless, many of these household decisions whether to switch fuelling or not depend on personal and cultural preferences as well as sex and the level of education of decision-makers. Rural decision-makers often consider new opportunities as too expensive or no more useful than the old-fashioned solution. Unfortunately, in countries such as India, deciders within a household are often men, who are also less considerate of health issues within a family. They tend to neglect the significance of substituting fuel sources and often overlook female opinions about onerous energy procurement (Bhide and Rodriguez Monroy, 2011, p.1058&60).

Eventually, electricity is the basis not only for a better state of health but also a source for improved education and productivity, because people are able to extend the amount of time dedicated to all sorts of activities beyond daylight without exposing themselves to hazardous fire and fumes. Unsurprisingly, only higher income classes are able to switch the energy source for household consumption completely to electricity and modern fuels (Idem, p.1058). Nevertheless, integral rural electrification has become a major target not only for policy makers in developing countries but also for independent institutions that propagate renewable energy solutions (ARE, 2011).

But why is rural electrification so difficult to achieve? Simply put, it is a question of financial means. Kaygusuz (2011, p.942) helps the reader to grasp the obvious facts thoroughly: *“[e]lectricity is expensive due to [...] capital-intensive technological interventions [that] transform a primary energy resource from its natural state to useful energy. It is considered qualitatively superior because of its ability to meet almost the entire range of energy end-uses, something that no other energy form can.”* The author further elaborates *“the crux of the rural electrification dilemma”* meaning that electricity is mostly conditional on the dominant status of its availability. He states that market economic theory has persuasively shown the reasons to request a relatively high price for scarce resources, which in the case of rural electricity implies bad news for many interested buyers. A large part of the rural

⁸ Meaning the process of switching from traditional to modern fuels (Bhide and Rodriguez Monroy, 2011, p.1058).

consumers will simply not be able to afford the relatively rare service and hence they will not be part of the development process (Ibid).

So, can rural electrification potentially be an economic remedy? Kaygusuz (Idem, p.943) rejects this claim by stating that underdeveloped rural areas will not necessarily experience industrial growth or regional development through electrification unless other contributing factors were in place as well. Hence, rural electrification alone is not a panacea. Nevertheless, it must be included into poverty reduction strategies, because limited power supply will nurture social injustice and restrict national utilities. Kaygusuz (Idem, p.946-47) furthermore explicitly accentuates that pondering on energy supply in the context of fighting poverty should focus on its significance in the daily life of rural communities and on the role it plays in ameliorating local livelihoods. Technological issues are secondary concerns, meaning that energy needs should be considered holistically. This implies internalizing approaches to health, education and job creation rather than focusing on promotion of a specific energy solution technology (Ibid). We will discuss the challenges of rural electrification in the case of India more particularly in section 5.2.2.

3.2. Lighting needs

Similarly to the discussion above, it has been asserted that official statistics – presenting the total share of electrified rural villages – are imperfect indicators for assessing an individual community member's access to electricity (Barnett in Kaygusuz, 2011, p.940): The actual power recipients may be only very few people within a village or community. Hence, such partial rural electrification may actually lead to increasing inequalities (Cecelski, 2003) and energy needs for lighting will in most households still be met by kerosene. Kaygusuz (2011, p.940) emphasizes this shortcoming by mentioning that lighting incorporates a special significance in a household's total energy consumption due to two reasons. First, he implies that illumination is doubtlessly a "*fundamental requirement of life, irrespective of class, income, or gender.*" And second, it is a relatively important part of a rural household's total expenditure on energy needs, even though it only reflects a small quota of total energy use. In other words, regardless of which power sources are used for lighting, they tend to be scarcer than for instance the amount of biomass utilized for cooking purposes. However, this reasoning may be subject to debate, because biomass tends to become short in supply in many parts of the world as well. So what could be a more sustainable solution for meeting illumination needs in off-grid rural areas in the long term? One almost abundant source of energy in many parts of India is solar power. Subsequently, we will concentrate on products that transform this source of energy into a sustainable form of electricity. In the following, we will thus introduce different off-grid lighting solutions that facilitate the detachment of non-renewable energy sources for underprivileged households.

4. Solar off-grid lighting solutions

In this thesis we are focusing on meeting lighting needs through household-level devices. According to the International Finance Corporation (IFC, 2012b, p.38), “[these products] offer a first step up the energy ladder.” The organization further recognizes that such products often depict the most cost-effective option for families living either in rural households or urban slums, even though they may only have a limited amount of operational features. Accordingly, the IFC (Idem, p. 40-42) has categorized different solar off-grid lighting solutions from the smallest to the largest into three groups: solar lanterns, solar kits and solar home systems. When referring to all three types of products, we will be using the term solar lighting solutions. It should be self-explanatory that all these devices are not dependent on grid power. Small torches are exempt from this analysis, because they do not possess the necessary features to lighten an entire room or household.

4.1. Solar lanterns

Solar lanterns are undoubtedly the most cost-efficient lighting solutions on the BOP market. Among other features they owe their popularity to their low price, which is ranging from USD 10-50. Compared to kerosene lamps they are of course also much safer and cleaner to use, which are inherent advantages of any solar lighting solution. Furthermore, they are supposed to be more reliable, because they do not depend on expensive disposable batteries such as traditional torches. Easily charged, they also provide a sufficient amount of illumination to continue productive activities such as working, cooking or studying during the dark period of the day. In some cases, solar lanterns are even able to charge small radios and mobile phones through a built-in electricity output. Needless to say, these additional features boost a product’s image in the BOP market immensely (Idem, 2012b, p.40).

4.2. Solar home systems

Solar home systems (SHS) are designed to provide electrical energy for individual households by mimicking traditional grid-based lighting for the entire home (Bairiganjan et al., 2010, pp.33-34). They can offer a power output of up to 250 Wp and usually include several components such as a photovoltaic panel, a charge controller, a battery, the loads and possibly an AC/DC inverter. The loads can consist of anything like lamps consuming a low amount of energy, fans, radios or mobile phone chargers. In order to prevent damage to the storage capacity because of a permanent deep discharge, SHS need an adequate design and technological prerequisites that allow charging processes to be optimized. Naturally, these characteristics require additional know-how for product operation and maintenance. However, in the long-term SHS are supposed to represent a very reliable

source of energy and can be adjusted to individual user needs. Prices may range from USD 300-500 (ARE, 2011, p.10 ; IFC, 2012b, p.41).

4.3. Solar kits

The last group situates itself between the two preceding ones. Solar kits are defined as “*portable solar home systems*” by the IFC (2012b, p.42), as “*picopv systems*” by ARE (2011, p.9) and as “*solar portable lights*” by Lighting Africa (2010, p.18). Solar kits are usually smaller and less expensive than traditional SHS, but still considerably more costly and aspirational than solar lanterns. The price is usually set at around USD 100-150. For this amount a customer can acquire a device that consists of a PV panel, batteries and a charge controller. In most cases it can furthermore power multiple lights and chargers for other appliances such as handsets, radios, fans or even small TVs. One major advantage is the products simpler handling compared to SHS, meaning that the kits do not necessarily require professional installation or maintenance. Nevertheless, thorough customer information and product presentation are highly recommended, because potential customers experience such a lighting solution as a more exclusive purchase and therefore they need to be willing to pay extra (IFC, 2012b, p.42). It would be devastating for product marketing if a solar kit’s aspirational reputation were destroyed by a poor or inexistent explanation of its enhanced functionality.

4.4. SmartLight Project – OOLUX

OOLUX is a small solar home lighting system – or solar kit – that was jointly created by Antenna Technologies, Caritas Switzerland and Bern University of Applied Sciences. The prior SmartLight Project initially envisioned developing an innovative solar lighting kit that accounts for the needs of potential customers at the base of the pyramid. From the very beginning, there has been a focus on guaranteeing a high technological standard and maximizing modularity in order to provide a highly adaptable lighting device for all kinds of terrains and customer categories. Furthermore, the project aims at easing product affordability by integrating a micro-finance system into the product to provide flexible payment options for end-consumers with limited disposable incomes. It is important to note that the developers put emphasis on the project’s socio-economic impact in developing countries. The goal is not only to offer a sustainable power output to underdeveloped regions, but to also to generate new income opportunities for the local population and social enterprises (OOLUX, 2013).

The centerpiece of OOLUX is the so-called PowerBox, which incorporates a 3.7V lithium-ion battery and an AC/DC inverter. It also contains the OOLUX micro-finance system, which is

based on a smart timer for installment buying. Next to this key feature, it contains further intelligence such as the maximum power point tracking (MPPT) technique, which enables gaining the optimal power output from the solar panel. Apart from the PowerBox, the initial packaging also includes a 5W solar panel, even though the system would support any photovoltaic panel up to 10W. Finally, OOLUX includes two 1W LEDs, a multi-plug mobile phone adapter as well as a lamp stand for reading or writing purposes (Ibid).

Figure 1: OOLUX



Source: Flink GmbH, 2013

Antenna's intention is to provide a BOP product that is highly adjustable to all kinds of domestic and commercial environments. Not only should it facilitate daily routines at home such as cooking, eating and studying, but OOLUX is also destined to offer new job opportunities for entrepreneurs. These individuals would for example be able to sell the device's power output to local customers by either renting out the battery or simply by charging their client's handsets at a local charging station. As mentioned above, an innovative micro-financing solution run by an in-house software has been introduced as well. Not only should this payment system ease product acquisition for the targeted low-income customer segments, but also guarantee a steadier and more predictable income flow for OOLUX retailers and reduce their vulnerability to the risk of non-payment. The idea is to establish a simple pay-as-you-go network with low up-front costs and recurring installment payments over a period of around two years, which also reflects the duration of the warranty. The electric current would be flowing according to the customer's payment and cease running once the prepaid credit has depleted. This pay-as-you-go procedure is supposed to persuade customers to frequent their retailer's shop at a regular basis and, hence, to

guarantee the OOLUX retailer a higher degree of information over a client's willingness to pay (Ibid).

4.4.1. Field testing

The OOLUX prototype – this includes the product as well as its business model as an integral package – was supposed to be tested in various countries for a period of two months in spring 2013. Among the pilot countries were African representatives such as Tanzania, Uganda and Zambia as well as Cameroon at a later stage. Additionally, India and Bangladesh were selected for trials in Asia. In order to carry out these tests, 1000 OOLUX units were produced and distributed to divers partner organizations. Every one of them received 100 kits. The subsequent goals of these experiments were manifold and included gathering prolific findings on product usability, financing and distribution schemes. Eventually, these findings should be transformed into tangible recommendations, facilitating Antenna to adapt their business venture in the lighting segment of various BOP markets. It goes without saying that this phase was also used for further market analysis in order to assess domestic competitors and OOLUX competitiveness. Finally, it is also notable that the field testers themselves were not only supposed to passively collect information but to also actively engage in on-site product training and local business model development if required (Antenna, 2013).

In the case of India, two partner organizations were selected, namely Delhi-based TARA and Bengaluru-based SELCO. Both organizations have extensively been active in the Indian BOP market and possess comprehensive expertise when diffusing sustainable energy solutions – including solar lighting and charging devices – in marginalized areas. Accordingly, they provided valuable insight for this thesis especially with regard to overcoming organizational challenges of serving underdeveloped markets in India. This information will be thoroughly discussed in chapter 7 within the framework of Anderson and Billou's (2007) 4As. In the same chapter we will also provide a more detailed background concerning the two partners and their operations. At this stage, the most important comment relating to the OOLUX pilots is that the kits did not get disseminated to any potential customer during the author's stay in India. Even though 100 units from Switzerland reached for instance TARA's headquarter in the beginning of May 2013, none of them had been sold or allotted by mid-June. Needless to say, this had implications on both the specific pilot setup in India as well as the market research activities, which had previously been elaborated by the field-testing team of Antenna.

4.4.2. Research tools

Anticipating the practical pilots, a series of different semi-structured questionnaires were elaborated for the field-testing phase in order to assess the product's market impact. More specifically, the goal of the research was to evaluate the OOLUX concept, the product's performance and technical viability. Hence the questionnaires were designed to cover inquiries concerning financial aspects such as the utility of the payment system, product affordability and the business model in general. Furthermore, the field-testers envisioned assessing the technical viability by stating questions regarding product usability and performance. The research methods were elaborated according to Mollebaek Larsen and Flensburg's (2011) deep dialogue framework, which is a part of their Market Creation Toolbox.⁹ These questionnaires were then broadly split into two target groups: customers and retailers. The former group depicts the end-consumers who obtain the product and want to benefit from features such as better lighting and mobile phone charging. The latter group designates vendors such as village level entrepreneurs (VLE) or possibly intermediary distributors, who also engage in selling or lending the product. These research tools were supposed to be commonly applied in all testing countries.

Unfortunately, none of these research tools has been applied effectively in India, because – as already mentioned – OOLUX kits did not penetrate target markets within the timeframe of the field tester's stay. Therefore, a new questionnaire was elaborated that encompassed assessing distribution challenges on an organizational level (see annex 1). The focus moved hence from collecting first-hand, practical insights to a more empirical form of denoting business solutions on the partner level. Anderson and Billou's 4A-Framework provided the basic structure for evaluating these distinct approaches in the BOP market. Subsequently, the partner organizations were interrogated in order to apprehend their strategies with regard to distribution criteria such as availability, affordability, acceptability and awareness. The goal was to identify the most important issues with regard to serving the Indian BOP market and to name the strategies these partner organizations generally apply to overcome obstacles as well as to appraise potential steps to successfully introduce OOLUX to marginalized consumers. The findings of this adjusted research will be discussed comprehensively in section 7.2. Prior to this, the following chapter will explicate the Indian market environment and especially the energy sector in more detail before we address existing approaches to merchandising solar lighting solutions in chapter 6.

⁹ For a more extensive discussion of Market Creation Toolbox in association with the OOLUX field-tests see Meli (2012).

5. Indian market environment

5.1. Socio-economic overview

India stretches over almost three million square kilometers, which is slightly more than one third the size of the United States of America and, hence, the world's seventh largest landmass. The country offers a variety of different climatic conditions as well as terrains, which contain a series of natural resources such as coal, iron ore as well as petroleum and gas. However, the nation is vulnerable to droughts, deforestation, soil erosion, desertification, and pollution of air and water (CIA, 2013). The yearly monsoon has a very distinct economic impact due to the agricultural sector's dependence on rain as a means of natural irrigation. A weak monsoon season signifies a bad harvest and therefore a reduction of the spending power among those who are employed in agriculture as well as a general hike in food prices. Subsequently, the monsoon also has a crucial influence on the Indian economy in terms of inflation and the balance of the current account (The National, 2013).

The country offers a mix of different religions and ethnics. Of the 1.2 billion Indians in 2011, 41% speak Hindi. Among the twenty-three official languages, English is the most important subsidiary language, although secondary language skills tend to deteriorate when moving from urban to rural areas. The country's median age is relatively young and it is predicted that India will outrun China as the most populous nation in the world by 2025. Even though India has been declared as one of the most dynamic economic powers, there have been setbacks to this development. According to the IEA (2012), there are numerous challenges to India's economic evolution, which also reflect on its energy sector. The agency describes the prevailing contradictions and complexities that portray the challenging Indian reality as follows: "*a democratic political system co-existing with an economy with traces of socialism and a widening income gap between urban and rural areas as well as among states*" (Idem, p.11).

The current picture of India's economy is somewhat dire. Due to heavy capital outflows and high current account deficits, the Indian Rupee (INR) hit an all-time low at 58.35 vs. the U.S. dollar (USD) on June 11th 2013 (Times of India, 2013). The economic growth in terms of GDP has been stagnant and even had to be adjusted for the year 2013 to 6.0% from previously 6.4%. Further, the inflation rate at around 6.5% is floating above the comfort level and consumption is unlikely to pick up very quickly due to rising fuel prices. However, the Indian central bank has not eased its monetary policy very aggressively. Contrary to its homologues in the other BRICS the repo rates has remained at 7% (Reuters, 2013).¹⁰

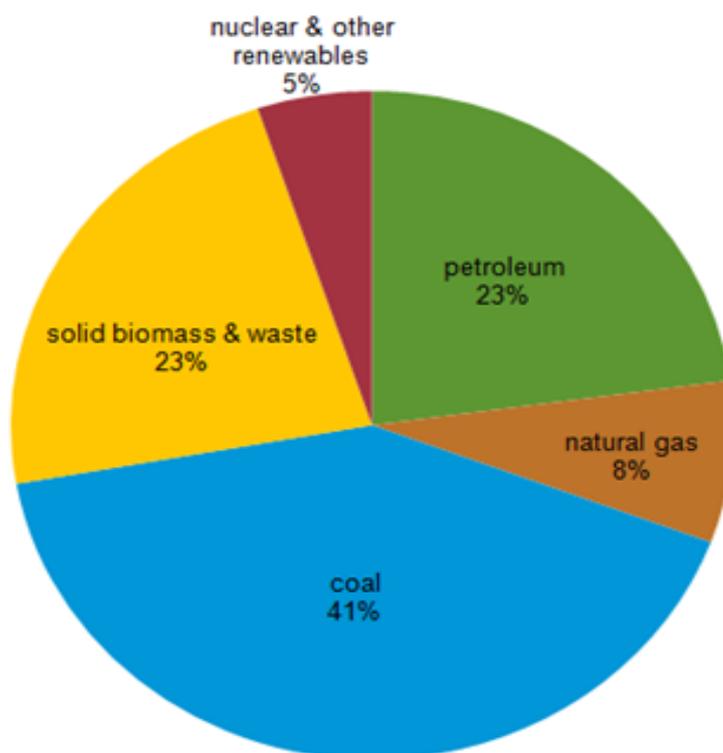
¹⁰ It should be noted that the Indian Rupee (INR) has depreciated even further over the summer of 2013. Nevertheless, we refer to the actual exchange rate at the end of the OOLUX pilot phase in mid-June 2013.

This is a different economic scenario from what the Indians have been used to after the reforms in 1991. Especially the years of 2009 and 2010 – after the global economic recession – had been very prosperous and GDP growth rates were over 9%. This previously positive development had an effect on both the absolute number of people living in poverty and the balance of economic growth between rural and urban areas. While the absolute poverty numbers have been reduced, the relative imbalance has been increasing. As a result, it is not surprising that India still lacks a decent performance in terms of United Nations Human Development Index (HDI). The country only ranks in the 134th place out of 187 positions. An insufficient performance in the education and health sectors can be named as main drivers for this outcome (IEA, 2012, p.13-14). Unfortunately, these failures have also an effect on job creation, which remains a constant concern among Indian economists. How can the Indian job market effectively absorb the bulge of working-age people (also called the demographic dividend) that will approximately culminate in 2030? The question is not only related to the number of working opportunities, but also to their quality. Many private enterprises are still operating in the informal market, which is an unlikely remedy to lift people out of poverty (The Economist, 2013).

5.2. Energy Market

India is after the United States, China and Russia the fourth largest energy consumer in the world. And along with economic and demographic growth, the hunger for energy will increase. The country relies on coal as the main source of energy due to the nation's large, state-controlled reserves (EIA, 2013). Traditionally, India used to utilize biomass as its main source of energy. However, the shift to other energy sources, such as coal, relates to its economic evolution and rising urbanization over the years. Geography and resource endowments are further criteria for the nation's main fuel choice. Hence, an abundant supply of coal due to local exploitation in states like Bihar and West Bengal translates into a larger dependence on coal when generating electrical power. Similarly, northeastern states rely on hydropower as a main source for electricity as a result of nearby rivers and accessible terrains (Bhide and Rodriguez Monroy, 2011, p.1060). Biomass – most commonly fuel wood and animal waste – are nowadays still mainly used for cooking and heating purposes in poor households of which many are situated in rural areas. Yet, the corresponding numbers for biomass as a share of total primary energy have decreased from 42% in 1990 to 23% in 2011. Coal currently represents a share of 41%, whereas other sources of energy such as renewables only incorporate a negligible part (5%) in the total fuel mix (Hammond et al., 2008, p.82 ; IEA, 2012, pp.25-26 ; Sharma et al., 2012, p.934).

Figure 2: Energy consumption in India 2011



Source: EIA, 2013

Subsequently, environmental and social impacts have become a major concern, because generating electricity from fossil fuels is linked to negative externalities. Quality standards of Indian coal are rather poor and represent a major factor of air emissions due to high ash content. Additionally, conversion efficiency has been stagnating on a low level. Only by introducing new sources of energy, can India diversify its supply and, hence, improve its current state of energy security. This especially means accelerating the commitment to renewable energy, if India intends to stick to its proposition to reduce carbon emissions drastically (Jolly et al., 2012, p. 200 ; Sharma et al., 2012, p.934).

5.2.1. The role of public authorities

The Indian government – including its numerous ministries in charge – plays a crucial role in the energy sector by setting the policy framework and interacting with important energy players through market regulation, indirect guidance and personal networks. The public authorities are determined to provide energy access to the entire population, because it was recognized that the country's economic development is hampered by energy scarcity (IEA, 2012, p.16 ; WII, 2010, p.1). However, the success of this process has been limited as many ministries operating in the same area are rather *"bent on to protecting their narrow turf, instead of acting in conformity with national energy objectives"* (IEA, 2012, p.20).

Consequently, the influence of the central government on energy policy is more restricted than expected. This is especially the case concerning decision-making on the level of independent states. Aggregate actions are prone to slow progress due to the country's federalist political organization and typically the process of policy modernization, which includes introducing more ecological energy sources, can differ widely across Indian states (Ibid).

In 2008, Prime Minister Manmohan Singh launched India's National Action Plan on Climate Change (NAPCC), outlining policies and programs that envision countering the country's problems related to its energy-security. At the same time, these measures are intended to address economic objectives and gradual climate adaptation (C2ES, 2008 ; IEA, 2012, p.23). One of the most ambitious projects is the Jawaharal Nehru National Solar Mission (JNNSM), which originated as an initiative from the NAPCC and has set a target of deploying 20'000 megawatt of grid connected solar power by 2022 (MNRE, 2013). Its main political driver is the Ministry of New and Renewable Energy (MRNE), which oversees all the planning of national policies as well as the promotion of development and deployment of renewable energy such as wind, solar and small hydro. Accordingly, the JNNSM is a supply-side effort aiming at guaranteeing a larger share of solar energy in the total energy mix (IEA, 2012, pp.20,23&73).

5.2.2. Issues of renewable rural electrification

Regardless of NAPCC's evolution and progress, India has in general been struggling to adapt appropriate measures for improving the development of rural electrification based on renewable resources. These issues may arise from various difficulties, which have been categorized into economic, legal and regulatory, as well as financial and institutional factors (Urmee et al., 2009 ; Bhide and Rodriguez Monroy 2011).

We first identify economic barriers to rural electrification in India. Due to a lack of public subsidies, high capital costs and considerable transaction disbursements, renewable energy technologies have been economically burdensome to low-income consumers. They commonly do not possess the necessary financial means to acquire such products. As a result, renewable energy technologies are inaccessible to a large part of the rural population. In many cases, these potential customers are also widely dispersed and struggle to create sufficient aggregate demand for the private sector. These factors augment the expense of distribution networks and make privately financed efforts to increase market penetration both less profitable and attractive. Furthermore, there is an insufficiency with regard to the correct pricing mechanisms for non-renewable energy. Potential risks and environmental damage of hazardous fossil fuels are whitewashed by cheap market prices. Simply put, the shift to sustainable electrification gets hampered, because in the short-term traditional means of

energy are still relatively less expensive for low-income consumers (Urmee et al., 2009, p.355 ; Bhide and Rodriguez Monroy, 2011, p.1061).

Next, the discussion revolves around a missing legal basis and an inadequate policy framework for marketing renewable power sources (Rodriguez Monroy and Hernandez, 2008, p. 1939). This includes some rather burdensome requirements on the producer level, which keep small stakeholder from entering the market. Again, private initiatives thus get constrained and promising small projects have been buried. In addition, the undertakings of public authorities incorporate deficiencies such as impractical promises and irrational commitments that purely result out of political interests. Unfortunately, many of these endeavors are lacking objectivity and their escapist guidelines frustrate program implementers and their willingness to commit themselves to reaching the objectives (Bhide and Rodriguez Monroy, 2011, p.1061).

Last, we specify financial and institutional barriers. These hindrances are based on restricted access to credit for consumers and investors as well as the general lack of adequate market information. The first of these barriers inhibits surmounting the obstacle of high up-front investments into renewable energy. The second impedes calculated economic decisions based on technical, geographical and commercial considerations (Urmee et al. 2009, p.335). Further problems on the institutional level include missing public guidance when campaigning for renewable energy technologies and a lack of support for erecting and maintaining these solutions. Such measures would be especially adjuvant during the initial phase of energy projects (Bhide and Rodriguez Monroy, 2011, p.1061). All these issues together denote apparent reasons for the current state of lacking progress in rural electrification that encompasses the whole country. It is thus possible that alternative approaches to energy supply could have a significant impact. Consequently, we will have a look at the Indian off-grid lighting sector and introduce the solar lighting market as well as its assets and shortcomings.

5.2.3. The off-grid lighting market

An IFC report (2012a, p.37) highlights a still urgent need for clean, sustainable and affordable lighting solutions in major Asian off-grid lighting markets. According to this report, **India very likely constitutes the most challenging case due to its vast demography. Even though estimations vary depending on the source, it is apparent that India can be considered as the largest potential off-grid lighting market on the globe. The Census of India (Col, 2011) estimates that over seventy-two million households run their lights using kerosene and a little under one million households do not possess any lighting device at all.** As we have cited Prahalad (2011) already above, in India a large majority of this underprivileged population

lives in rural regions. More accurately, the IFC (2012a, p.37) reckons that around 94% of the off-grid population does not reside in urban areas.

In absence of grid power and modern energy services¹¹ the most common sources of lighting in rural households are fossil fuels, and in particular kerosene. The amount of kerosene expenditure out of total household consumption becomes higher the lower income levels fall. Especially people in low-income states such as Bihar, Uttar Pradesh, Jharkhand, Orissa, Assam, West Bengal and Rajasthan are likely to predominantly use lamp oil for lighting purposes. The IFC (Idem, p.38) therefore also acknowledges that these states account for over 65 percent of total off-grid rural households.

Figure 3: Households using kerosene as lighting source or no lighting source at all

Total number of Households in rural India using kerosene as lighting source or no lighting source (Census, India 2011).

States	Use kerosene as lighting source	No lighting source
Jammu & Kashmir	188,737	38,945
Himachal Pradesh	39,316	1310
Punjab	96,153	29,840
Chandigarh	162	6
Uttarakhand	203,702	4214
Haryana	335,163	14,830
NCT of Delhi	1107	158
Rajasthan	3,729,712	94,903
Uttar Pradesh	1,91,06,303	25,475
Bihar	1,49,63,430	16,926
Sikkim	8036	554
Arunachal Pradesh	46,190	27,401
Nagaland	60,116	4273
Manipur	108,112	2350
Mizoram	28,211	524
Tripura	229,132	2431
Meghalaya	193,788	3799
Assam	3,783,685	10,749
West Bengal	7,928,533	54,868
Jharkhand	3,111,480	00
Odisha	5,114,439	89,584
Chhattisgarh	1,236,319	13,152
Madhya Pradesh	4,549,047	22,244
Gujarat	865,971	94,715
Daman & Diu	191	25
Dadra & Nagar Haveli	2691	212
Maharashtra	3,110,979	169,216
Andhra Pradesh	1,310,660	71,231
Karnataka	967,296	39,320
Goa	4238	748
Lakshadweep	5	00
Kerala	303,079	00
Tamil Nadu	793,803	57,383
Puducherry	3424	475
A & N Islands	11,392	354
Total	72,434,602	892,215

Source: Census of India 2011 in Podes, 2013, p.607

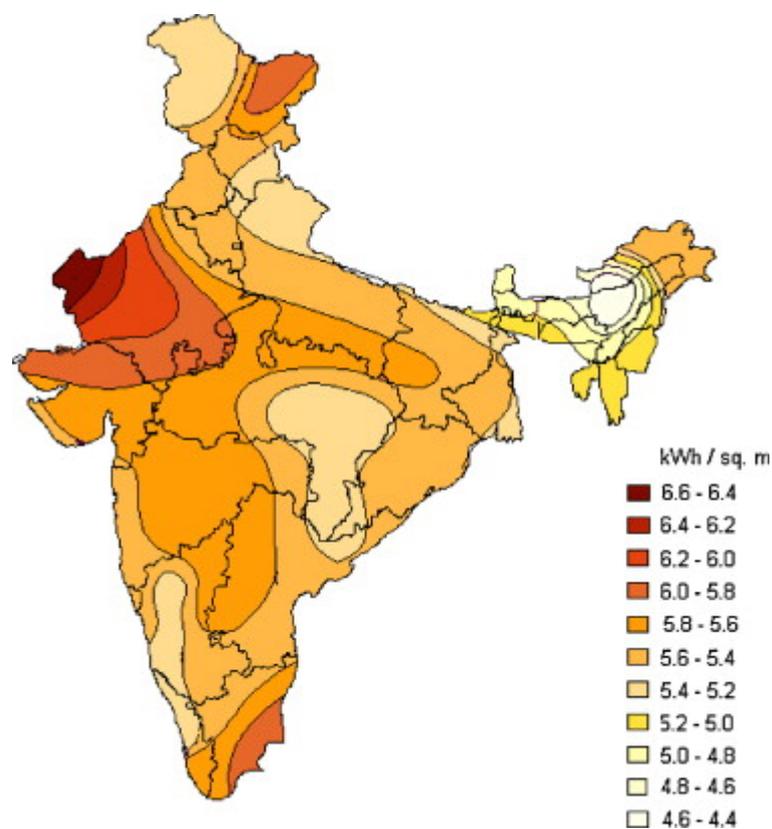
¹¹ Modern energy is defined as „a household having reliable and affordable access to clean cooking facilities, a first connection to electricity and then an increasing level of electricity consumption over time to reach the regional average“ (IEA, 2011, p.12).

The report (Idem, p.39) further identifies high kerosene subsidies as a major challenge for pushing the energy turnaround in India. This issue has become a political subject, because the main beneficiaries of these subsidies are rural and low-income households. Due to their relatively large number, they represent an important voter base for any political party. As a consequence, cutting this type of financial support could thrill the power structure in domestic politics. The IFC (Ibid) estimates that the share of subsidies for lighting purposes currently accounts for 50% of total kerosene grants, which equal USD four billion per annum in total.

5.2.4. The solar lighting market

India is situated in the sunny belt of the world, so there is a considerable potential for electricity generation through solar power. The country is blessed with rich solar energy resources: most parts get around three hundred sunny days per year. Depending on the region, sunshine hours can vary between 2300 and 3200 annually (Raman, 2012, p.3321 ; Sharma, 2011, p.1772 ; Sharma et al., 2012, p. 935).

Figure 4: Solar radiation in India



Source: Sharma et al., 2012, p.935

This setting is fruitful for PV technologies such as solar lighting devices. However, market penetration of these products is currently still quite poor. Similar to the set of problems that impede the dispersion of renewable rural electrification, there are numerous reasons that account for the limited spread of PV technologies, including insufficiency of solar radiation locally, product availability, affordability as well as long-term maintenance services. In any case, it is illusionary to expect that all the 72 million undersupplied households (Col, 2011) would automatically switch to lighting systems powered by sunlight. The potential share of clients utilizing solar power can be assumed to only equal about one third of the total number. This estimation results from three multipliers, namely the fraction of the population that actually gets sufficient solar radiation, the fraction that has a sufficient amount of disposable income and the fraction that shows the propensity to use solar lighting devices. Taking these restrictions into account, the number of possible consumers would most likely fall down to around twenty-five million (Chaurey and Kandpal 2009, p.4911ff). Unsurprisingly, the IFC (2012a, p.41ff) estimates that just 4-5% of off-grid households are already using solar lanterns or other solar lighting solutions.

One further reason for this low market penetration could also be market distortion by government subsidies. Some solar companies believe that initiatives such as the Remote Village Solar Lighting Program (RVSLP) running under the JNNSM have modified customer expectations who are now accustomed to freely distributed or heavily subsidized solar lighting solutions. Unfortunately, they have sometimes also experienced poor quality standards and bad product performance (Bairiganjan, 2010, p.35). It has thus become more difficult to market high quality products in a cost competitive manner in regions which have officially been declared as unreachable through the grid by the MNRE. Nevertheless, an increasing number of private small and medium enterprises has not been discouraged, but has instead engaged in providing solar lighting solutions that do not meet MNRE subsidy requirements. This also involves a stronger focus on products using light-emitting diodes (LED) instead of compact fluorescent lamps (CFL). However, customer preferences do vary in that regard. Some client segments prefer CFLs to LEDs due to their (perceivably) higher level of brightness and warmer color temperature (IFC, 2012a, p.42-44).

6. Marketing solar lighting solutions

Naturally, solar lighting solutions feature a number of commercial disparities compared to traditional means of lighting such as kerosene lanterns. In this section, we will discuss different market issues of solar lighting solution by first enumerating pros and cons concerning the operational features of such products. Then, we will assess various theoretical models to enhance product financing and eventually look at currently used practical mechanisms by selected organizations operating in the Indian BOP market. Last, we will scrutinize distributional issues and concentrate on business models of different market players that engage in disseminating solar lighting products and similar services.

6.1. Operational features of solar lighting solutions

As mentioned before, initial capital costs of solar lighting solutions are much higher than those of their traditional counterparts. However, there exists a series of operational advantages when utilizing solar power. To begin with, the product's ongoing functioning does not depend on the often reoccurring and very volatile investment into fossil fuel. Even though battery replacement implies a relatively high cost, it nevertheless does not require periodic short-term expenditures. Furthermore, solar powered lighting offers a brighter form of illumination – which in most cases can even be adjusted by users – and is much safer to use. In the long-term, subsidizing solar lighting may even be a less onerous endeavor for public authorities, because these products only require a subsidy for the initial investment or acquisition, but operating costs henceforth are much lower than for instance the heavy sponsorship of the domestic kerosene price (Chaurey and Kandpal 2009, p.4911).

Nevertheless, Ramchandra Pote (2013, p.601) identifies several reasons why rural customers are skeptical about solar lighting solutions: First, there are doubts about the products' reliability. Naturally, consumers are not willing to invest in unreliable devices that have an evidently poorer performance than grid supply or traditional means of lighting. In some cases this kind of attitude has been influenced by previous negative experiences. Second, batteries – most probably the first product item that depletes – are in reality difficult to replace. Their availability is among the most important preoccupations, because without reliable after-sales services it can become challenging and costly to arrange new batteries. Third, there are worries about product maintenance, because locals of rural communities often lack the necessary expertise to guarantee a smooth functioning. Last, community members may not only wish illumination through solar energy, but they would also like to run further devices such as fans, radios and TVs. Depending on the type of solar lighting solution, it can be difficult to generate enough power output for all sorts of supplementary appliances (Ibid): a solar kit like OOLUX, for instance, will evidently not suffice to run a flat screen TV.

From a business perspective, many of these preoccupations may be impedimentary to market entry for inexperienced candidates. It is indeed difficult to ensure proper servicing and maintenance procedures in rural areas if an organization lacks the basic network. Therefore, any (seriously committed) market player should avoid distributing low quality components in the first place, especially if the capacity of reparation mechanisms is insufficient. Needless to say, a disreputable level of product viability increases the risk of displeasing customers and losing their confidence. Nonetheless, a functioning maintenance service can become an important revenue stream for solar lighting companies, particularly if product sales are completely separated from these repair services (Bairiganjan et al., 2010, p.35).

6.2. Financing

Solar lighting systems can provide tailored electricity supply to many types of customers, because these systems are often easily configured and modified according to energy needs of particular households. Nevertheless, they still face major issues concerning individual financing. Funding of solar kits and SHS can become a delicate challenge due to the relatively high up-front investment costs for low-income groups (Bairiganjan et al., 2010, p. 35). Still, free distribution to marginalized communities is not an answer. The Alliance for Rural Electrification (ARE) (2011, p.12ff) mentions that it is imperative to dismiss free product dissemination altogether – regardless of how simple the business model or technology standard for a specific solar lighting device might be. The argument on which most stakeholders in the development sector agree is that rural customers should contribute financially from the very beginning in order to develop a sense of ownership and appreciation for the value of the system. In contrast, free distribution – organized by public authorities for instance – can have a negative impact on business development and may potentially even spoil the solar lighting market completely (Pode, 2013, p.598).

So how can we find customized financial schemes for rural clients? Until now, almost all solar lighting system programs relied on some form of subsidization. For financial schemes to become more sustainable, administrative practices have to be improved. It is important to disclose costs, tariffs, subsidy components as well as disclaimers of politically motivated favors (Idem, p. 602). Furthermore, microfinance contracts have to clearly reflect the financial benefits and accumulated savings for end-users. In any case, more transparent pricing methods – that display the potential rate of long-term reimbursement to customers – will surely contribute to decisive market advantages for innovative BOP enterprises (Ibid ; Pode, 2010, p.1103).

ARE (2011, p. 13) similarly highlights the importance of exhaustively assessing individual energy expenses in order to provide adequate microfinance schemes to consumers. Such models should certainly include well-designed leasing features that also take into account the

solar energy system's depreciation over time. Consequently, these financing schemes may help estimating a product's resale value in case of a customer's insolvency and the subsequent call back of the product.

6.2.1. Financing models

We will now turn to different financial models that reflect pertinent examples of business solutions for solar lighting solutions like OOLUX. Naturally, some of these options facilitate overcoming the burden of high up-front investment and subsequent product acquisition for BOP customers more than others. The focus will first be on possibilities that private organizations can pursue. Hence, in this theoretical overview we do not include public subsidies on interest rates or capital provided by the MNRE for instance (Liming, 2009, p.1101). However, in section 6.2.2 we will introduce practical financing examples that also include endeavors of public authorities.

6.2.1.1. Ownership model

The ownership model intends selling the entire solar lighting product directly to customers at full cost. Users will benefit from completely free utilization once they have acquired the product. There are neither restrictions to usage time nor location. Nevertheless, the ownership model comprises additional user responsibilities in order to safeguard a product's flawless functionality. Long-term operation and maintenance of the product are entirely a customer's concern. This signifies that a household needs to ensure proper product handling – such as orienting the PV module correctly – and stocking provisions for reparation once the warranty has depleted. While these exigencies might ensure more careful manipulations by product users (Chaurey and Kandpal, 2009, p.4911), it is debatable whether – in the case of OOLUX for instance – the targeted customer segment in rural areas will be able to defer the necessary financial means for both the up-front investments and maintenance costs in the long-term. In addition, Anisuzzaman and Urme (2006) mention that even though cash sales induce easy financing and low transaction costs, the customers are in turn likely to acquire undersized systems and replace defect components with cheap and unreliable alternatives in order to secure the highest economies possible.

6.2.1.2. Fee-for-service model

In the fee-for-service or rental model a user does not install the solar energy device (or some of its components) fixedly at home, but rather rents it at times from a central charging station. By transferring a usage fee or buying a prepaid chip card, a potential customer can draw on the offering of an energy service provider (ARE, 2011, p.13). In some cases customers pay a

down payment that covers both a warranty and the service fee for the first month (Anisuzzaman and Urmee, 2006). It goes without saying that this model requires some sort of easily accessible infrastructure for product charging and servicing within a rural community. Hence, product accessibility might become an issue in weakly-populated areas. Nonetheless, the concept of the fee-for-service system allows customers to benefit from third-party maintenance as well as to flexibly draw on the service when needed. This is an option regardless of whether end-users own the device and only charge the battery at the central station or whether they rent the whole product. Naturally, certain disadvantages such as a limited renting duration and restricted access to facilities can occur, which might diminish customer convenience in some cases. Similarly, a distributor may need to deal with reckless product usage, because customers will not treat the appliances as carefully as their own possessions. Nevertheless – compared to the ownership model – the fee-for-service program seems to be a more realistic option for large-scale dissemination of solar energy devices. This is due to the fact that it overcomes the burdensome up-front investment and offers customers a more flexible investment choice (Chaurey and Kandpal, 2009, p.4911). Furthermore, the energy service provider can bundle operational costs by aggregating a large customer base into a single project (Liming, 2009, p.1101).

6.2.1.3. Hire purchase model

The hire purchase model envisions an agreement that a product's capital cost will be paid on installment basis over a certain period of time. Mostly, the consumer and the supplier agree on an initial down payment (Anisuzzaman and Urmee, 2006). This approach is very similar to the leasing model: in both cases suppliers lease the solar lighting products to end-customers. The difference is that in the hire purchase model product ownership will be transferred to the customer at the end of the predetermined period, whereas in a leasing arrangement it can be freely decided whether the product will eventually return to the dealer (operational leasing) or whether ownership is transferred to the customer (financial leasing). In any case, the lessor – as the product owner – will be held responsible for product maintenance and other support services during the leasing period (ARE, 2011, p.14). The hire purchase model probably designates the best-suited choice for OOLUX financing also due to the product's integrated financing system, which allows determining payment schemes according to affordability levels of target groups. Nonetheless, the elaboration of these payment schemes can be a demanding challenge. In many cases they have been determined over too short of a short period, which led to high real interest rates (Derrick, 1998, p.213).

6.2.1.4. Consumer credit

Consumer credit is another model targeting improved affordability. Credits can be granted by any kind of stakeholder. This includes the product supplier or retailer himself as well as NGOs and various private businesses such as rural development banks or microfinance institutions (MFI). So far, consumer credit mechanisms for solar lighting solutions have been more difficult to manage than traditional micro-credit lending models. The reason for this could be that acquiring a fabricated source of illumination does not automatically translate into an income-producing activity. In reality, undertakings that generate income are often an essential requirement for MFIs to deliver short-term financial services to rural households. Hence, many MFIs are skeptical of funding solar lighting devices. As a result, they do not offer customized financing solutions that take into account the differences in credit size, payment frequency and duration of lending adequately (Martinot et al., 2006, p.328). It is therefore primordial to educate financial institutions about the nature and market potential of solar lighting systems. Especially local and regional commercial banks could stimulate investment and contribute to changing lending and business practices if they were more aware about the functioning and benefits of renewable lighting solutions in the BOP market (Pode, 2010, p.1102).

6.2.2. Practical examples

As we have determined above, affording solar off-grid appliances has been difficult for low-income groups mostly due to high up-front costs. Possibly, the return on investment has been discouraging in the long run as well, because maintenance and after-sales services were poor or even inexistent. India is furthermore suffering from an immature state of its credit market for marginalized communities, mostly because strong public commitment and policy support are missing. Nevertheless, there have been a number of distinct public and private efforts to overcome the absence of simple credit schemes and the lack of adequate energy infrastructure. These decentralized attempts in the energy segment seem crucial to revitalize the campaign of poverty alleviation, because the Indian government's former, centralized approach to extend grid supply has proven to misjudge the rural population's primary requirements and, above all, it has been denoted as being too costly (Lacayo, 2006). Public institutions such as the MNRE have recently launched a financing method which introduces a subsidized credit plan for off-grid SHS in order to support the commercial marketing of such products. This scheme, developed in 2011, envisions covering financial inducements in rural areas by offering subsidies on capital and interest rates for target customers. Accordingly, commercial banks in peripheral zones have been encouraged by the National Bank for Agriculture and Rural Development (NABARD) to engage in promoting subsidized financial resources for solar off-grid applications. This example proves that public

authorities can indeed exert a weighty influence in fighting energy poverty. Similarly, a USD 7.6 million financing plan by United Nations Environment Programme (UNEP) enables rural customers to access loans through numerous branches belonging to two of India's major banking groups. This program is based on interest rate softening, which not only lowers credit risk among rural households, but also enables strengthening the existing cash market for solar lighting solutions. Within this framework, loan repayments are typically scheduled over 5 years with interest rates revolving around 9-15%. Additionally, raising a loan requires a 15% deposit in the beginning. To encourage banks to participate, every commissioned loan is rewarded with a little premium by the UNEP program (Pode, 2013, p.607-608).

As an independent organization, SELCO – one of the OOLUX partners – has persistently been pursuing sustainable product financing in cooperation with rural banks, MFIs and credit cooperatives. In general, SELCO customers only have to provide a 15% upfront payment of the total product price. This is believed to be a critical percentage level, which in most cases cannot be set higher. Eventually, the rest of capital cost is covered by a 5-year loan at interest rates around 12-17%. Finally, Barefoot Power¹² – a private solar lighting entity – has been focusing on other types of adjustments to the market, such as reducing product size. The company's devices have hence become more affordable to low-income households. Consequently, it is also possible to adapt customer loans. In cooperation with MFIs, Barefoot Power has been able to arrange smaller loans that can be characterized pro-poor. In this case, the collaboration is commission-based, so that Barefoot Power further rewards MFIs for their marketing efforts by offering a little bonus on product sales next to the interest they already gain (Idem, p.607&609).

6.2.3. Obstacles in practice

We have discussed various theoretical models of financing solar lighting solutions and also touched on some successful practical examples in the last section. We will now turn our focus on problems that may arise when applying the financing theory in practice. Sam Wong and Vivek Mathur (2011) have investigated a case of an ineffective practical implementation, namely a solar lantern project in Rajasthan. This project was based on a renting or fee-for-service system. In general many ventures that engage in rural electrification or the dissemination of renewable lighting solutions not only envision facilitating customers to acquire new products, but also to create job opportunities for the local population. However – as demonstrated by Wong and Mathur (Ibid) – running a solar lighting project successfully can actually become a very demanding exercise. In fact, while the tasks of offering an affordable product and fostering a possible rise in income might seem complementary in the

¹² For more information see www.barefootpower.com (accessed October 8th, 2013)

first place, this may not be true in practice. We now shortly review the most important aspects of the empirical findings that reflect how practical implementation in rural areas can be far from the initial, abstract intentions.

The program's decentralized approach envisioned offering 50 solar lanterns for rent from central charging stations in different rural communities. Additionally, the NGO in charge of the project was supposed to recruit one community member as an entrepreneur. This person would be responsible for daily operations such as running the charging station, offering maintenance and especially collecting the monthly subscription fee of INR 60 (USD 1.03)¹³. Even though – for the purpose of this project – the products as well as service stations had been delivered free of charge, customers were nevertheless supposed to contribute financially when drawing on these services. The project managers thereby intended to enhance their sense of ownership, to boost the efficiency of product utilization and to cover maintenance costs. The lump sum of INR 60 was calculated on a daily rental price of INR 2 per lantern. But due to transaction costs and the requirement of more predictable income patterns for the entrepreneurs, the cost for single, non-successive day rentals would finally amount to INR 5 instead of INR 2 (Wong, 2012, p.116-117). While this project revealed many strategic and operational shortcomings, we will subsequently point out those issues that are relevant to the financial arrangement – namely the fee-for-service model – and to the convenience of solar lighting solutions in marginalized regions in general.

Regarding the financial aspect, organizational deficits that foster mismanagement and inflexible payments can be devastating. For instance, subscription fees for renting solar lamps inherit some inconspicuous disadvantages when not properly organized and monitored. **Transferring a lump sum for the whole month instead of gradually paying single daily fees can become a major obstacle for such a project.** Especially rural community members are vulnerable to fluctuating incomes because farming, which is their primary occupation, is a seasonable business. Hence, they also have to perpetuate a very conservative handling of their financial means in order to be able to react to unforeseen incidents. Unfortunately, service providers cannot always organize fund collection on a daily basis and many organizations argue that collecting fees on a monthly basis can reduce transaction costs drastically. Hence, they extract higher sums for daily rental. Maximizing rental flexibility can be attractive for some customers, **however the majority quickly deems that the daily fees for renewable lighting are too expensive and they rather revert to traditional means of lighting such as kerosene lanterns** (Ibid).

Concerning the actual utilization of solar lighting solutions in this specific study, there still exist significant obstacles to the products' perceived utility among rural population. According

¹³ We use the conversion rate from June 11th, 2013 (1USD/58.35INR).

to Wong (Ibid), kerosene for example provides BOP customers a better sense of control and flexibility, because it is more practicable to share liquids than solar lights among community members. Whatever amount of kerosene has not been used can thus be stored or at the same time made available for others. Such sharing means that two households living apart can indeed benefit from kerosene consumption at the same time (Ibid). Whereas, splitting solar lanterns or batteries in half will in turn have a rather controversial effect on effective illumination and both parties most probably end up sitting in the dark.

6.3. Distribution

Another obstacle to effective penetration of the solar lighting market concerns distributional aspects. James L. Koch and Al Hammond (2013, p.130) acknowledge that “[*l*]ast mile distribution is the single most difficult challenge to overcome in serving fragmented BOP off-grid energy markets.” The authors emphasize that it is demanding to develop a robust and stable distribution system and any such attempt deserves additional consideration in order to thoroughly foster diffusion and market penetration. This “*make or break issue*” (Idem, p.133) asks companies to experiment with various options to successfully serve the BOP market. Enterprises therefore have been applying different value chain approaches such as using existing retail channels, working with independent partner distributors or establishing their own sales channels. Furthermore, firms have been cooperating with local community organizations, cooperatives or self-help groups, and some even tapped new markets by setting up micro-franchise agents. The authors (Ibid) also attest that regional distribution networks might work for simple devices such as solar lanterns, but that organizational capacities would have to be increased if more complex products such as SHS were to be propagated.

In India the most common large-scale players in the solar lighting market are currently Tata BP Solar¹⁴ – offering a wide range of solar lighting solutions – and SELCO – mostly providing indoor and outdoor home lighting. Examples of smaller energy companies are Barefoot Power and Greenlight Planet. Even though the country possesses the capability of manufacturing most key components for solar lighting solutions, domestic operators are still assembling at only 40% of their total capacity. Especially smaller enterprises prefer importing ready-made products from producers in China and Taiwan (IFC, 2012a, p.45-46).

¹⁴ For further information see www.tatapowersolar.com (accessed on October 8th, 2013)

6.3.1. Models of domestic market players

In the following we introduce three BOP market players that have been distributing solar lighting devices in India. The selection of units of analysis is subjective, but is related to a certain degree to their business relevance with regard to OOLUX. This is either because a company has been identified as a competitor (Greenlight Planet) or potential partner (Simpa Networks and Project Dharma). It is evident that numerous other actors operating in the solar lighting market could have been described just as well. However the scope of this section is limited and only intends to cover some of the best business practices. We will hence highlight organizational characteristics by briefly outlining every company's history, offering and value propositions.

6.3.1.1. Greenlight Planet

Greenlight Planet is a U.S. based for-profit company, which started to provide marginalized Indian households solar energy solutions in 2005. Since two of its three founding members are either of Indian descent or Indian citizens, the company benefited from distinct local expertise. The result of Greenlight Planet's efforts was a solar lantern called Sun King, which was commercialized in 2009. Today there is a series of different Sun King lanterns that vary in price and battery capacity. The most interesting product (compared to OOLUX) is the SunKing Pro, which not only enlightens dark households for up to 30 hours (most energy-efficient modus), but also offers a power output for charging purposes. Customers can run any 5V device with a SunKing Pro, however, mobile phone charging is definitely the most pertinent mode of use. Furthermore, the lantern includes a Lithium Ferro-Phosphate battery (1450mAh), a 2.5Wp solar panel and a 1W power LED. All is covered by a two-year warranty and currently costs USD 32. Being a premium version it possesses a higher up-front cost than Greenlight Planet's most economic model the SunKing Eco, which is sold for USD 11. The price of the Eco version is relatively low and equals a payback period of only 3-4 months in terms of a customer's kerosene savings (Hystra, 2013, p.32 ; Greenlight Planet, 2013). Currently Greenlight Planet employs around 450 full-time workers around the globe and gets additional support from numerous independent village sales agents. While manufacturing takes place in China, there are three main distribution channels: direct sales, sales via NGOs and bulk sales to global distributors. The first channel focuses on the company's own teams. So-called "Saathis" are salespeople, who are known in the local context and are looking for possibilities to enhance their income. Saathis are paid on commission basis and are recruited, trained and supervised by Greenlight Planet Team Leaders. The second leg is based on partnerships with NGOs, however it only plays a minor part relative to total sales in India. The firm cooperates among others with Pratham – a large educational network and the biggest Indian NGO – but tries to limit subsidized sales or donations in order to preserve a

competitive market. Third, Greenlight Planet organizes bulk sales to distributors operating in other areas than India such as Africa. These sales constitute up to 50% of total volumes. Next to these distribution models, Greenlight also runs after sales services – which in general are provided through the same distribution system – for its SunKing products. This disposition enables a more rapid problem solving process counting around 7-10 days regardless of whether the service happens within the warranty period or not (Ibid).

6.3.1.2. Simpa Networks

Simpa Networks (Simpa) intends to “*make modern energy simple, affordable, and accessible for everyone*” (Simpa Networks, 2013). Initially based in the US, the company operates out of Bengaluru, Karnataka since 2011. So far Simpa has not penetrated the off-grid market completely, but has mostly been focusing on under electrified villages, where people use SHS as a backup energy source. Similar to telecom companies, Simpa has established a pay-as-you-go energy service to underserved households in developing markets. The company’s Progressive Purchase model is web-based and allows customers to top up their systems by purchasing prepaid credit with their mobile phone or over a web interface. This enables Simpa to offer a lower upfront price for their products and once the customer has amortized the full purchase price by continuously recharging, the system will completely unlock. Currently, the company is offering five different solar devices priced from around USD 145 to 320. The products consist of 15-40W solar panels and offer a power output to further run lights, fans, small radios and mobile charging appliances. Concerning distribution, Simpa is piggybacking on existing channels. In particular SELCO has become one of its key partners and represents a system integrator for Simpa. Hence, SELCO sells products that run with Simpa’s prepayment solution through its own network and takes further care of product installation and after-sales services. Meanwhile, Simpa overlooks payment processes and pricing plans (Entrepreneur India, 2013 ; Simpa Networks, 2013).

In a discussion with Simpa (Interview with Simpa Networks, Bengaluru, June 2013), further insight into the organization’s work processes materialized: as a foreign company, Simpa cannot become a legal MFI, therefore the firm restricts its role to being a service provider in the energy market. This solution is somehow both an opportunity as well as a setback. On the one hand, Simpa can adroitly deal with difficult ownership questions, as the firm only transfers product ownership to its customers when the full price has been repaid. Until full amortization, Simpa thus acts as the product’s proprietor and only sells energy to households even though the device is installed on a private rooftop. On the other hand, the firm faces tough competition from banks whose loans have often been peppered with politically motivated subsidies. Hence, for a market player like Simpa it becomes difficult to propose competitive pricing schemes, because local banks are often mingling with native decision-

makers and may offer very low interest rates to potential voters in order to make the incumbents' reelection more likely (Ibid).

Simpa also mentioned that it was no trivial task to set up the operational backbone: the text message servicing. The difficulties that arose were mostly due to language and literacy issues. Some customers were simply not able to write such a message. By establishing a call center, Simpa found an ordinary solution circumventing literacy problems. However, running a call center contains some organizational obstacles and requires a tight staff management. By building new infrastructure, Simpa envisions to penetrate the energy market of underserved customers more holistically. Unfortunately, the working environment in the Indian development sector is very challenging. This is not only because it proves to be difficult to recruit and retain qualified staff due to the lower wage standards compared to other sectors. It is also more complex to persuade potential customers that from an economic perspective renewable energy solutions can be the sounder option than traditional means of lighting. In contrast to many African countries, Indian energy subsidies distort simple expenditure calculations, thus, it is also more complicated to demonstrate underprivileged households the potential cost reductions through the use of solar energy (Ibid).

6.3.1.3. Project Dharma

Project Dharma (Dharma) was launched in 2009 in cooperation with Pratham and Reuters Market Light, an agricultural market information provider. Dharma – based in New Delhi – has begun creating a large rural BOP distribution network providing tailored services and products, which are meant to enhance rural livelihood at an affordable price. The goal is to build a large wholesale network that gives rural entrepreneurs access to training and formation while at the same time providing them a sustainable income. Dharma further envisages offering micro-finance solutions to any type of stakeholder in the rural markets of Maharashtra, Bihar, Uttar Pradesh as well as Karnataka. Ultimately, the company identifies itself as an interface between rural consumers and product and service providers aiming at operating in marginalized areas (Hystra, 2013, p.42 ; Project Dharma, 2013).

Villages counting less than 5000 people are in Dharma's main focus. The firm concentrates on distributing both consumer durables and fast-moving consumer goods. The product range consequently includes solar lanterns, SHS, smokeless cooking solutions, water purifiers, cooling devices as well as means of production such as sewing machines among others. In Dharma's model, the manufacturers are generally responsible for after-sales services, however the local team represents the first point of contact in case of customer appeals. Concerning distribution Dharma first sources products from different suppliers. The organization then scatters them among warehousing facilities at state-level before handing

them to local distributors, who again frequent Dharma's numerous VLEs and local shops. The VLE's often consist of local youth with some basic educational level, who are being taught additional entrepreneurial skills by Dharma. Interestingly, they have to make an upfront payment for the products they sell. The so-called cash & carry model is supposed to boost sales by offering incentives as well as securing commitment. While the VLEs may enjoy a substantial amount of liberty of action, Dharma does not renounce staff management completely. By including supervisory and mentoring services, the company intends to retain effective forms of operation (Ibid).

7. BOP marketing strategies

This chapter comprises the most practical part of this thesis. In order to better understand the requirements to successfully market BOP products, we conducted a number of interviews with OOLUX partner organizations in India. The goal was to comprehend valuable strategic decisions and operational mechanisms that can enhance market penetration as well as to grasp what procedures and obstacles may lead to failure. Therefore, Antenna's field-testing team prepared a practical research paper for analyzing distributional challenges in low-income markets before the pilot testing phase (see Moser et al., 2013 in annex 2). In the context of the OOLUX field-tests in India, Tanzania and Zambia, the authors collected an overview of challenges identified in existing academic and business literature for supplying the world's poor. This study was derived from the so-called "4A-Framework" based on Jamie Anderson and Niels Billou's proposal (2007). The 4As include critical market features for delivering products and services to BOP customers, namely availability, affordability, acceptability and awareness. According to the authors, any enterprise accessing the BOP market needs to tackle these challenges in order to effectively establish itself in such a distinct business environment. Before focusing on examples of applied business practices within the 4As, we will first introduce the respective partners and their field of operation, because these insights will contribute to our understanding of the subsequent challenge assessment.

7.1. OOLUX partners

On the one hand there is TARA, an experienced BOP organization that has been pursuing project cooperation with many local partners such as Nidan in Bihar. On the other, there is SELCO a social enterprise mainly active in the state of Karnataka that also collaborates with Nidan in specific projects. Both have been involved in the OOLUX pilots. We will present these organizations by mentioning their origins as well as their main characteristics in order to obtain a better insight into their techniques of handling distributional challenges in the Indian BOP market. Further below in section 7.2, we will then discuss in more detail their institution-specific solutions to serving marginalized communities.

7.1.1. TARA

TARA (Society for Technology & Action for Rural Advancement) is a social enterprise situated in New Delhi. In its own description it acts as an incubation engine of the Development Alternatives Group¹⁵ and has been providing numerous development solutions

¹⁵ Development Alternatives is a none-profit society providing "eco-solutions" for the poor and marginalized. For more information see www.devalt.org (accessed on October 9th, 2013).

since its inception in 1985. TARA further qualifies itself as an enabling, aggregating and managing actor in the endeavor of eradicating poverty. The first characterization refers to the organization's ability to create livelihood support systems, training and capacity building for the rural poor and marginalized communities. Second, it bundles support service packages, helps exploring new markets and connects large corporations with small local enterprises in order to boost opportunities for BOP market development. Third, Governments and civil society networks can benefit from TARA's market expertise including community development and service delivery programs such as affordable housing and renewable energy among others. As a matter of fact, TARA mainly operates in the Hindi speaking parts of Northern India, but has been able to expand its operations also to adjacent regions in the South as well as neighboring countries such as Bangladesh and Bhutan (TARA, 2013).

TARA usually operates together with selected "grassroot" NGO's in its target regions. When choosing these local partners, TARA first examines the partner organization's outreach. One main criterion to assess the potential of a partner's ability to penetrate the market is the frequency of interactions between this service provider and its beneficiaries. Such village-level interaction may happen at any type of venue within a local community. Examples are self-help, farmer and health groups or local decision-maker meetings. TARA therefore hardly ever operates autonomously, but rather intends to maximize its social impact in accordance with its partner's ground expertise. Most of these collaborative programs are based on earlier successful projects, which not only allow TARA diversifying existing arrangements, but they also enable predicting current and future cooperation more precisely. In such a setup, TARA can furthermore incrementally introduce new products and services to its partners, without affecting the ongoing fieldwork negatively (Interviews, meetings and observations at TARA, New Delhi, April-June 2013).

Another key element of TARA's engagement is to promote more business oriented thinking within its partner organizations. Thereby, TARA intends to expand the existing horizon and introduce new markets as well as market opportunities. Thus, it is a very crucial feature to establish reliable training capacities at various agent levels. It has proven to be especially fruitful to nourish local know-how and awareness of BOP applications within rural communities. Once TARA has initiated these basic capacities, it is often the partner NGOs who further develop community projects and directly manage the most important stakeholders on site. At a later stage, TARA mostly restricts itself to only provide further consulting services in a less pro-active manner (Ibid).

7.1.2. Nidan

Nidan is TARA's local partner NGO in Patna, Bihar, and has also established a successful partnership for solar off-grid lighting solutions with SELCO¹⁶. The organization started in 1995. Initially, its function was to fight for street vendors rights, who at the time faced massive pressure from the state government of Bihar. Nidan helped to restructure the unorganized sector especially in the city of Patna. Loosely connected to its mother organization, Adhiti, Nidan started forming self-help groups and organized linkages to banks for microcredit programs in order to restrict informal money lending habits among the underprivileged community. They slowly enlarged their focus also on hawkers, artisans and slum dwellers in order to finally create, replicate and activate structures and systems to cater the needs of the poor. Today, Nidan still primarily puts emphasis on worker empowerment by promoting statutory protection against systematic exploitation and engaging in labor welfare as well as other protection programs (Nidan, 2013).

7.1.3. SELCO

One of the most prominent players in the solar lighting market is SELCO based in Bengaluru, Karnataka. In 1995 organization was founded by Dr. Harish Hande and operates as a for-profit social enterprise. Based on previous experiences, SELCO promotes the credo that the underprivileged part of the population can be empowered by building connections between local income generation and sustainable energy services. It is SELCO's goal to enhance for-profit business models along with guaranteeing a social impact among the poor (Jolly et al., 2012, p.206). Therefore, the company focuses on providing tailored customer services and a variety of around twenty SHS adapted to different customer segments and usage modes. This offering needs to take into account the particularities of locally prevailing financial means and product needs. Thus, from the company's point of view, standardized lighting products will not penetrate the BOP market successfully. The reason for this is first and foremost the very distinct payment capabilities among a heterogeneous population. Payback settings must be in accordance with income patterns. Accordingly, SELCO has established a strong credit network, mostly together with rural banks and self-help groups, but there are also linkages with commercial banks, rural farmer cooperatives and microfinance institutes. The organization further runs promotional campaigns in remote villages as well as local fairs and has put emphasis both on continuous interaction with customers and strong support services. Needless to say, this approach requires significant organizational efforts in order to continuously assess local product necessities and energy requirements (Bairiganjan, 2010,

¹⁶ We will shortly mention the type of this cooperation further below. However, in the framework of this thesis, Nidan's main partner remains TARA.

p.36 ; Hystra, 2013, p.49 ; IFC, 2012a, p.44 ; WII, 2010, pp.55-57). Once these criteria have been fulfilled, the enterprise organizes product assembly locally through regional branch offices as well as energy service centers (ESCs). Today SELCO employs around 170 people. Next to the headquarter team there are local teams of technicians, managers and sales-persons, who actively sell, install and service energy products such as SHS (Jolly et al., 2012, p.207).

7.2. Challenges of serving the BOP market

We will now turn our focus more particularly on distributional challenges in the BOP market and refer to different strategies that these partner organizations pursue when handling such issues. The subsequent institution-related answers have mainly been identified through a series of semi-structured interviews that follow the 4A-Framework (see section 4.4.2 and annex 1). Nonetheless, internal meetings, informal discussions and observations have also contributed to completing this research. The objective was to detect the most pertinent organizational obstacles regarding each challenge as well as to present potentially coherent business solutions for serving the BOP market. The layout for the assessment of each challenge is as follows: first, we define the specific problem designated by Anderson and Billou (2007). Next, we provide common market solutions found in recent business literature and reports. Further, we denote the individual approaches that TARA, Nidan as well as SELCO apply in their field operations and contrast these findings concurrently with probable implications for marketing OOLUX. On a more abstract level, we will finally reproduce potential business opportunities in the case of a rural village in Bihar in order to illustrate some of the gathered know-how more palpably.

7.2.1. Applying the 4A-Framwork

Note that Anderson and Billou's characteristic necessities in the 4A-Framework are not specifically linked to problems of distribution, but rather to a more generalist approach of serving the world's poor. Nevertheless, they offer a valuable setting for identifying a list of specific challenges that may arise when marketing and delivering a product such as OOLUX. It is important to mention that the list of challenges restricts itself to conditions "*in the field*" (Moser et al., 2013, p.1). Therefore, these challenges focus on internal business issues arising from improper management capabilities or lacking know-how as well as external deficiencies such as missing infrastructure or difficult climate conditions on site. However, this listing does not include any preceding supply chain challenges arising from product development or manufacturing and the like (Ibid).

7.2.2. Availability

According to Anderson and Billou (2007, pp.14-16) availability denotes “*the extent to which customers are able to readily acquire and use a product of service*” (Idem, p. 14). The challenge hence consists of ensuring customers access to products and services in a reliable (and possibly innovative) manner in the long-term. However, often it is burdensome to overcome obstacles such as fragmented or inexistent distribution channels in BOP markets. Therefore, interlinked delivery segments for products and services must be adjusted to the specific BOP requirements (Shukla et al., 2011, p.8).

Recent literature has enumerated a variety of different solutions to challenges: Missing transportation links, deficient communication networks or lacking energy supply can for instance be tackled by focusing the distribution system on local delivery methods such as collaborating with small and micro enterprises (including village entrepreneurs) or partnering with grassroots NGOs and local authorities (Anderson and Billou, 2007, p.16 ; Jenkins et al., 2009, p.7). Public institutions may also constitute market players that can assist in overcoming soft infrastructure issues such as missing access to financial services or favorable business policies. In general, BOP market suppliers need to ponder on product availability in the long-term, too. Continuous access can only be guaranteed if the inventory gets managed correctly and after-sales services are properly executed (Shukla et al., 2011, p.9). Finally, it is important to recruit and especially retain qualified staff in order to persevere a functional network (Hammond, 2011, p.197ff ; Hystra, 2013, p.13). In the following, we will first sketch TARA and Nidan’s mutual cooperation concerning the distribution of products and services as well as their approach to customer assistance. We will then describe SELCO’s operational functioning and the organization’s pursuit to continuously offer pertinent BOP solutions in the Indian solar lighting market.

In conformity with the literature discussed in section 3.1, TARA has underlined the importance of guaranteeing access to energy in underdeveloped markets. Commonly, this requirement is significant in any scenario, where a stakeholder is concerned about establishing new distribution networks in order to improve the availability of products and services. Energy thereby depicts a key criterion, because it is an essential prerequisite to further expand the network of basic services such as water supply. A reliable access to water again is vital for any kind of rural community interested in economically stable market conditions. By now, villagers share this kind of perception with regard to the gradual development of rudimentary services as well. So, we can assume that the proliferation of such basic living conditions depicts a necessity for enhancing market penetration in underdeveloped regions (Interviews with TARA, New Delhi, May 2013).

In this practical case, we will be considering the setup of the most rudimentary facilities in less detail, because TARA mostly operates via existing distribution networks that have been established and strengthened by their partners beforehand. Thus, this organization is able to benefit from well-elaborated distribution channels and rarely needs to engage in establishing basic infrastructure itself (Ibid). One of its partners, Nidan, has been focusing on making these supply channels as transparent as possible not only vis-à-vis its employees and collaborators but also vis-à-vis community members. The idea is that a mutual understanding of the prevailing demand and supply conditions facilitates operating in BOP business remarkably. Nidan calls its dominant market strategy the “single face approach”, where a single employee is responsible for a certain cluster or zone and keeps reporting to a project manager operating out of Nidan’s headquarter in Patna. The cluster manager¹⁷ is not only responsible for on-site projects but also for further marketing of products in associated villages. Hence, the manager introduces new merchandise and services directly to the potential customers in his sector. This kind of inter-personal product introduction has been more successful than simply shelving new devices in local stores or running erratic advertisement campaigns. The reason for this is that villagers wish to handle the product directly and appreciate pro-active commitment by the person in charge of product vending. After sales, the cluster manager will also be responsible for any kind of ensuing issues concerning product maintenance or service disruptions. Luckily, Nidan is far from being short in manpower and can put faith into a large pool of employees on project sites. Hence, the organization is able to maintain credible customer relationships and an enduring supply chain that at the same time eases presenting new innovations. Last, the single-face strategy is according to Nidan also the most cost-efficient option for ensuring prolonged availability in marginalized markets (Interviews with Nidan, Patna, May 2013).

When cooperating together with grassroot partners such as Nidan, an organization like TARA does not need to ponder much on overcoming physical aspects of product availability. Naturally, dissemination becomes more difficult when basic hard infrastructure is missing. Nevertheless, this issue does not constitute one of the core problems: Even if large geographical dispersion exists, most venues within TARA’s area of operation are accessible by road, which catalyzes product placement. More important availability-related questions arise from sales-force management and inventory controlling. Even though the associated challenges may vary depending on the distribution model (e.g. the single-face approach or centralized sales), it is in any case crucial to recruit talent. This endeavor is essential for enabling reliable after-sales services, which in the long-term determine any product’s market competitiveness (Interviews with TARA, New Delhi, May 2013).

¹⁷ We use this term as a synonym for a person responsible for a project in a certain region in both organizations TARA and Nidan.

After-sales services are also inherently linked to individual product handling. TARA and Nidan therefore both underline the importance of showing customers how to use a device correctly, because the target groups also need to be aware of their responsibilities. This is especially the case where product ownership does not get transferred completely. Consequently, both organizations appreciate any manufacturer's effort concerning capacity building and staff training, because in order to prevent malpractice, customers as well as intermediary vendors need to be shown appropriate handling instructions. Besides, it is important to present a transparent enumeration of a device's pros and cons in the very beginning to avoid the spread of misleading product conceptions. Needless to say, broken promises are mostly fatal for business development. In the end, a reliable supply chain can only execute its best potential if the related costs and responsibilities are openly communicated between customers and vendors. Accordingly, trust building (further elaborated in the acceptability section) may be one of the most important factors when tapping the BOP market and ensuring product availability (Interviews with TARA and Nidan, New Delhi and Patna, May 2013).

In contrast to TARA, SELCO mostly manages its distribution channels on its own. There exists no franchising model either; instead the majority of stakeholders are employed by SELCO itself. Apart from the headquarter in Bengaluru, there are different regional branch offices and ESCs, which establish the link of SELCO's energy services to remote communities in rural areas of Karnataka. The ESCs function primarily as offices rather than shops or showrooms, but SELCO representatives do organize product demonstrations in their area of operation. Moreover, there are three storage hubs that manage the inventory and organize product procurement for various branches statewide. Yet, it is noteworthy that outside of Karnataka there exists a thriving partnership between SELCO and Nidan, which aims at providing solar lighting solution to street hawkers in Patna.¹⁸ Furthermore, there is SELCO Labs¹⁹, a separate legal entity under the umbrella of SELCO foundation, which is mostly responsible for product testing and also runs pilots for products whose conformance has not been verified yet. This particular division has been characterized as an open-source organization providing last mile innovations for underserved communities. SELCO Labs thus characterizes an important link in guaranteeing amplified product availability by gradually enlarging the offer on the BOP market (Interviews with SELCO, Bengaluru, May 2013).

¹⁸ This cooperation is based on a fee-for-service model, in which batteries and CFLs are rented out to local market vendors from a central solar charging station. When asked about the market potential of OOLUX in street markets, SELCO stated that in general the market for smaller SHS or solar kits is more competitive and might also be more difficult to manage. Whether OOLUX could be a viable option for these hawkers is thus still subject to further research.

¹⁹ For more information see www.selcofoundation.org/selcolabs (accessed on October 9th, 2013)

So far SELCO has mostly been focusing on larger solar lighting solutions than for instance OOLUX. In this segment, the organization has been putting emphasis on product customization and professional installation in order to guarantee close and sustainable customer relations. Similar to TARA and Nidan, consistent personal interaction with villagers and business associates is a very important feature of SELCO's daily business. In general, the social enterprise is determined to make products available to any kind of customer segment and intends to match the solution to its target consumers. Nevertheless, to ensure a certain level of economic viability, a customer basis of an adequate size needs to be present to initiate projects in a new region (Ibid).

Typically, sales peak in the period between January and May when power outages are more common and the heat striking. After that, guaranteeing product availability becomes more difficult also due to the heavy rains and floods during the monsoon phase. Contrary to TARA, SELCO clearly states that transportation can become a serious issue, especially with villages being very remotely situated and when regular connections are missing. Customized transportation solutions can therefore become very expensive and difficult to organize. This might also be due to the relatively larger energy solutions that SELCO dissipates requiring more voluminous means of transport. In return, the issue of lacking communication has become less of a concern due the large dispersion of mobile phones. Nonetheless, phone charging and therefore a continuous flow of communication can still depict an important obstacle in isolated areas (Ibid).

Finally, according to SELCO, the challenge of securing availability of products and services not only includes infrastructure concerns but also the management of human resources. The social enterprise underlines the importance of employing qualified staff. Their workers should be able to maintain products and sustain energy services in order to assure their functionality. In the long-term, procuring a reliable service will lead to an enduring social impact. SELCO emphasizes the impact on society and is eager to help building new infrastructure all together. The organization's intentions are not only to develop the BOP market but also to improve rural livelihood. When asked about project outcomes, SELCO admits that its approach to service diffusion and product proliferation might not be the most cost-efficient method, but it definitely designates the most effective solution in terms of market penetration. Nevertheless, significant market issues such as product recycling are not yet completely resolved. So far only 25% of energy devices get properly disposed or are sent back to the manufacturer. This result has been deemed unsatisfactory by SELCO and notable improvement will be sought in this regard (Ibid).

To conclude the discussion on availability, we can retain that all three organizations employ certain strategies that literature has enumerated to tackle this specific challenge. Both TARA

and SELCO (outside of Karnataka) are cooperating with local grassroot NGOs like Nidan in order to organize their distribution system more locally and enhance their presence in the market. Furthermore, they both acknowledge the importance of supply chain management including inventory control and staff guidance. As one would expect, these strategies require further adaptation to the continuously changing local context in different venues. Nevertheless, the basic structure reflects many similarities. With regard to OOLUX, these partners do exhibit the necessary prerequisites to enable product availability in the long-term. They not only incorporate the ability to overcome physical distribution issues, but they also emphasize the importance of personalized customer contact (through methods such as the “single face approach”) and demonstrate willingness to engage in product training in order to enhance customer confidence. These are only a few advantageous attributes among others that foster overcoming the challenge of availability in the Indian BOP market and thus qualify TARA and SELCO as suitable partners for OOLUX in this regard.

7.2.3. Affordability

As claimed by Anderson and Billou (2007, p.17) “[t]he second hurdle to overcome in serving BOP consumers is to ensure that products or services on offer are affordable.” In general BOP customers only possess very little disposable incomes and the amount may fluctuate significantly over the year. Further, most of the time there exists no access to credit institutions or insurance services, which requires them to be smart shoppers and risk-averse investors (WEF, 2009, p.11). Hence, companies need to adapt their offering in order to allow even the poorest customers to participate in the market (Anderson and Billou, 2007, p.14).

According to recent literature, the challenges related to affordability are three-fold: first low consumer purchasing power and income volatility; second, product affordability and third, low access to capital for small and medium enterprises (SME). The first issue can be addressed through consumer financing by providing adapted credit schemes and flexible payment methods (IFC, 2012b, p.58&61). We have already touched upon these solutions to some extent in the practical discussion further above. Next, one can reduce the BOP premium on quality and reliability by adapting products through innovative packaging and design. Thus, product affordability can be enhanced if products are offered in smaller quantities or if packaging is developed more cost-effectively (Anderson and Billou, 2007, p.16-17). Finally, it is important to ensure financial partnerships for SMEs, who secure last-mile distribution (Shukla et al. 2011, p.9). In this section, we will therefore first reproduce TARA and Nidan’s engagement in consumer financing and then assess product affordability in the case of

OOLUX. Further, we will discuss partner-specific perceptions of scaling²⁰ as a potential source of enlarged financial independence and finally outline SELCO's approach to affordability.

With regard to improving customer purchasing power in general, one way of making products more affordable is to generate new business and job opportunities within a community. In a partnership with a large donor organization, TARA has accordingly been working on an interesting concept of developing new rural village centers altogether.²¹ These centers are mostly backed by a large solar off-grid power plant (up to 30 MW) and are supposed to contain the most important basic service facilities such as a workshop, a bank or a medical center. The local community has the possibility to not only draw electricity from this renewable energy source, but also to engage in new income-generating activities that emerge around this commercial zone. Accordingly, Nidan highlights the importance of individual entrepreneurship on the village level. First, such activities enable raising the level of local purchasing power significantly and second they can facilitate the process of recruiting new talent. In many cases newly recruited VLEs from rural areas have engaged in product procurement on behalf of Nidan in their respective region (Interviews with TARA and Nidan, New Delhi and Patna, May 2013).

Other methods that target improving product affordability include offering flexible payment plans in order to ameliorate purchasing power with regard to products like OOLUX. TARA and Nidan mostly work with rent schemes that are based on monthly payments and are adjusted to typical expenditure levels for lighting purposes in rural communities. In Nidan's area of operation for instance, a typical household – counting 4 to 6 persons – may earn around INR 2000-6000 (USD 34-103) per month. Since the majority of earning is spent on food and health care, a household will invest around INR 150-200 in lighting purposes. This includes mostly traditional means of lighting such as kerosene lanterns and candles. However, Nidan also mentioned that rural households are willing to spend more for improved quality. Based on these estimations, TARA assesses installment rates for solar lighting solutions usually at INR 200-300 per month. Unlike SELCO neither TARA nor Nidan cooperate with MFIs or banks, nor have they any experience with alternative payment methods such as swapping merchandise for crops or the like (Ibid).

In the practical case of OOLUX, TARA has elaborated various financing scenarios for the duration of the pilots and has also calculated subsequent options for further product

²⁰ It should be noted that with respect to affordability, we focus on financial implication of scaling rather than a firm's general expansion and impact in the BOP market as for instance discussed by Jolly et al. (2012, p.201)

²¹ For more information see www.smartpowerindia.com (accessed October 9th, 2013)

placement after the initial testing phase. Among others TARA mostly focuses on arrangements that include a local NGO as an intermediary sales agent. TARA has prepared settings where they would (1) sell the products directly to customers, (2) sell them on the basis of an equated monthly installment (EMI) or (3) rent them out to customers.²² As mentioned above, non-independent operations are based on cooperation with a grassroots NGO (like Nidan in Bihar). Independent sales or renting schemes run by TARA itself would only be an option in Bundelkhand, a region covering parts of Uttar Pradesh and Madhya Pradesh where autonomous undertakings by TARA are more common (Meeting with TARA, New Delhi, May 2013).

Taking into account that OOLUX disposes of an integrated financing system, EMIs would seem to be the most pertinent option for sustainable product sales in marginalized markets. In contrast, direct sales of a relatively costly product like OOLUX would hardly depict a realistic alternative for target customers in the low-income sector. It goes without saying that one should nevertheless not disregard this last possibility completely. Yet, in this section we will focus on the elaboration of EMI-based pricing schemes concerning the period after OOLUX pilots. To this end, TARA first has to calculate total import costs. Generally, this includes the initial freight on-board (FOB) price of the product, custom duty (in India around 16% of the FOB price) and total costs of transportation. Furthermore, the pricing has to consider operational costs (such as promotion, maintenance, contingencies and staff requirements at TARA and the partner NGO). **Eventually, total prize almost doubles from the initial OOLUX FOB price. This does not depict a very surprising finding: as a rule of thumb, doubling total prices are a likely scenario for most imported solar lighting products in India (Ibid).**²³

As projected, an EMI – so one monthly installment – for OOLUX would be fixed at INR 300 and should embrace a recovery period of two-years at the maximum.²⁴ This reflects the duration of the warranty guaranteed by OOLUX manufacturer Antenna Technologies. However, it turned out that such an EMI scenario is hardly accomplishable for OOLUX, because total product price finally exceeded initial expectations and calculations. Contrary to the initial scenario, **the adjusted recovery period would last two years and five months at a monthly rate of INR 300.** Alternatively, the EMI could be set at almost INR 400 to curtail the recovery period down to two years. However, this is deemed to be too expensive for potential customer in TARA's area of operation. **Ensuring product affordability therefore abruptly becomes a significant issue in the case of OOLUX (Ibid).**

²² These scenarios are similar to the models discussed in section 6.2.1.

²³ This finding is in accordance with experiences made by Simpa Networks

²⁴ We use this term as the period of time in which the sum of collected monthly revenue eventually matches the total price of OOLUX.

Similarly, a renting scheme including an initial down payment and a monthly fee prove to be too expensive for OOLUX as well. This option would foresee a single INR 500 down payment and subsequent monthly fees of INR 300 including a lump sum of INR 50 that would cover the subscription fee guaranteeing product maintenance and other customer services. Again, the calculated recovery period is exceeding the warranty term by about four months. As a result, affordability indeed becomes a challenging obstacle when trying to market OOLUX, because the flexible payment plans or renting schemes turn out to be unaffordable for target customers in underdeveloped regions (Ibid).

Returning to theoretical implications, affordability also includes challenges concerning organizational financing and the lack of commercial loans. With regard to internal budgeting of BOP enterprises, it is always desirable to ensure a better level of liquidity through enhanced product sales. This is especially true when financial partnerships to raise capital are not available at the time. Thus, scaling becomes a crucial issue, because additional sales can amplify on-going product procurement and revenue generation. By expanding product sales, smaller organizations and NGOs are able to develop an independent source of income and reduce their dependence on grants and other external funds. Furthermore, economies of scale may also enhance product affordability for customers in the long-term. Nidan expresses an explicit interest in generating larger revenues with more extensive dissemination of BOP products in order to eventually become a financially self-sustaining institution. However, the NGO also acknowledges that enhanced financial responsibility can become an issue within a relatively small organization. This organizational shortcoming is mainly due to the lack of experience in dealing with larger cash flows and might also be associated to negligent fee collecting practices in the field. Nevertheless, Nidan emphasizes that the development of rural markets should not be managed leniently or emotionally, and that a strict regime of encashment would thus have to be enforced in any event (Interviews with Nidan, Patna, May 2013. When asked about larger product volumes, TARA in turn mentions that a scaling process may be hampered by external influences in the market. Namely government activities can cause serious issues if competitive products get distributed freely. In such a scenario, market development and eventually scaling can become very challenging for small organizations and enterprises, because target beneficiaries are already accustomed to cost-free products and services (Interviews with TARA, New Delhi, May 2013).

SELCO's strategy to enhance affordability aims primarily at improving consumer purchasing power. The social enterprise intends to convince potential customers to change their energy sourcing habits by showing the financial long-term effects of switching to renewable power

sources. It is shown that poor households can substantially lower their level of expenditure for lighting purposes. As mentioned before, major obstacles for this kind of promotion are public kerosene subsidies. Most Indian residents get two liters of subsidized kerosene at the price of around INR 14 per month. Nevertheless, they need to acquire additional four liters in order to cover the total fuel usage for their monthly energy needs (including lighting). Unfortunately, the subsequent (black) market price is about four times higher. SELCO hence encourages potential clients who want to switch to other lighting devices to take a loan from a local bank. Next to administrative assistance, the organization in some cases also helps beneficiaries financially by subsidizing the initial down payment or interposing a fix deposit. This mechanism supports overcoming both the first barrier to accessing financial aid for low-income customers as well as to lower the default risk on their loans. Such forms of cooperation with banks have helped SELCO to establish a substantial market-share in the state of Karnataka. Thereby, they mostly handle the extensive paper work that may discourage rural communities from engaging with banks (Interviews with SELCO, Bengaluru, May 2013).

For SELCO, impact is the most important aspect, profit only comes in second position; therefore, they focus on the mission itself and less on sales incentives. Still they acknowledge that it is important to achieve certain level of scale even though they do not intend to discriminate any potential customer. It therefore makes sense to concentrate customers into larger clusters that are more likely to attract the support of financial institutions. These clusters are then also in the focus of further product and service procurement in order to not only extend the social impact but possibly also increasing the number of sales (Ibid).

In conclusion, affordability definitely delineates an essential challenge for marketing OOLUX in India. Even though the partner organizations are well endowed with experience in promoting flexible payment or credit schemes to counter low consumer purchasing power and fluctuating incomes, they have however not been able to successfully tackle product affordability with respect to OOLUX. This issue arises due to high total costs that result from various expenses in the whole supply chain and the limitations with regard to extending the payment period beyond the duration of the two-year warranty. Therefore, much work is needed in order to ameliorate product affordability by adapting the offer to the most pertinent needs and possibly even reducing its size or content. In contrast, there appear to be fewer obstacles concerning the financing of last mile distribution on the partner level. However, Nidan – representing a relatively small NGO – explicitly named its interest in securing new and larger flows of income in order to reduce the dependence on grants and external funds. We may assume that scaling OOLUX could display a potential remedy for financial

vulnerability of such institutions, but only if its market price can be adjusted to income patterns of marginalized communities.

7.2.4. Acceptability

Anderson and Billou (2007, p.15ff) acknowledge the importance of gaining acceptability, meaning that companies need to ensure that there is a sufficient willingness to consume, distribute and sell a product or service. Hence, the authors put special emphasis on the need to adapt merchandise to distinct needs of different stakeholders in the market. They specifically assert that companies need to formulate an adequate response to cultural challenges and socioeconomic circumstances as well as to address particular business habits that persist locally.

In recent literature, divers sub-challenges and subsequent strategies have been identified to overcome this challenge of acceptability. A first sub-challenge is the initial lack of trust in new products and brands. It can be tackled in multiple ways: Options include offering the customers real economic benefits or catalyzing consumer trust by disseminating products via reputable local sales agents. Furthermore, manufacturers can also piggy-back on the supply chain of well-respected companies and offer professional after-sales services that focus on specific consumer needs (Hystra, 2013, p.5-6 ; IFS, 2012, p.56ff). Second, a company needs to manage longer-term acceptability by avoiding negative feedback (Hystra, 2013, p.11) and putting the focus on localizing its products and services. Attempts to improve local supply channels signify conducting in-depth field research and collaborating with local stakeholders to holistically grasp the local business practices (IFS, 2012, p.45 ; Shukla et al., 2011, p.10). Finally, companies that want to tackle the challenge of acceptability need to prepare for potential cultural diversity and barriers (Vachani and Smith, 2010, p.8 ; Shukla et al., 2011, p.4ff) by closely cooperating with local communities in order to analyze and understand their specific habits and traditions (IFS, 2012, p.45 ; WEF, 2009, p.29). Hereinafter, we will look at the type of customer contact conducted by TARA and Nidan in order to ensure continuous acceptability and exemplify different promotional nudges that enhance consumer trust in BOP products. Additionally, we denote experiences made by SELCO.

TARA seems to be well prepared for building consumer trust within rural communities, because its cluster managers ensure close and regular cooperation with their local collaborators and rural community members. This means that the organization not only operates out of its distant headquarter in Delhi, but constantly sees to visiting the project sites in order to safeguard the close link to the development of all their undertakings. Nidan accordingly states that preserving a continuous interconnection to the customer base is

undoubtedly an important factor in business instigation. Currently, however, securing consumer trust does not depict much of an issue, because Nidan operates in familiar surroundings in Bihar and has been able to wholly adapt to local needs. Their single-face approach has further facilitated this adaptation. While these are possible measures to adapt to local circumstances and to enhance acceptability when launching a new product or service, this market feature has to be verified in the long-term as well. Consequently, TARA points out that promises have to be validated in BOP markets. Indeed, negative feedback that turns into a bad word-to-mouth spiral can be devastating for the whole business. In such cases it is primordial to be present on the ground and to be able to rely on employees who can handle such incidents. Therefore, organizations like TARA are eager to engage in straightforward promotional campaigns from the very beginning, because demonstrations and free testing help forming realistic expectations among the customer base. Furthermore such activities are important for emphasizing the social impact of a new product or service (e.g. linking the merchandise to improved conditions for working or studying) as well as for enlightening potential consumers of new usage possibilities.

As an example of improved acceptability of solar lighting solutions, common safety concerns have gained in significance among rural households. Almost every family has witnessed a fire caused by imprudent kerosene manipulations and is well aware of its potential to destroy a livelihood. Therefore, enhanced safety – as a major product asset – and the reduction of hazardous fumes within a house have to be stressed when marketing a relatively more expensive lighting solution. Especially women – who are often concerned about their children’s wellbeing when no one is able to look after them – will react positively to such improvements, even if the associated costs are slightly higher (Interviews with Nidan, Patna, May 2013). Another way of further ameliorating acceptability was discussed among TARA executives and envisages to channel the promotion through highly regarded BOP networks such as local doctors and healers. Such adaptations make a product seem very aspirational and possibly also more trustworthy in the perception of their acquaintances. As discussed in theory, product ambassadors can hence add value. As a small premium it may also be advantageous to include some useful gadgets that increase product modularity into the promotional offering (Meeting with TARA, New Delhi, May 2013).²⁵

With regard to the acceptability discussion, SELCO admits that rural customers have become more informed and interrogative about product performance and corresponding services. They are more forward thinking and are familiar with the principles of solar lighting solutions. Subsequently, they want to have detailed information about service schemes,

²⁵ For instance tossing a small fan in the OOLUX offering was a much discussed option during the pilot phase.

technical facts and the warranty conditions. In general, they prefer well-established products that have proven to be a good investment elsewhere, but innovative devices can nevertheless experience successful market penetration if they have previously been demonstrated properly. Convincing new customers furthermore depends on local servicing, which can depict an additional asset in trust building within the community. Members certainly appreciate a company's effort to establish a permanent physical presence in form of service stations. Regarding cultural differences that could influence product acceptability, SELCO has so far not been very concerned. This actuality is due to the fact that Karnataka, the area where the organization mainly operates independently, is its home state. Another reason is its focus on local recruitment in order to guarantee the most customer-oriented services possible (Interviews with SELCO, Bengaluru, May 2013).

We can summarize that all partner organizations concentrate on local business solutions and intensify their linkages to target communities in order to verify the highest level of acceptability for their products and services. Possibly, this has also been a reason why they do not need to piggyback on other firms' supply chains: they have already established themselves as respected market players with a specific focus on local particularities. In this regard, OOLUX could be effectively promoted through these partner channels and become successful BOP merchandise as long as initial product presentation and subsequent after-sales services are handled professionally in order to contain a substantial amount of negative feedback.

7.2.5. Awareness

Awareness – the last challenge – denotes “the degree to which customers are aware of a product or service” (Anderson and Billou, 2007, p.15). In most BOP markets, proper advertising media does not exist and establishing a sufficient level of awareness may constitute a hurdle which should not be underestimated. Companies therefore need to ponder on alternative communication channels that take the local advertisement practices into consideration in an appropriate manner. Additionally, rural low-income customers may not be able to perceive conventional advertisement as valuable or informative as required, possibly due to a lack of education or a different media conception (Vachani and Smith, 2010, p.6ff).

Awareness includes challenges such as limited access to modern communication and media platforms as well as low literacy and education levels. The issue of limited access can be approached by expanding a firm's marketing channels to more local means of product promotion like village demonstrations and free testing in order to capitalize on word-of-mouth

recommendations. Oral feedback is indeed an important component and companies should focus on measuring and ensuring ongoing customer satisfaction (IFS, 2012, p.51 ; Hystra, 2013, p.9ff ; WEF, 2009, p.12). Furthermore, there is the possibility to set up a wholly new communication infrastructure oneself. This sounds more complicated than it really is, because in many cases procurement of very simple communication devices such as a single handset or laptop for a whole community can already enhance information dissemination significantly (Vachani and Smith, 2010, p.8). The second problem – low literacy and education levels – often leads to information asymmetries and complicates product introduction. Hence, companies may engage in consumer education and training as well elaborating powerful messaging processes that provide informed purchasing advice. It can also be useful to enable access to online community portals and to identify potential partnerships with local decision makers as well as opinion leader in order to secure a more stable and accurate flow of information (Shukla et al., 2011, p. 4-9; Vachani and Smith, 2010, p.14ff). Below, we will ascertain TARA's evaluations concerning customer awareness in the solar lighting market, its effect on high-end products and further implications that affect campaigning. We then shortly mention SELCO's proceedings and summarize the findings with regard to the potential of OOLUX to be recognized as a familiar product among BOP customers.

As stated by TARA, rural community members have recently begun to pay for energy willingly, which may reflect a better perception of product benefits or – simply put – higher awareness. Especially women seem to be the driving force behind this process. Nevertheless, visually attractive and well-targeted campaigns are still an important factor in creating more public recognition of BOP products and services. A company or its distribution partner should on that account organize door-to-door activities in order to bring the products as close as possible to potential customers. One can further strengthen promotion through focus group discussions and community meetings as long as individuals are able to grasp the functioning and benefits of the specific merchandise (Interviews with TARA, New Delhi, May 2013).

Especially high-range products have much more difficulty to penetrate the Indian BOP market, because in India customer awareness about enhanced utility has not yet been completely developed. Therefore, advertisement campaigns are important in order to create the link between a device's price and benefits. So far cheap and low standard products have been flooding the market, thereby contributing to serious concern and disbelief among potential customers with regard to general product utility. TARA thus states that it is important to stay persistent and organize multiple events in order to guarantee that the customers have completely understood the purpose of a service or the responsibility of

product ownership. The sense of ownership is in any case crucial for local customer awareness and should be enhanced continuously. Alternatively, providing small gadgets that make a client's recent purchase visible to others can raise customer confidence too (e.g. a nameplate stating that this household is a friend of product X). Needless to say, people will quickly lose trust or forget entirely about a product if the announcements do not comply with the real *modus operandi*. Such a case can also be a delayed delivery, which makes customers wait too long for their purchased goods and as a consequence they lose interest. A reliable communication stream is therefore primordial to ensuring continuous awareness. What communication or language barriers are concerned, TARA has so far not encountered any difficulties. This is based on the fact that the organization mostly works in Hindi speaking regions. Nevertheless, raising awareness and keeping up communication streams could become an issue if TARA were to expand their area of operation permanently into other regions or countries (Ibid).

SELCO addresses the challenge of raising awareness in rather traditional manners. The enterprise does for instance not employ any formal marketing team that is responsible for product promotion. Yet, the organization is eager to use every possible contact in public nuclei to nurture awareness within local communities. Moreover, sales executives are usually distributing product brochures when visiting individual households for the assessment of their specific energy needs. This way the rural population receives more adequate information concerning products and services that would fit their personalized demand in a more sustainable manner than traditional energy solutions (Interviews with SELCO, Bengaluru, May 2013).

In conclusion, we can make note that none of the partners reinvents the wheel concerning the challenge of awareness raising. However, this may not be necessary, because these organizations have been successfully promoting their merchandise in promotional campaigns that include door-to-door marketing and community events. Hence, they are capable of overcoming the BOP challenge relating to customers who have limited access to modern forms of media and communication. Similarly, the second issue associated with low levels of literacy and education can be tackled by organizing discussions and by stimulating the sense of customer ownership. We can therefore expect to find a potentially powerful basis for OOLUX promotion and awareness raising. Yet, we should at the same time not underestimate the tenacious difficulty of successfully communicating the additional benefits of high-end products in the Indian BOP market.

7.2.6. Challenges in rural Bihar

In the following we will describe a rural community visited during the pilot phase that could potentially represent a market opportunity for solar lighting solutions such as OOLUX. A village in Bihar will serve us as a specific example on how to adapt the OOLUX offering to locally prevailing market challenges. It is noteworthy that the subsequent insights were gained on basis of informal discussions together with local villagers and representatives of TARA and Nidan.

The village is situated on the island of Nakta northwest of Patna and surrounded by the Ganges. Grid supply is inexistent on the whole island and according to the villagers there do not exist any diesel generators in this specific settlement either. However, this rural community is economically well off compared to other areas in Bihar. The villagers generate their income mostly by selling various agricultural products, including dairy produce (Meeting with local villagers and representatives of TARA and Nidan, Nakta, May 2013). Nonetheless, the village is still far from becoming a prospering settlement. In order to better illustrate the difficulties to improve livelihood in such a location, we will briefly screen some of the infrastructural issues.

There are for instance only few schools close to this village. Those that are run by the government are less reliable, because teacher attendance is relatively low. Seemingly, private schools are the slightly better option for those community pupils, whose parents are able to afford this service. Nevertheless, providing a credible level of schooling remains a deficiency for numerous children. Many teachers and staff members find it difficult to reach the rather remote island due to inadequate means of transport and irregular connections. Sometimes access is even completely impossible, because passing the Ganges can become very hazardous and straining during the period of the monsoon. The only bridge that directly connects the island to the mainland is a seasonal solution with interlinked steel parts that are floating on the water surface. Unfortunately, this route's safety is a reason for concern, if the river's current is strong (Ibid).

A local family or household does not necessarily live in a single residence but rather in several connected houses. According to Nidan – who has been active on the island in cooperation with TARA – one household consists of four to six members. Nonetheless, it seems that many extended families gather in larger housing clusters that may consist of up to ten houses. Hence, a single household may be occupied by a multiplicity of people, which enlarges their aggregated energy needs. Every month kerosene expenses (including fuel for lighting purposes) add to around INR 350-400 per capita. Out of this amount, around INR 100 (roughly the economized amount for two liters of kerosene) are government subsidies

meaning that in a month individual contributions must total INR 250-300 per person to attain the quantity needed (Ibid).

Interestingly, a few years ago, local authorities constructed an off-grid street lighting system consisting of a street lamp, a solar module and a battery in order to enhance visibility on public streets in the village during night. However, the administration did not replace the batteries once they had been depleted; instead the nearby households jointly started collecting money in order to finance the replacement. Unsurprisingly, this reoccurring process can take some time, because in the given moment not every adjacent stakeholder has enough disposable income at hand to cover the required share of money. Nevertheless, the community members are very aware of renewable energy technologies and have been keen to expand the supply as soon as possible (Ibid).

When told about OOLUX they noted that one of the main benefits this product may offer is more secure handling. Fires caused by candles and oil lamps are definitely a major concern among the community members. Furthermore, mobile charging has been identified as a very important attribute. So far the villagers have worked out some rather creative solutions for charging their handsets. Their approaches include among others tapping the government-supplied batteries which lighten the street lamps or running their tractor in order to power a frugal electricity generator. According to the villagers, OOLUX would definitely be a more comfortable solution and it would be worth investing a higher amount into such a device (Ibid). Finally, the sense of product ownership for individuals seemed to be a very appealing privilege and should not be underestimated as a promotional edge, because most of the villagers have so far only experienced preset products that did not permit any customized configuration or handling. So, what are the most pertinent challenges when marketing OOLUX in such a village?

With regard to availability, OOLUX could be sold and distributed without any great concerns in the non-monsoon season, because the island is easily accessible in relative terms. Hence, any distributor could simply ship the products over using either local means of transportation or own vehicles. However, as soon as heavy rains start pouring down this exercise could become increasingly complicated and more locally aligned business solutions were required. Especially, guaranteeing reliable after-sales services would depict a major issue and any organization distributing OOLUX would have to ponder on detached servicing mechanisms that operate independently from the headquarter. This means that there should be a local technician (or qualified retailer) present on the island, who has access to some form of storage and mobility. Evidently, this individual would best be recruited from the local

population and would have to receive thorough product training before starting the job.²⁶ Not unexpectedly, it would be greatly beneficial if communication streams did not break down during the rainy months in order to uphold a constant exchange of information between the distributor and the local technician. In the case of Nakta, it would probably suffice to hire a single technician for the whole island given that he disposed of an adequate means of transportation and his customers were able to contact him at service hours via mobile phone.²⁷

Product affordability for customers remains a major concern as we have already discussed in the section dealing with TARA's financing schemes. This fact would probably not alter in the case of this village, even though the locals indicated that they were willing to pay a price premium for a quality product. Considering this information, it would possibly be less challenging to tackle the burden of low purchasing power, because the potential consumers are relatively better off in the first place and might even be inclined to temporarily invest larger amounts of money with regard to their lighting needs. Of course, a distributor would still have to emphasize the long-term financial benefits of solar lighting solutions compared to traditional means of lighting in order to make the offering more attractive. Under certain circumstances it could also be possible to reduce for instance OOLUX's total price slightly if specific adjustments to village needs were taken into account. This could imply reducing the product volume by abstaining from some parts judged as being superfluous by community members.

In any case a distributor should serve such a community by procuring a product that effectively meets the needs of the locals. Seemingly, acceptability or the willingness to acquire OOLUX seems to bear a high potential, because several of its features could be appreciated. Among other reasons, the product first addresses some of the safety concerns mentioned above. It is not only less hazardous in terms of the potential to destroy assets, but it also reduces the exposure to dangerous fumes, which may affect health status of family members. Second, it is a useful device to overcome the troubles of mobile phone charging, which either can be a rather improvised exercise (tapping large batteries or running tractors) or a costly affair (independent entrepreneurs offer charging services for a predetermined fee). Third, acceptability can be enhanced by referring to the important sense of product ownership. Many rural villagers have not yet experienced thoroughly the sensation of disposing valuable merchandise independently. Nonetheless, they are seemingly eager to make this type of experience, which can eventually be beneficial for marketing high-end products all together.

²⁶ As a matter of fact TARA has already successfully conducted such product training internships in previous projects as witnessed during a visit to TARAGram in Orchha (May 2013).

²⁷ Evidently, this form of communication also relies on telephone network conditions during the "harsh" season. In any case mobile phones are already quite common on the island.

Finally, we need to consider raising product awareness. This is an undertaking that most probably requires some form of bounded door-to-door promotion and demonstration. Naturally, this may not be the most cost-efficient option, but it certainly will have a more persistent effect, because advertisement and powerful messaging can unfold its potential best in smaller groups. This suggests that an audience consists of an extended family or a cluster of nearby households instead of the whole village population gathering at a central campaigning venue. Talking and negotiating in an impartial meeting with a limited amount of people appears to be a fruitful opportunity to raise awareness and to gather valuable market information. Nevertheless, one should bear in mind that such discussions should not only include the male representatives of a household, but also their wives and daughters. This gender-related assertion is subject to further consideration, because – as witnessed during the visit – accessing female decision-makers in India is a noticeably less straightforward task than bargaining with men.

8. Conclusion

This thesis aimed at depicting the current situation of the off-grid solar lighting market in India by scrutinizing pertinent challenges to businesses and independent organizations that intend to introduce products and services in this highly contested business environment in a prevailing manner. For this reason, we first introduced the common reasoning of BOP marketing in the literature and illustrated the most conventional energy and lighting needs in marginalized communities. We then discussed different solar lighting solutions in more detail and assessed the distinct features of OOLUX as well as the prerequisites for the field testing phase. Next, this dissertation attempted to assess the Indian market environment by depicting the socio-economic circumstances. Grasping this setting holistically depicted a difficult endeavor due to the Gordian mingling of cultural, economic, political and religious influences in this vast country. Therefore, we limited ourselves to some basic data that provided a simplified overview. Similarly, we described the complexity of the energy market – where a variety of public and private actors has been involved – in a rather rudimentary form in order to scrutinize further energy-related topics, such as rural electrification. The reasons why guaranteeing overarching rural electrification is a challenging undertaking gave us a platform to elaborate possible off-grid alternatives, that is solar lighting solutions. We then analyzed a small selection of thriving projects in the solar lighting market by focusing on theoretical and practical approaches to financing and distribution. In order to eventually find an answer to our research questions – that focused on business strategies enabling the marketing of BOP products such as OOLUX within the 4A-Framework – we examined in detail the steps that Antenna's local partner organizations undertake to overcome the challenges of serving poor customers in India.

The first research question encompassed identifying pertinent business strategies to overcome obstacles that Antenna's partners presently face in their area of operation. After having assessed their most important procedures, we can denote that TARA, Nidan and SELCO have collected extensive experience on how to tackle these distinct challenges. Generally, these organizations are engaging in mutual cooperation in order to organize their distribution system more effectively and to enhance their presence in the market. They further attempt to align their offering to local conditions that are characterized by low purchasing power and volatile incomes. Also, they have been successfully intensifying the linkages to the target population and have thereby become respected market players who focus on local particularities and continuously aim at enhancing acceptability of their products and services. This furthermore applies to their awareness raising efforts that are determined by promotional campaigns including door-to-door marketing and community events in underdeveloped regions.

These first findings had direct implications on our analysis concerning the second research question that inquired whether these preconditions are sufficient to effectively establish OOLUX in the Indian solar lighting market. In conclusion, we can positively confirm that three out of four challenges are likely to be managed successfully by these organizations. The main obstacle however remains affordability. The product's final price already brought the pilots to a halt and will undoubtedly further raise problems in the Indian market, if none of the stakeholders involved can come up with a flash of inspiration. Of course, many different options have been discussed that among others revolved around linking the product to some larger BOP package, adding little gadgets or changing its composition to lower production costs. Whether such measures can enhance competitiveness is subject to further investigation. As it currently stands, the present version of OOLUX is unlikely to penetrate the Indian off-grid solar lighting market any time soon. This fact implies that – given the positive status of the other challenges – affordability might depict the most significant obstacle to overcome for effective servicing of marginalized customer segments on the Indian subcontinent.

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10. Appendix

Annex 1: Partner questionnaires

Overview Questions Distribution Challenges

This questionnaire is designed for academic research purposes and in the framework of a thesis for a Masters in International Affairs at the University of St.Gallen, Switzerland. The present research is linked to the field-testing of OOLUX (a multipurpose solar charging device), but mainly intends to identify organizational approaches to distribution challenges of solar lighting products in rural markets. The structure of this questionnaire is based on a set of distributional challenges for serving the world's poor (BOP customers) that have been described as the 4A's (Availability, Affordability, Acceptability and Awareness) by Anderson & Billou (2007). Each challenge contains subgroups that name more specific criteria concerning rural distribution issues.

Overarching questions

- What are the main objectives and activities of your institution?
- What products and services do you sell or provide? Does it include lighting products and/or products sold with flexible payment systems?
- Who are your target customers?
- How is your value chain / distribution network organized? Who are your partners?

Availability – Getting the product to the customer

To which extent are customers able to readily acquire and use a product or service?

Are the following criteria an issue? If no, what is the current solution? If yes, how are they tackled?

Distribution network

- Establishing a new or using an existent distribution network (incl. access to communication, energy and water)
 - How many players should be in a value chain (most efficient)?
 - Where does the consumer want to see the product (shop, respected person)?
 - How do other companies reach the customer?
 - Which one works? Which one is the most cost efficient?
- Transport infrastructure / physical distribution to customers (geographical dispersion, lack of means of transport etc.)
- Scaling
 - What's the number of potential customers?
 - What kind of issues have you faced when scaling up?
 - Is the business model reproducible? What are important factors?
- Management & Controlling (sales-force, inventory etc.)
- After-Sales Services (product maintenance, recycling etc.)

Affordability – Enabling the customer to purchase the product

To which degree are the goods and services affordable to target customers? Can purchasing power be increased?

Are the following criteria an issue? If no, what is the current solution? If yes, how are they tackled?

Affordability

- Cost of product (including taxes, transport etc.)
 - What is the income level of people? Percentage spent on food, electricity etc.?
 - What kind of other products are available on the market?
 - How to make switch people from one product to the other? Higher utility, lower price?

Improving Purchasing Power

- Generating business and job opportunities (also through use of products)
 - Does a middle man increase product costs significantly?
- Payment systems (pre-payment, EMI, microloans, payment by crops etc.)

Acceptability – Encouraging the customer to adopt the product

To which extent are stakeholders willing to consume, distribute or sell a product or service?

Are the following criteria an issue? If no, what is the current solution? If yes, how are they tackled?

Rural market

- Trust building within communities
- Adapting to cultural diversity and barriers
- Adapting the business model to local market mechanisms
- Managing adoption process

Awareness - Making the customer aware of the product

To which degree are the customers aware of the product or service?

Are the following criteria an issue? If no, what is the current solution? If yes, how are they tackled?

Creating Awareness

- Establishing and using promotional channels (local media, radio etc.)
 - How do you make the consumer aware?
- Communication / language barriers (literacy, IT knowledge etc.)

Creating a Market for a product

- Creating / Using market mechanisms in place

Annex 2: OOLUX working paper

The challenges of serving rural BOP markets

Working paper for the practical case studies and the OOLUX field test

by Simon Moser, Bettina Naef and Thomas Tenchio

Introduction

The following paper intends to give an overview of the various challenges of serving people at the bottom of the economic pyramid as well the respective approaches to these challenges. Based on existing academic and business literature, the purpose of this working paper is to build a framework for the three practical case studies on the challenges of serving rural low-income markets in India, Tanzania and Zambia. The practical research for each case study is carried out in the framework of the OOLUX field test organised by Antenna Technologies. OOLUX is a product, which has been developed in the collaborative SmartLight project including Antenna Technologies, Caritas Switzerland and the Bern University of Applied Sciences. The project intends to distribute a high quality solar-powered lighting and charging device to households in rural areas. The case studies will examine if the challenges identified in theory correspond to the country-specific situation on the ground, and analyse the conditions for successfully addressing them. The ultimate goal is to evaluate the potential of the OOLUX Business Model and to provide Antenna Technologies with recommendations on possible adaptations and developments.

The following list of distribution challenges is classified according to the so-called “4-A Framework” proposed by Jamie Anderson and Niels Billou (2007). The two authors suggest that those businesses which have successfully developed and delivered products and services to people living at the bottom of the economic pyramid, have adopted a common approach which has been key to their success: the delivering of four A’s, namely availability, affordability, acceptability and awareness (Anderson and Billou, 2007, p.14). While Anderson and Billou’s framework is not specifically related to distribution challenges (but rather to how and with which products and services BOP markets should be served), it nevertheless provides a useful basis for the present classification. It should also be noted that the four A’s are not themselves challenges but serve as categories for our list of challenges.

Each category of challenges is structured in the same way. After a brief introduction to what the respective “A” means, the corresponding challenges found in the literature are specified. A short explanation of the particular challenge is each followed by a list of the most pertinent strategies to address that challenge.

The list includes challenges on two different levels: one level represents the conditions that one finds on the ground, like bad roads or illiterate consumers. The other level concerns the business itself, such as the difficulty of managing adoption processes. The challenges on the second level are related to the first inasmuch as they may be a result of the complex environment of BOP markets. Challenges that relate to aspects of the business model that are not relevant for the practical case studies, like the organisation of manufacturing, are not considered in the present paper.

Availability

According to Anderson and Billou (2007, p. 14-16) ensuring availability of products and services depicts one of the biggest challenges in BOP marketing. Overcoming the obstacle of operating with fragmented or even inexistent distribution channels has been a major issue for many companies trying to enter this allegedly lucrative market of the world's poor. Anderson and Billou put it as follows: "[...] while there might be a market of more than 700 million poor Indians, delivering goods and services to them is not easy." The particular challenge of guaranteeing availability of products and services characterizes an important issue of a conventional distribution channel where goods get passed down the chain from one entity to the next until they reach the end-consumer. The interlinked delivery elements possess specific features that have to be adapted to this unique operational environment (Shukla et al., 2011, p.8). The main challenges and the most pertinent strategies in order to procure availability of products and services in the BOP market are the following:

1. **Reaching target markets with missing hard infrastructure:** Enterprises focusing on customers in low-income groups may have to overcome infrastructure gaps that hinder market activity as well as value creation and have to be addressed through business-led solutions. Gaps in hard infrastructure include lacking access to storage facilities, adequate transportation, communication networks as well as to energy and water supply (WEF, 2009, p.18). What is more, rural BOP markets are often characterized by adverse weather conditions, long distances due to geographical dispersion and hostile terrain often combined with bad roads (Shukla et al., 2011, p.7).

Strategies:

- a. **Distributing via small and micro enterprises** can be an increasingly successful strategy in order to reach BOP customers. These actors benefit from better market penetration due to their ability to operate with smaller volumes and their higher chances to establish relationships of trust with local communities (Jenkins et al., 2009, p.7). It may also contribute to an expanded network of storage facilities (Shukla et al., 2011, p.8).

- b. **Distributing via Village Entrepreneurs (VLEs):** VLEs, usually recruited from within a village and earning their income on a commission basis by selling specific products and services (Dutt, 2012, p.1), may operate more effectively than a company-owned retail network. Being familiar with their neighborhood and operating in a restricted area, VLEs are well placed to take advantage of proven local distribution methods, for instance by using alternative means of transport like rickshaws and canoes (Anderson and Billou, 2007, p.16).
 - c. **Partnering with others and leveraging shared resources.** Examples would be leveraging shared or bidirectional distribution channels (with products and services flowing in two directions, e.g. agents who both stimulate purchases from farmers and sell them goods) (Vachani and Smith, 2010, p. 26), sharing infrastructure with other companies and organizations by allocating common plots and offices or partnering with NGOs, donors and governments in order to combine organizational capabilities (Jenkins et al., 2009, p.14; WEF, 2009, p.7).
2. **Reaching target markets with missing soft infrastructure:** Next to missing hard infrastructure there might also be a lack of soft features such as missing financial services, market information, producer organizations, education programs or policies and regulations that strengthen business operations (WEF, 2009, p.18; Clarke et al., 2010, p.9). Both types of infrastructure gaps are typically considered to be a public responsibility, however, many BOP customers live in remote regions, where public services are underdeveloped (WEF, 2009, p.18).

Strategies:

- a. **Rearranging the value chain:** It may be useful and cost-effective to create a distribution system that sources from local producers and leverages existing local distribution channels in order to overcome soft infrastructure constraints that otherwise hinder distribution for non-local companies. A coordinated supply chain can grow into a platform that facilitates business operations and may bring benefits to the producers as well as the consumers (WEF, 2009, p.26).
- b. **Forming active partnerships with the public sector and local communities as well as unconventional market-players.** In order to guarantee long-term profitability in low-income markets, private action needs to address institutional misalignments by collaborating with local communities, public actors and organizations that have established networks with deeper reach. For instance, partnering with universities, development agencies or

even competitors can help address a lack of skilled people, low access to market information or inexistent quality standards (WEF, 2009, p.18; p.29-30); IFC, 2012, p.66-68).

3. **Making products and services continuously available:** Ensuring availability of products and services in the BOP market means that post-sale services must be guaranteed continuously. This is especially important for organizations delivering products with relatively high degrees of technical complexity and maintenance requirements (Shukla et al., 2011, p.9). Especially in sparsely populated areas, ensuring comprehensive, formalized after-sales service can be complex and expensive, so creative and flexible approaches are needed.

Strategies:

- a. **Optimize the placement of storage facilities as well as maintenance and repair service centres** to lay the basis for a continuous post-sales service meeting customers' needs.
 - b. **Manage inventory correctly**, deploy technological tools and operational processes and provide necessary training to ensure inventory control.
 - c. **Arranging maintenance infrastructure and calculating repair cycles** adequately helps establishing after-sales services as well as a continuous delivery of products and spare parts (Shukla et al., 2011, p. 9).
4. **Managing and controlling complex distribution networks:** Given the fact that rural BOP markets are very dispersed and distribution channels often adapted to local contexts, a complex distribution network involving diverse stakeholders with different perspectives and needing different incentives may have to be managed. This leads to high transaction costs, for instance in the area of recruitment, management and training of last mile distribution sales forces. (Hystra, 2013, p.13).

Strategies:

- a. **Decentralizing and externalizing:** working with local institutions and entrepreneurs and give them decision-making power leads to high responsiveness and more collaborative relationships between companies, consumers and entrepreneurs (Viswanathan, 2011, p.157ff).
- b. **Motivated and skilled employees/entrepreneurs** facilitate the management of complex distribution networks as well. By developing shared goals and values, offering career opportunities and organizing team events, a company can ensure an attractive work environment. Providing competitive compensation particularly enhances the satisfaction and thus the reliability of

employees, thereby leading to continuity in staff (Hystra, 2013, p.13; WEF, 2009, p.22).

- c. **Make an effort to find the right staff and partners.** Leveraging partnerships, global and local networks as well as personal connections – if necessary with a lot of persistence – can help finding the right staff for positions at various levels (or finding partners that will support the recruitment of suitable employees) (Hammond, 2011, p.197ff).

Affordability

Anderson and Billou state that the second overarching barrier for doing business at the BOP is to ensure that products or services on offer are affordable (Anderson and Billou, 2007, p.9). This barrier is obvious, given the fact that the 3.7 billion people comprising the “base of the pyramid” (BOP) earn USD 8 per day or less, deal with fluctuating, uncertain income and have generally limited access to credit or insurances. These circumstances make BOP customers smart shoppers and risk-averse investors (WEF, 2009, p.5). The main market challenges related to this barrier, as well as relevant business strategies to increase affordability are the following:

1. **Low purchasing power and income volatility:** Rural BOP customers typically have both low income per capita, and low disposable incomes. Income flows of BOP households are further often volatile and unpredictable. In addition, access to saving and affordable credit institutions is low (WEF, 2009, p.11).

Strategies:

- a. **Consumer financing:** Increase affordability through the provision of access to credit, thereby raising the end customer’s ability to pay for product and service offerings. Possible strategies to provide financial products and services that are accessible, convenient, flexible, continuous and affordable include providing in-house credit and partnering with NGOs, microfinance institutions or rural banks (IFC, 2012, p.58).
 - b. **Flexible payment methods:** Maximize affordability through the implementation of flexible payment methods better suitable for the volatile income patterns of many BOP customers. (IFC, 2012, p.61).
2. **Product Affordability:** As BOP customers are characterized by low incomes and little savings, they are reluctant to make large up-front purchases. However, even though BOP customers are price sensitive, they cannot afford to invest their money

into products with a short lifespan and thus are often ready to pay a premium for quality and reliability (WEF, 2009, p.25).

Strategies:

- a. **Innovative packaging and product design:** Maximize affordability through innovative packaging, like offering products in very small units, and/or intelligent cost-effective product design (Anderson & Billou, 2007, p.16-17).

Contrary to the challenges listed above, the subsequent challenge does not concern affordability on the end-customer level, but on the level of small and medium enterprises and other stakeholders securing the last-mile distribution.

3. **SME's barriers (low access to capital):** Small and medium enterprises involved in the local distribution chains often have little financial capabilities and lack access to capital.

Strategies:

- a. **Channel financing:** Ensure the proper functioning of channel operations by providing partners with access to financing through partnerships with social investors, microfinance institutions and rural banks (Shukla et al., 2011, p 9).

Strategies to cut costs and increase affordability exist for almost every stage of a supply chain and are thus not explicitly mentioned in this section. While cost efficiency in distribution systems is addressed under "availability", strategies to cut production costs are not considered in this paper, because this stage of the value chain will not be evaluated in the field test.

Acceptability

Another critical factor when serving the world's poor is, according to Anderson and Billou (2007, p.15ff), gaining acceptability – or willingness to consume, distribute or sell – for the product or service offered. To achieve acceptability, products or services need to be adapted to the distinct needs of both target consumers and the actors involved in their distribution and sale. There can be country- or region-specific aspects, or distinctive local business practices that distributors have to take into account. As with all consumers, it is crucial to understand their daily lives and the related needs¹ (Anderson and Billou, 2007, p.18). The following distribution challenges as well as the most relevant strategies to address them relate to the

¹ A good example is the Chinese appliance maker Haier, who discovered that rural, low-income customers in China did not seem to perceive the purchase of a washing machine just for laundering clothes an investment worth the money. Instead, they used the machines also for other purposes like cleaning vegetables. Haier took this habit serious and consequently developed a washing machine for the dual usage of laundry and vegetable cleaning, and another model to make goat cheese. Similarly, Coca-Cola provides their distributors in BOP markets with iceboxes due to the frequent lack of electricity and refrigerators (Anderson and Billou, 2007, p.18).

fact that business must in some way ensure the acceptance of their products and services by target users:

1. **Initial lack of trust in new products and brands:** Rural, low-income consumers usually prefer known brands and products (Hystra, 2013, p.9; IFS, 2012, p.51). One major reason is their risk-adverseness. There is often a fear that something will go wrong with unproven offerings, or that the purchase is not worthwhile the investment: BOP consumers may be unaware of future benefits – it takes some time for customers to see themselves that a product was worthwhile the investment – or wary of potential technical issues, maintenance and replacements (IFS, 2012, p.63; Hystra, 2013, p.2ff; Shukla et al., 2011, p.3ff).

Strategies:

- a. **Offer real economic benefits** – and make them as tangible as possible, best using marketing slogans with straightforward economic arguments (Hystra, 2013, p.5).
- b. **Lower the (perceived) risk of being disappointed.** One way is to make people experience themselves how much they can actually benefit from and/or save with an improved device (like a cooking stove or a solar lantern)², or in what ways it brings advantages over alternative choices. Another is to provide complementary services dealing with the perceived risks (Hystra, 2013, p.6; Shukla et al., p.11).
- c. Try to understand and **leverage local institutions and village politics.** Such strategies may include seeking the endorsement of community chiefs, engage entrusted locals or making opinion leaders test the product for free, and hopefully lead to positive word-of-mouth (Hystra, 2013, p.10; see also “Awareness” point 1.a).
- d. **Build consumer trust**, for instance by developing a recognisable brand, hiring reputable locals as sales or marketing agents or leveraging existing consumer brands (e.g. partnering with a well-known company to distribute a product) (Hystra, 2013, p.6; IFS, 2012, p.60ff).
- e. **Incite potential customers to adopt a new product or brand** by designing products and services that (seemingly) enhance their social status, for instance by offering a basic as well as an improved version of a product (Hystra, 2013, p.6).

² One example is Toyola, who proposed the customers of their cooking stoves to hire the stove for a certain period, during which they are encouraged to deposit the savings from reduced charcoal usage to see how much they save (Hystra, 2013, p.6).

- f. **Offer a warranty as well as professional and consumer-friendly after-sales service**, for instance by engaging a trained agent in each village, ensuring that broken parts can easily be repaired or replaced (IFS 2012, p.56 ff). This requires the agents to have a stock of spare parts and to know how to service the devices (Vachani and Smith, 2010, p.13).
2. **Manage longer-term acceptability**: Sometimes a product is not used anymore when customers would have to make a proactive effort in order to allow a continuous use. How can customers be incited to make proactive efforts in case of technical problems or replacements? (Hystra, 2013, p.11).

Strategies:

- a. **Avert negative word-to-mouth** by evaluating and instantly following up with customer dissatisfaction (Hystra, 2013, p.11).
 - b. **Provide professional after-sales services** and promote these services to make sure potential customers know what they will be offered (Hystra, 2013, p.11; see also point 1.f).
3. **Localisation of products/services and delivery processes**: Offerings and delivery channels must be fitted and shaped according to the needs of target customers in order to be successful (Shukla et al., 2011, p.10). Yet, it may not be easy for outsiders to understand local markets and the diverse consumer preferences and needs (Debelak, 2011, p.23).

Strategies:

- a. **Conduct primary and secondary research** (on population, usage rates, demographics, behavioural patterns, alternate product choices and lifestyle) and collect and distribute intelligence information about the marketing environment to understand the different needs of various customer segments (Shukla et al., 2011, p.10). **Field research**, with staff extensively dealing with local communities and partners, particularly helps to understand consumer needs. The insights gathered must then be integrated in the product development in order to design appropriate, possibly customized offerings (IFS, 2012, p.45).
- b. **Offer complementary products** in order to modify or complete the product portfolio so that it best matches customer needs and preferences (Shukla et al., 2011, p.10).
- c. **Collaborate with local intermediaries, village level entrepreneurs and/or opinion leaders** who have a deep understanding of local economic

processes, consumer needs and pathways to influence local businesses, households and individuals. Also, potential buyers should be involved in developing and communicating the value propositions of a product or service (Shukla et al., 2011, p.10).

4. **Adapt to cultural diversity and overcome cultural barriers:** Decisions of local consumers as well as staff members are influenced by cultural norms, preconceived notions or conventional wisdom that may be difficult to understand for outsiders (Vachani and Smith, 2010, p.8; Shukla et al., 2011, p.4ff). In addition, target markets are often characterised by high cultural diversity, so distribution channels must be apt to handle different cultural groups (Debelak, 2011, p.23).

Strategies:

- a. **Collaborate with local communities** and partner with organisations that are deeply familiar with the region in order to develop a good understanding of the local cultural circumstances (WEF, 2009, p.29).
- b. Staff of foreign companies or organisations should carry out **field research** in order to get familiar with the local social and cultural context (IFS, 2012, p.45).

Awareness

Awareness refers to the extent to which consumers know about a product or service (Anderson and Billou, 2007, p.15). The lack of access to conventional advertising media like television and Internet makes awareness-building among low-income consumers an important challenge. Companies must find alternative information channels like billboards along roads, marketing material tailored for small shops, street performances and product demonstrations in the local communities (Anderson and Billou, 2007, p.19). What is more, rural low-income consumers often have low education levels and may thus not be able to derive value from existing information (Vachani and Smith, 2010, p.6ff). The following challenges and related strategies to successfully tackle them exist under the category of awareness:

1. **Limited access to modern communication and media platforms:** Even if mobile phone subscriptions and Internet access have increased a lot in recent years, access to communication infrastructure is still often unsatisfactory in rural areas, leaving BOP consumers unfamiliar with new offerings and their proposed benefits. The **lack of electricity** is an additional obstacle to straightforward access to information (Vachani and Smith, 2010, p.8; WEF, 2009, p.28).

Strategies:

- a. **Use unconventional marketing channels:** While billboards or radio ads can contribute to raising awareness, the best publicity is good experience of friends and relatives and individual experience from testing a product. Business should thus in particular capitalise word-of-mouth and relationships at local level, for instance by offering free trials to opinion leaders. Village-level demonstrations or road shows are also important, allowing target customers to experience and test the product themselves³ (IFS, 2012, p.51; Hystra, 2013, p.9ff; WEF, 2009, p.12)
 - b. Related to the strategy above is the need to put emphasis on **measuring and ensuring customer satisfaction**, which in turn generates positive mouth-of-word (Hystra, 2013, p.11).
 - c. **Set up a communication infrastructure oneself**, for instance by procuring one farmer per village with a computer so that he can access information, e.g. on current market prices or agricultural practices provided on a special website for farmers. Such a setting will facilitate the circulation of valuable market information among the community members so productivity can be enhanced and more informed purchases made (Vachani and Smith, 2010, p.8).
2. **Low literacy and education levels:** rural BOP consumers often do not have enough knowledge and skills to understand and analyse market information, and consequently to derive value from it (Vachani and Smith, 2010, p.6ff). In addition, poor education levels prevent the development of conventional, cost effective marketing and communication materials resulting in information asymmetries and prolonging new product introductions. Rural BOP consumers do thus often not possess accurate information to make informed purchasing decisions (Shukla et al., 2011, p.4).

Strategies:

- a. **Educate end consumers about product offerings and benefits**, for instance through farmer-training programmes or promoters visiting villages to educate community members. Such strategies can involve guided product testing, or training village agents (including women!) to communicate relevant information to fellow villagers. The latter additionally generates income, which may contribute to a better education of the children (Vachani and Smith, 2010, p.14ff; WEF, 2009, p.28).

³ Greenlight Planet, for instance, pour water on their solar panels to demonstrate that they are waterproof; and d.light throw their lanterns on the floor to give proof of their robustness (Hystra, 2013, p.10).

- b. **Elaborate powerful messaging** which is easily understandable for target consumers and which incites them to take action (Shukla et al., 2011, p.9).
- c. **Install Internet community portals** using voice-over design in the local language (Vachani and Smith, 2010, p.14ff).
- d. **Identify and partner with opinion leaders or local media**, who can play an important role in mobilising early adopters and followers (Shukla et al., 2011, p.6; WEF, 2009, p.28).

Conclusion

This paper intended to identify a variety of strategies to overcome the most pertinent distribution challenges in the BOP market. Anderson's and Billou's (2007) "4-A's" served as a framework for categorizing these challenges and proximate strategies addressing the complex requirements of last-mile distribution. All the findings have been compiled from existing academic and business literature and should eventually serve as a mean to evaluate the potential of the OOLUX Business Model and to provide Antenna Technologies recommendations on possible adaptations and developments for marketing its product successfully in BOP regions around the globe.

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