



Barriers & Niche Strategies for Scaling-Up Technology Firms at the Base of Pyramid

Boma Harahap

Delft University of Technology

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Public Version

Barriers & Niche Strategies for Scaling-Up Technology Firms at the Base of Pyramid

Prepared By

Boma Harahap (4255410)

is partial fulfilment of the requirements for the degree of

Master of Science

in Management of Technology

at the Delft University of Technology,

Graduation Committee:

Prof. Dr. Cees Van Beers

Dr. J.Roland Ortt

Dr. Linda Kamp

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Executive Summary

There are 4 billion people with income less than \$3000 per year, which belong to the Base of Pyramid (BoP) market segment. These people share similar characteristics such as experiencing health problems, lack of education and poor living conditions. This state is realized by several entrepreneurs as potential business opportunities, which come in form of technology solutions such as solar lanterns, drinking-water purifiers, and biomass cook stoves. Through the provision of these technologies, entrepreneurs focusing on the BoP aim at getting profit, while at the same time consciously provide technologies that can solve the aforementioned issues.

On the other hand, even though there is an increasing trend and influx of investment by these social enterprises, many companies still find it difficult to scale their solution to the poor. For example, many technologies are only sold in constrained geographic markets and unable to be replicated to other markets or regions to achieve an appropriate scale of business.

Thus, the research aims to understand on how technology firms focusing on BoP can solve the barriers of scaling and implementing niche strategies to grow their business. To understand the matter, the research will identify and analyze barriers, strategies and also the linkage between them. In addition, the research also establishes the relative importance of each barrier and strategy that is relevant in the BoP market.

From the research, it is understood that the issue of scaling from these BoP companies can be approached by using *niche* concept. *Niche* is defined as an application of technology to small number of people that precedes the diffusion of these products to a mass-market. The approach is known to be used for analyzing technology introduction in the western market. This research aims to extend the application of the *niche* concept in the new field at the BoP.

The research is conducted in three steps; the first phase is the theoretical gap identification from the previous studies of strategic niche management, high-technology diffusion and BoP literatures. Second phase is the identification on barriers and strategies, in which a draft list of barriers and strategies is identified and validated by conducting interviews with BoP experts and desk research of secondary case studies. The last phase is the validation of barriers and strategies & identification of their relative importance. In this last phase, six primary case studies are conducted through interviews with companies that sell three kinds of products: solar lantern, drinking water purifier and biomass cook stove.

The final outcome of the research is a total of identified 21 barriers, which are grouped into three categories: market, consumer and company barriers. Out of 21 barriers that have been identified, 9 barriers are categorized as *essential barriers* at the BoP: *Financial Capital, Affordability, Consumer's Awareness, Institutional aspects, Knowledge of Application, Production system, Consumer's Demand, Natural Resources Labor & Employee and Infrastructure*.

From the aforementioned barriers, the *financial capital* is found to be the most important barrier as companies require funding for working capital in the form of credit for their partners, material for their products and also marketing funding for promotion to consumers.

Moreover, 15 niche strategies are also identified, with 8 of them are considered to be *essential niche strategies*: *partner network strategy, access to finance, education approach, demo experiment and develop, explore multiple markets, geographic approach, technology complementary strategy and upper-income BoP market segment approach*.

From the aforementioned strategies, *partner network strategy* is identified as the most important strategy. Partners can come in different forms such as distributors, resellers, NGOs and local organizations. Partners are required due to the need for the company to access local market. For example, several companies require cooperation with local entrepreneurs or informal organizations to help promote and sell their product to local society. Partners also provide flexibility, as one region may require different approaches in relation to the condition or consumer preference.

In this research, the linkage between barriers and strategy is obtained. In most situations, it is found that a strategy can solve more than one barrier. For example, *partner network strategy* is found to be relevant to help solve the essential barrier of *financial capital* and *affordability*. These linkages also indicate *geographic approach* as an important strategy as its implementation can solve several barriers of *government policy*, *consumer's demand* and *natural resources & labor*.

In addition, from the six study cases, the notion of context-specific barriers & strategies is known. The notion indicates that barriers and strategies can be affected by the context of company, region, products and time. Those factors give the notion of *dynamic barriers*, which means that barriers are changing over time depending on the condition of the company and market. This revelation thus can affect the kind of strategies that company needs to develop overtime. The research extends this notion by identifying several possible stages that companies need to go through in their quest to pursue a large-scale market.

The implication of findings is important for both managers and academic society. From managerial perspective, the findings of the research are important as tools to help managers identify a solution for specific barrier that companies encounter in the BoP market. From an academic perspective, this research enriches the application of strategic niche management theory by applying it in the new domain of the Base of Pyramid market.

In addition, it is found that the notion of the *dynamic barriers*, which is still not quite covered in this research, will be an important step for further research. Understanding and predicting the stages and development of barriers that a company encounters can shed light for many companies to scale their product in this market. Next, the need of universal product design that may be relevant for different markets can be crucial in company's attempt to achieve a large-scale market. Lastly, the understanding of the current BoP firms operation extends the idea for the companies to implement *global scale niche market strategy*, in which firms operate by selling small number of products in number of countries to develop their product and market.

In memory of my friend

Kaisar Siregar

Acknowledgements

Thesis research is not just a partial requirement to complete your study and take your degree. But it is also a chance to actually find and test your interest. Looking back, at least that was what I believe when I started to decide a thesis topic. I know my thesis research need to be related with my three interests: technology, business strategy and social impact. In the end, I am really grateful and satisfied that I am able to finish my study and graduate with a topic that relates with all of my three interests.

But the work itself is nonetheless a long and bumpy journey, and again looking back I will not be able to finish this report without help from many people, and thus I wish to thank several people.

First of all I would like to thank my graduation committee. Prof Cees van Beers for introducing me the concept of Base of Pyramid, it really opens the door for me to start and exploring the topic further. For both my supervisors, Dr. Roland Ortt & Dr. Linda Kamp, I thank for all of the discussions and feedback that help make the thesis analysis sharper. Most importantly, I thank for all of your words of wisdom, patient and care that were sometimes all that kept me going through to finish my thesis research. I could not ask for better supervisors.

I also would like to show my love to my family back home: Ayah, Mama and Adek who has given me a support, without any of them I would not be here at all.

I would also thank all of my classmates in MoT. It has been a pleasure to meet you all, learn from each other's and know different new cultures. All of the Roland Holstlaan member Melissa, Aldin, Arimbi, Andre, Andri, Damar, Tri, Riska, Rezki and Devi thanks for the friendship in Delft.. I would also want to thank Aryo, Lia and Arka for sharing the family warmth in Amsterdam, Marja Brand, for all of the assistance during my difficulties, and Rani for all the huge help towards the end of my thesis completion.

And last I also want to give recognition to the Ministry of Communication and Information Technology of Indonesia that given me an opportunity to study in TU Delft.

Delft, 4 December 2014

Boma Harahap

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Introduction

This chapter introduces the research by presenting two background sections. The objective of the first section is to give the reader an understanding of the research domain and context while the second section covers the research framework used in the research.

1.1 Background

In this section, the background of three domains of this research is given: Base of Pyramid, Business Prospective and Scaling-up Technology at the Base of Pyramid Market. Understanding the concern of each domain and context will give a solid foundation for this whole research.

1.1.1 Base of Pyramid

The phrase “Bottom of the pyramid” is made well known by Prahalad & Hall (2004) initially in their book ‘Fortune at the base of Pyramid’. They use the phrase to identify a market category consisting of four billion people who live on less than \$2 per day (Prahalad, 2004). The main notion of the Bottom of Pyramid is that companies need to see the poor not just mainly as consumers, but rather as creative entrepreneurs who are actively trying to solve the problem that they have (Prahalad, 2004). Aligned to this notion, is the concept of Inclusive Innovation, i.e. the (George, McGahan, & Prabhu, 2012) or Inclusive business (Ansari, Munir, & Gregg, 2012), notion on business initiative that create or enhance opportunities to improve living conditions of those at the Bottom of Pyramid. The concept helps to formulize previous studies that mostly come from business literatures on companies’ effort to approach opportunities at this market (Arnold & Quelch, 1998) (Hart & Christensen, 2002) . In addition, some researchers explore the market with more focus on the unique behavior of the consumer in this market (Van Kempen, 2007) (Subrahmanyam & Gomez-Arias, 2008), or behavior of the poor people in general (Banerjee & Duflo, 2011).

One of the criticism of the first Bottom of Pyramid concept is that the early researches failed to empirically point out the size and also the threshold of income for the Bottom of Pyramid market, which led to various interpretation of the market potential (Jenkins R. , 2005) (Karnani, 2007) (Warnholz, 2007). Only later research is able to provide an empirical foundation of definition on consumer (World Resource Institute, 2007). The research also provides a new definition of ‘Base of Pyramid’, which is different from the term ‘Bottom of Pyramid’. The Base of Pyramid is defined as people who live on less than \$3,000 a year in terms of their local purchasing power (World Resource Institute, 2007). By this definition, Base of Pyramid is not only mean to cover the poorest segment of the population, estimated around 1 billion of people, but also to a larger segment of population estimated around 4 billion of people, who still lives well below the western poverty line standard (World Resource Institute, 2007). The abbreviation of ‘BoP’ also interchangeably uses to abbreviate ‘Base of Pyramid’ instead of ‘Bottom of Pyramid’. In this research ‘BoP’ will be used to refer the definition of ‘Base of Pyramid’.

The population segment that can be categorized falling into this market is huge, and may be identified as majority of the population in Africa, Asia, Eastern Europe, as well as in Latin America and the Caribbean (World Resource Institute, 2007).

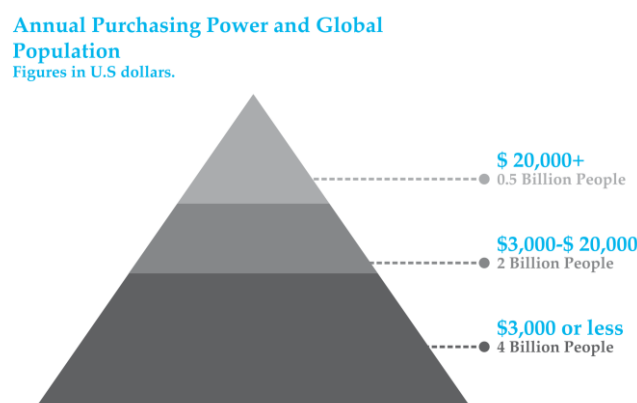


Figure 1.1 Categorization of purchasing power (Source: World Research Institute, 2007)

While definition of BoP population only covers the concerns of the poor's income, poverty is actually a multi-dimensional problem. The poor have several commonalities that are evident to their living conditions. The people who belong to the BoP category share similar characteristics such as:

- Health Problems.** The poor condition creates a problem of health, hunger and housing (Alkire & Santos, 2010). Moreover, a condition of nutrition-based poverty traps, where the poor not only necessarily lack of calories but also other nutrients such as iodine that is important to increase their quality of work (Banerjee & Duflo, 2011). The condition results in a poverty cycle trap, where the poor are unable to break-out from the poverty line once they are trapped into such condition.
- Lack of Education.** The poor are also associated with the lack of education (Alkire & Santos, 2010). While the quantity of schools keeps increasing due to government initiatives in many countries, the quality of education in school is still not promising. Many of the children are still unable to read after finishing their primary school, creating a problem of illiteracy in the society. This mostly happens because of the deficit in numbers and quality of teachers in many poverty regions (Banerjee & Duflo, 2011).
- Poor living condition.** Most people live in a poor condition because of the lack of income and are thus unable to fulfill their basic needs such as health care, water, sanitation, and energy (Alkire & Santos, 2010) (World Resource Institute, 2007).

All of the above mentioned characteristics need to be taken into account for a common condition that emerges in poor society at the BoP region.

1.1.2 Business prospective

The poor living condition creates business opportunities that are seen by many firms from all over the world. The opportunity is provided in many sectors in the society such as food, housing, water, health and energy sector. The size of the estimated business potential varies across sectors, with food sector offering the biggest potential (\$2,895 billion), followed by energy (\$433 billion) (World Resource Institute, 2007). The opportunity is also created by the lack of government effort in these less-developed countries

to provide basic needs to the poor. For instance, the absence of an electricity grid has affected more than 4 billion people, most of which live in the poor countries (Lighting Africa, 2010).

The business potential opportunities are realized by several entrepreneurs by making social enterprise; organization that applies commercial strategies to focus on solving social problems, rather than maximizing profits for external stakeholders (Ridley-Duff & Bull, 2011). The business proposition for instance comes in the form of technology provision such as affordable solar lantern, which has been increasingly introduced for the poor (Lighting Africa, 2010). Another technology solution such as biomass cook stove also penetrates the market due to the need of safer stove to replace traditional cook stove. Around 3 billion people worldwide currently depend on firewood, charcoal and coal for daily cooking and heating. The condition can bring a greater risk to quality of life due to household air pollution (Global Alliance for Clean Cookstove, 2013). In addition, 11 percent of the global population or more than 780 million people still live without access to an improved source of drinking water (United Nations, 2012). In this region, it is common for women to walk for several kilometers carrying 20 to 30 liters of water on their head, often barefoot (Kapoor, 2003), a problem which can be easily solved with a simple technology such as drinking-water purifier.

While there is increasing influx of investment in many less-developed countries, many companies are still unable to scale up their production. In this research, scale is defined as an effort from company to drive profitable commercial growth by reaching a greater number of people at the BoP (LaBrecque, 2014). With some exceptions, current practice shows that social enterprises still find it difficult to scale their solutions towards the large number of the poor (Gradl & Jenkins, 2011) (World Business Council for Social Development, 2013). While others remain constrained in local market, and several others converted into pursuing philanthropic endeavors because targeting financial profit remained elusive (London & Hart, 2010). In general, based on 439 market-based solutions in Africa, it was found that a mere 13% of them had achieved significant scale (Koh, 2014). Many of the projects that social entrepreneurs initiate only constrained in a region and unable to be replicated to the wider market or other regions. It is known that succeeding at a large scale is far harder than succeeding at small market (Karamchandani, Kubzansky, & Frandano, 2009). These issues may happen because the specific market provides unique challenges that are different from other markets, especially from the western world market.

1.1.3 Scaling-up Technology at the BoP

The invention and introduction of new technology in the western market have happened for years since the invention of steam engine. Various technologies, many of them are successfully accepted by society, have been the subjects of study for many researches especially to their relation to the diffusion processes. Many studies have helped to understand the process of technology introduction to consumers. New technology products have specifically different characteristics compared to other products such as consumer products because factors such as the novelty of the products can result into kind of complexities that can emerge from market uncertainty, technological uncertainty, and competitive volatility (Mohr, Sengupta, & Slater, 2010). The condition can translate into more effort needed by firm to introduce the products into market to achieve large scale diffusion.

In condition where large scale diffusion cannot happen instantaneously, a condition of *niche* has been discovered to occur in many technological products diffusion process. A *niche* is defined as application of a technology to a small number of people or region and it precedes the large-scale diffusion of these products to a mass-market (Raven, 2005). The application of such a niche approach, known as 'Strategic Niche Management' for example can be seen in the development of steam ships, which at an early stage were only used within small communities before becoming widely used by people (Geels, 2002). A niche

might happen for instance when the technology still needs time to develop and/or requires a protected space to get feedback from the actors (Raven, 2005).

Moreover, firms and companies realize the importance of niche applications and thus create a niche strategy, which is defined as a set of approach that is implemented for the application of technology diffusion at a niche (Ortt, 2012). Variations are identified in the application of the niche strategy depending on the market and conditions. The niche framework is built based on the cases of technology development in the developed nations, which is different from the conditions in the developing nations such as in the case of the BoP market. The notion extends the idea of the application of niche management strategies in the new domain for the BoP market.

Specific to the BoP market, there are two factors for why a niche strategy can be a crucial concept in relation to product scaling-up. Similar with the common condition that happens in high-technology market, the market is still new and thus the market is still low-penetrated and thus the industry is not yet established. For instance the market penetration of solar lantern in Africa is estimated only 4% (Lighting Africa, 2012). Moreover, in many countries, the rate of people that still using traditional biomass stove, especially in rural areas is 80% to 90% (Global Alliance for Clean Cookstoves, 2011). Thus, the market is still not yet matured similarly with niche market.

The second factor is that social business needs to achieve large scale diffusion. An appropriate scalable business is crucial as firms in this market can only take a small profit margin from each product sold (Jenkins, Ishikawa, Geaneotes, & Paul, 2010), which can happen because the lack of consumer's purchasing power. Thus, firms need to aim for scalability of a volume-based strategy by selling to a wider consumer market or to make sure that the repetition of purchases happens. Both of the mentioned factors are the main reasons why the identification of niche strategies is important in the BoP market.

1.2 Research Framework

In this section the framework of the research will be explained. The research objective will be firstly explained before later it is derived into several research questions in the following subsection. Next, several research scopes are mentioned as focus on this research. Next, a research approach is explained in the following subsection. Last, the structure of the whole report will be explained in the last subsection.

1.2.1 Research Objective

The process of identifying the strategies to find the BoP market strategies will be approached first by identifying barriers that social business encounter in the market. The current research regarding BoP is widely from the Business or Economic scholars with a focus on discovering business opportunities and strategies of the emerging market (Arnold & Quelch, 1998) (Hart & Christensen, 2002) (Hammond & Prahalad, 2004). Most of the studies also try to understand the unique consumer characteristics at the BoP (Van Kempen, 2007). On the other hand, the Strategic Management theory attempts to understand the process of how technology can be accepted in the wide stream market (Kemp & Schot, 1998). In this research both fields of study will be interrelated to find the balance between the two. The process will enrich the existing knowledge of technological strategy in the western market especially the strategic niche management literature. This provides the scientific relevance for this research, and will be elaborated more in chapter 2.

Moreover, as has been mentioned in previous section on business prospective, understanding the factors that influence business to scale can shed light into adoption factors, especially for the barriers to scale-up business. On the basis of the respective barriers, a list of niche strategies that can assist the stimulation of technology scale-up will be established. Thus, as practical relevance, the research is expected to provide

inputs for firms focusing on the BoP market in formulating strategy to solve business barriers to grow and scale their business.

1.2.2 Research Questions & Sub Questions

The main research question with sub research questions are formulated as follows:

“How technology firms focusing on Base of Pyramid market can implement niche strategies to grow business into a large-scale market?”

To answer the main research question, several sub-research questions are identified to help to answer the main research question. The questions of strategies will be approached by firstly understanding the barriers from both theories and fields.

1.
 - a. What are the barriers that can inhibit the scaling of products to a wider market from theories?
 - b. What are the barriers that can inhibit the scaling of products to a wider market from case studies in the BoP market?
 - c. What is the relative importance of each of the identified barriers in inhibiting the scaling of products to wider market from case studies in the BoP market?

From the answers to these questions the barriers from the theories and the field in the BoP market will be compared.

2.
 - a. What are current niche strategies that are applied based on the theories?
 - b. What are current niche strategies that are applied in the BoP market?
 - c. What is the relative importance of each identified niche strategies application in the BoP market?

Answering these questions will give a list of niche strategies from both theories and the field of BoP market.

3. **How are the linkages between barriers and niche strategies applied in the BoP market?**

Answering the last question will give a condition and understanding on the first two questions on barriers and strategies relation.

1.2.3 Research Scope

Taking into consideration the time available and constraints, this study limits itself to some respects:

Types of market

In terms of market scope, the consumer type is Base of Pyramid market as already previously defined. Moreover, this study will focus on the condition where the technology is provided by firms or private enterprises. The condition is different for instance from product grant, that also commonly found at the BoP.

Types of products

In terms of products scope, this study will focus on three types of products: solar lantern, biomass cook stove and water purifier. The reasoning to choose these three products will be elaborated in Chapter 4

Region focus

There is no specific region focus, but most companies which have been interviewed are mostly active in Africa and Asia. These two regions are the most location where population of BoP currently resides.

Types of firms

The research concentrates on the companies which solely focus on the BoP. The research does not aim at multinational companies that have multiple products sold in various types of market that includes market in developed nation.

Time

The research and data collection are conducted from the period of April – October 2014.

1.2.4 Research Approach

In order to approach the research objectives, a multiple case studies method is used. This approach is used because of the focus on a contemporary phenomenon in real-life context. Multiple cases provide replication procedures that can help the development of a rich theoretical framework. This framework can become a vehicle for generalizing new cases (Yin, 2003). The approach will be presented with a linear-analytic structure, in which the problem will be presented at first via the relevant literatures. The following sub topics will cover the methods used and findings based on the data that was collected from the case studies (Yin, 2003). In addition to the process, at the early stage of the research a literature review is conducted in order to find the theoretical gap on the basis of the current literatures. Theory gap identification then becomes the foundation to develop theory that will be confirmed during the multiple case studies stage.

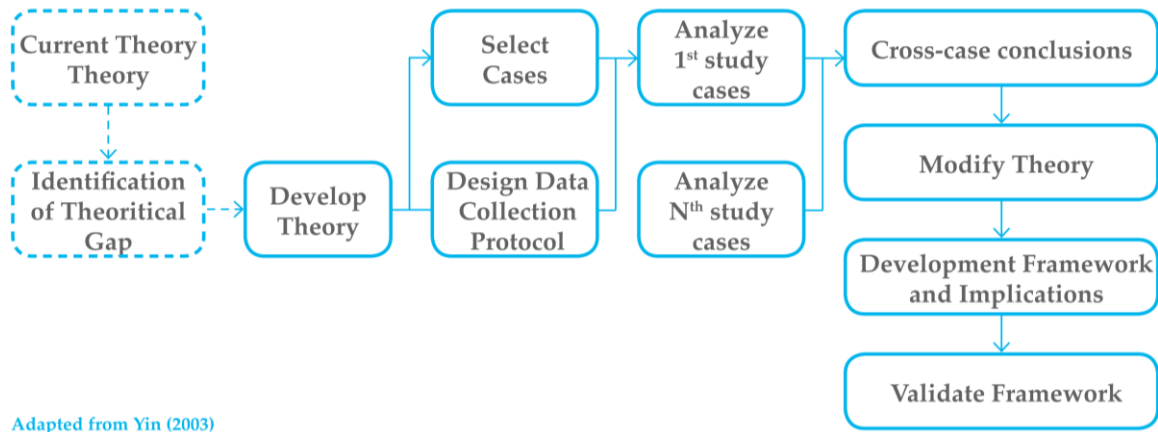


Figure 1.2 Case Study Method (adapted from Yin, 2003)

The research can be divided into several phases: theoretical gap identification, identification of barriers and strategies, and validation of barriers and strategy & identification of relative importance. Figure 1.3 Research Approach describes each of the phases with corresponding details and also different methodologies conducted at each separate phases. Each separate phases of the research can be looked in details below.

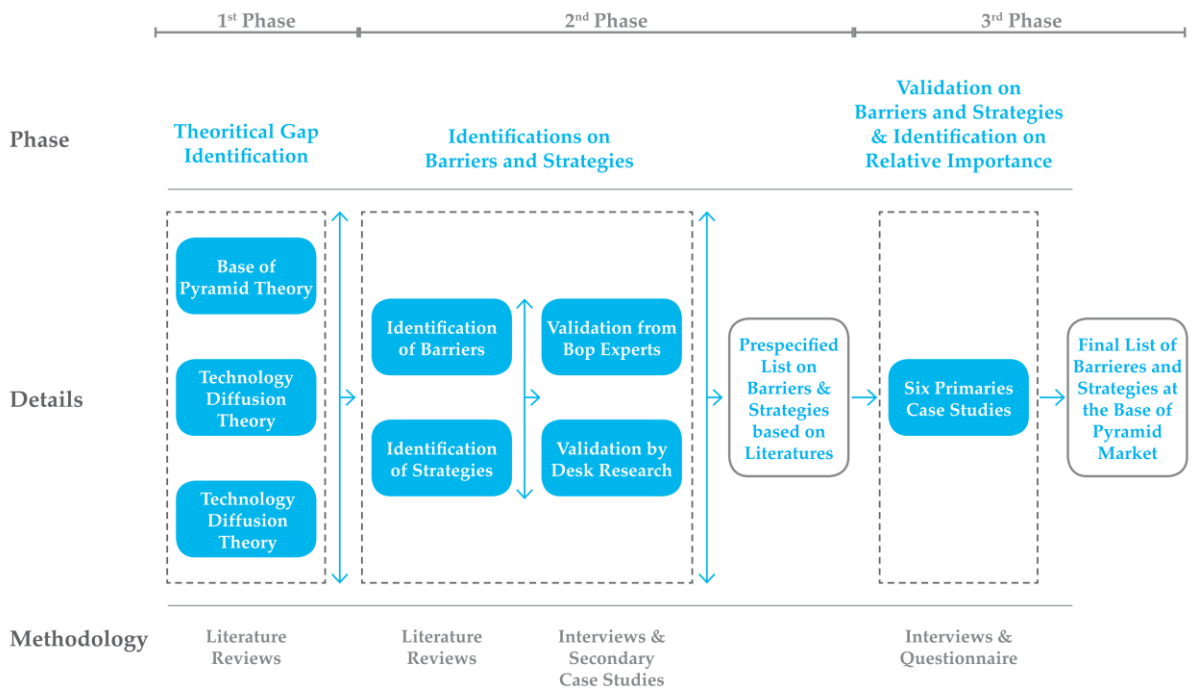


Figure 1.3 Research Approach

First Phase: Theoretical gap identification

At this first phase, literature reviews on three main domains of the research are conducted: Base of Pyramid Theory, Technology Diffusion Theory, & Strategic Niche Management theory. Several studies and theories that are related to the research will be discussed. The outcome of this phase is an understanding of the theoretical gap, especially regarding barriers and strategies to stimulate the products diffusion to large-scale market. This phase will be elaborated in chapter 2 & chapter 3.

Second Phase: Identification of Barriers and Strategies

At the next phase of the research, barriers and strategies will be identified on the basis of literature reviews. Similar with theoretical gap identification, literatures and studies are conducted on three main domain of our research: Base of Pyramid Theory, Technology Diffusion Theory & Strategic Niche Management Theory. From each study field, barriers and strategies that inhibit the technology scaling up will be identified. BoP experts will validate the identified barriers, while desk research is conducted to validate both the barriers and strategies.

The purpose of the expert interview is to validate the first list of barriers gathered from literatures. An 'expert' is defined as the one who possess technical knowledge especially regarding business perspective (European Consortium for Political Research, 2009). There are several reasons why this step is important. First, because it can help assure that the list is applicable with condition of the BoP, especially due to the fact that the literatures used in this research are not only coming from the BoP literatures. This fact is also the reason that the step is required to check the interpretation and the grouping process of each barrier which have been identified. In the process of segregating and interpreting each barrier, the pertinent or important barriers are segregated exclusively, while the less stand-out/less important barriers can be grouped together with other barriers. Expert interviews will help to indicate which barriers are important to be grouped independently in relation to their importance. The last reason is to identify if there are barriers which have not been identified from the literatures. Expert interview can highlight this issue of completeness of barriers if there are any important barriers missing in the list.

For pragmatic reasons, in the first round of expert interview three chosen people with experience and expertise regarding business at the BoP are coming from TU Delft. In the event where all of the three experts believe that the pre-specified barriers have already covered majority of the barriers at the BoP, the round of expert interview will be stopped. The profile of our three experts, Dr. Otto Kroesen, Ing, Esther Blom, and Ing, Boukje Vastbinder can be seen below.

Dr. Otto Kroesen is affiliated to the Department of Philosophy. He teaches ethics, communication philosophy, and intercultural communication. He publishes on the emergence of Western/modern values in relation to the development of society and technology. A matter of concern, experimental and study is the search for equilibrium and a path dependent co-development of values from east and west, north and south and the imagined world society, especially in developing countries. Moreover, he organizes and supervises international and intercultural internships in developing countries, specifically regarding the activities of some technology business in many countries such as Africa and Asia. The experience and lesson learned from these activities is needed as the reason to interview him.

Ing. Esther Blom is a Project manager and Lecturer Social Entrepreneurship for Delft Centre for Entrepreneurship at TU Delft. Moreover, she also has experiences in organizing sustainable projects for physically disabled persons in developing countries. In addition, she also owns a consultancy service where she gives training programs to individuals, companies and NGOs about entrepreneurship opportunity in developing countries.

Ing. Boukje Vastbinder currently works as a trainer and business and program developer at valorization center at TU Delft. She is also a lecturer and researcher of sustainable entrepreneurship at Delft Centre for Entrepreneurship, Delft University of Technology. This is where she gets her expertise about Base of Pyramid market especially in the social and sustainable side of business and innovation for start-up business.

Next, after the pre-list of barriers is validated by the experts, a desk research will be conducted to see the relevance of the list of barriers. The desk research is conducted from secondary case studies taken from

Scopus and UNDP Growing Inclusive Markets (GIM) database. The phase is important to give more understanding and to put in context the barriers and strategies, which can be helpful during our interviews in the primary case studies. In addition, desk research is also important to give the first indication of the relative importance on each barrier in the BoP market. The outcome and the process which have been conducted at this phase can be seen in chapter 3.

Third Phase: Validation of Barriers and Strategies & Identification on Relative Importance

For the last phase, primary case studies by interviews with six firms on real cases will be conducted. The phase is required as the next step to validate the pre-specified barriers and strategies which have been built from the previous phase. From these case studies, the pre-specified barriers and strategies can be confronted with real situation and company conditions. The company is expected to provide feedback, examples and experiences on each respective barrier shown to the companies that can be useful as an additional or enrichment to the pre-specified list of barriers and strategies.

Moreover, companies can explain the context of how each barrier is relevant for them, and also how they try to solve each barrier through several strategies. A linkage among barriers and strategies can then be made. The relation of these barriers and strategies will be important especially for managerial relevance, as companies then can pick specific strategies based on barriers that they have identified.

In addition, the relative importance of each barrier and strategy will be identified. For this purpose, a questionnaire is developed to analyze the result of the interview quantitatively. This is coupled with the open question method that used in interview, which is more explorative in nature when conducting the interviews. The relative importance will be important to give companies an indication about which barriers and strategies that companies need to prioritize in order to help them scaling their business. The outcome of the final phase is a final list of barriers and strategies along with their relative importance and linkage. The details of the methodology and result of the interviews and questionnaires can be seen in chapter 5 and chapter 6.

The unit of analysis for this research will be firms which are working in Base of Pyramid markets. Hence the unit of observation will be the firms activities especially related to sales and distribution initiatives at the BoP. The list of the company and their respective product focus can be seen in Table 1.1.

Companies/Organizations	Products focus
African Clean Energy	Biomass Cook stove
CV Karya Mandiri	Biomass Cook stove
Holland for Water	Drinking-Water Purifier
Kopernik	Drinking- Water Purifier*
D.Light	Solar Lantern
Ndassie Solar Engineering	Solar Lantern

*Kopernik also sells other range of products

Table 1.1 List of companies

All of the previous phases lead to the answer of the research question. The summary of the respective method and the corresponding research questions and the corresponding chapters can be seen in the Table 1.2.

Number		Research Question	Methods	Chapter
1	a	Barriers from Theories	Literature review	3
	b	Barriers at BoP	Desk research & Interviews	3, 5 & 6
	c	Barriers relative importance	Desk research & Interviews	3, 5 & 6
2	a	Niche strategies from Theories	Literature review	3
	b	Niche strategies at BoP	Desk research & Interviews	3, 5 & 6
	c	Barriers relative importance	Desk research & Interviews	3, 5 & 6
3		Linkage between barriers and strategies	Desk Research & Interviews	3, 5 & 6

Table 1.2 Summary of method for each research questions

1.2.5 Structure of the report

This sub-section is intended to give a visual presentation on the whole structure of the report. The structure of the research document can be seen in Figure 1.4. The main report, excluding appendix chapter, is consists of 6 chapters, with each chapters contain several sections. Each section then consists of several subsections.

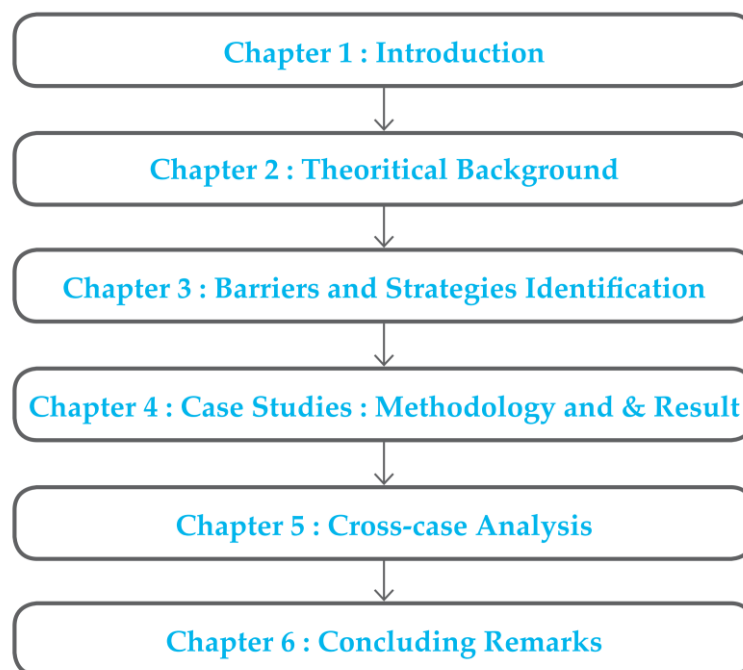


Figure 1.4 Report Outline

Theoretical Background

To understand the barriers and strategies on product scaling-up problem in the BoP market, several theoretical background that have been applied around the issue will be used. This chapter will focus on theoretical gap identification phase. In Figure 2.1 below, the highlight in grey color indicates the specific phase that will be the focus on this chapter.

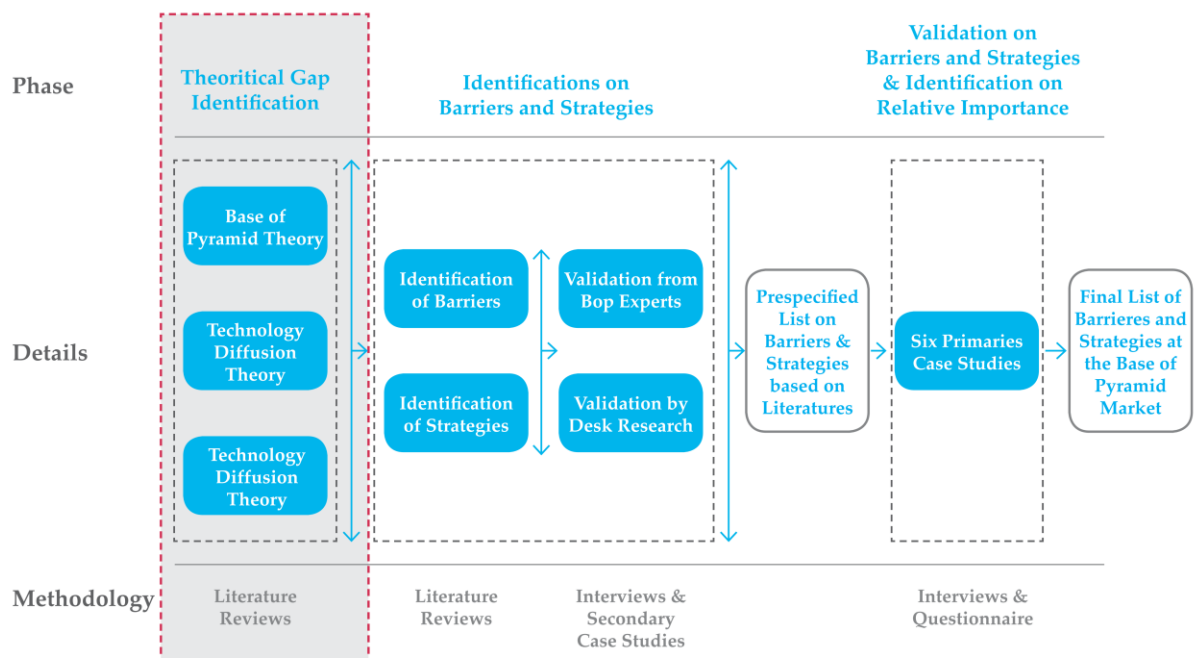


Figure 2.1 Focus on research approach in chapter 2

As can be seen from the Figure 2.1, theoretical gap identification includes three focal fields BoP literature, Technology Diffusion Theory and SNM theory. As the background of the BoP was already discussed in the first chapter, the first theory that will be discussed in this chapter comes from technology diffusion theory, which will help to understand the product stages toward the mainstream market. The second theory that will be used is Strategic Niche Management theory to help to explain the process of a technology product development to be used in wide market. To be more specific, some niche types and their differences in regards to variation in technology development will be shown.

2.1 Technology diffusion pattern

The development of technology in the society used to be understood as an erratic process, in which the process is unpredictable and spontaneous. This view changes when scientists and engineers start to believe that they can steer this development, especially regarding the diffusion of the technology itself in the society. The motivation of research starts because of the findings that innovation cannot sell by themselves, even when the obvious benefit is widely realized by the potential adopters (Rogers, 2003). The major diffusion traditions are diversely coming from scholars from many backgrounds such as anthropology, sociology, education, public health, marketing and geography. Rogers and Shoemaker (1971) firstly attempted to make a generalization of the diffusion concepts from those many sectors.

Diffusion is defined as the process for innovation to be communicated via certain channels over time among the members of a social system. Based on his researches, Rogers concluded that the adoption of an innovation usually follow the S-shaped curve. He then modeled the flow of innovation into several phases in S-curves (Rogers, 2003). The understanding of this S-shaped curve follows the question regarding what kind of consumer adopts the innovation. This leads to adopter categorization based on their innovativeness. The classification is a simplification that aids the understanding of human behavior, although understandably it loses some information as a result of grouping individuals. Rogers (2003) categorized the adopter into five categories: innovators, early adopters, early majority, later majority, and laggards. Figure 2.2 shows the proportion of each consumer category relative total proportion of the whole market.

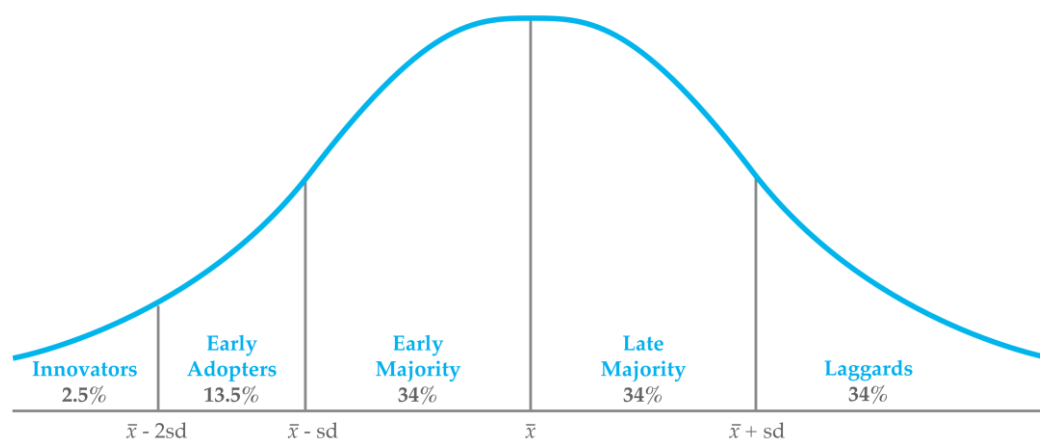


Figure 2.2 category of consumer based on their innovativeness (Source: Rogers, 2003)

From the Figure 2.2 it can be seen that an understanding of the characteristics of early adopters' category is important because this category provides adjacencies to the early majority category, which is part of the mainstream market. Based on his research of many cases, Rogers (2003) make a generalization of the early adopter characteristics. The characteristics are divided into three categories: socioeconomic status, personality values and communication behavior. The people that belong to the early adopter category are defined as the people with higher socioeconomic status in term of education and income. From the personality values, they have higher intelligence and also better cope with risk and uncertainty. And last, from the communication behavior they are identified as people with higher social participation.

In addition to giving more understanding about the early adopter context, Rogers (2003) also mentions several factors that can increase the rate of technology diffusion in the market such as:

1. There should be a system's context for the critical mass adoption, which means that technology already reached the mainstream market that can provide pressure to adopt an innovation. This is for instance a system's hierarchy, reward system and/or regulations that can encourage or discourage the adoption of new idea.
2. Individual's perception of the innovation needs to be shaped for example by implying that the perceived efforts to adopt is very low, adoption is inevitable, very desirably or that the critical mass has already occurred or will occur soon.
3. The innovation should be introduced to intact groups in the system whose members are likely to be relatively more innovative.
4. Incentives for early adoption of the interactive innovation should be provided, at least until a critical mass is reached.

Expanding the notion of the S-curve from Rogers (2003), the process of market stabilization phase is preceded by two earlier phases, which are innovation and adaptation phase as can be seen in Figure 2.3 (Ortt, 2010). In each of the phase, the company has several focus concerns that related with the technology diffusion phase in the market. We identify several strategies along the product technology diffusion stage in the market as follows:

1. Innovation phase, which is defined as a period from invention to initial market introduction. The concerns at this phase are related to strategic investment decision and also new product development strategy and also period concerns with growth and competition to become the technology dominant in the market (Anderson & Tushman, 2010).
2. Adaptation phase, which is defined as the period from initial market introduction to industrial production and large-scale diffusion. Specific to early adaptation phase, companies concern with sales and growth related to product adoption (Rogers, 2003). Also, the specific period concerns with finding the first market segment (Moore, 2006).
3. Market stabilization phase which includes company strategy to introduce the product (Porter, 1998), also differentiation and target small (niche) market in the mature market (Kotler & Armstrong, 2014).

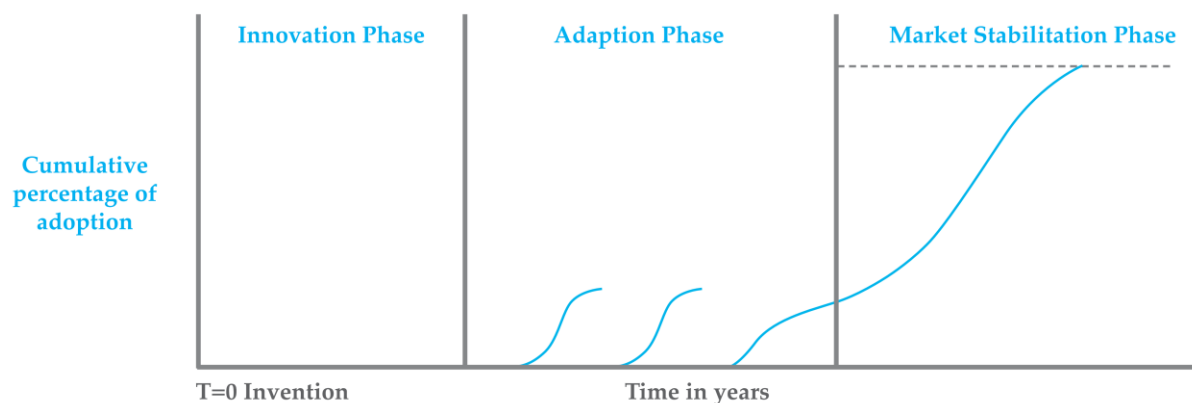


Figure 2.3 Technology pattern (Source: Ortt 2010)

2.2 Background of Niche Approach & Strategic Niche Management

In this research, we use a term of *niche* in the term of *strategic niche* which is defined as application of niche that appear prior to industrial production of large-scale diffusion in mass market (Ortt, Langley, & Pals, 2013). In this market, niche is used especially in a relation to the technological change process, on the basis of evolutionary concepts. Based on the notion, technology is emerged from the selection and variation mechanism, similar to the analogy of survival of the fittest in biology field (Jeroen, van den Bergh, Faber, Annemarth, & Oosterhuis, 2006). Technological variation is defined as the creation of technological designs by engineers or scientist. Selection refers to the process of choosing the design preferred (Raven, 2005).. This idea then evolves, when technological variation is not completely random, but can be steered by the engineers. There are certain rules within technological regime that embed the production of technologies (Rip & Kemp, 1998). The rules refer to some shared structure such as routines and norms. The regime creates a selection environment and retention processes, not only based on the selection mechanism but also from the expectation of a technology. Expectation of the future selection environment creates a niche, not on the basis of actual market failure or success.

Strategic Niche Management (SNM) framework aims at shaping and evaluating the process from niche application of an innovation to mass market application. SNM focuses on concrete available technologies that are tested on a small scale. SNM looks into the performance of a system by reviewing three processes at the niche level and its connection with the external landscape environment. Moreover SNM focus its framework about the development of technology in national level via market niche, regional level through several pilots or local level via connected pilots. The three processes in niche are: learning processes, building social networks and voicing and shaping expectation (Schot, Slob, & Hoogma, 1996). The first process is learning mechanism in the society. A good learning process covers both first and second order learning which means learning is not only about technology but also about social learning and the learning process is reflexive. In the reflexive learning, the underlying values and beliefs are tested instead of only included in the process. This process incorporates various actors with regular interactions among them. The second process that is identified in SNM is the network formation. This process describes that an emerging niche is accompanied by the emergence of social network such as producers, users, regulators and societal group. In the early phases, the size of the network is constrained but growing together with the size of technology development. When the network expands, more resources are needed and hence more actors will be involved. There are two characteristics that will determine the success of SNM: the variation of the network composition and the alignment of all the actors in the network. And last process is learning more about the expectations in which the expectations of different actors are taken into account. The analysis for this process focuses on the development of involved stakeholders and also on the degree of variation of actors during the time (Raven, 2005). One thing to look at is whether the expectations of the actor diverge or converge towards same goal.

To expand the theory of SNM, a theory of Multi Level Perspective, which explains that the success of a new technology is governed by processes in different levels of aggregation —(macro-level) socio-technical landscape (meso-level) regimes and (micro-level) niche, is introduced (Geels, 2002). Niche or Micro-level can be seen as “incubation rooms” for radical novelties that are protected from the selection process in the regime. The technologies in niches are still in the experimental phase and expensive, but important in order to give locations for learning process (Geels, 2002). Hence, deviation and variations from the status quo can occur, such as alternative technologies and practices. This comprises individuals or individual actors (companies, environmental movements) (Rotmans, Kemp, & Van Asselt, 2001).

The regime or Meso-level is defined as the rule-set or grammar that is embedded in institutions, infrastructures and stakeholders such as engineering practices and production process (Geels, 2002). The usual practices in the regime give certain stability to the existing technological development. These sets of

rules also create trajectories of the technology. There are seven dimensions in the socio-technical regime: technology, user practices and application domains (markets), symbolic meaning of technology, infrastructure, policy and techno-scientific knowledge. In several conditions, radical innovation that started in niches has a hard time to break out the regime. This can happen only if there are problems and tensions that emerge from the current regime. This can result in a regime change in order to adapt the new technology from the niche level. Hence, new regimes gradually grow out of old ones (Geels, 2002).

The socio-technical landscape or Macro level, relates to external heterogenous factors such as material and immaterial elements that can affect the transition process. These elements can, for instance, be the oil prices & economic growth that could affect the technology's development. The landscape is an external structure or context for interactions of actors. While regimes refer to rules that enable and constrain activities within communities, the context of landscape is even harder to change than that of regimes. Landscapes do change, but more slowly than regimes. The nested character of these levels means that regimes are embedded within landscapes and niches within regimes. The macro level comprises of conglomerates of institutions and organizations (Rotmans, Kemp, & Van Asselt, 2001).

2.3 Towards a Typology of Niches

In this subsection we will discuss several types of niches to build our foundation and give a perspective on the niche condition that we will discuss throughout the research. We will use several sources to explain the differences of each niche types.

In this research, we will focus on the niche condition that happens prior to the large-scale diffusion of the products. The definition is from strategic niche management literature which is different from '*mature niche*', which refers to a specific market that emerges after the large-scale diffusion happens (Ortt, Langley, & Pals, 2013) or refers concentrated marketing / niche marketing to a specific market that emerges after the large-scale diffusion or stagnant market place (Kotler & Armstrong, 2014). In the later market condition, firms need to differentiate their products through price, product, and marketing or distribution service. Mature niche for example can be seen in the market of healthy drinks in order to aim at health-conscious segment of market (Kotler & Armstrong, 2014). Even though the number of consumers in the segment of market is limited, many firms can still gain considerable profits. Niche creation innovation can also be defined as opening new market opportunities with the use of existing technology (Abernathy & Clark, 1985).

Moreover, niches themselves can be divided into technological niches and market niches (Raven, 2005). Technological niches are located between early technological variations in R&D niches on the one hand, and selection of the variations in market niches with distinctive selection criteria on the other. Technological niches happen when suppliers and users try to explore and learn about the technology. When suppliers and users have learned enough, the technology may be launched commercially and protection may be phased out, the technological niche then evolves into a market niche.

Specific to the introduction of new technologies in the new market, it has different characteristics depending on several factors such as the kind of market and technologies. Both of these factors provide differences in the nature on how the technology should be introduced to the market. One way to identify the differences is through the nature of protection and stabilization that the technology needs to have prior to its introduction. Figure 2.4 shows the categorization of several niche types. The horizontal axis represents the stabilization that is required to provide structures, for example, in form of regulation to local practices. The higher of the product technological certainty level, the higher the stabilization level of the technology. Stabilization can also depend on the interaction among experiments on the niches; the intensity of the interactions is proportional to the increase of stabilization (Raven, 2005).

On the other hand, the vertical axis represents the protection from rules in the regime. The protection is required to shield the new technology against the harsh selection from the current socio-technical regime. The protection for instance can be through product subsidy, but not necessarily. Both of the axes create four types different of niches (Raven, 2005).

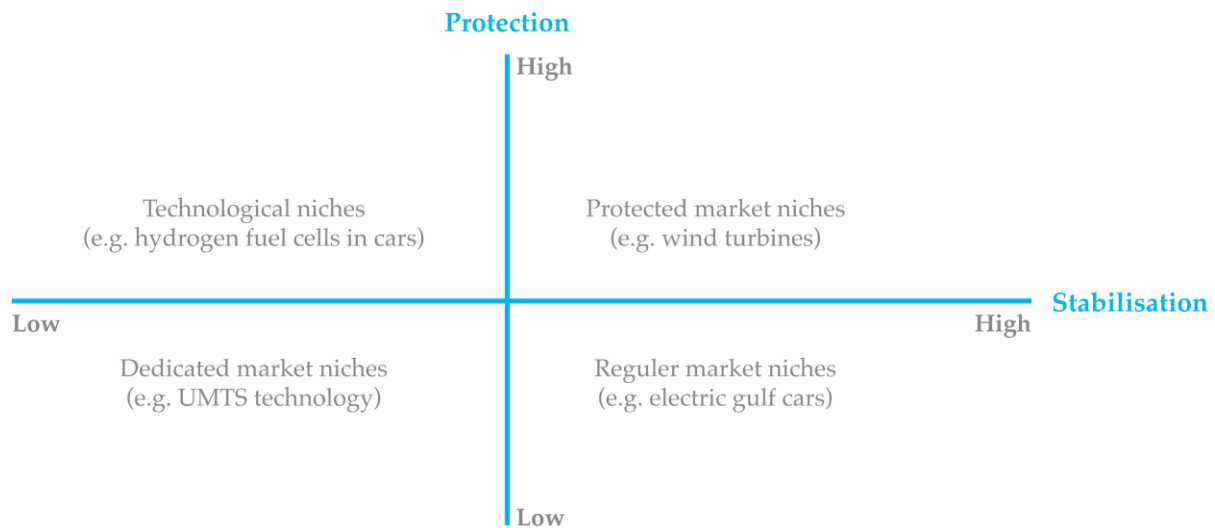


Figure 2.4 Four types of niches on the basis of protection and stabilization (source: Raven 2005)

Each of the categories of niches represents different condition of the development of the technology. For instance, the niches on the upper left-hand corner (technological niches), requires high level protection but low stabilization periods. In this kind of niches, there is relative limited experimentation of the technology regardless if there is high expectation of the technology or not. Thus, a protection is required to shield the technology from the market.

All of the above mentioned niches types come from the framework of SNM and need to be taken into account when one wants to introduce a new technology in the market. On the other hand, there are other literatures that also aim to explain the emergence of radical innovations. Ortt (2012) defined several categories of technology based on a meta-analysis of the literatures about niches. There are three founded categories regarding the types of niche that emerge prior to the emergence of mature market.

1. **Unique Functionality.** Technology focus on a market where it has a unique functionality. In this market the technology does not compete with an established technology. A market can be created by carefully entering subsequent market segments with limited competition.
2. **Government involvement.** As mentioned in previous section, the technology which evolves with government creates a protected space to help the survival of the technology to the market forces.
3. **Small Societal Group.** Market is radically created because of an act of idealism by small societal group. The group gathers support while slowly introduces the new products to the market without government intervention in the process.

The condition and situation for above emergence of niches are further explained in Table 2.1. Each of the niche category explained that the emergence of niche is different from one another.

No	Factors	Unique Functionality	Government Involvement	Small Societal Group Initiatives
1	Explanation	Innovation compete with contemporary tech with characteristics then later compete to the mainstream market	Protected space created in order for the technology gain economies of scale and learning effects that helps to create complementary services that push a regime shift	A small societal groups that share a same idealistic view gradually formed a specific market
2	Initiator of Innovation	Market-based	Market-based with government intervention in most cases	Small societal group create a protected space without government intervention
3	Incumbent Technology	None	Exist	None
4	Competition	Alternative new or emerging technologies	Incumbent Tech can be (but not always) destructed after the new technology diffused	None. The new innovation becomes new alternatives products in the market
5	Early Phases	Primary then secondary niche, in which consumer aims for utility maximization versus premium price	Protection of technology via subsidy	Innovation slowly introduce parallel with the effort from societal group to gain support
6	Case Example	Solar Panels	Bioenergy Technology	Organic Food

Table 2.1 Differentiation of Niche Development (Source: Ortt, 2012)

From the table above we can see that each of the niche types, emerge from different factors that support the technology development. The unique functionality is focus on the pertinent advantage of the technology itself. The government involvements play a strong part in promoting the technology, while the small societal group initiatives come from the strong initial support from the consumer themselves.

2.4 Chapter Summary

In this chapter several literatures from technology diffusion and strategic niche management are explained to give an understanding of the current theory and framework on technology development. The technology diffusion theory explains on several phases that technology experienced before it reach a wider market. On the other hand, the strategic niche management focuses on the process of the technology development. In addition, several types of niche are distinguished to emphasize the definition of niche that is used throughout this research. Next on Chapter 3, the application on the literatures, specifically on the barriers and strategies identification will be conducted. The relation on specific theory to the context of BoP will be discussed in Chapter 6.

Identification of Barriers and Strategies

This chapter will provide an understanding of the barriers and strategies to scale-up businesses. It will be approached by looking in-depth at several literatures from different backgrounds. These literatures are important to build a foundation for the investigation to identify barriers and strategies, which will be this chapter main focus as can be seen in Figure 3.1 highlighted in grey color.

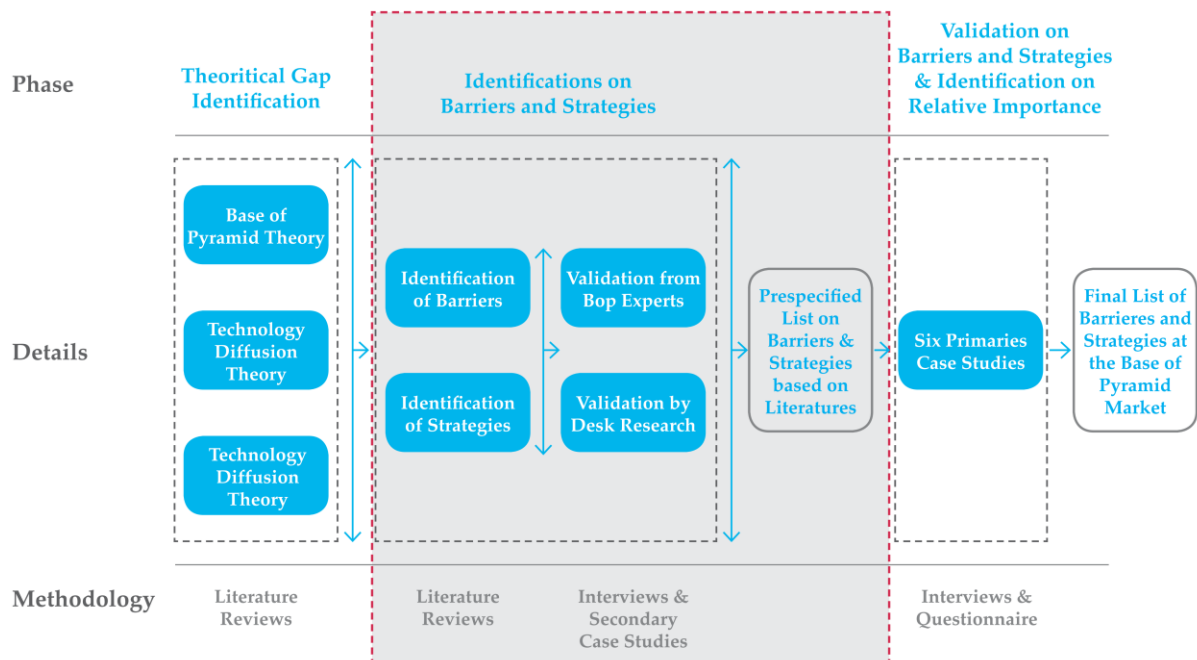


Figure 3.1 Focus on research approach in chapter 3

As can be seen in Figure 3.1, in the first phase, this chapter will identify barriers and strategies from literature reviews discussed in chapter 2. Each of the process has different approaches such as literature review and interviews and will be elaborated in the respective sections. From these literature reviews, the first list of barriers and strategies is obtained. The barriers will be later validated by interviews with BoP experts, while both barriers and strategies will be validated by desk research from secondary case studies. The outcome of the process is a pre-specified list of barriers and strategies that will be used for the primary case studies. In addition, in the last sub-section the linkage between barriers and strategies will be constructed from the desk research. Each process will be elaborated in the following sections.

3.1 Identification of Barriers

The identification of barriers is the first process to conduct to make a pre-specified of barriers. In the following sections the identification process and the result will be further elaborated.

3.1.1 Barriers Literature Source

Researchers have identified several barriers that either specific to constrained domain such as sustainable technology (Kemp & Schot, 1998), or covers many technologies but still solely come from technology introduced in the western market (Ortt, Langley, & Pals, 2013). Both of these literatures can be categorized into strategic niche management theory and technology diffusion theory. Moreover, the current researches from the Base of Pyramid (BoP) literatures only specifically enlist the barriers and strategies that very general in focusing on all products at the BoP (Anderson & Markides, 2007) & (Prahalad, 2012) or apply to only specific products such as solar lantern (Lighting Africa, 2010). The researches do not attempt to focus on technology product business, specifically at BoP market and thus create a theoretical gap that we will focus on this research.

Therefore due to the understanding of such theoretical gap, in the first stage of this research, all of the mentioned literatures that come from various different backgrounds from Kemp & Schot (1998), Ortt, Langley & Pals (2013), Anderson & Markides (2007), Prahalad (2012), Lighting Africa (2010) and several other literatures will be reviewed to approach our intended research focus.

Several literatures such as Kemp & Schot (1998) and Ortt, Langley & Pals (2013) are focusing on the research on technology products from developed nation. In this research, the result of both studies will be applied in the new context of BoP market. Moreover, both studies build on the theories such as SNM and niche strategies that are currently absent from the literature from the BoP field studies.

On the other hand, most of the BoP literatures, such as Anderson & Markides (2007), Prahalad (2012), Lighting Africa (2010), fit the context of the market that will be studied in this research, except that most of this literatures are not focusing on explaining the technology development, especially in the general context. Thus, all of the studies will be combined to meet the research objectives. Brief explanation on each literatures and their position in this research can be seen below:

1. Strategic Niche Management Literature
Study from Kemp & Schot (1998) is selected to represent the SNM literature. The study focused on the sustainable technology field, especially in the transportation technology. In addition, the research focuses on finding the main reason of the underutilization of alternative sustainable vehicle in the western market.
2. High-technology Diffusion Literature
The study from Ortt, Langley & Pals (2013) covers vast number of literatures regarding new radical high-technology diffusion at the western market, especially in three sectors: chemical, materials & metals, pharmaceuticals & healthcare, and telecommunication & media. Based on 37 case studies, their research reveals several factors and actors that may contribute to the emergence of niche prior the product large-scale diffusion at the market.
3. General Base of Pyramid Literatures
For this field two literatures are selected which cover the popular framework for business at the BoP. The early framework from Anderson & Markides (2007), with additional research from Prahalad (2012) which is the 4As framework is selected because it is common for the BoP research.

4. Base of Pyramid specific Technology literatures

Adding to the literature sources, report from Lighting Africa (2012) on the provision of solar lantern in the BoP market in Africa is added. The report provides specific challenges for the technology introduction in the market. Solar lantern is also the appropriate example of technology as a base case due to its advanced introduction compared to other kinds of technology in the BoP market.

Based on these literatures, there are some points to be emphasized. First point is the differences of term for 'barriers to scale'. All of the literatures are coming from different background and thus has different terms to explain quite similar specific phenomenon. The differences of the term and words are as follow:

- Strategic Niche Management Literature by Kemp & Schot (1998), use the term *underutilizing of the technology* to describe the lower of adoption of sustainable vehicle compared to the normal vehicle in the society.
- High technology diffusion literature by Ortt, Langley & Pals (2013) approaches the market situation from the technology diffusion and thus tries to understand the factors that *prohibit the large-scale diffusion* of the technology.
- Coming from business literatures, the study by Anderson & Markides (2007) and Prahalad (2012) point out the factors that company needs to take into account to *serve customers effectively* in the market. The factors are important to be considered as strategic innovation for firms in the BoP market.
- Report of Lighting Africa (2010), focuses on the *barriers to scale-up* the products for the business especially in the solar lantern market.

Based on the above explanation, although there are slight differences in meaning and emphasizes of the problem focus, the similarities from across literatures can be seen. The similarities are that all of the literatures discuss the problem of the new technology provider or product seller to introduce the product to wider consumer. The understanding of these similarities is important to identify the barriers and strategies that are mentioned in the literature. This report will mainly use the word *scale* to refer to the phenomenon where business tries to sell their products to a wider mainstream market. On the next chapters, several barriers gathered from each of the literatures will be shown.

3.1.2 Strategic Niche Management Literatures

The strategic management by Kemp & Schot (1998), points out 7 barriers that may explain why the alternative sustainable technology is still underutilized in the mainstream market. All of the seven factors with each of the explanation can be seen at the Table 3.1. The first column shows factors demonstrated by the literatures and the second column shows the explanation of each respective factors.

Barriers	Explanation
1. Technological factors	<ul style="list-style-type: none"> • New technology does not fit to existing system • Requirement of complementary technology that is not available or expensive • Technology still needs to be developed and thus expensive • Large-scale introduction to understand unforeseen design specifications changes.
2. Government Policy and Regulatory Framework	<ul style="list-style-type: none"> • No clear message from government for the need of the technology (e.g. clear view for future technology developer) • Existing regulation that inhibit new technology

Barriers	Explanation
3. Cultural and Psychological Barriers	<ul style="list-style-type: none"> Cultural or psychological image from the new technology that contradicts with the image from existing technology can form a barrier, even though it is given a better outcome, Contradicting values such as freedom and flexibility Unfamiliarity with the new alternatives can lead to skepticism
4. Demand factors	<ul style="list-style-type: none"> Contradicting prospective of users' preferences, risk aversion and willingness to pay. The new technology unable to meet high expectation (e.g. performance) Price of the product is too expensive Assumptions that demands cannot be changed. The argument that manufacturer cannot manufacture a product that demand has not been clearly articulated.
5. Production factors	<ul style="list-style-type: none"> Development from prototype to mass product can be troublesome. Investing in new technologies is considered sunk cost that may not be gained back Existing companies do not want to risk their own core competences New enterprises need sufficient capital & competence to scale and market new products.
6. Infrastructure and Maintenance	<ul style="list-style-type: none"> New infrastructure such as new distribution system is needed Mechanics do not know the new technology for maintenance service High sunk cost to invest in new infrastructure
7. Undesirable social and environmental Effects of new technologies	<ul style="list-style-type: none"> Side effects such as environmental concerns that can affect the image and performance of the new technology.

Table 3.1 Barriers from Strategic Niche Management Literatures (Source, Kemp & Schot, 1998)

3.1.3 High-Technology products

From the high-technology products literature, the study by Ortt, Langley & Pals (2013), formulizes 12 factors that may hinder the large-scale diffusion to happen to the wider market. All of the factors and its explanation can be seen in Table 3.2. The first column is the list all of the factors that can inhibit the technology to reach large-scale diffusion based on the literature, while the second column shows the explanation of each respective factor.

Barriers	Explanation
1. New high-tech product	Missing one of the functionality, the technological principle and the differences in the main components, can hinder the process of large-scale diffusion to happen. Products cannot get a good perception of price/quality against product competitors.
2. Production system	Absent of good production system that can support the occurrence of large-scale diffusion
3. Complementary products and services	The unavailability of one product and services from the production, distribution, adoption and usage can hinder the large-scale diffusion process to occur.

Barriers	Explanation
4. Suppliers (network of organizations)	Suppliers do not have good network or coordination and also enough resources to provide the products.
5. Customers	Customers do not identify the application and knowledge of the product and thus do not willing to pay for the adoption
6. Institutional aspects (laws, rules and standards)	Prohibition of the technology via regulation
7. Knowledge of technology	Lack of knowledge required to develop and produce the technology
8. Natural resources and labor	Lack of required resources and labor in the production of the products across the supply chain processes
9. Knowledge of application	Lack of understanding from both producer and consumer of the product regarding the use of the new technology for the practical application
10. Socio-cultural aspects	Clash of norms, values, and culture embodied in the society regarding the use of the product(s)
11. Macro-Economic aspects	Bad economic condition that may influence the diffusion of the technology.
12. Accidents or events	Unexpected situation outside the prediction or the control of the firms and consumers such as wars

Table 3.2 Barriers from High-Technology products literature (Source: Ortt et al 2013)

From BoP literature, 4 factors are found which need to be taken into account to help business to serve the market effectively. The factors are *awareness*, *affordability*, *availability*, and *acceptability*, known as the 4As (Anderson & Markides, 2007). In addition, other research also promotes another 4As with similar factors except one: *access* (Prahalad, 2012). Thus, we will use the above five factors as our barriers factors for the BoP market. Explanation on all factors is given in Table 3.3. The first column shows the list of the factors mentioned in the BoP literatures, while the second column shows the explanation of each respective factor.

Factors	Explanation
1. Awareness	Creation of awareness to the product and service for the consumers and producers which enable them to know what product is available and how to use the product. The challenge will be on how to reach these customers without traditional advertising methods.
2. Affordability	The necessity to make the product price as low as possible for the low income consumers. Consumers in the BoP market live with daily wages and thus cash flow is an issue.
3. Availability	Ensure a seamless supply of products and services by building trust and loyalty base at BoP. Distribution channels in the BoP market are often non-existent.

Factors	Explanation
4. Acceptability	The extent that consumers and other party in the value chain is willing to consume, distribute and sell the products. The products need to meet the unique needs of customers and also distributors.
5. Access	The need to enable the access for the consumers in remote locations to get the product/service.

Table 3.3 Barriers from Base of Pyramid literature (Source: Anderson & Markides, 2007; Prahalad, 2012)

In addition, one of the most in-depth research regarding technology products in the BoP market is in the field of solar lighting products. The research conducted by Lighting Africa was a joint initiative of World Bank and International Finance Cooperation (IFC). In 2010, the organizations setup the first research involving numbers of solar lantern companies (Lighting Africa, 2010) (Lighting Africa, 2012). List of challenges to scale-up solar lantern business in sub-Saharan Africa can be seen in Table 3.4. The first column shows all of the factors mentioned in the literature as barriers for solar lantern scale up, while the second column shows explanation and more detailed information on each factor.

Factors	Explanation
1. Access to Finance	<ul style="list-style-type: none"> Financing needs across the value chain from manufacturers, wholesalers, small retailers (Financial capital) to customers (Affordability).
2. Distribution challenges	<ul style="list-style-type: none"> Long sales cycle High distribution cost Fragmented local distribution network, Poor infrastructure, Dispersed target population, Heterogeneous customers, thus need to be sensitized
3. Lack of consumer awareness	<ul style="list-style-type: none"> Consumers are unaware of quality of the products and their benefits. Misperception that solar lights are more expensive than kerosene and biomass lighting
4. Poor product quality / market spoilage	<ul style="list-style-type: none"> The poor performance of substandard cheap lighting devices (with disposable or grid re-charged batteries) make a large number of BoP customers have a negative bias against modern lighting devices in general.
5. Policy issues	<ul style="list-style-type: none"> Incorporation of off-grid solutions in rural electrification programs, Taxes, duties and subsidies that contradict the solar lighting Lack of Quality control, Business development assistance
6. Lack of after-sales service	<ul style="list-style-type: none"> Solar lights price points and low levels of product penetration have limited manufacturers' ability to provide favorable and comprehensive after-sales practices cost-effectively. End-users also are often unaware that they are entitled to warranty and service, which inhibits demand for such services.

Table 3.4 Barriers from Solar Lantern report (Source: Lighting Africa 2012)

Specifically for the *access to finance barriers*, it is need to be highlighted that it covers the lack of financing for the upstream financing such as the wholesaler need of working capital for stock replenishment in market expansion. Moreover, *lack of access to finance* also covers the condition for the consumers' affordability

concern. Thus, the *access to finance* barrier will be segregated at later section into two factors: *lack of financial capital* and *affordability*.

3.1.4 Combined Barriers

Based on the listed barriers from Kemp & Schot (1998), Ortt, Langley & Pals (2013), Anderson & Markides (2007), Prahalad (2012) and Lighting Africa (2010), the combined list can be seen in the Table 3.5. The table has a purpose to give visual presentation on the grouping or segregation of each barrier mentioned by each literature. Each of the literature mentions different barriers that can be seen in second to fifth column. These barriers that have similar meaning or purpose are grouped in similar row. For instance, in the first row, in the second column Ortt (2012) mentions *Institutional aspects (laws, rules, and standards)*, which has close meaning to government policy and framework factor from Kemp & Schot (1998) and two other factors of *Policy issues and market spoilage* from Lighting Africa (2012). The interpretations of all the factors are grouped in the last column of ‘combination’ where all of the factors are divided into two different factors: *Institutional aspects and Law, Rules and standard*.

Some papers which do not mention factors with close meaning with others are indicated by the black highlight. For example, in the first row, literature by Anderson & Markides (2007) & Prahalad (2012) do not mentions any factors that closely relate to *Institutional aspects and Law, Rules and standard*, therefore the fourth column in the first row is highlighted by black color. Similar process is conducted to all barriers that are mentioned in the literature. Some of the barriers are related to each other and thus need to be separated to make the barriers mutually exclusive.

No	Literature				Combination			
	Ortt, 2012	Kemp & Schot, 1998	Anderson & Markides, 2007 and Prahalad, 2012	Lighting Africa, 2012				
1	Institutional aspects (laws, rules and standards)	Government Policy and Regulatory Framework		Policy issues	Institutional Aspects			
				Market spoilage	Law, Rules & Standard			
2	Production system	Production Factors			Production System			
3	Natural Resources & Labor				Natural Resources & Labor			
4	New high-tech product				Technological Factors		New high-tech product	
5	Knowledge of Technology						Knowledge of Technology	
6	Knowledge of Application						Knowledge of Application	
7	Complementary products and services						Access to Finance	Complementary Products & Services
8	Suppliers (Network of Organizations)	Infrastructure & Maintenance	Availability & Access	Financial Capital				
				Infrastructure				
				Collaboration Issue				
				Distribution challenges				Suppliers Availability
				Lack of After Sales Service				Lack of After Sales Service
9	Customers	Demand Factors			Consumer's Demand			
			Acceptability , Awareness &	Lack of Consumer Awareness	Consumer's Awareness			

No	Literature				Combination
	Ortt, 2012	Kemp & Schot, 1998	Anderson & Markides, 2007 and Prahalad, 2012	Lighting Africa, 2012	
			Affordability		
					Affordability
10	Socio Cultural	Cultural & Psychological Factors			Socio-Cultural & Education
11	Accidents or events	Undesirable social and environmental Effects of new technologies			Accidents or Events
					Undesirable social & environmental effects
12	Macro-Economic				Macro-economic aspects


 Literatures do not mention barriers with close meaning

Table 3.5 Combined barriers based on the literatures

Based on the above list, the factors will be segregated, and several factors will be emphasized, especially in relation to the BoP market. Summary of the explanation for the interrelation among barriers is as follows:

1. *Supplier (network of organizations)* barrier from Ortt, Langley & Pals (2013) covers two important things: not only the availability of suppliers that is related to production factors, but also the necessary infrastructure to enable large scale diffusion. This factor will be segregated into *supplier availability* and *infrastructure* factors.
2. *Poor product quality and market spoilage* is caused by two factors, the lack of regulation and lack of consumer awareness regarding the product quality (Lighting Africa, 2012). Thus, the *Poor product quality and market spoilage* will be segregated into *institutional aspects* and *consumer's demand* factors.
3. Some of the factors are close but more detailed definition gives different explanation such as *accidents or events* factor and *Undesirable social and environmental Effects of new technologies*, consequently both factors need to be segregated.

The combination of barriers covers 20 factors: *New high-tech product, Knowledge of Technology, Production system, Complementary products and services, Natural Resources & Labor, Suppliers Availability, Collaboration Issue, Financial Capital, Lack of After Sales Service, Knowledge of Application, Socio Cultural, Consumer's Demand, Awareness, Affordability, Infrastructure, Institutional aspects, Laws, rules and standards, Undesirable Social Impact, Accidents or events, and Macro-Economic factors.*

3.2 Validation of Barriers with Experts

In order to validate all of the barriers established from literatures, three interviews with academicians, who have expertise in the BoP market: Dr. Otto Kroesen, Ing. Esther Blom, and Ing. Boukije Vastbinder, are conducted. There are two reasons why validation with experts is important. First, to check the result of segregation of the 20 factors which have been listed in Table 3.5. Some of the factors which have been discovered are interrelated with each other and need to be categorized differently. In the process, a factor might be unidentified to be segregated, which may be considered important in BoP market, while it is not found in other markets. Second is to find whether there are new barriers which have not yet been covered in the literatures. The discussion with the experts about the list of the 20 barriers lasted between 30 and 60 minutes.

3.2.1 Input from experts

The interview with all of the three experts results in some of the factors to be highlighted:

Society relations

The main issues in the BoP culture related to market are on trust, collectivism, expectation, and confidence. All of these issues create the BoP market to have certain degree of collectivism in which the condition is “We versus them”. The condition creates a compartmentalization of the society where the people have higher moral obligation to help solely to their close relatives (Krosen, 2014) (Vastbinder, 2014). The condition can result in problem in business condition such as lack of after sales service due to lack of expectation from the people (Krosen, 2014) and also bureaucratic issues such as corruption and nepotism (Vastbinder, 2014).

Competition from Low Quality, Cheap or Free Products

Consumer in the BoP market may get affected with the fact that there are many products with low quality currently sold in the market. These products such as cheap solar lantern, which are easily broken, can create a wrong impression of generalization of the whole solar lantern as easily broken. The condition can create a market spoilage that can hinder the society to buy the products (Krosen, 2014). Moreover beside from the low-quality products the BoP market also possibly gets competition from free products. Free products may come from social organizations that provide products freely to consumer, with the purpose on helping them (Blom, 2014)

Competition from Existing products

The second competition can come from existing products. The products that are introduced firstly in the market, even though have a lower quality or performance, can inhibit the consumer to buy the new products. The situation can happen for a reason that the consumer already acquainted with the existing products. For example while cooking on kerosene and biomass cook stove serve the same purpose, the consumers are already getting used to kerosene as an existing product thus it hard to promote the cook stove usage. To change the consumer behavior will require an effort from the companies to do it, which is sometimes quite difficult (Blom, 2014).

Start-up company factors

The fact is that many companies that are active at the BoP are still at the early stage of their business and thus have problems that common start-up companies have. Specific at the BoP this can for instance happen when firms find difficulties in selling their products towards their BoP target consumer, and thus shift their consumer target market. The change of focus without deliberate thinking can lead to the company's failure especially at the early stage of the business. Thus, factors such as vision and commitment can be very important for start-up companies (Vastbinder, 2014).

Clash between entrepreneur and philanthropists

Fund dependency for BoP companies and NGOs that focus in the BoP market can be problematic. Moreover in the case of Netherlands there is an issue for legal structure for social enterprise, because it works in the middle of for-profit company and non-profit organization such as NGO. The legal structure for this social enterprise does not exist in Netherlands and many other countries, and thus forced to solve the problem by establishing their organization as two different entities; as NGO and Company. At the early stage, they try to get fund such as grant to their NGO entity, to help kick start their company, and interchangeably later once the company making profit, they will fund the NGO activities from their company profit (Vastbinder, 2014).

Insecurity/ uncertainty can provide a problem for companies

In several countries, the condition regarding the country economic can be problematic for business. For instance, in one case in Tanzania, a bank once banned due to their involvement with terrorism act. The ban has resulted in capital freeze that affected companies that save their capital in the bank, even though the companies did not do anything wrong. This is an example on how economic condition can affect companies business and has become the reason of why many companies are unwilling to invest in the BoP market (Vastbinder, 2014).

3.2.2 Interpretation of input from experts

Based on the interview with experts, some of the findings will be interpreted and compared them with the pre-specified of barriers that which have been developed previously. The interpretation of each factor is as follows:

Socio-cultural factors

The draft list of barriers has covered 'socio-cultural factors' which covers norm, values, and perception towards the products. The discussion with experts has enriched the definition of cultural factors to a wider perspective on how the society itself operates. The notion of trust and collectivism will be added to the definition of socio-cultural factors.

Start-up company factors

Another input from the experts is related to the factors of the internal companies, especially during start-up. All of these factors are very important due to the majority of the companies at the BoP are currently still at the early stage. The focus of this research will be in the market itself and thus the barriers mentioned in relation to start-up factors will not be included in the list.

Inferior products

One important factor that is mentioned by the experts is the effect of free and low-cheap quality products. This factor of 'Market Spoilage' is already covered in the literature from Lighting Africa (2012), but taken out from the list due to its relation with institutional law and regulations factor. Therefore, a new barrier named *inferior product* factor will be created.

Institutional, law and regulations

This factor covers the example of corruption mentioned by the experts. The fact that regulation does not force the business to comply with the rules which leads to some practice such as corruption is covered in this factor.

Uncertainty / Insecurity

The uncertainty and insecurity coming from the war and economic condition are already incorporated into the draft list.

Thus, from the expert interview, a new barrier of *inferior products* is added to make up our 21 list of barriers for technology scale-up at the BoP as can be seen in the first column in Table 3.6. The second column shows a brief explanation of each barrier and the last column shows a possible example of barrier specific to BoP context. In conclusion, from the first round of three expert interviews, there are not any major additional barriers and suggestions in relation to BoP market. For that reason, the expert interview round is finished and the next stage of strategy validation from desk research will be conducted.

Factors	Details	Possible examples of barriers at the BoP
1. New high-tech product	All factors related to the new-product such as function, technology principle & main components	Due to their novelty, the products are still not functioning well
2. Knowledge of Technology	Technological knowledge regarding the products	Firms still have lack of knowledge to develop the products in industrial scale
3. Production system	The whole production facilities especially in a factory	Manufacturers have insufficient capacity
4. Complementary products and services	All complementary products and services required to support the products to function well	Difficulties in finding fuel (e.g. kerosene for cook stove)
5. Infrastructure	All the infrastructure required to sell or use the new products to function/be distributed	Road is not available or in bad condition
6. Natural Resources & Labor	Required resources and labor in the production across the supply chain processes	Raw material & workers are not available in the region
7. Suppliers Availability	Availability of suppliers with required capability	No suppliers in the region are able to provide parts of products
8. Collaboration Issue	All the involved parties need to collaborate well to sell the products	The organizations are unable to work together
9. Financial Capital	Upstream / upfront financing for actors in the product value chain	Capital for market expansion or stock replenishment for manufacturers, wholesalers and small retailers is not available
10. Lack of After Sales Service	All of the services provided after the products sold to the consumer	Product maintenance is not provided

Factors	Details	Possible examples of barriers at the BoP
11. Knowledge of Application	Understanding from both of producer and consumer of the product regarding the new technology usage for the practical application	Consumers have a hard time to know how to use the product
12. Socio Cultural & Education	Norms, values, and culture condition of the consumer	The society does not trust the products & consumers have low education level
13. Consumer's Demand	The willingness from the consumer to buy the product to fulfill their needs	The demand for the existing technology products is still high, thus consumer does not need the new product
14. Consumer's Awareness	Consumer awareness regarding the products	There is lack of information regarding product availability/information in the market
15. Affordability	Concern of price due to low-income	Product price is too expensive
16. Inferior products	Low-quality / cheap / free products swarming the market	There is market spoilage or consumer lack of trust / perception because low-quality products are easily broken
17. Institutional aspects	Laws and policy imposed by the government to regulate supply and demand of the market	High Import tariff & limited/over subsidies given can increase the product price
18. Laws, rules and standards	Rules and standard that are imposed by local society or organization that can influence the supply and demand of the market	Standard for products quality is not exist
19. Undesirable social & environmental effects	Side-effect from the products	The products create side-effect that harm consumers
20. Accidents or events	Situation that is outside the prediction or the control of the firms and consumers	War that may prevent consumer to access the products
21. Macro-Economic aspects	General economic condition	Consumers' general income decrease due to economic condition

Table 3.6 Pre-specified Barriers to Scale-up at BoP (Harahap, 2014)

3.3 Validation of Barriers and Strategies by Desk Research

The second process to validate the list of barriers is desk research. The research is conducted by literature research on secondary case studies from two main sources, which are Scopus and UNDP database. This process has two important objectives. First from these literatures of case studies, the real example of how each of these barriers happen in the BoP market will be found out. The real example can be the first indication and evidence of barriers emergence in the BoP market. Second, the literature reviews can be a

good indication on the relative importance of each barrier in the market. The more the barriers are mentioned in the market, it indicates that the barriers are more important in the BoP market.

3.3.1 Methodology of Desk Research

Desk research for Base of Pyramid market was conducted via study of **46** BoP articles from Scopus and **23** articles from database from UNDP inclusive growth database. UNDP Growing Inclusive Market (GIM) is initiative from UNDP that seeks an approach on how business can contribute to human development by including the poor in the value chain such as by becoming consumers, producers, business owners or employees. The organization conducts several studies in many regions with the report available to be publicly accessed. Based on its official website, there are 166 available case studies. From all of those articles we create selection criteria to select few of the articles that fit with our research objective and scope. The selection criteria that we make are as follows:

1. The article needs to be based on the real case studies (not conceptual). This criterion is chosen so that we can get the real on field experience from the companies, instead of prediction/forecast on what will happen with their products.
2. The products in the article need to be related to technology fields (e.g. solar water heaters). This is fit with the specification of technology that we have in this research.
3. The business is business-to-consumer and not business-to-business model. This is to emphasize that the products or service is targeting the BoP consumers as the end-user.
4. Consumer needs to be involved in supply chain process as consumers or other role, and they need to put proportion of their income to buy or lease the products. This is in relation to the BoP concepts, which emphasize the role of the consumer in the supply chain.

Similarly, on the basis of those criteria, the 46 journal articles from Scopus are gathered by using “Bop & Pyramid & Case” keyword. It is possible that one article discussed more than one study case and hence all the articles reveal 32 study cases, from 12 diverse sectors such as food, energy, water, and transportation. Only **seven** articles are selected based on the relation to the objective of the research. In addition, from UNDP Growing Inclusive Market (GIM) database, by using ‘technology’ keywords we get the result of 23 articles from the search engine, but only **two** of the studies are suited for the research objective. Most of the studies that are not selected are because the article does not fit the criteria that we have set above. Thus a total of **9** articles of case studies are selected for the desk research. The list of 9 articles and sources can be seen in Appendix.

3.3.2 Result and Example of Barriers from Desk Research

This sub-section will show the results and example of barriers emergence in the BoP market as can be seen in Table 3.7. The first column shows the list of the 21 pre-specified barriers which have been built previously. The second column shows the details and example, directly from the secondary case studies which have been gathered. The last column mentions the source of literature for the case studies.

Barriers	Details / Example	Source
1. New High Tech Product	Since no minor adaptation of existing car model should achieve the price imperative of the low cost car, an entirely new design had to be crafted from scratch	(Ray & Kanta Ray, 2011)

Barriers	Details / Example	Source
2. Knowledge of Technology	Tata Motors created a new blue print for designing low-cost cars—combining in-house design capabilities for initial prototype design and engine development, with collaborative partnerships	(Ray & Kanta Ray, 2011)
3. Production System	To lower manufacturing costs of sub-assemblies in the main plant, the company chooses labor intensive method. Lack of scale production	(Ray & Kanta Ray, 2011) (Hall, Matos, & Martin, 2014)
4. Complementary products and services	The CleanCook stove needs a stable supply chain of alcohol as its fuel. The provision of the product are difficult because of distribution problem	(Sesan, Raman, Clifford, & Forbes, 2013)
5. Natural Resources & Labor	The original plan to reform methanol from flared gas in Delta state did not materialize due to lack of resources	(Sesan, Raman, Clifford, & Forbes, 2013)
6. Suppliers Availability	Ratan Tata was unsuccessful in convincing component suppliers to participate in making an ultra-low-cost Asian People's car	(Ray & Kanta Ray, 2011)
7. Collaboration Issue	The merchants were to provide cash withdrawals for OI customers, and in return merchants would receive a commission for each transaction. Unexpectedly, many merchants refused to enroll.	Berger, E., Nakata, C, 2013
8. Financial Capital	Provision of financial credit at the BoP is rare with banks are very strict lending money to entrepreneurs.	(Silvestre & Silva Neto, 2013)
9. Lack of After Sales Service	Implementation did not end with launching the technologies but continued through changes and improvements thereafter	(Berger & Nakata, 2013)
10. Knowledge of application	BOP customers are unfamiliar with electronic technologies and hence made them hesitant to use the biometric equipment. Customers need to be demonstrated that products provide performance at low-cost.	(Berger & Nakata, 2013) (Hall, Matos, & Martin, 2014)
11. Socio-cultural	New technology sometimes can only be used by the perceived leaders in relation to short-term mindset. High level of informality. Low-level education of the consumers require more training Rwandan bank staff initially rejected the biometric technology for a context-specific, cultural reason: satanic influences.	(Silvestre & Silva Neto, 2013) (Foster & Heeks, 2013) (Berger & Nakata, 2013)

Barriers	Details / Example	Source
12. Consumers' demand	Individual household compositions and annual fuel expenditure revealed that those already spending the most on cooking fuel are more likely than others to benefit from the cost savings offered by the CleanCook	Sesan, T., Raman, S., Clifford, M., Forbes, I, 2013
13. Awareness	To encourage customers to come to the stores for OI's new POS cash services, OI employed a public awareness campaign. Bypassed literacy problems and the low ownership of TVs among the rural poor.	Berger, E., Nakata, C, 2013
14. Affordability	However, as mentioned before, the cost of a SWH is about six times higher than for a PWH. As a consequence, the poorest cannot really afford to buy it.	Alali, 2011
15. Infrastructure	Brick-and-mortar banks are hard to operate when electricity is unreliable. They are also difficult to reach due to sparse roads and lack of transport options	(Berger & Nakata, 2013)
16. Government policy	Problems in getting licenses for foreign technology and import tariffs hinder the business development	(Ray & Kanta Ray, 2011)
17. Alternative Products	However, it was clear that the local manufacturing process was poorly designed, in particular for the solar tanks.	Alali, 2011
18. Rules & Standard	A quality label featured by an advertising sticker commonly known as the 'macaron' was designed to prove the compliance of the SWH with the CDER's quality standards. To have its SWH certified, a company must formally apply for the CDER's certification.	(Alali, 2011)
19. Undesirable social & environmental effects	-	-
20. Accidents or events	Widespread insecurity that arose in Kenya following election-related violence has increased the M-Pesa transfers during the period of tension.	(Foster & Heeks, 2013)
21. Macro-Economic	Increasing demand for solar panels of higher wattage in Germany and all major manufactures has created shortage of solar panels in rest of the world markets. SELCO was caught unaware and did not have enough material to serve customer demands.	(Mukherji, 2011)

Table 3.7 Barriers and examples from secondary sources

3.3.3 Relative Importance of Barriers

In this subsection, we will identify on relative importance of barrier that we find from the secondary sources. The relative importance will be indicated by the number of mentions of each barrier in each of the study. The higher the total number of mention in the study, indicate the higher of importance of the barrier at the BoP.

All of the articles from the secondary sources have concluded that *consumers*, especially the *affordability* factors are the main concern for the market. This factor is widely recognized and has become the precondition that firms need to take into account if they want to succeed in the market. The importance of the barrier that can inhibit product scaling up can be reflected in the number of times it is mentioned in all of the articles as can be seen in Table 3.8. The first column of the table indicates the rank of the barriers based on the number of articles in which the barriers are mentioned as can be seen in the third column. From the third column the relative importance rank of the barriers can be determined. The last column shows which literature sources mentioning the barriers.

It is evident that the *customers* factor is mentioned in all of the articles. The cases in the articles recognized that the affordability is the main concern of the consumer demand at the BoP. Moreover, the suppliers are the second most mentioned factor. This factor is usually related to the coordination, competence or available suppliers in the region. The third most mentioned factor is the socio-cultural, which is usually related to the lack of education and awareness of the consumer at the BoP. This result will be compared with the result of interview in chapter 5.

Rank	Barriers	Number of Articles	Source
1	Affordability	9	Ray, S., Kanta Ray, P, 2011
			Sesan, T., Raman, S., Clifford, M., Forbes, I, 2013
			Silvestre, B.S., Neto, R.e.S., 2013
			Berger, E., Nakata, C, 2013
			Foster, C., Heeks, R. 2013
			Hall, J., Matos, S.V., Martin, M.J.C. 2013
			Seelos, C., Mair, J. 2007
			Mukherji, 2011
			(Alali, 2011)
2	Socio-cultural aspects	5	Sesan, T., Raman, S., Clifford, M., Forbes, I, 2013
			Silvestre, B.S., Neto, R.e.S., 2013
			Berger, E., Nakata, C, 2013
			Foster, C., Heeks, R. 2013
			(Alali, 2011)
3	Suppliers	4	Ray, S., Kanta Ray, P, 2011
			Berger, E., Nakata, C, 2013
			Foster, C., Heeks, R. 2013
			Seelos, C., Mair, J. 2007
	Government Policy	4	Ray, S., Kanta Ray, P, 2011
			Sesan, T., Raman, S., Clifford, M., Forbes, I, 2013
			Silvestre, B.S., Neto, R.e.S., 2013
			Berger, E., Nakata, C, 2013
5	New High Tech Product	3	Ray, S., Kanta Ray, P, 2011
			Sesan, T., Raman, S., Clifford, M., Forbes, I, 2013
			Alali, 2011
	Production System	3	Ray, S., Kanta Ray, P, 2011
			Hall, J., Matos, S.V., Martin, M.J.C. 2013
			Alali, 2011
	Financial Capital	2	Silvestre & Silva Neto, 2013

Rank	Barriers	Number of Articles	Source
7			Mukherji, 2011
	Collaboration Issue	2	Silvestre, B.S., Neto, R.e.S., 2013
			Sesan, T., Raman, S., Clifford, M., Forbes, I, 2013
	Natural Resources & Labor	2	Sesan, Raman, Clifford, & Forbes, 2013
			Alali, 2011
	Knowledge of application	2	Berger, E., Nakata, C, 2013
			Hall, J., Matos, S.V., Martin, M.J.C. 2013
11	Rules & Standard	1	Alali, 2011
	Knowledge of Technology	1	Ray, S., Kanta Ray, P, 2011
	Complementary products and services	1	Sesan, T., Raman, S., Clifford, M., Forbes, I, 2013
	Consumers' demand	1	Sesan, T., Raman, S., Clifford, M., Forbes, I, 2013
	Awareness	1	Berger, E., Nakata, C, 2013
	Lack of After Sales Service	1	Berger, E., Nakata, C, 2013
	Infrastructure	1	(Berger & Nakata, 2013)
	Macro-Economic	1	Mukherji, 2011
	Accidents or events	1	Foster, C., Heeks, R. 2013
	Alternative Products	1	(Alali, 2011)
21	Undesirable social & environmental effects	-	-

Table 3.8 Barriers and number of mentions in the secondary sources

3.4 Identification of Niche Strategies

Identification of the strategy process is similar with barrier identification, except there is no validation by experts for the strategy phases. In this section, the process and result to give the outcome of pre-specified niche strategies will be discussed.

3.4.1 Strategic Niche Management Literature

Kemp & Schot (1998) proposed several strategies to shift the technology regime in the vehicle industry:

1. Change the structure of incentives in which market forces play such as by means of tax & price incentives. In this strategy, even though the changes are made by the policy makers, the decision is still made at the decentralized level by individual actors. The disadvantage of this strategy is that radical changes are difficult to happen considering the dominance of existing technologies. This strategy of putting the decision in individual actors is considered more policy-driven strategy and out of scope of firms' strategy, which is the main focus of the research.
2. New regime creation strategy. In this strategy government create the new regime for example, similar with the way decision-makers plan for large infrastructure works such as railway systems. In this strategy the social context such as requirement can be a problem. Firms have difficulties to plan successful market introduction as user requirements develop overtime in often unpredictable ways, nonetheless it does not stop the government to demand or supply the technology. We will combine the activity of both initiatives by the government as *government-lead supply strategy*, as the government lead the initiative to promote the technology to the market. In the case of railway system in which the government acts as the main provider for technology.
3. Build on-going dynamics of socio-technical change and exert pressures to modulate the dynamics into desirable directions. Policy makers need to stimulate the co-evolution of supply and demand to produce desirable outcomes, in both short and long term. The approach is conducted through process management that aims to change the rules of the game that creates a space for variation and selection of the technology, to learn about the issues in technology development. The success of this approach however will depend on the development outside the reach of policy-makers and other actors. This approach is categorized as *supplier network strategy*.

Geels (2002) and Raven (2007) proposed two strategies to promote the technology to the wider market:

1. Niche accumulation strategy. Increasing demand results in a change in the regime or landscape level. Different niche markets outside the mass market develop the complementary products and services, required institutions and networks.
2. Hybridization strategy. The technology physically links up with established technologies to solve particular bottlenecks. The new technology is radically combined with existing technology in such of hybrid product design.

3.4.2 High-technology diffusion literature

Similar with the barriers, to identify niche strategies that industry implemented the literatures from the high-technology diffusion are reviewed. Based on these literatures, niche strategy is developed to cope with the respective barriers which emerge in the specific condition. Several niche strategies emerging in the general market are as follows (Ortt, Langley, & Pals, 2013):

1. **Demo, experiment and develop niche strategy.** Product is demonstrated to the public in a constraint environment so that the limited quality performance of the product can be accommodated.
2. **Top niche strategy.** The products aim the specific top-end niche of the market with possibility to tailor the special product to this small numbers of consumers.
3. **Subsidized niche strategy.** The products are subsidized to particular segment of users as the segments are considered to be important.
4. **Redesign niche strategy.** The products are introduced with simplification so that it can be produced with the current knowledge and thus, sold at lower price. The strategy helps to explore the relationship of suppliers and customers.
5. **Dedicated system or stand-alone niche strategy.** The products are used with a dedicated system of complementary products and services are designed.
6. **Hybridization or adaptor niche strategy.** The products are combined with the existing product, and its complementary services that related with it to ensure a compatibility with existing product infrastructure.
7. **Educate niche strategy.** Educate and conduct experiment aimed to increase consumers' and customers' knowledge.
8. **Geographic niche strategy.** Choosing a specific region in which the barriers such as laws and rules are less strict and resources are available.
9. **Lead user niche strategy.** Find the innovators or lead users who can help to develop and experiment with the products.
10. **Explore multiple markets niche strategy.** Diffusing the products to more than one region to explore the new applications.

From the above mentioned strategies, it needs to be emphasized that for the *subsidized niche strategy*, the research constraint the scope into initiative that are conducted by firms. The literature from Ortt, Langley & Pals (2013) covers the definition of subsidy that provided by the firms, and not just by government and thus this research incorporates the strategy. The subsidy strategies that are solely initiated by government and not in relation with private firms, is out of scope of this research.

3.4.3 Base of Pyramid Literature

One of the most in-depth research regarding technology products in the BoP market is in the field of solar lighting products. The research was conducted by Lighting Africa, a joint initiative of World Bank and International Finance Cooperation (IFC). From the research, there are some solutions proposed by firms and organizations to solve the identified barriers in the solar lantern market as can be seen in Table 3.9. The first column shows the list of the strategies mentioned in the literature. The second column shows the specific strategic solutions which the literature proposed to solve the respective barriers.

Barriers	Strategy Solutions
1. Access to Finance	<p>For Upstream financing: (1) Supplying working capital for trade finance at the manufacturer level and extending it to distributors (2) Trading CER credits through the Clean Development Mechanism.</p> <p>For End-users: (1) MFI-based micro-lending (2) engaging the semi-formal and informal financing sector, and (3) payroll financing</p> <p>Technology complementary strategy. (4) mobile payment-enabled lending and pay-as-you-go models</p>
2. Distribution challenges	<p>Multiple business model strategies to maximize their reach into target BoP populations: Standard retail and dealer-distributor networks, NGO/MFI, Institutional Micro-franchise, Rental, Proprietary/ own distribution</p>

Barriers	Strategy Solutions
3. Lack of consumer awareness	Trend of increasing marketing effort from firms, through television, radio and newspaper, and direct marketing efforts
4. Poor product quality / market spoilage	Increased adoption and incorporation of quality standards and testing programs at the national level, Introduction of a universal, simple, visually-appealing seal of quality that would aid consumers to easily differentiate between quality and substandard products.
5. Policy issues	Approach government for regulation changes
6. Lack of after-sales service	Trend of increasing marketing effort from firms

Table 3.9 Strategies from BoP Literature

In relation with policy issues, we mention as one of the strategy that firms can do is by approaching government for regulation changes. The study from Lighting Africa (2012), mentions an effort in which firms can proactively try to change the regulation for example by setting quality standards, and thus we cover the strategy on this research.

3.4.4 Strategies from secondary case studies

Similar with the barriers identification, the database of Scopus and UNDP are utilized to identify strategies that firms are implemented in the market. The literatures selection process is similar with the barrier identification in subsection 3.2.3. From the secondary literatures three main strategies that are commonly implemented in the BoP market are identified:

1. Approach Higher Income level / Social Status

In this approach, firms sell the products, either intentionally or unintentionally to the people with higher income in the society instead of to the people with lower income. People with higher income are referred as Top of Pyramid market (ToP) or Middle of Pyramid market (MoP). People from higher income have higher purchasing power and thus will be able to afford new radical products, which usually have higher price. Therefore, approaching this market can help the diffusion of the products, especially at the early phase. The approach can be seen in several cases (Sesan et al, 2013) (Alali, 2011).

2. Geographic approach

The geographic approach is conducted in order to increase the rate of innovation and technology diffusion for firms. The similarities of location are expected to increase the interaction between people or suppliers. This is, for instance, can be seen in the granite machinery case by Silvestre, B.S., Neto, R.e.S (2013). Other strategy for geographic approach is related to choosing a region for project expansion strategy as in the case of solar lantern diffusion by Selco (Mukherji, S. 2011).

3. Gender market segmentation

Problem of gender inequality is still a challenge especially in poor countries. Women and girls have been the victim of violence with many of them die during child birth, especially in sub-saharan Africa. Women also more prone to have problems in accessing education, non-respect of basic human rights, lack of income/job, hunger and malnutrition and HIV/AIDS (Banerjee & Duflo, 2011). Hence, many social enterprises and NGOs use their business as a tool to help eradicate this problem by targeting them as

their consumers or other role in supply chain. The notion is also supported by the fact that traditionally, women have the position as decision maker especially in rural market (Chikweche,T, John Stanton,J & Fletcher, R , 2012). The inclusion of women in business is important as it can bring confidence and self-esteem, which is the underlying reason why some firms especially NGOs involve woman in their value chain, for instance, as the sellers (Sridharan, S., Viswanathan, M. 2008).

3.4.5 Strategies archetype identification

The last step of the strategies identification is to make sure that all of the strategies are mutually exclusive. A map is created from the strategies which have been identified and segregated one on the other as can be seen in Table 3.10. Each of the literature mentions different strategies that can be seen in the second to sixth column. Strategies with similar meaning are grouped in the same row. For instance, in the second row, Ortt, Langley & Pals (2013) mentions ToP approach, which is considered similar to the approach *people with higher income strategy* from secondary sources in the sixth column. Some literatures which do not mention factor with close meaning with others, will be indicated by black highlight. For example, in the first row of the table, no other literatures beside the one from Ortt, Langley & Pals (2013) mention *Demo, experiment and develop niche strategy*, thus, in the first row the cell is highlighted with black color, from the third to sixth column. In the last column, the list is combined by interpretation for strategies based on several sources.

It is need to be mentioned that although the research aim at segregating each barrier to be independent and not related with each other, this process need to be taken at this stage as a simplification to help us analyze each barrier. As found previously from the study of Ortt, Langley & Pals (2013), a barrier can raise due to factor from other barriers, but the research will waive that concern at this chapter of at the research, with a discussion of relation among barriers will be discussed in Chapter 6. The result of the segregation process can be seen in Table 3.10.

No	Literature					Combination
	Ortt, Langley & Pals, 2013	Kemp & Schot, 1998	Geels (2002) & Raven (2007)	Lighting Africa, 2012	Secondary Sources	
1	Demo, experiment and develop niche strategy.					Demo, experiment and develop niche strategy.
2	ToP niche strategy				Approach people with higher income	Top of Pyramid Approach
3	Subsidized niche strategy					Subsidized niche strategy
4				Access to finance strategy		Access to Finance
5	Redesign niche strategy					Product Redesign
6	Dedicated System or stand-alone niche strategy					Dedicated System or stand-alone strategy
7	Hybridization or adaptor niche strategy		Hybridization Strategy			Hybridization or adaptor strategy
8				Technology Complementary Strategy		Technology Complementary
9	Educate niche strategy			Marketing efforts & Product Quality Education		Education Approach
10	Lead user niche strategy					Lead user Approach
11		Government-lead supply strategy				Government-lead supply strategy

No	Literature					Combination
	Ortt, Langley & Pals, 2013	Kemp & Schot, 1998	Geels (2002) & Raven (2007)	Lighting Africa, 2012	Secondary Sources	
12	Geographic niche strategy		Niche accumulation strategy	Multiple Distribution/ Business models	Geographic Approach	Geographic Approach
13	Explore multiple markets niche strategy					Explore multiple markets
14		Supplier Network Strategy		Setting Quality Standards		Supplier Network Strategy
15					Gender Approach	Gender Market Approach

Table 3.10 Strategies Archetype identification

Some explanations for the above strategies:

1. *Subsidized niche strategy* and *access to finance strategy* have different meanings that might interrelate with one and others. *Subsidized niche strategy* emphasizes the need of financial in the technology development phase, especially in relation to the product price (Ortt, Langley, & Pals, 2013). While *access to finance strategy*, emphasizes two front, first, the working capital for the actors in the value chain (e.g. distributors), and second to the end-user in term of financial model to provide product affordability (Lighting Africa, 2012).
2. *Hybridization or adaptor niche strategy* and *Technology complementary strategy* have different meaning although both of the strategies are quite related one and another. *Hybridization strategy* focuses on the combination between the new technology and incumbent technology, which the combined new technology is expected to become substitution in the market. On the other hand, *Technology complementary strategy* is the use of other existing technology to complement the new products which are sold. The complementary technology is considered more familiar by consumers in the market.
3. While *multiple market niches* and *multiple distribution models* provide differences in focus both strategy will be merged. Multiple market niches focuses on approach in different market to gain more understanding in technology application (Ortt, Langley, & Pals, 2013). On the other hand, *multiple distribution models* is application of different approaches to understand the best strategies especially for distribution, while the technology application is already understood. Both strategies will be merged to *explore multiple market* to cover the whole value chain from technology development to market understanding. It needs to be noted that the strategy is usually implemented in different geographic areas, thus, quite interrelated with *Geographic Approaches strategy*.
4. The *lead user niche strategy* only covers the practice from academic or experts that lead the development of technology. One more strategy is added, focusing more on the technology lead market conducted by government, *Government-lead supply strategy* as the notion taken from Kemp & Schot (1998).

Based on the above interpretation, the compilation of 15 strategies are as follows: *Demo, experiment and develop niche strategy*, *ToP niche strategy*, *Gender Market Approach*, *Access to finance Strategy*, *Product Subsidy strategy*, *Redesign niche strategy*, *Dedicated System or stand-alone niche strategy*, *Hybridization or adaptor niche strategy*, *Technology Complementary strategy*, *Educate niche strategy*, *Geographic niche strategy*, *Lead user niche strategy*, *Explore multiple markets niche strategy*, *Government-lead supply strategy*, and *Supplier Network Strategy*. The definition of each strategy can be seen in Table 3.11.

No	List of Strategy	Definition / Examples
1	Demo, experiment and develop	Consumers and producers are demonstrated the technology to get more knowledge on the technology application and possible development
2	Top of Pyramid Approach	Sell the products to people with higher social income or status, expecting the consumption will trickle to larger market
3	Gender Market Approach	Sell technology to specific market segment, because they have higher influence regarding technology purchase and development
4	Access to Finance	Producers injected with funding to develop technology or grow their business
5	Product Subsidy	The consumer pay less price, in order to push for sales
6	Product Redesign	Change of product specification to approach a specific market
7	Dedicated System or stand-alone strategy	Product used in a constrained system/region firstly for example in a laboratory setting
8	Hybridization or adaptor strategy	Combination of the new product with the existing available product
9	Technology Complementary	Use other available technologies in the market to enhance the process to introduce the new technology
10	Education Approach	Transfer of knowledge to customers and suppliers
11	Geographic Approach	The products first sold in a region where it can be more easily accepted
12	Lead user Approach	The products first sold to the people/institution with specific technology expertise/demand e.g. university
13	Explore multiple markets	The products sold into different markets/region in order to gain understanding of the technology or find the best way to expand the business
14	Government-lead supply strategy	Works with government, to provide technology to society even though the demand from the market is not yet articulated
15	Supplier Network Strategy	Parties collaborate with each other's to expand their network and better stimulate technology acceptance and development

Table 3.11 Pre-specified niche strategies (Harahap, 2014)

3.5 Barriers and Strategies linkage

In this section the list of barriers and strategies based on the literatures will be combined. Several literatures directly compare both of the barriers and strategies such as study from Ortt, Langley & Pals (2013) and Lighting Africa (2010). Another study from Kemp & Schot (1998) does not give a direct comparison, but a barriers and strategies still can be established by interpretation. The linkage from each background of literature: Strategic Niche Management Literature, High-technology diffusion literature and Base of Pyramid Literature will be discussed in detail.

Barriers-strategies approach will be conducted instead of strategies-barriers approach as the former approach will be useful for practical solution for companies to help them find solution/strategies for barriers which they encounter in the market. The illustration of the approach can be seen in Figure 3.2.

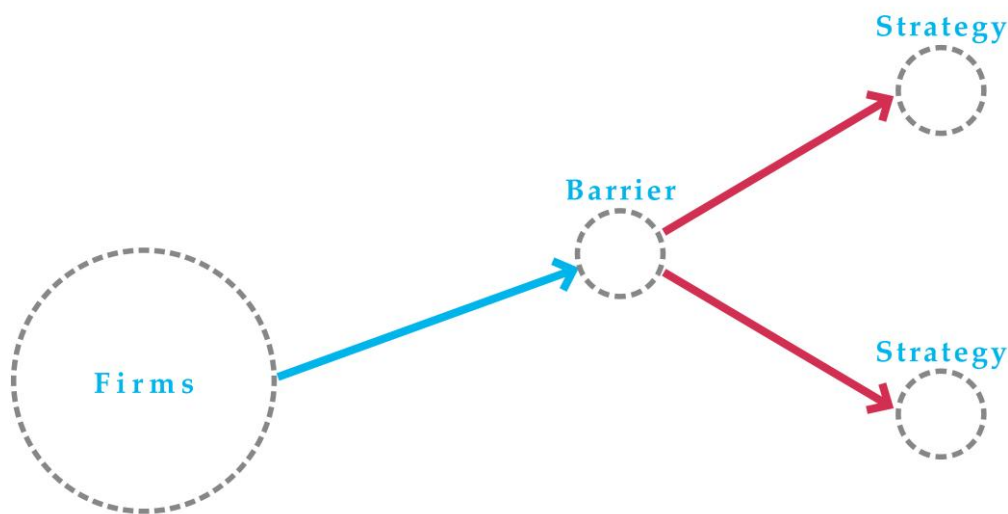


Figure 3.2 Illustration of barrier-strategy approach

In this approach, the research is focusing on the real condition that happens in the business. Company will encounter barrier during the operation of their business, in which they will prescribe strategy to solve these barriers. Thus, this barrier-strategy approach will be easier to be applied by the company. In addition, presenting the result in barrier-strategy approach will help identifying additional strategies that have not been mentioned before in the literature. Moreover, in the final outcome, the final list has a purpose as a checklist of strategies for companies to help solve their problems. For this objective, presenting the final list in form of barriers- strategies approach will be more applicable.

3.5.1 Linkage from Strategic Niche Management Literature

The literature by Kemp & Schot (1998) does not specifically address the problem from barriers-strategies perspective, and thus, interpretation from the explanation of strategies that the study mentioned will be made. As already mentioned in subsection 3.4.1, there are two strategies which have been identified from Kemp & Schot (1998): *Government-lead supply strategy* and *Supplier Network strategy*.

The definition of *Government-lead strategy* is a strategy where government needs to be involved to create new-technology regime and firms has difficulties to provide the technology to the society. Thus, the importance of the strategy to solve several barriers is interpreted as follows:

- Government-lead strategy is useful in the market where the need of the product in the market is not yet articulated. Thus, such strategy can be used to address the *consumer demand* barrier.

- Moreover as the heuristics for this market are not yet established, government can introduce and solve the necessity of *institutional aspects, and laws rules and standards* barrier.
- The strategy can also address the *infrastructure* problem. In the event where the infrastructure is not built yet, private firms will be unwilling to invest and thus, government needs to invest upfront. This example happens in the case of railway systems as explained in the study.

The second strategy which has been identified from Kemp & Schot (1998) is the *supplier network strategy*. The strategy puts the importance of process management among actors along the supply and demand value chain to create room for experimentation and develop the product. Therefore, the importance of the strategy to solve several barriers is interpreted as follows:

- This strategy focuses on the interaction between actors in order to be able to develop the technology to the wider market. And thus, the strategy is important to address the newness of technology barriers such as the *new high tech product* and the *knowledge of application*.
- This strategy is also related to the *consumer's demand* barrier because the need of such product may not be articulated yet in the market. The problem of need articulation can also be related to the problem of *awareness* in the market.
- The strategy is also an important step to build *rules and standard* in the new market as collaboration in the market can together create a rules and standard accepted by all actors in the network.
- The strategy is also useful to anticipate the *undesirable side-effect* of the products from the feedback from the supplier in the markets.

From the above list it can be seen that government-lead strategy, as the literature suggest can be used to solve three kinds of barriers: *consumer's demand, infrastructure and institutional aspects*. On the other hand, supplier network strategy can be used to solve the barriers of *new high tech product, knowledge of application, consumer's demand, awareness, laws, rules and standards and Undesirable social & environmental effects*.

All of the barriers and strategies above will be re-arranged to follow barriers-strategies logic as can be seen in Table 3.12. The first column shows eight barriers which have been identified from the literatures, and the second column shows whether the two strategies of *government-lead supply* strategy and *supplier network* strategy can be used to solve the specific barriers. For instance, in the first row, consumer's demand can be solved by two kinds of strategies: *government-lead supply strategy* and *supplier network strategy*, while in the second row, the barrier of *infrastructure* can only be solved by government-lead strategy as mentioned in the literature.

Barriers	Strategies
1. Consumer's Demand	Government-lead strategy
	Supplier Network Strategy
2. Infrastructure	Government-lead strategy
3. Institutional aspects	Government-lead strategy
4. New High Tech Product	Supplier Network Strategy
5. Knowledge of Application	Supplier Network Strategy
6. Awareness	Supplier Network Strategy
7. Laws, rules and standards	Supplier Network Strategy
8. Undesirable social & environmental effects	Supplier Network Strategy

Table 3.12 Linkage between Barriers and strategies from Kemp and Schot, 1998

In this sub-section the linkage between strategy and barriers from the perspective of high-technology diffusion literature study by Ortt, Langley & Pals (2013) will be elaborated. The study has touched the linkage between strategies and specific market situation in which they can be adopted to introduce a product. In Table 3.13, the first column shows the list of ten niche strategies that the literature has identified. The second column shows the summary of explanation about the barriers that each respective strategy suggests to tackle. The last column shows the barriers which have been identified previously which correspond to the explanation shown in the second column.

Generic niche strategies	Explanation from literature	Barriers
1. Demo, experiment and develop niche strategy	The lack of knowledge in the technology can lead to the lack of quality of the product	Knowledge of technology, New-high tech product
2. Top niche strategy	The lack of knowledge in the technology can affects the production system. In addition, the lack of product resources can affect price	Knowledge of technology, Production System, Affordability, Natural resources & Labor
3. Subsidized niche strategy	The lack of knowledge in the technology affects the product availability and production system which lead to higher price. This can also happen because of the lack of resources.	Knowledge of Technology ; Production System; Affordability, Natural Resources & Labor
4. Redesign niche strategy	The lack of knowledge in the technology affects the product availability and production system which lead to higher price. Other possible causes are lack of resources, the absence of knowledge of application, institutional aspects, or law rules and standard. In addition, the socio cultural aspect might affect suppliers and/or customers.	Knowledge of technology, Production System, Affordability, Natural Resources & Labor, Knowledge of Application, Socio-cultural Aspects, Institutional Aspects, Laws Rules & Standards, Suppliers Availability/Infrastructure, Consumer's Demand
5. Dedicated system or stand-alone niche strategy	The lack of knowledge in the technology affects the complementary products and services availability.	Knowledge of Technology, Complementary product & Services
6. Hybridization or adaptor niche strategy	The lack of knowledge in the technology and/or resources affects the availability and complementary products and services.	Knowledge of Technology, Complementary product & Services, Natural Resources & Labor
7. Educate niche strategy	The lack of knowledge in the technology can affect both suppliers and customers	Knowledge of technology, Suppliers availability/Infrastructure, Consumers demand
8. Geographic niche strategy	The lack of knowledge in the technology affects the institutional aspects, and also rules and standard. In addition, the lack of resources can affect the products or the complementary products availability. Moreover, socio-cultural aspects or macro-economic aspects affect the suppliers' availability. Last, accidents or events can affect the institutional aspects in the region.	Knowledge of Technology, Institutional Aspects, Laws Rules and Standard, Natural Resources and Labor, Complementary products & Services, Socio- Cultural, Suppliers Availability, Consumer's Demand, Institutional Aspects, Accidents or events, Macro Economic Aspects

9. Lead user niche strategy	The lack of knowledge of application affects the customers due to the novelty of the products. Moreover, socio-cultural, macro-economic aspects and accidents or events may affect the suppliers and/or customer availability.	Knowledge of Application, new-high tech product, Consumer's Demand, Socio-Cultural Aspects, Macro Economic Aspect, Accidents or Events, Suppliers Availability/Infrastructure
10. Explore multiple markets niche strategy	The lack of knowledge of application, due to novelty of the products affects the customers.	Knowledge of Application, New high-tech product, Consumer's Demand

Table 3.13 Linkage between Strategies to Barriers from (Ortt, Langley, & Pals, 2013)

From the Table 3.13 it can be seen that each of the ten strategies mentioned in the literature can have a purpose to solve more than one barrier. Moreover, it needs to be emphasized that the literature does not present the problem in barriers-strategies approach as intended in this research, thus, the barriers and strategies that which have been identified in Table 3.13 will be transformed into a new Table 3.14, where the problem is mentioned in barriers- strategies approach. The first column in Table 3.14 mentions list of barriers and the second column list the corresponding strategies that can be used to solve the barriers mentioned in the literature .

Barriers	Strategies
1. New high-tech product	Demo, experiment and develop niche strategy
	Lead user niche strategy
	Explore multiple markets niche strategy
2. Knowledge of Technology	Demo, experiment and develop niche strategy
	Top niche strategy
	Subsidized niche strategy
	Redesign niche strategy
	Dedicated system or stand-alone niche strategy
	Hybridization or adaptor niche strategy
	Educate niche strategy
	Geographic niche strategy
3. Production system	Top niche strategy
	Subsidized niche strategy
	Redesign niche strategy
4. Complementary products and services	Dedicated system or stand-alone niche strategy
	Hybridization or adaptor niche strategy
	Geographic niche strategy
5. Infrastructure	Redesign niche strategy
	Educate niche strategy
	Geographic niche strategy
	Lead user niche strategy
6. Natural Resources & Labor	Top niche strategy
	Subsidized niche strategy

Barriers	Strategies
	Redesign niche strategy
	Hybridization or adaptor niche strategy
	Geographic niche strategy
7. Suppliers Availability	Redesign niche strategy
	Educate niche strategy
	Geographic niche strategy
	Lead user niche strategy
8. Knowledge of Application	Redesign niche strategy
	Lead user niche strategy
	Explore multiple markets niche strategy
9. Socio Cultural & Education	Redesign niche strategy
	Geographic niche strategy
	Lead user niche strategy
10. Consumer's Demand	Redesign niche strategy
	Educate niche strategy
	Geographic niche strategy
	Lead user niche strategy
	Explore multiple markets niche strategy
11. Affordability	Top niche strategy
	Subsidized niche strategy
	Redesign niche strategy
12. Institutional aspects	Redesign niche strategy
	Geographic niche strategy
13. Laws, rules and standards	Redesign niche strategy
	Geographic niche strategy
14. Accidents or events	Geographic niche strategy
	Lead user niche strategy
15. Macro-Economic aspects	Lead user niche strategy
	Geographic niche strategy

Table 3.14 Summary of Linkage between Barriers to Strategies from (Ortt, Langley, & Pals, 2013)

3.5.2 Linkage from the Base of Pyramid literature

The last linkage to be made is taken from the BoP literature. The study from Lighting Africa (2012), will be used which discusses barriers to scale-up specific to solar-lantern industry. The study discusses in-depth about the real solution which it has previously identified. Different from previous two literatures from Strategic Niche management and High-technology diffusion, the study approaches the problem by barriers-strategies approach, instead of the other way around. The list of barriers and interpreted strategy can be seen in Table 3.15. In the table, the first column shows the specific barriers which the literature mentions that solar firms encounter in the market. The second column mentions the details of the barriers while the examples of barriers are mentioned in the third column. The last column shows the list of the interpretation of which strategy corresponds to the barriers.

Barriers	Details	Example	Interpretation of strategy
1. Upstream financing (Financial Capital)	Supplying working capital for trade finance at the manufacturer level and extending it to distributors	Equity from VC or donor,	Access to Finance
	Trading CER credits through the Clean Development Mechanism	Manufacturer-funder Partnerships or Trade, MFI Co-finance agreement, Rural Entrepreneur charge station	Supplier Network Strategy
2. End User Financing (Affordability)	MFI-based micro-lending for PLSs	MFI Financing, Informal Credit Scheme	Supplier Network Strategy
	Engaging the semi-formal and informal financing sector	Rental or pay-per-use models	
	Mobile-payment enabled solar lantern lending and pay-as-you-go	Works with mobile phone company	Technology Complementary
	Payroll Financing	Works with company to help the provision of product through employee payroll	Supplier Network Strategy
3. Distribution (Suppliers Availability)	Suppliers agree that there is no 'winning solution exists at scale'	Works with different kind of distributors channel in the market	Explore multiple markets
4. Lack of consumer awareness	Marketing and advertising	Consumer awareness campaign via direct marketing and mass media marketing	Education Approach
5. Poor product quality / market spoilage (Inferior Products)	Increase adoption and incorporation of quality standards and testing programs at the national level	Lighting Africa Standard	Supplier Network Strategy
	Introduction of a universal, simple, visually-appealing seal of quality that would aid consumers to easily differentiate between quality and substandard products.	Testing and verification for distributors and manufacturers	Education Approach
6. Policy issues (Institutional Aspects)	Incorporation of off-grid solutions in rural electrification programs,	Commercial approach to rural electrification	Government- lead strategy
	Taxes, duties and subsidies, Quality control, Business development assistance	Initiative from the government such as Ministry of Energy and Minerals	Education Approach
7. Lack of after-sales service	Product price, low level of penetration and limited manufacturer ability	Some manufacturers find it more viable to replace the entire product without offering repairs	Product Redesign Strategy

Table 3.15 Linkage between Barriers and strategies from (Lighting Africa, 2012)

The Table 3.15 provides us with real example of barriers and strategy solution occurred in the BoP market. Similar with previous two literatures, in several barriers, the literature may suggest more than one strategy to solve a barrier. In total the literature found similar total number of seven barriers and seven strategies.

3.5.3 Summary of the linkage of barriers and strategies

In this sub-section all of the result of linkage from the three sources of literatures we have discussed previously (Table 3.12, Table 3.14, Table 3.15) will be compiled. The compilation of the barriers and

strategies linkage will be useful to compare the result with the case studies which will be discussed later in Chapter 5. The compilation of linkage of barriers and strategies from the literature can be seen in Table 3.16. In this table, the first column shows the list of all the barriers which have been previously identified, while the second column shows the list of all strategies that are linked to the barrier in the first column. For instance, the first barrier which have been identified is *New High-tech product* is shown in the first column. The literature review reveals that there are three strategies that company can execute to solve such barrier: *Demo, experiment and develop niche strategy*, *Lead user niche strategy*, *Explore multiple markets niche strategy* and *supplier network strategy*, which are listed in the second column of *strategy*. Similar interpretation can be seen for all of the 21 barriers identified.

No	Barriers	Strategy	Source
1	New high-tech product	Demo, experiment and develop	(Ortt, Langley, & Pals, 2013)
		Lead user Approach	(Ortt, Langley, & Pals, 2013)
		Explore multiple markets	(Ortt, Langley, & Pals, 2013)
		Supplier Network Strategy	(Kemp & Schot, 1998)
2	Knowledge of Technology	Demo, experiment and develop	(Ortt, Langley, & Pals, 2013)
		Top of Pyramid Approach	(Ortt, Langley, & Pals, 2013)
		Product Subsidy	(Ortt, Langley, & Pals, 2013)
		Product Redesign	(Ortt, Langley, & Pals, 2013)
		Dedicated System or stand-alone strategy	(Ortt, Langley, & Pals, 2013)
		Hybridization or adaptor strategy	(Ortt, Langley, & Pals, 2013)
		Education Approach	(Ortt, Langley, & Pals, 2013)
		Geographic Approach	(Ortt, Langley, & Pals, 2013)
3	Production system	Top of Pyramid Approach	(Ortt, Langley, & Pals, 2013)
		Product Subsidy	(Ortt, Langley, & Pals, 2013)
		Product Redesign	(Ortt, Langley, & Pals, 2013)
4	Complementary products and services	Dedicated System or stand-alone strategy	(Ortt, Langley, & Pals, 2013)
		Hybridization or adaptor strategy	(Ortt, Langley, & Pals, 2013)
		Geographic Approach	(Ortt, Langley, & Pals, 2013)
5	Infrastructure	Product Redesign	(Ortt, Langley, & Pals, 2013)
		Education Approach	(Ortt, Langley, & Pals, 2013)
		Lead user Approach	(Ortt, Langley, & Pals, 2013)
		Government-lead strategy	(Kemp & Schot, 1998)
6	Natural Resources & Labor	Top of Pyramid Approach	(Ortt, Langley, & Pals, 2013)
		Product Subsidy	(Ortt, Langley, & Pals, 2013)
		Product Redesign	(Ortt, Langley, & Pals, 2013)
		Hybridization or adaptor strategy	(Ortt, Langley, & Pals, 2013)

No	Barriers	Strategy	Source
		Geographic Approach	(Ortt, Langley, & Pals, 2013)
7	Suppliers Availability	Product Redesign	(Ortt, Langley, & Pals, 2013)
		Education Approach	(Ortt, Langley, & Pals, 2013)
		Lead user Approach	(Ortt, Langley, & Pals, 2013)
		Geographic Approach	(Ortt, Langley, & Pals, 2013)
		Explore multiple markets	(Lighting Africa, 2012)
8	Collaboration Issue	-	-
9	Financial Capital	Access to Finance	(Lighting Africa, 2012)
		Supplier Network Strategy	(Lighting Africa, 2012)
10	Lack of After Sales Service	Product Redesign	(Lighting Africa, 2012)
11	Knowledge of Application	Product Redesign	(Ortt, Langley, & Pals, 2013)
		Explore multiple markets	(Ortt, Langley, & Pals, 2013)
		Lead user Approach	(Ortt, Langley, & Pals, 2013)
		Supplier Network Strategy	(Kemp & Schot, 1998)
12	Socio Cultural & Education	Product Redesign	(Ortt, Langley, & Pals, 2013)
		Geographic Approach	(Ortt, Langley, & Pals, 2013)
		Lead user Approach	(Ortt, Langley, & Pals, 2013)
13	Consumer's Demand	Product Redesign	(Ortt, Langley, & Pals, 2013)
		Education Approach	(Ortt, Langley, & Pals, 2013), (Lighting Africa, 2012)
		Geographic Approach	(Ortt, Langley, & Pals, 2013)
		Explore multiple markets	(Ortt, Langley, & Pals, 2013)
		Lead user Approach	(Ortt, Langley, & Pals, 2013)
		Government-lead strategy	(Kemp & Schot, 1998)
		Supplier Network Strategy	(Kemp & Schot, 1998)
14	Consumer's Awareness	Supplier Network Strategy	(Lighting Africa, 2012)
		Education Approach	(Lighting Africa, 2012)
15	Affordability	Top niche strategy	(Ortt, Langley, & Pals, 2013)
		Product Subsidy	(Ortt, Langley, & Pals, 2013)
		Product Redesign	(Ortt, Langley, & Pals, 2013)
		Supplier Network Strategy	(Lighting Africa, 2012)
		Technology Complementary	(Lighting Africa, 2012)
16	Inferior products	Government-lead strategy	(Lighting Africa, 2012)
17	Institutional aspects	Product Redesign	(Ortt, Langley, & Pals, 2013)
		Geographic Approach	(Ortt, Langley, & Pals, 2013)
		Government- lead strategy	(Kemp & Schot, 1998)
		Education Approach	(Lighting Africa, 2012)
18	Laws, rules and standards	Product Redesign	(Ortt, Langley, & Pals, 2013)
		Geographic Approach	(Ortt, Langley, & Pals, 2013)

No	Barriers	Strategy	Source
		Supplier Network Strategy	(Kemp & Schot, 1998)
19	Undesirable social & environmental effects	Supplier Network Strategy	(Kemp & Schot, 1998)
20	Accidents or events	Lead user Approach	(Ortt, Langley, & Pals, 2013)
		Geographic Approach	(Ortt, Langley, & Pals, 2013)
21	Macro-Economic aspects	Lead user Approach	(Ortt, Langley, & Pals, 2013)
		Geographic Approach	(Ortt, Langley, & Pals, 2013)

Table 3.16 Summary of the linkage of barriers and strategies on literatures

From Table 3.16 above, it can be seen that the literature has proposed certain niche strategies to solve several specific barriers. Exception happens for collaboration issue barrier, in which no literature mentions about how firms can solve such barriers that emerge in the market. In addition, as have been pointed out previously, in many conditions of barriers, there are several strategies that company can choose to solve it. This is one important understanding taken from barriers and strategy linkage at this point.

3.6 Chapter Summary

This chapter attempted to create a list of barriers and strategies from different sources. Firstly, literatures from strategic niche management, high technology diffusion and base of pyramid are reviewed to look through barriers that inhibit product scale-up. To validate the list of barriers, interviews with experts were conducted. Next, the list of barriers and strategies was validated by desk research on secondary case studies. The outcome of the last validation is a list of pre-specified barriers & strategies that contains 21 barriers and 15 strategies. In addition, desk research was also conducted to create a linkage among barriers and strategies which reveal that in most cases, more than one strategy can be prescribed to solve a certain barrier. The result of the linkage will be compared with the primary case studies in chapter 5.

Case Studies: Methodology & Results

In this chapter, the research will focus on the validation of barriers and strategies identification by the relative importance phase. Figure 4.1 shows the phase highlighted in grey color. Specifically for this chapter, the results from each six case studies will be elaborated. The later phase of the final list of barriers and its linkages will be analyzed in Chapter 5.

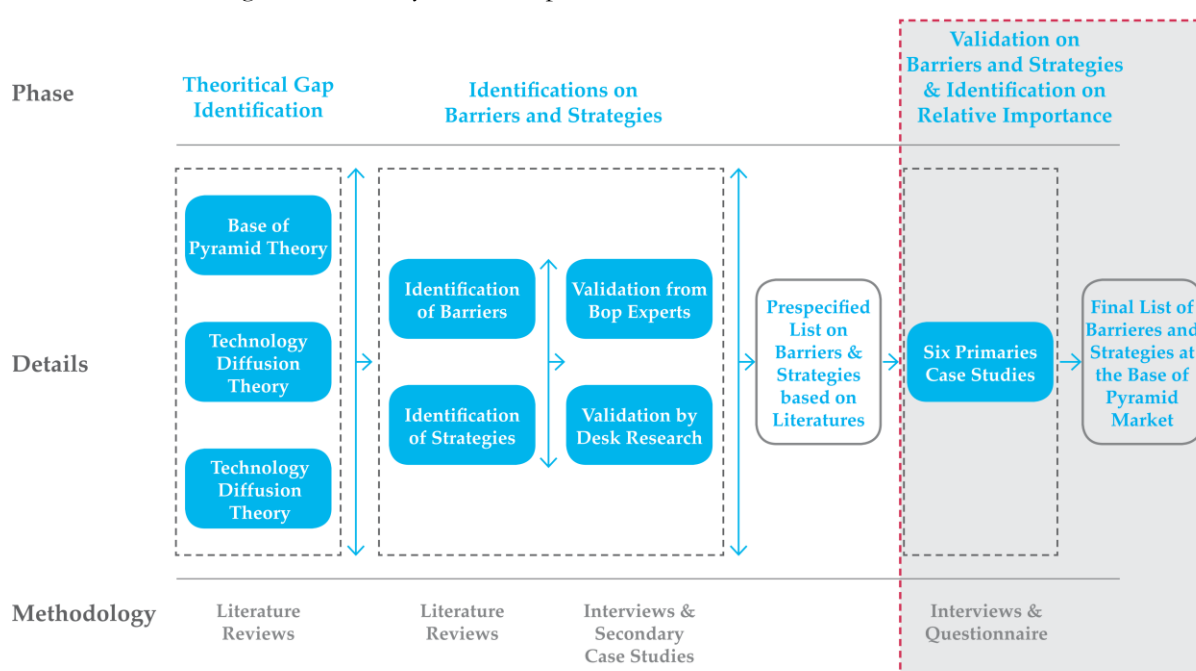


Figure 4.1 Focus on research approach in chapter 4

In the first section, the methodology for the case studies will be specifically elaborated, especially on criteria and processes of company selection. Next, the processes and methods of interviews which have been conducted will be explained. In the following sections, each company case and the outcome of the interviews will be presented. The outcome of the case study includes the barriers, strategies and also the linkage between them. In the last section, summary and findings from the chapter will be shown.

4.1 Methodology

There are several reasons why case studies are important for the research. The first reason is to check whether the pre-specified barriers and strategies have covered all of the relevant barriers and strategies which occurred in the BoP market. By asking companies, the first finding from literatures can be confronted with real case of barriers emergence and related strategies from each companies. Moreover, case studies are also important to find the relative importance of barriers. By having in-depth information from each company, the understanding of the most important barriers that inhibit the company to scale-up its products to the society is expected to be achieved. The scope of case & companies that selected in this research are as follows:

a. Industry and Technology selection

The focus is to get information from technology companies focusing on the BoP market. Several criteria and reasons for industry and technology selection are as follows:

- Consumer needs to directly contribute their income in order to get products or services from the technology. This is important notion to differentiate social business from free products initiative such as grant, which is a usual practice in the BoP market. The company might get the income directly from the end-consumer, or through intermediary such as distributor.
- The first selection process is selecting the companies' industry sector. Two sectors of business: energy and water sector. Energy sector is represented by two technologies: solar lantern and biomass cook stove, while water sector is represented by drinking water purifier product.
- The reason to choose Energy and water sectors because they represent a huge potential business of \$463 billion (Energy \$433 billion & Water \$20 billion) (World Resource Institute, 2007). Moreover, both two sectors are very closely related to the provision of technology as the solution to the poor living condition of the society. In addition, solar lantern business and cook stove business represent two of the most advanced technology provision initiative outside ICT sector.
- All of the selected products are retail or household products, which are believed represent most technologies that are sold in this market and are affordable to consumer need in the BoP market. Moreover, this kind of technology has less complexity in contrast to larger technology such as electricity grid. By choosing simpler technology, it is expected that understanding the crux of the problem will be easier and thus, a foundation to expand to more complex technology will be achieved.

b. Company & regions

Based on the above mentioned selection criteria, several companies are contacted. There are 14 companies contacted, but only 11 which responded to the interview request. From those companies, only 6 companies are finally able to be interviewed. As it has been mentioned in the research scope, there is no constraint of region in the company selection. Selected companies are mostly operating in several countries in Africa and Asia, especially Indonesia. The list of companies and their respective selected product focus can be seen in the Table 4.1.

Companies	Product focus on this research	Based	Main Market
African Clean Energy	Biomass Cook stove	Lesotho	Rwanda, Zambia & Malawi
CV Mandiri	Biomass Cook stove	Indonesia	Indonesia
Holland for Water	Drinking water-purifier	Indonesia	Indonesia
Kopernik	Drinking water-purifier*	Indonesia	Indonesia
Ndassie Solar Engineering	Solar Lantern	Netherlands	Cameroon
D.light	Solar Lantern	China / India	India, Kenya

*) Kopernik also sells other range of products

Table 4.1 List of Companies and its respective products and main market

Table 4.2 below shows the number of products that the companies have already sold up until now to give a perspective about the business scale of each company.

Company	Products Sold
1. African Clean Energy	35,000
2. CV Karya Mandiri	25,000
3. Kopernik	40,000*
4. PT Holland for Water	30,000
5. Ndassie Solar Engineering	0**
6. D.light	7,000,000

*The number covers other technology beside water purifier that Kopernik distributed

** Ndassie has trials in 5 regions in Cameroon, but not yet practically sold the products to consumer

Table 4.2 List of Companies and its respective number of product sold to consumers

From Table 4.2 it can be seen that four companies: ACE, CV Karya Mandiri, Kopernik and PT Holland for Water sold about the same numbers between 25,000 – 40,000 products, while Ndassie is still at the very early stage with product sales. Another company D.light has already sold around 7 million products to their consumer around the world.

4.2 Interviews Methodology

In this section, the methodology for the primary case studies by interviews will be described. First the general information regarding the interview will be given. Next, the detail of the interview process method will be described, which covers the interview questions and questionnaires.

4.2.1 General information

After selecting companies, the next step will be interviewing the company representatives. The interview was conducted via face-to-face meeting or via Skype, telecommunication application software that provides free service for video chat and voice calls from computers and mobile devices. The interview is conducted in either English or Indonesian, which is the native language of the main researcher. The interviews were taken during July – August 2014 period, with each interview takes about an hour. The interview is semi-structured, in which the preset interview questions have been developed. Some questions will be added if any clarification or more in-depth information based on the interviewees' answer is required.

4.2.2 Interview process

The first important part of the interview process is the questions design. As been mentioned previously, the two main objectives for the case studies are; to check the pre-specified of barriers and strategies and to find the relative importance from the list of barriers and strategies. Thus, based on both objectives, the questions are design for such purposes.

a. Opening

In the first part of the interview, the interview is started by giving a brief description of the thesis research. The communication is usually started by e-mail, in which the 300-word abstract describing the main point and the objective of the thesis is provided. At this opening phase, two of the main points of barrier and strategies are informed will be asked to the interviewee.

b. Interview Questions

After finishing the opening phase, the interview questions part is started. The questions design is divided into four sections as follows:

- **Introduction**

In the first part of the interview, understanding of several important things such as the product, the company and also the role of the interviewee in the company is expected to be achieved. This is important to enrich the information that is already publicly available in the company website. This part is also useful as a warm-up question as this question considered to be easily understood by the interviewee. Next, question about factors that help them achieve the success in the market is asked. The specific question has a purpose as a bridge between the first questions about general company introduction and the business situation case, which will help guide the interviewee to move their mindset to start thinking about business barriers that will be asked next.

- **Barriers**

The next questions are about barriers for scaling-up the business. The questions are divided into two phases: non-aided and aided part. In the first phase, the questions about barriers with non-aided way are asked with an open questions method. The aim from this phase is to get the expected Top of Mind (TOM) answers from the interviewee. The TOM answers are expected to give an indication of important barriers mentioned by the interviewee.

In the second phase, the interviewee will be asked about the barriers which are relevant with the business by showing the 21 pre-specified barriers which have been identified previously. The interviewee then will be asked to indicate the relative importance of each barrier by filling in the questionnaire form which has been provided. In most of the cases the interviewees are asked to provide examples of the respective barriers that they encountered. There are two reasons why process is important; first, it provides a direct quantitative comparison among barriers based on the list. Second, it also opens the opportunities for the interviewee to think of other factors that have not been thought previously when the interviewee is questioned in non-aided way.

- **Strategies**

Similar with the *barriers* part questions, question about *strategies* part is divided into two parts, non-aided and aided questions. In the non-aided questions part, open question is given to the interviewee about their company's strategy to scale-up business, while in the aided questions part, 15 niche strategies which have been prepared are presented. The interviewee is asked to indicate the relative importance of each strategy to their business in the questionnaire.

- **Closing**

In the closing part, some of the answers mentioned before are clarified and a linkage between barriers and strategies is made based on the previous answers given by the interviewee. If time permits, some additional questions which have been prepared before are given to the interviewee.

The list of all questions can be seen in the Appendix.

c. Questionnaire design

During the interview session, in the aided question part the interviewee is provided with a questionnaire to help them indicate the degree of importance of barriers and strategies in the list. The questionnaire is given using a Likert scale, using a 7-level degree to indicate the level of importance of each barriers and strategies.

The format of the 7-level Likert scale is as follows:

1. Not relevant
2. Slightly relevant
3. Somewhat relevant
4. Moderately relevant
5. Relevant
6. Very relevant
7. Extremely relevant

The reason to use a 7-level scale instead of a typical 5-level scale in the questionnaire is to avoid the ambiguity of the data outcome due to cultural/habitual perspective. During the company selection process, it has been known that there are going to be at least two interviewees that come from Indonesia. Based on the researcher's past experience, people from the country have a tendency to select their answers towards the medium-scale answer. Therefore, in 5-level scale answer, there will be a tendency to select scale 3 or scale 4.

The outcome of this tendency will make it difficult to analyze the real preference of the person because many of the answers then will be skewed toward these two options only. While the reason behind this is not fully understood, the issue is anticipated by designing the questionnaires using 7-scale. It is expected that the interviewee will give less answered skewed to the medium outcome as it will range from scale 3, 4, 5 and 6 in 7-scale, instead only from 3 and 4 in 5-scale Likert scale questionnaire. The increase of the range of options will help to better analyze the difference of preference from the answers.

For practical reason, Google Form, an application for a simple online survey, is used to present the questionnaire to the interviewee. This is important especially because most of the interviews are not conducted face-to-face. Google Form helps present the questionnaire visually and also helps to consolidate the data for analysis purpose. The detail of the questionnaire can be seen in Appendix.

4.3 Case Results: African Clean Energy

In this section, African Clean Energy will be briefly describe before discussing in details the case result of the company barriers, strategies and also linkage between barriers and strategies.

4.3.1 Company Profile

African Clean Energy (ACE) is a cook stove company that currently sells their products through partners in Zambia, Rwanda and Malawi and also through direct selling at their home base in Lesotho. In addition, the company plans to expand to South Africa in the near future, and other countries outside the African border. As of September 2015, the company already sold 33,000 cook stoves to all of the countries mentioned above.

The product that ACE sells is biomass cook stoves that can burn variety of fuel such as twigs and cow dung, and also processed biomass fuels such as wood pellets and briquettes, which are made from materials such as sawdust and agricultural waste. Thus, the product will give benefit for people as they can replace paraffin and charcoal, which is not very sustainable. It is claimed that the stove can burn almost any type of fuel smokeless by using a gasification process. It gives potential to improve the health and environment in a global scale. Moreover, the stove has a DC connector and USB ports that can be used as additional source of power, which is an important feature especially for consumers that are located in off-grid condition (African Clean Energy, 2014).

At the moment, the company is aiming to get carbon credits as a method of making their products more affordable for low income people. For similar reason, they are also exploring cooperation with micro financial institution (MFI) in their target countries. In addition to the financial initiatives, the company currently initiates a crowd funding campaign through Kickstarter projects (Walker, 2014).

4.3.2 Barriers

The interview with ACE reveals several factors that are inhibiting the companies to scale-up. The key barriers can be seen in Table 4.3.

Questions	Scale	Factors	Quote
Open Questions (Non-aided)	-	Finding reliable partners	"You need someone who is reliable, who has a capital and good plan. Sometimes they are pop-up in country that you wouldn't think"
	-	Working capital	"It's mostly Bill of Material. If you are a manufacturer and you order your components, in a sort of a pre-planned schedule. But you will need a lot of working capital for that. "
Closed Questions (Aided/ Questionnaire)	Extremely Important (Scale: 7)	Financial Capital	Idem with 'Working Capital'
		Inferior Products	"I find it all the time; people sell the poor people lousy products. Because the attitude is that this people poor so we need to give them something very cheap, and this is I think the wrong attitude"

Questions	Scale	Factors	Quote
	Very Important (Scale: 6)	Knowledge of Technology	"We are kind of manufacturing experts, that's what we are good at"
		Production System	"We can flat pack our products so in term of production capacity we almost unlimited"
		Complementary products and services	"So we have commercial operation at the moment in the pellet sectors"
		Suppliers Availability	
		After Sales Service	"We designed our whole business model to make sure our business provide this to people."

Table 4.3 List of most relevant barriers for ACE from interview

From the above table, two of the most important factors for ACE are highlighted: lack of financial capital and finding reliable partners barriers.

Lack of financial capital

It can be interpreted that ACE's concern on the lack of capital is related to two things. First is the need to fulfill the huge market needs to sell the products. ACE seems do not have problem in finding the market to sell the products, but rather currently explore ways to sell their product more effectively, with less cost but still in the fastest way. By doing so, they hope to revolve back the capital quickly to better scale-up their business. In addition, it is understood from the quote mentioned in Table 4.3, the financial capital is required for Bill of Material, which is required to pay their suppliers/manufacturer before they can start producing the products.

Finding Reliable Partners

ACE mentioned another important factor about their collaboration with partners specifically about their resellers, who are mostly pellet producers located in other countries outside Lesotho. ACE mentioned that it is really hard to get good partners. Good partners that they currently have are mostly founded '*with a little bit of luck*' rather than founded systematically. Partners also have shaped ACE's strategic plan, for example choosing countries target for their strategic expansion.

Other barriers

In addition to emphasize the important barriers above, several of other barriers that are related to ACE are highlighted:

- *Knowledge of technology* barrier is mentioned as one of the very important barrier for the company. This barrier is not the problem of the company at the moment, but rather a constraint that they have in the past. Currently the company has developed the third product version, which has been improved greatly compared to the previous versions. ACE believes that they have an expertise in manufacturing the product as can be seen in their quote in Table 4.3.

Moreover, ACE also mentioned several barriers that are slightly or not relevant for them:

1. *Consumer's demand*: The demand of the product is really high and thus they do not find a problem to find the demand or to articulate the consumer's demand of their products
2. *Infrastructure*: In the country that they are currently active, especially Lesotho, the road is fine and thus, they do not find this barrier as a challenge for them
3. *Macro-Economic Aspects*: In general, they feel that the economic in Africa is on the way up and thus, this barrier is not really a constraint for their business.

4.3.3 Strategies

ACE reveals some important strategies that they have executed in the past and will continue to be used in the future as can be seen in Table 4.4..

Questions	Scale	Strategies	Quote
Open Questions (Non-aided)	-	Finding reliable partners	"You need someone who is reliable, who has a capital and has a good plan. sometimes they are pop-up in country that you wouldn't think"
		Constant innovation on the product.	"It's not even in full production yet and we already know where the next step are going to be"
Closed Questions (Aided/ Questionnaire)	Extremely Relevant (Scale: 7)	Demo, experiment and develop	"We are preparing one demo in South Africa, yeah well that's the idea, a road show and combining that with a retail location"
		Access to Finance	"We do crowd funding, so I expect you to follow us on Facebook and kick starter"
		Geographic Approach	"Specifically not just in what country do you do it, also in what part of that country and geographic concentration as much as possible."
	Very Relevant (Scale: 6)	Top of Pyramid Approach	"We do it, by definition in Lesotho, to the people we sell."

Questions	Scale	Strategies	Quote
		Gender Market Approach	"We sell through woman, almost exclusively. in practice almost everyone who buy to us are woman"
		Product Redesign	-
		Dedicated System or stand-alone strategy	-
		Technology Complementary	"This is specifically for the mobile phone, we have a mobile recharging feature"
		Supplier Network Strategy	-

Table 4.4 List of most relevant strategies from interview with ACE

From the above table, three important strategies that ACE has mentioned are highlighted:

Finding reliable partners

The expansion strategy from ACE depends on finding reliable partners that are located mostly in African countries. The company also supports the strategy by creating a product that can be easily assembled, a flat pack product that is suitable for all markets.

Constant innovation of the product & Demo, Experiment and Develop strategy

In relation to their expertise in manufacturing, the company strives to increase the quality of the products through *develop strategy*. Moreover, *product demo* is quite relevant in the condition where ACE wants to penetrate the new market in South Africa. They intend to have an exhibition for consumer in form of a road show to promote the products in the new market.

Access to Finance

The company currently does a crowd funding campaign through Kickstarter platform. They also mentioned that they are looking for a philanthropist that can invest to their company, while bank-lending and selling equity is not an option that they are willing to pursue in the near future.

Geographic Approach

Geographic approach is relevant with ACE as they approach the market by creating 'a pocket' in which they aim for denser population area that can help the product to be sold more effectively. In addition, the company is really flexible in approaching the market outside Lesotho, proven by their expansion in other countries such as South Africa and Zambia.

4.3.4 Barriers and Strategies Linkage

After obtaining several barriers and strategies conducted by ACE at the moment or in the past, there are three main key points from ACE business situation and condition: High quality products, financial capital, and network strategy.

First, ACE focusing on making high quality products has been acknowledged as their main core competence as the "product manufacturer". The novelty of the feature in the stove such as the ability to recharge phone is one of the main feature that distinguishes ACE product with other products in the market. On the other hand, the availability of such feature also can result in more expensive products. In addition, according to ACE, it should not be a problem for the BoP market as the need for such products

is high. Moreover, in some regions they plan to address the affordability issue via micro financing strategy. Focusing on the high quality of product is the strategy that the company takes in order to solve the barriers of inferior products that occur in the market.

Second, the problem of financial capital is mostly related to the delay of Bill of Material and the required capital for them to pay their supplier upfront. The bottleneck has made them pay more expensive price for components because they are unable to achieve a large-scale order. The only clear solution that ACE provides for this is to increase their financial capability in order to achieve a better cost.

Third, another revealed condition is that ACE does not choose their first market in Lesotho solely due to the business conscience, but rather from the network and expertise they have in the market. The fact that the founder has resided in Lesotho prior starting the company has played an important role in choosing the market as the company based. The same way later happened when they decided to expand to other market such as Zambia and Malawi due to the existence of a good partners and expertise in the market. The finding shows that network by finding the right partner is highly important in this market, even more important than other business consideration such as needs or market condition in the specific country. It is believed that flexibility of ACE geographical approach, by not constraining themselves to specific region, has helped themselves to scale their business up to this level.

4.3.5 Summary

The discussion about barriers and strategies with ACE has provided a better idea, not just regarding the company challenges in scaling-up their business but also regarding the phase and development of the business. The important barriers and strategies mentioned by ACE are depicted in Figure 4.2. In the above section of the figure, we depict the company position and consumers are depicted in the bottom part of the figure. In the company attempt to reach consumer, from top to bottom, the company will encounter several barriers and challenges, which positioned about in the middle of the pictures. The writings in red color are some relevant barriers that ACE encounters, while the writings in blue color show strategies that relevant to ACE up until now.

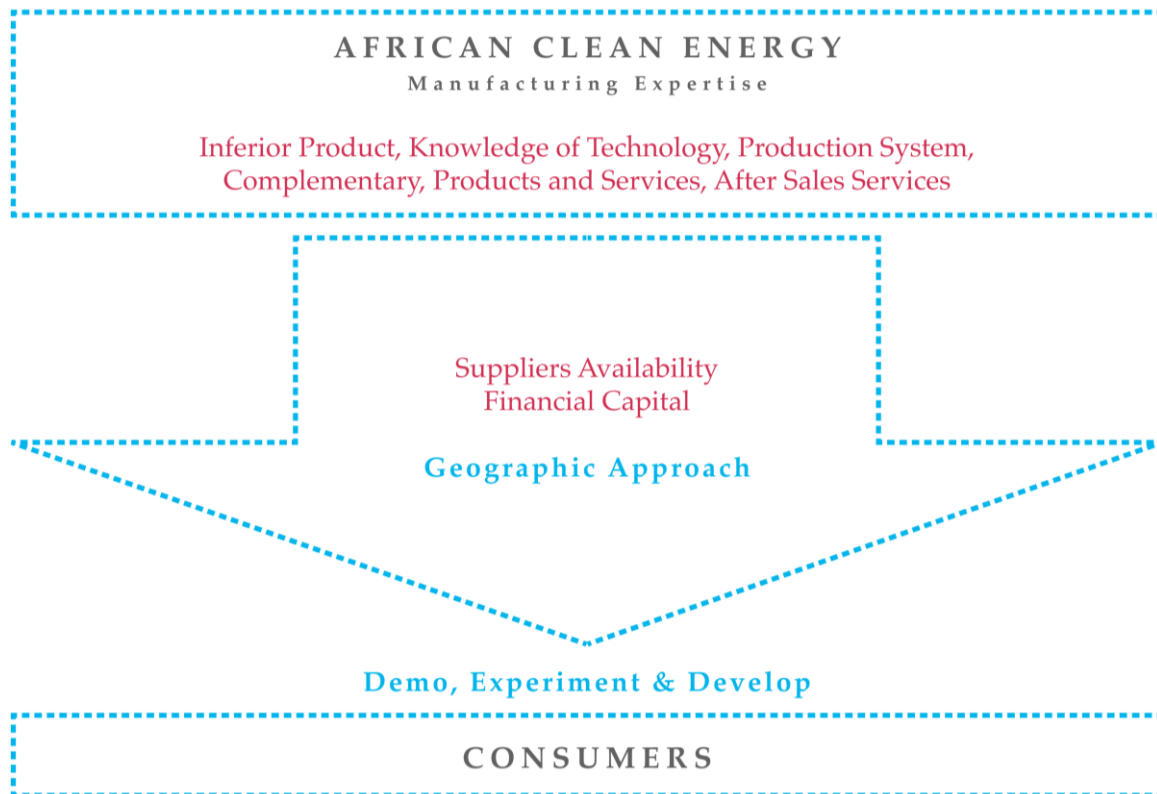


Figure 4.2 Summary of ACE barriers and strategy

In the case of ACE, the company encounters several barriers in the past such as *knowledge of technology* and other barriers that are relevant up until now such as *inferior products barrier*. All of these barriers are quite related with the expertise of ACE, as manufacturing experts who they already have since the company founded. Thus they expect that they can solve such barriers that are related with products.

Meanwhile, at the moment, in their quest to scale-up their business, admittedly the company still in the process of learning to distribute their products to their consumer. At the moment they work with their suppliers that located in different regions to help them distribute and sell their products. Each of these entrepreneur/suppliers required a financial capital in form of credit. Moreover, finding the entrepreneurs that has appropriate competence is not easy, and thus created a problem of suppliers' availability. The problem is addressed by ACE with *geographic approach* that they implement. In addition ACE also do *demo, experiment and develop strategy* to improve their product distribution to their consumers.

4.4 Case Results: CV Karya Mandiri

In this section, the second case from biomass cookstove company CV Karya Mandiri will be briefly described before discussing in details the case result of the company barriers, strategies and also linkage between barriers and strategies.

4.4.1 Company Profile

CV Karya Mandiri is Indonesia-based cook-stove company first founded in 2011. The company was first started by Ir. Muhammad Nurhuda, based on his research on biomass stove in 2008. During the early years, the founder admitted failing to sell the products to consumers due to several reasons. The first reason is from the product side: the stove that he developed was electricity-powered that was not really suitable with the consumers demand. Moreover, the design of the products is less attractive. Second, the government has an initiative to promote the use of LPG (Liquefied Petroleum Gas) stoves; this initiative, complemented with LPG subsidy for the consumers, has created competition for CV Karya Mandiri biomass stoves'. He then decided to redesign the product and joined a business competition which he won in 2010. From this competition he got the first business partner, Inotek, a business incubator, which gave him a loan that later turned into grant to start a company (Nurhuda, 2014).

Since the first version in 2008, the product has gone through several developments. The current version of the product, called Primesquare biomass cook stove, uses solid biomass as fuel such as woodchips and sticks with maximum size of 10-15 cm. Moreover, the stove can also use leaves or plantation residue in the form of pellets or briquettes. The Primesquare stove uses up to 80% less fuel than a traditional cook stove and also produces less smoke (Primecookstoves).

The cook stove uses biomass such as wood and mainly sold in Indonesia. Up until know, the company have already sold around 25,000 cook stove mainly to its home country, Indonesia, and to several African countries. The company mostly sells directly to government body and distributors, although also sells directly to their several customers. One of the main partners of CV Karya Mandiri is the Ministry of Energy and Mineral Resources (ESDM), which regularly opens a tender for the provision of biomass stoves which CV Karya Mandiri has joined several times. Another partner is Prime, which is their distributor specifically for African market.

4.4.2 Barriers

The interview with CV Karya Mandiri reveals some of the relevant barriers to the company that can be seen in Table 4.5 below.

Questions	Scale	Factors	Quote
Open Questions (Non-aided)		Existing Product	"I can say at the moment that it's hard to sell the product, compared to the LPG because LPG is much cheaper because of the subsidy."
Closed Questions (Aided/ Questionnaire)	Extremely important (Scale : 7)	Production System	"I do not have this problem now, but I can imagine of having this in the future"

Questions	Scale	Factors	Quote
		Knowledge of Application	"Because for our product, if the consumer uses it wrongly it can have a lot of smoke and not works well. That's why the distributor and consumer needs to know"
		Affordability	"The society wants a practical and affordable (product), and I realize that my stove is not going to be practical as LPG stove"
	Very Important (Scale: 6)	Collaboration Issue	"I used to have a problem with one of our distributor"
		Consumer's Awareness	"The product is new, thus there is lack of awareness from people"

Table 4.5 List of most relevant barriers from interview with CV Karya Mandiri

From the Table 4.5, several barriers from CV Karya Mandiri are highlighted as follows:

Existing Products

CV Karya Mandiri mentions that the challenges to sell their products, is the existing LPG stove products available cheaply and are supported by the government. The LPG is much cheaper due to subsidy by the government. The condition has affected the demand of the biomass cook stove, proven in 2009, the products has a slump in sales due to promotion by the government regarding the use of LPG stoves.

Production System

The company mentions that this is an important barrier even though they do not have such problem at the moment. They expect this might be a relevant problem for them in the future.

Knowledge of Application

The company emphasizes the importance of using the product correctly, because if used wrongly, the product will not perform as expected. Even though it is still safe, cooking by using the cook stove wrongly can result in a lot of smoke.

Affordability

CV Karya Mandiri emphasizes the concern on affordability of the cook stove, especially compared to LPG cook stove provided by the government for free.

Other Factors

- The company also mentions other problems such as '*collaboration issue*' that once happened with their distributor candidate in Africa. The problem has already been solved, and they do not have any more problems with their new distributor. In addition, they mention the lack of awareness of the products due to the novelty of the products.

4.4.3 Strategies

CV Karya Mandiri mentions several factors related to strategies they execute in the market as can be seen in Table 4.6.

The company does not answer the questions in open questions part regarding strategy to scale-up. It is understood that the company seems to understand the perception of strategy only related to marketing initiatives such as promotion activities. Regardless, the company answers some of strategies that relevant for them in the closed sections and questionnaire part that can be seen in Table 4.6

Questions	Scale	Strategies	Quote
Closed Questions (Aided/ Questionnaire)	Very Important (Scale : 6)	Demo, experiment and develop	"In 2010, the ministry of energy invited us to do a testing and benchmarking, in which our stove results in the best test."
		Access to Finance	"At first we get the finance from Inotek which helps"
		Product Redesign	"Market the responds is negative because the stove still using electricity. So we then introduce the products to the market without blower in the market"
		Government-lead supply strategy	"The government buys the stoves because they have a program"
		Supplier Network Strategy	"in Africa, we sell it through our distributor Prime. This is still new. I do it because I want to know whether my product is suited with the market there"

Table 4.6 List of most relevant strategies from interview with CV Karya Mandiri

Each of the strategy will be elaborated as follows:

- *Demo experiment and develop* is important for the company as they are still developing some products at the early stage and also experiment by joining competition which they won.
- *Access to finance* is important specifically for CV Karya Mandiri when they received the grant to start their company.
- *Product redesign* is reflected by the product development stages. Currently, the company is selling its third version of the products, which is much better than the previous two versions.
- *Government-lead strategy* has helped the company to grow until now. The fact that the company has sold most of their cook stoves to the government projects is one of the highlight of the strategy from the company.

- *Supplier network strategy* is reflected by the way the company tries to expand its market in Africa through collaboration with local distributor in the region. Moreover, the company also has an idea to work with pellet producer in the future.

In addition, it is to be highlighted that CV Karya Mandiri does not mention any barriers as *extremely important* (Scale 7) for strategies. The condition might be an indication that shows a bit of the concern on why the questionnaire is designed using a 7-scale, instead of 5-scale. It shows the tendency of interviewee's answers will skew to the middle range of the scale.

4.4.4 Barriers and Strategies Linkage

Based on several barriers and strategies mentioned above, it is understood that there are some relations between barriers and strategies that the company has experienced so far.

In CV Karya Mandiri case, it can be seen that the company's main challenge is to rival the competition from the LPG stove provided for free by the government. Moreover, the LPG fuel is also subsidized which makes the cost cheaper. This condition has made the aim to conduct direct selling in Indonesian market is harder. Luckily, the company is able to work with the government to apply *government-lead strategy*. The fact that the stove from CV Karya Mandiri is the best high-quality biomass cook stove in the market, proven by the company getting selected by from several project tenders, helps to support the application of the strategy. The *government-lead strategy* also helps the company to solve the problem of lack of promotion that the company has encountered so far. The founder admits not being able to do a lot of marketing initiatives due to his job as lecturer, which takes his available time for the company.

The sales from the government help them to better improve their products. In the early phase, the company struggled to find which kind of cook stoves accepted by the market, *the product redesigning* finally enabled them to find the kind of products that the market wanted.

The company expansion program by finding the partner in other countries will probably become the source of growth in the future. The direct selling approach is predicted to be unsuccessful unless there is a major change in the government regulation in the future. Thus, a *geographic approach* strategy of finding other markets will be one of the solutions. So far, the company has been able to sell around 7,000 stoves in Africa and the number is expected to be growing in coming years.

4.4.5 Summary

In this sub-section we will make a summary on what CV Karya Mandiri barriers and strategies to scale-up business. We sum up their activities in Figure 4.3. In the figure, the boxes represent parties that are involved in the value chain such as company, suppliers and consumers. For instance in the above section of the figure, we depict the company position and consumers are depicted in the bottom part of the figure. In the company attempt to reach consumer, from top to bottom, the company will encounter several barriers and challenges in their distribution processes which positioned about in the middle of the pictures. The writings in red color are some relevant barriers that ACE encountered, while the writings in blue color are strategies that relevant to ACE up until now.

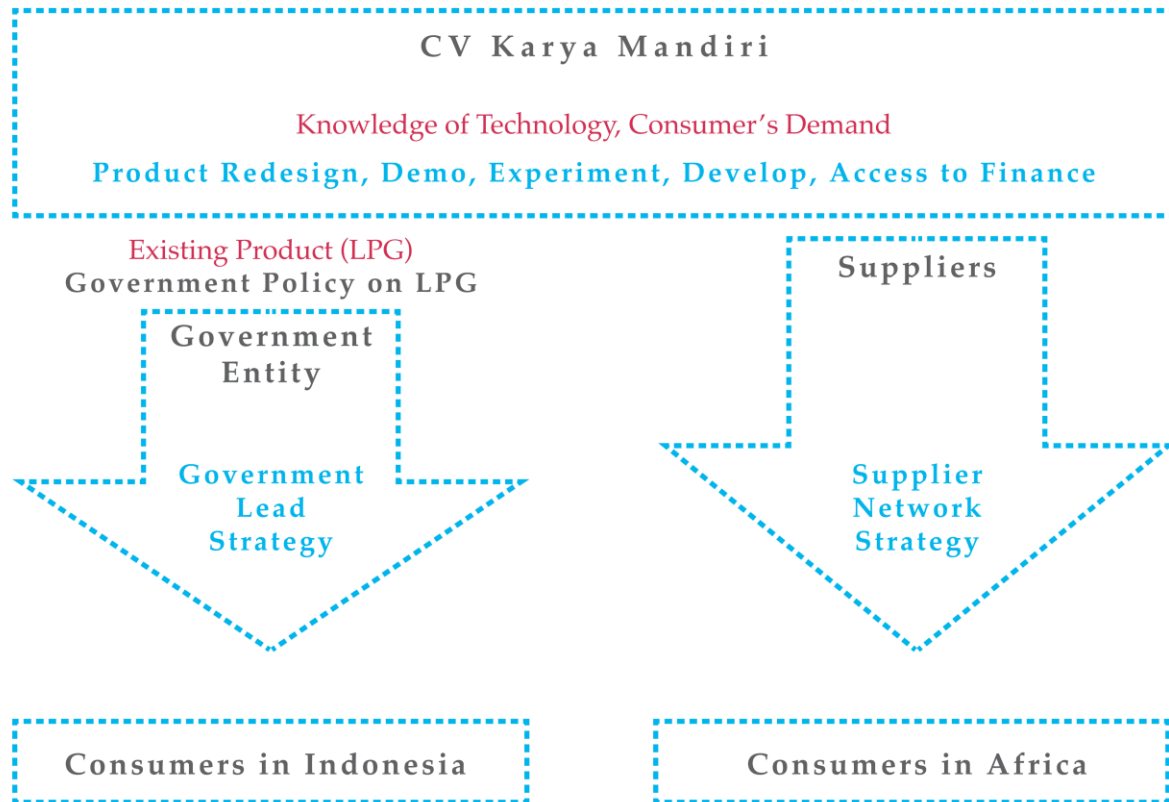


Figure 4.3 Summary of CV Karya Mandiri barriers and strategy

CV Karya Mandiri encounters several barriers such as *knowledge of technology* and *consumer's demand*. The latter especially happened during the early stage of the company development and can be solved by implementing *product redesign* and *demo, experiment, develop strategy*.

Moreover, company realized that the main issue in its home market is the fact that the government policy on LPG, will constrain the demand from the consumers. The company solves the issue by implementing two strategies: *government-lead strategy* and *supplier network strategy*. The former is implemented by cooperating with government entities specifically in Indonesia. The latter strategy is conducted by working with distributors specific to African market. The expansion to other markets will also be interesting as the products are initially made in Indonesia, where the consumers are different from those in African region. By implementing both strategies company can still develop and scale their business.

4.5 Case Results: PT. Holland for Water

In this section, PT Holland for Water; a drinking-water purifier company will be briefly described before discussing in details the case result of the company barriers, strategies and also linkage between barriers and strategies.

4.5.1 Company Profile

PT Holland for Water is based in Indonesia and started by its founder through their understanding of the problem of lack of clean drinking water while they were serving for disaster recovery project in Aceh, Indonesia. The company currently focuses its market in Indonesia, where estimated 90% of their sales come from. In addition, they also sell their products in Burkina Faso & Mozambique. The main target market of their products is the 150 million people in Indonesia that have income of 7 dollars a day and up to now they have already reached 140,000 worldwide. The company aims at reaching 2 million people by 2018.

The water purifier product, called Nazava, uses a ceramic that can filter a particle (0.0005 millimeter). It also uses carbon to help neutralize the chemical substance such as pesticide, and silver to kill virus and other micro-organisms. Thus, the product can filter dirty water and turned it into a drinking water without boiling the water (Nazava).

The company sells most of their products through their resellers located across Indonesia. The approach of selling through resellers is learned from trial and error process for three years of company development. Besides selling through resellers, the company also sells the products through NGOs, which sell to the consumers mostly located outside Indonesia and also through direct selling to their consumers.

4.5.2 Barriers

The interview with PT Holland for Water reveals several factors that are important for the companies. The key barriers which refer to specific example can be seen from the quote in Table 4.7

Questions	Scale	Factors	Quote
Open Questions (Non-aided)	-	Consumers' Income	"The biggest area of challenge is money. People can't take risks to buy something that they think as waste of money."
		Awareness of water quality	"You might know the hygiene awareness in Indonesia is not very high"
		Fund to grow business	"Other challenges of course are very hard to get funds to grow your business"
Closed Questions (Aided/ Questionnaire)	Extremely Relevant (Scale: 7)	Financial Capital	"If you have more money, you can invest it in the marketing in order to scale up faster to grow the company"
		Consumer's Awareness	"The most important barrier is the education; otherwise people just buy. Who needs education about mobile phone? Nobody, right?"
		Affordability	Idem

Questions	Scale	Factors	Quote
		Institutional aspects	“Several times that water filters are kept in the warehouse (in the harbor) because suddenly they need a certain document because the regulation change overnight”

Table 4.7 List of most relevant barriers from interview with PT Holland for Water

Some of the relevant barriers from the interview with PT Holland for Water are highlighted as follows:

Financial Capital

The company requires financial capital to do marketing for their products and to recruit more resellers. The company works mostly with resellers that come from many regions in Indonesia. The resellers are mostly normal consumers rather than business entities that already develop their business before. In order for them to get the products, most resellers at first need to pay PT Holland for Water in full amount upfront by cash.

Consumer's Awareness

The consumer awareness, according to PT. Holland for Water, is enclosed within several aspects. The first one is regarding the consumer knowledge of product existence. The consumer only knows traditional way of processing water, in which through boiling water, thus, an education is needed because consumer is still not familiar with the product.

The second aspect is regarding the problem and the need for clean drinking water. Most of people with low-education level do not understand the danger of consuming water directly from the river or even tap water, which is still not safe to consume in Indonesia. Thus, promoting the need of consuming clean water is required to be spread out as well.

Institutional Aspects

Problem from institutional aspects is specific to the problem in the harbor, regarding the import of some parts of the products which are imported from India and thus, required to pass through the border in Jakarta, the capital city of Indonesia. The company sometimes finds that regulation can change overnight and the goods cannot pass through the border.

Other Barriers

While some of the most important barriers according to PT Holland for Water have been highlighted, there are also several barriers considered not important, for instance, *new technology product* barrier. Because the water filter is a low-tech product, the company does not have any problem developing the technology. Moreover, for Knowledge of Application barrier, although the company considers this an important issue, it is not a problem for them due to the easiness of using the products from the suppliers and consumers point of view.

4.5.3 Strategies

The interview reveals some strategies implemented by the company up until now which can be seen in Table 4.8.

Questions	Scale	Strategies	Quote
Open Questions (Non-aided)		Increase Resellers	“Now we have 52 resellers and we want to increase it to 72. And increase capacity of the reseller. So the reseller can sell (the product) more, from 100 per month we want to increase it to 200 month”
		Financing	“Finding interested investor as many as possible and to improve the training and marketing knowledge of our customers and resellers”
			“So the people can pay in installment, so we reduce the upfront cost”
Closed Questions (Aided/ Questionnaire)	Extremely Relevant (Scale: 7)	Top of Pyramid Approach	“We did a research, that average income of our resellers are for customers for people 1 to 3 million (IDR) a month. If you own 3 million (IDR), it's not the base of pyramid and I consider above the base of pyramid”
		Gender Market Approach	“The target market is arisan and ibu-ibu PKK. Women are responsible to provide water at their house, so they are the one who struggle with this problem”
		Education Approach	“The most important strategy for us is education because you talk about behavior change, and it is more complicated”
		Explore multiple markets	“We try for the first three years to sell it (the Water Filters) through many (distribution) channels. At this moment it is not so relevant, although it's important to keep trying

Table 4.8 List of most relevant strategies from interview with PT Holland for Water

Several strategies to highlight from PT Holland for Water are as follows:

Top Pyramid Approach

The company has conducted their own research in which indicated that on average, the income of their consumer is around IDR 3 Million (USD245) per month that means that the income of the consumer is around USD8 per day. This is slightly higher than the income of the Base of Pyramid definition which has been defined before although they not necessarily target the very top of the pyramid. Even so, the company in general tries to target people that live below USD7 a day in the countries.

Gender Market Approach

One of the ways which the company or reseller sells their products is through the societal group such as *arisan* and PKK. *Arisan* is a regular monthly meeting usually held by women, specifically housewives in Indonesia. PKK (*Pembinaan Kesejahteraan Keluarga*) is a social organization with a purpose to educate women about family matters such as raising child. PKK also has the same regular monthly meeting like *arisan*. Through this meeting, resellers, who are the member of *arisan* or PKK, present the products to the women audience and are able to sell the products.

Education Approach

Education happens through regular meeting of *arisan* and PKK conducted regularly. The company helps provide marketing tools for their resellers that include an education material containing the issue of the need of clean water that can be used to promote the products to their consumers.

Explore multiple markets

The approach has been continuously executed by the company, especially in finding the right distribution channel. During the past three years, the company has tried several ways for example by putting the product in the modern market channel such as supermarket shelf. The company learned that this kind of method has proven to be unsuccessful for the water purifier products. It is understood that the current method of selling through resellers is the way to scale the business forward.

4.5.4 Barriers & Strategies Linkage

The discussion with PT Holland for Water has given some understanding of the company's effort to solve several barriers that they encounter.

The company has tried several approaches through the *explore multiple market strategies*, which are conducted by trying several distribution methods in different locations and places. For instance, the company learned that the problem of awareness due to the novelty of the product can affect the sales in several distribution channels. The condition thus has made the sales at the supermarket is not successful because consumers do not understand and are not aware about the product. A demo or explanation is required before they are willing to buy the product. The understanding of this issue has made the company focusing on selling the product through resellers.

The distribution channel through resellers helps the company to reach people who live in many parts of the countries with no infrastructure such as warehouse to be built. This also enables the company to tap the opportunities and demand by accessing the existing societal meetings such as *arisan* and PKK. In addition, resellers have also helped them solve the *awareness* strategy through training that is given to and conducted by the resellers.

In addition, the company also provides a micro financing loan for their resellers through cooperation with Kiva, a non-profit organization with a mission to connect people through lending to alleviate poverty (Kiva - About Us). Once the reseller meets certain criteria, they can apply a loan from Kiva, which will enable resellers to purchase more goods at one time so that they can scale faster and save shipping costs. The resellers receive loans at 0% and can choose to repay on a weekly, bi monthly or monthly basis (Kiva - Nazava Walter Filters).

4.5.5 Summary

In this sub-section, a summary of PT. Holland for Water's barriers and strategies to scale-up business will be made. Their activities are depicted in Figure 4.4, the above section of the figure depicts the company, while consumers are depicted in the bottom part of the figure. In the company's attempt to reach consumers, from top to bottom, the company will encounter several barriers and challenges, which positioned in the middle of the pictures. The writings in red color are some relevant barriers that PT. Holland for Water encounters, while the writings in blue color are strategies relevant to PT. Holland for Water up until now.

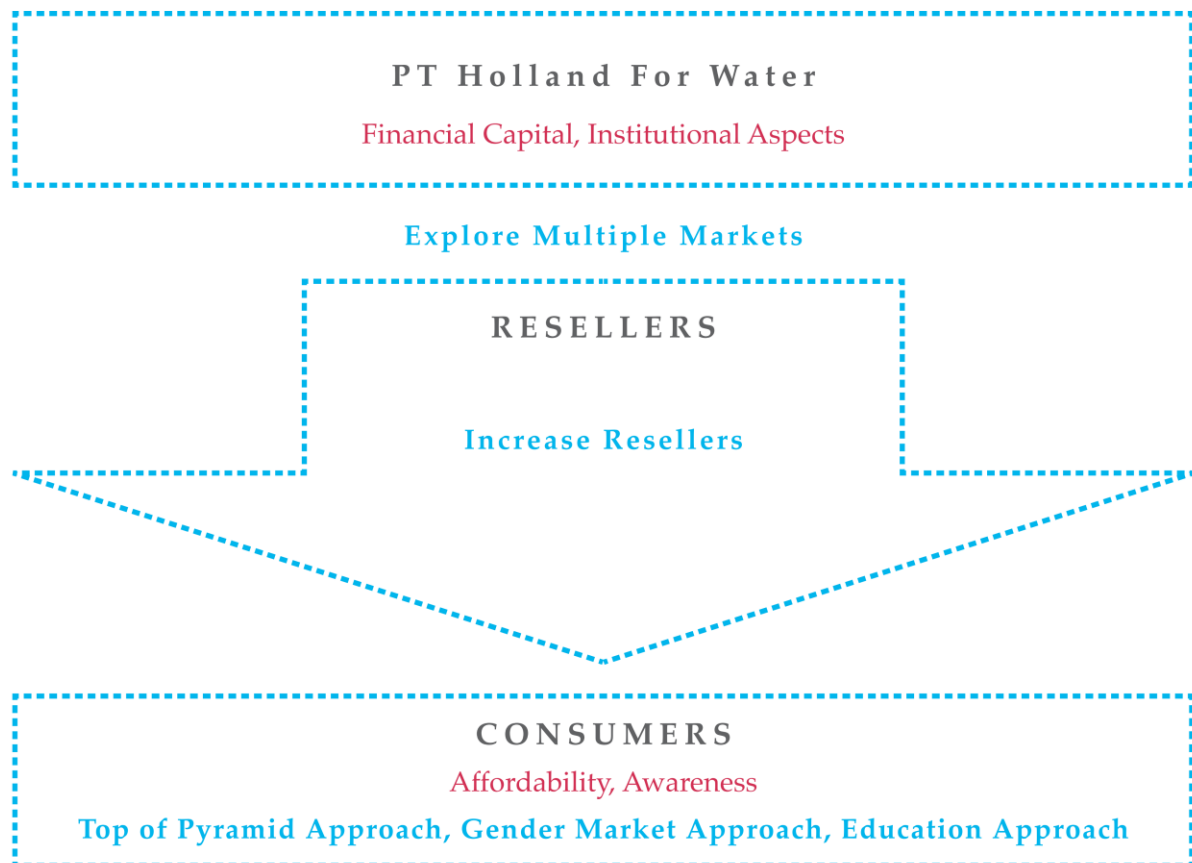


Figure 4.4 The Summary of PT Holland for Water barriers and strategy

PT. Holland for Water finds that *financial capital* is the biggest issues in their effort to scale-up their business, which is coupled with the *institutional aspects* that are especially relevant with Indonesian market. However, the most important thing for PT Holland for Water is the company's effort for a few years to find the right way to expand its market has helped them to achieve its position up to now. In the current situation, the company can grow and expand their business throughout their main market in Indonesia by increasing the number of resellers. This is one of the highlight of the case study, an example of *explore multiple market approach* that the company did in the early years. The learning process from that approach has helped them to find the best strategy. Moreover, the business model which they implement by selling the products through resellers have given them a local potential and perspective which is an important factor for selling in the Base of Pyramid market to solve *awareness* and *affordability* barriers. Resellers solve the barriers by implementing *top of pyramid approach, gender market approach and education approach*. All of these strategies are implemented mostly via informal organizations where most of resellers are active.

4.6 Case Results: Kopernik

In this section, Kopernik profile will be briefly described before discussing in details the case result of the company barriers, strategies and also linkage between barriers and strategies

4.6.1 Company Profile

Kopernik is a non-profit organization founded in 2010 and currently based in Indonesia. The organization has a purpose to help distribute life-changing technologies in many parts of the world. Up until now, the organization has distributed over 40,000 technologies in over 20 countries. It needs to be emphasized that, even though Kopernik is non-profit organization, in most cases they require their consumer to buy their technology, as they do not provide support of giving the product for free. The money that they get from their end consumer is used for operational and also to fund the new projects elsewhere. The company is not only enlisted as Indonesian foundation (*Yayasan*), but also Indonesian Limited Company (*Perseroan Terbatas*) to support their mission in Indonesia (Kopernik, 2014).

The organizations have many kinds of projects regarding technology diffusion initiative in the world, but it is going to be described here two initiatives which are quite related to this research. First, the projects they do outside Indonesia. In these projects, Kopernik work with local organizations in many countries in the world. These local organizations usually request technology to Kopernik directly through information found in the Kopernik website. Kopernik then selects the project and initiate a crowd funding campaign to provide this technology to the local organization. Kopernik expects this local organization to sell these products to their local society, within an agreed time, depending on their capability. Once Kopernik gets the money back from the local organizations, they will use the money to fund their other projects.

The second kind of project is the ones they conduct in Indonesia. In these projects, Kopernik is more directly involved by finding/initiate a local organization to work with them. Kopernik also provides training such as book keeping and entrepreneurship skills for the local organizations, so that they will be able to sell more of the products. The funding of the projects is usually obtained by requesting /getting grant from companies such as from their CSR funding. The money is then used by Kopernik to buy a technology for a society with certain needs such as drinking-water purifier, in most case by direct payment. Once Kopernik gets the technology, they will work with local organizations to sell to the community; this can be done through consignment model or other model that works best in the region. This research will focus on the second part of the organization activities, which are their projects in Indonesia, specifically in drinking-water purifier case.

4.6.2 Barriers

From the discussion with Kopernik, there are several important barriers found that are extremely relevant for the organization; the list of the barriers can be seen in Table 4.9.

Questions	Scale	Factors	Quote
Open Questions (Non-aided)	-	Consumer's Need	"Why sales in Aceh are higher than in the other regions? Because first the needs for (Kopernik's) technology products in Aceh is higher"
	-	Existing societal network	.in Aceh, we work with existing groups of teachers. The latter one performs much better because they already have an existing social group that we do not have to change or create

Questions	Scale	Factors	Quote
Closed Questions (Aided/ Questionnaire)	Extremely Important (Scale: 7)	Financial Capital	“Because to enter the market of remote areas is very expensive and thus company is not willing to market their products to these areas. Kopernik receives grants or donations to cover expenses to pay for initial investment to enter the market, introduce the products, explore possible logistic system and create demand...”
	Very Important (Scale: 6)	New high-tech product	-
		Knowledge of Application	“It's important that we give training for the people/our tech agents/distributors”
		Socio Cultural & Education	-
		Consumer's Demand	Idem with ‘Consumer’s need’
		Consumer’s Awareness	"in certain area, they do not think that drinking water directly from the river is unhealthy"
		Affordability	“The groups have already had activity/job/occupation such as teaching, but the income is low”
		Macro-Economic aspects	-

Table 4.9 List of most relevant barriers from interview with Kopernik

From the discussion with Kopernik, there are several factors to be highlighted that are relevant for them:

Consumer's Need

The first factor that is really important is the consumer’s need of the products. Kopernik highlights the differences of speed of product scaling from two projects as an example, where one of the projects has managed to sell more products in one region compared to other regions. For them, the necessity has played bigger factors here.

Existing societal network

Second barrier mentioned to be important is the existing societal network or group that works with them. The business model they use relies heavily on the capacity of the local organizations that exist in the society. The better the quality or potential of the local organization, such as higher degree of meeting frequency, will help them to sell the products and scale more. Kopernik again mentioned the evidence from two of their projects, where one project performs better due to the existence of better local organizations.

Other factors

There are other factors although considered very important but are not really related with Kopernik operation, especially in water purifier case, for instance, in new high tech product case where they do not have any problem with the product. *Knowledge of application* is considered to be very important as they provide training for the consumer and local organization. This also relates to the consumer awareness, especially regarding the health concern. *Affordability* is mentioned as one of the important barriers.

Macro-economic aspect is also very important, especially related to the differences in general income. On the other hand, factors such as complementary products are not really relevant for the water purifier products because the products can work without the requirement of complementary product. Moreover, accidents have never happened to affect the scale of the products.

Additional Barriers

In the interview, Kopernik mentioned additional barriers that they think have not been covered in the list provided. Kopernik mentioned about the high distribution cost that the company needs to pay which increase the price of the products sold to the community. This condition is especially relevant for the region in Indonesia. The factor is interpreted as closely related to infrastructure.

4.6.3 Strategies

The discussion with Kopernik reveals several strategies that the company identifies to be relevant with their work. The list of strategies can be seen in Table 4.10.

Questions	Scale	Strategies	Quote
Open Questions (Non-aided)		Work with local partners	"We work with existing group of teachers. The latter one performs much better because they already have an existing habit that we do not have to change or create"
		Provide payment options	"..usually with group we give consignment, for individual we give an option for cash"
		Explore different markets/ways	"For instance we try through people of religious group, which we are not really sure at first. Turn out it sells much better than the farmer group"
Closed Questions (Aided/ Questionnaire)	Extremely important (Scale: 7)	Access to Finance	Idem with 'provide payment options'
		Education Approach	-
		Explore multiple markets	-
		Supplier Network Strategy	Idem with 'works with local partners'
	Very Important (Scale: 6)	Demo, experiment and develop	-
		Geographic Approach	-

Table 4.10 List of most relevant strategies from interview with Kopernik

Below are the several strategies which are most relevant with Kopernik:

Work with local partners

The main strategy for Kopernik is to work with various existing societal groups. This method will help them in two ways, to easily access the potential consumers and to help them supervise the payment. The group can work as social pressure especially when consignment model is provided.

Provide payment options

Kopernik provides a consignment model, in which the consumer can get the products first and pay in installment for 3-6 months periods. This model has been proven to be one of the reasons for the consumer to purchase the products.

Explore different markets/ways

This strategy is especially related to the payment and promotion model that are conducted through local organization. Many of the models are context-specific and thus, assumption of a success of a model needs to be kept away and any model or suggestion needs to be tried once the organization comes to the market.

Other Strategies

- Another strategy that needs to be mentioned is the *education approach*. In the context of Kopernik, their reseller in informal organizations is also their product consumer and thus, training such as health benefit of using water purifier is important. Moreover, Kopernik also gives their consumer entrepreneurship training which is really beneficial for the people.
- *Demo experiment and develop* is important for Kopernik, especially when they first try to enter the market. They usually give demo of all of the range of products, with many different brands, and ask the society to select the best technology for them.

4.6.4 Barriers and strategy linkage

Kopernik has provided more insight regarding the organization's effort to introduce life-changing technologies to the society. Some of the strategies they executed are well linked with the barriers that the company encountered.

Kopernik highlights that they are non-profit organization even though they sell the product to the society. The non-profit status has given them advantage in two ways. First, the organization was able to receive grant from donors such as companies. The funding is used for operation, but most importantly to buy the product that they want to sell upfront. As they do not produce the technology by themselves, they source the technology from the technology producers. The second advantage is they do not have the risk of having inventory upfront without selling to the consumer straight away. This luxury condition is not owned by for profit companies. The condition also lets the organization to do a consignment model because the technology is already funded with grant fund, prior it is distributed to the consumer.

Kopernik works with existing informal local organizations. This model has provided them access to the untapped potential consumers that is not reached by traditional sales channel. Most importantly, by working with local organizations, they solve the concerns of the consumers not paying the products because the sellers who come from the local organization are acquainted with the product purchasers. This helps the consignment model that has been mentioned previously to be successful.

4.6.5 Summary

In this sub-section a summary of Kopernik's barriers and strategies to scale-up business will be drawn. Their activities are summed up in Figure 4.5. The above section of the figure depicts the company. Consumers are depicted in the bottom part of the figure. In the company's attempt to reach consumer, from top to bottom, the company will encounter several barriers and challenges, which are positioned in the middle of the pictures. The writings in red color are some relevant barriers that Kopernik encounters, while the writings in blue color are strategies that are relevant to Kopernik up until now.

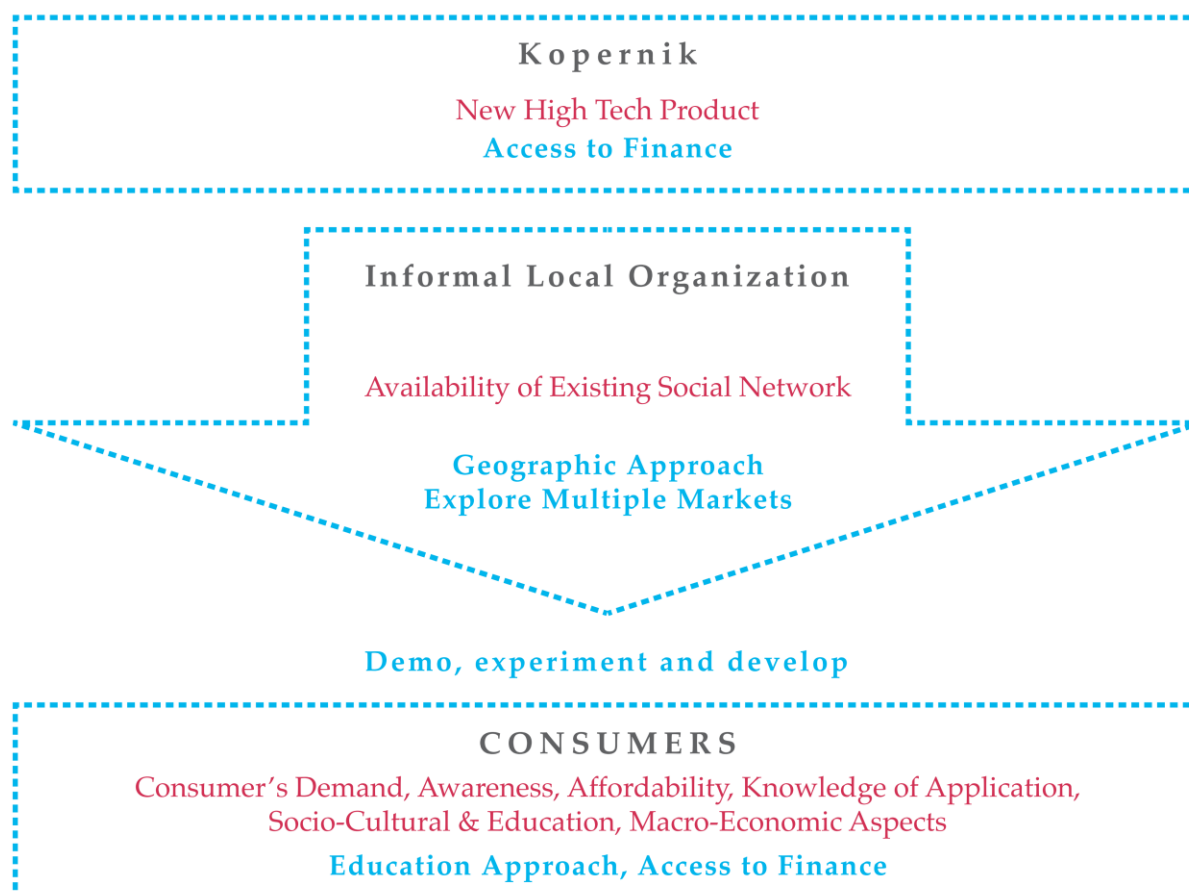


Figure 4.5 Summary of Kopernik barriers and strategy

Kopernik's strategy as a non-profit organization provides an insight on several strategies that can be implemented to tackle some of the barriers that are found in the BoP market. First, the fact that Kopernik sells several products at the same time can solve the issue of *new-high tech product*. The consumers can choose from several products that already function well, with suggestions from Kpopernik. Moreover, the organization's position as an NGO waives the problem of financial capital to certain extent, as the company is eligible to receive grant from companies and other donors.

Next, the company working with informal local organization that works in many different geographic locations is an implementation of *supplier network strategy*. The *supplier network strategy* that is implemented by cooperating with local organization has been one of the models that is very important in the new market where the consumer has low awareness of the products. However, several variations of strategies need to be taken into account and thus, it extends the application of *explore multiple markets strategy*. From the consumer side, Kopernik implementing consignment model, in which the consumer is allowed to receive the product first, and later pay in installment, has helped the organization to scale-up their business. The strategy is important in addressing the affordability issue.

4.7 Case Results: Ndassie Solar Engineering

In this section Ndassie Solar Engineering will be briefly described before discussing in details the case result of the company barriers, strategies and also linkage between barriers and strategies.

4.7.1 Company Profile

Ndassie Solar Engineering, next will be mentioned as Ndassie, is a solar lantern start-up company founded by Jean-Seraphin Kpeguep, who originally came from Cameroon. His initiative to start Ndassie was started when he was visiting his home town and realized the problem of inadequate lighting in his home village. After finishing his study, he won a business competition about solar lights and then decided to start a solar lantern business that fits the need of the people from his home town.

Not only the solar lantern fits to solve the problem of lighting in the community, but also fits the culture and habit of the region. Moreover, it is able to solve other society problems such as high unemployment occurs there. The disadvantage of many solar lighting products in Cameroon is supervision from a person is required to monitor the sun movement and also to guard the lantern because the risk of wild animals damaging the lantern when it is put outside during recharging process. Thus, in many households in Cameroon a person from a household needs to stay at home to take care of solar lantern every day and will not be able to work for the whole day. This issue creates more problems in a country where unemployment rate is already high.

Ndassie then provides a product and business model that aim at tackling the aforementioned problems. The solution that Ndassie provided focuses on *in community light solution*, which means that the solar lantern system fits the society. They provide a solar lighting charger system that is available in the village where the people already have their *firefly solar lantern*, the name of Ndassie's products, can recharge their lantern once every 3 or 4 days here. By doing so, the consumer can concentrate on working in their agricultural field for the whole day and only needs to walk once every 3 days to the solar charging station.

The business model creates a job for a person to supervise the charging station and does not change the habit of the people, as they are used to walking to buy kerosene for the needs. But now the people walk to charge their solar lantern instead. Moreover, the product also provides a feature for mobile charging in the products. Consumer can plug-in their mobile phone device, which is an increasing needs for people in many countries nowadays.

The business of Ndassie relies on their cooperation with local entrepreneurs in Cameroon. Ndassie sells their product such as charging stations to the entrepreneurs, whom Ndassie expects them to be able to reach their network of consumers in the society. They also provides a chance for these entrepreneurs to rebrand their charging station, opens up the chance for multinational companies to give their Corporate Social Responsibility (CSR) budget, and helps reduce the cost for the technology. Ndassie also expects the local entrepreneurs to get the profit from the recharging service they provide to the lantern owners.

4.7.2 Barriers

Some of the barriers identified by Ndassie which affect their business can be seen in Table 4.11.

Questions	Scale	Barriers	Quote
Open Questions (Non-aided)		Consumers' perception	"There is a risk that the end product is not acceptable by the user"
			"Our target consumer groups, mostly in Africa. Thus we need to produce the products beforehand, the products need to be ready in-shelf that requires some funds"
		Financial Fund	
Closed Questions (Aided/ Questionnaire)	Extremely important	Financial capital	"We are currently busy to get more capital and investor on board, so that we can increase our inventory and marketing."
		Institutional Aspect	"At the level of beneficial countries, the price of the product can vary due the custom fee which is different for each country"
	Very Important	After Sales Service	-
		Consumers demand	Idem
		Inferior Products	-

Table 4.11 List of most relevant barriers from interview with Ndassie

From the above table, it can be seen that several factors are considered to be relevant with Ndassie:

Consumer's perception & Financial Fund

Ndassie mentioned that the people in his country and in Africa need to see the product first before they can understand and have the interest to buy the products. This is related to the necessity of the business to have an inventory of products that can be shown to prospective consumers.

Other barriers

In the discussion for other barriers, the after sales service and inferior products are the concern that Ndassie will have in the future. Ndassie mentioned that currently there are many low-quality solar lanterns in the market although this issue is not quite his concern of competition due to the fact that his products have a higher quality. In addition, the after sales service might be needed at the later stage of business, as Ndassie mentioned.

4.7.3 Strategies

The discussion with Ndassie reveals some of the strategies that the company wants to implement in the future that can be seen in Table 4.12

Questions	Scale	Strategies	Quote
Open Questions (Non-aided)		Finding entrepreneurs	"We are looking for entrepreneur to adopt the station as means for additional income."
Closed Questions (Aided/ Questionnaire)	Extremely Important (Scale: 7)	Demo, experiment and develop	"We also create events (to show our products), in Netherlands here and soon in Africa to increase awareness and develop network."
		Top of Pyramid Approach	"That's basically what we do, we sell it to entrepreneurs"
	Very Important (Scale: 6)	Product Redesign	"There is a need for preference for certain countries/region, for example, when you go to tropical areas; the blue color is not really good."
		Education Approach	"We need to train the consumer because this is the new innovation."

Table 4.12 List of most relevant strategies from interview with Ndassie

Finding entrepreneurs

The core of Ndassie's strategy relies on their ability to find as many entrepreneurs as possible located in less-developed countries to sell their products. They do not plan to do other strategies at the moment and thus, that strategy becomes important for them.

Other strategies

- *Demo experiment* is strategy that they do in many of their events, intended for prospective entrepreneurs or companies that have intention to provide them with grant. They also train the entrepreneurs to do a demo, which later will be conducted to their end-consumer.
- *Top of pyramid approach* is related to the strategy to find entrepreneurs. Entrepreneurs that are based in the Ndassie's target countries are mostly people that have above average income.
- *Product redesign* is their concern in the future as they are currently developing their products based on the market in Cameroon. They understand that once they try to expand to other market, they might need to redesign their products to meet specific consumer's need.

4.7.4 Barriers and strategy linkage

Currently Ndassie is still in the early phase of their business. They only have a short term business roll-out, which is expected to be conducted next year. Thus, this condition needs to be understood while making a linkage of barriers and strategies they have or expect to do in the future.

First, Ndassie has the plan to expand to more than 20 countries based on the current contact they have. This strategy will be implemented by finding prospective entrepreneurs located in countries all over the world. This strategy is similar with *supplier-network strategy* which has been identified previously.

Second, even though the company has already done some tests in 5 different regions in Cameroon, there is still a concern that the products is not well accepted in the market, as Ndassie mentioned while answering the questions about business barriers. This concern of products acceptance is identified as very relevant to Ndassie because they are still in the early stage of the business.

Last, the interview with Ndassie provides an insight that inventory problem can be related to socio-cultural or habit in the region. The consumers needing to see the product by themselves first before deciding to buy has created the importance of having a ready stock in their inventory.

4.7.5 Summary

In this sub-section a summary of Ndassie's barriers and strategies to scale-up business will be drawn. Their activities are summed up in Figure 4.6. The above section of the figure depicts the company position. Consumers are depicted in the bottom part of the figure. In the company's attempt to reach consumer, from top to bottom, the company will encounter several barriers and challenges, which are positioned in the middle of the pictures. The writings in red color are some relevant barriers that Ndassie encounter, while the writings in blue color are strategies that are relevant to Ndassie up until now.

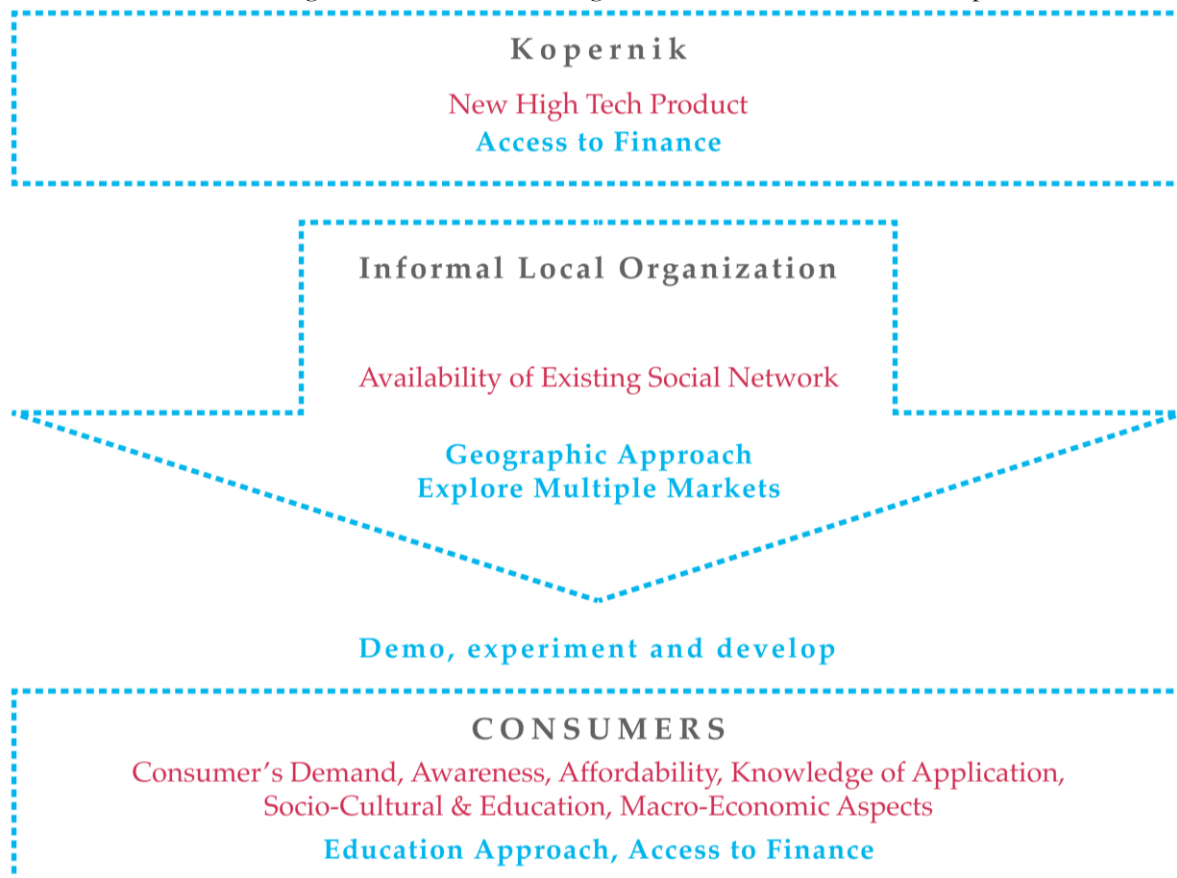


Figure 4.6 Summary of Ndassie barriers and strategy

Ndassie focuses on providing technology that is relevant to their market and approaches the way to scale-up by identifying the prospective entrepreneurs, whom they expect to sell their products to consumers. The entrepreneurs are expected to make a profit through the service of recharging the lantern, which they provide to the consumers. This model is quite relevant to the home of Ndassie in Cameroon and they expect to be working as well in other countries. On the other hand, the company still has a concern whether the consumers will demand their product which is also exacerbated by the fact that there are many inferior products in the market.

It can be said that the way Ndassie works with entrepreneurs can be categorized as *supplier network strategy*. By definition, according to Ndassie, they also implement the ToP pyramid approach as the entrepreneurs are usually people with above average income or status. The entrepreneurs are also expected to assist the company on education approach strategy to their consumers.

4.8 Case Results: D.Light

In this section D.light company profile will be briefly described before discussing in details the case result of the company barriers, strategies and also linkage between barriers and strategies.

4.8.1 Barriers

D.light is for profit social enterprise founded in 2006, selling range of solar lantern products all over the world. The company started their operation in China and India, and up to now has sold the products in 62 countries, with around 12,000 outlets located globally. Since founded, the company has sold 7 million units and impacted 40 million lives globally. The company currently has 400 employees (d.light).

The company started its business in selling affordable solar lantern and now expanding into solar lanterns that provide more features. It has 4 kinds of products: D. light S2 and S20 – affordable solar lantern, S300 –premier lantern with mobile charging feature, and D20 a solar home system. All of the products are intended for covering the different needs for people in the BoP market.

The company sells the products in two ways. First, in their primary markets, in 6 countries such as Kenya and India, the company directly sells to the communities through the company's own networks. That means the company develops its own supply chain channels such as warehousing and also sales agent directly in the field. Second approach is by selling through their partners to the rest of the countries, approximately 56 countries. In this market, the company exports their product to their partners who then develop their own methods to sell the products. The company first sells the product through the later approach, before it finally grows and thus decides to expand by growing and invest in building their own network in several primary countries. Each of the approach contributes equally, around 50% to the business.

Recently, the company introduces pay-as-you-go method for their D20 product. Pay-as-you-go (PAYG) provides their customers with option to buy D.light product via mobile payment system. The PAYG allows customers to buy solar system by credit; in which the customers can put initial deposit and pay the solar system daily in installment for a period of one year (Lighting Africa, 2014).

4.8.2 Barriers

The discussion with D.light reveals several barriers that the company encounters as can be seen in Table 4.13.

Questions	Scale	Factors	Quote
Open Questions (Non-aided)		Working Capital / Financing	"..financing is a big one, for the whole distribution chain and also to consumer as we try pay-as-you-go and other financing models."
		People investment	"I think it will also be a challenge for our systems capacities to keep pace with our sales growth. It is always a challenge to grow from small social enterprise to a global multinational company"

Questions	Scale	Factors	Quote
		Risk of Counterfeit	“Risks for our market include the proliferation of copycat and counterfeit products”
Closed Questions (Aided/ Questionnaire)	Extremely Important	Financial Capital	Idem
		Affordability	-
	Very Important	Consumer’s Awareness	-

Table 4.13 List of most relevant barriers from interview with D.light

Working Capital / Financing

D.light mentions that the need of working capital is very important for them even in the future. The financing will be needed for instance, when the company gives credit to their partners and also to start a pilot project.

People Investment

D.light highlights that the investment of the highly experienced people is one of the factors that helps the company to be successful so far, on the other hand it can also create challenges as the company grows from a small social enterprise to a global multinational companies. The management capacity and also making sure that the company culture remains intact will be huge challenges. In addition, D.light also mentions that the company’s ability to invest in people is one of the factors that other similar companies in the industry are not able to do. The people investment is possible because the company is able to get the support from the lenders such as social venture capital which does not push for profit, especially at the early stage of the company.

Risk of counterfeit

The fact that the company aims at global scale creates a risk of copycat and counterfeit products. This is a risk that company needs to take into account in the future.

Other factors

Although does not specifically mention the reason, D.light points out that financial capital and consumer awareness are very important factors for the business to scale-up in the future. This will be represented in the strategy that the company pursues in the next section.

4.8.3 Strategy

Several of the most relevant strategies for D.light can be seen in Table 4.14

Questions	Scale	Strategies	Quote
Open Questions (Non-aided)		Expansion through local partners	“We will continue to do a mix model for distribution, including partnerships in some markets and direct sales in other areas”
		Increase penetration/direct sales in priority market	
		Pay-as-you-go strategy	"Pay as you go or product financing is going to be really crucial to address the affordability challenge. We are currently working on piloting different models in different countries, and our model will be country specific. The challenge is going to be how we will scale the financing of products globally"
Closed Questions (Aided/ Questionnaire)	Extremely important (Scale : 7)	Demo, experiment and develop	“We are currently working in piloting in different countries”
		Access to Finance	“Financing is a big one, for the whole distribution chain and also to consumer as we try pay-as-you-go and other financing models.”
		Explore multiple markets	“We have very flexible model, we do not have one model that we do everywhere similarly. We are very context-specific, each country will depend on different local partners and conditions in the specific regions”
		Supplier Network Strategy	Idem

Table 4.14 List of most relevant strategies from interview with D.light

Expansion through local partners & direct sales in priority market

The company is willing to continue the strategy that has helped them grow to this level. In more general term, they are aiming at breadth of business through increasing the number of partners in countries all over the world. At the same time, they try to increase their market depth, in term of penetration depth by focusing on direct sales in their priority market.

Demo Experiment & Develop

The fact that the company keeps improving their current product line, proven by the launching of the new product D.20, shows that they keep developing from the technology side. In addition, the company also experiments in the new distribution scheme such as the pay-as-you-go model that was launched early this year.

Access to finance

The company is not yet commercially bankable and thus, going to need the fund, not from the bank, but from the lenders that are more socially conscious. Moreover, the company is also working with some Micro Financial Institution (MFI) to provide financing for consumers.

Explore multiple markets

The fact that the company currently selling the products to various countries in the world shows that the company tries to explore market without only focusing in their priority market.

Supplier network strategy

This strategy is represented by the D.light business model of working with local partners in many countries in the world

4.8.4 Barriers and strategy linkage

The company's success up until this stage is related to the ability of the company to solve the barriers that they encounter, by implementing certain strategies that fit the barriers. Some of the relation of barriers and strategy that they encounter are as follows:

The model of business that D.light conducts has helped the company to achieve their objective, which is a global scale business. The objective is represented by a product strategy, which is relevant to various countries, not only one country or region, and also through partnership strategy, in which the company does not do many investments outside their priority countries. The company realizes that the market is really context-specific and the local partners they work with are expected to understand the best approach for the market where they work. The application of the strategy represents *suppliers network strategy* and *explores multiple market strategy*, which is also required to solve the financial barrier that they have.

It is evident that the main barrier of working capital also occurs in a big company such as D.light. The fact that the company works with many partners, which many of them require credits, might exacerbate the problem. However, the company might be helped by the fact that they can find an investor who does not push for profit especially at the early stage of the company growth. The condition has helped them to achieve the scale that they want.

The affordability concern of the BoP consumers is addressed by the company by providing pay-as-you go model and also by working with several MFI in the market. The new distribution model is also possible due to their experiment not only in technology side, but also in distribution side. The balance between product and distribution/marketing development has been mentioned as one of the factors that make them successful up until now.

4.8.5 Summary

In this sub-section a summary of D.light barriers and strategies to scale-up business will be drawn. Their activities are summed up in Figure 4.7. The above section of the figure depicts the company position. Consumers are depicted in the bottom part of the figure. In the company's attempt to reach consumer, from top to bottom, the company will encounter several barriers and challenges, which are positioned in the middle of the pictures. The writings in red color are some relevant barriers that D.light encounter, while the writings in blue color are strategies that are relevant to D.light up until now.

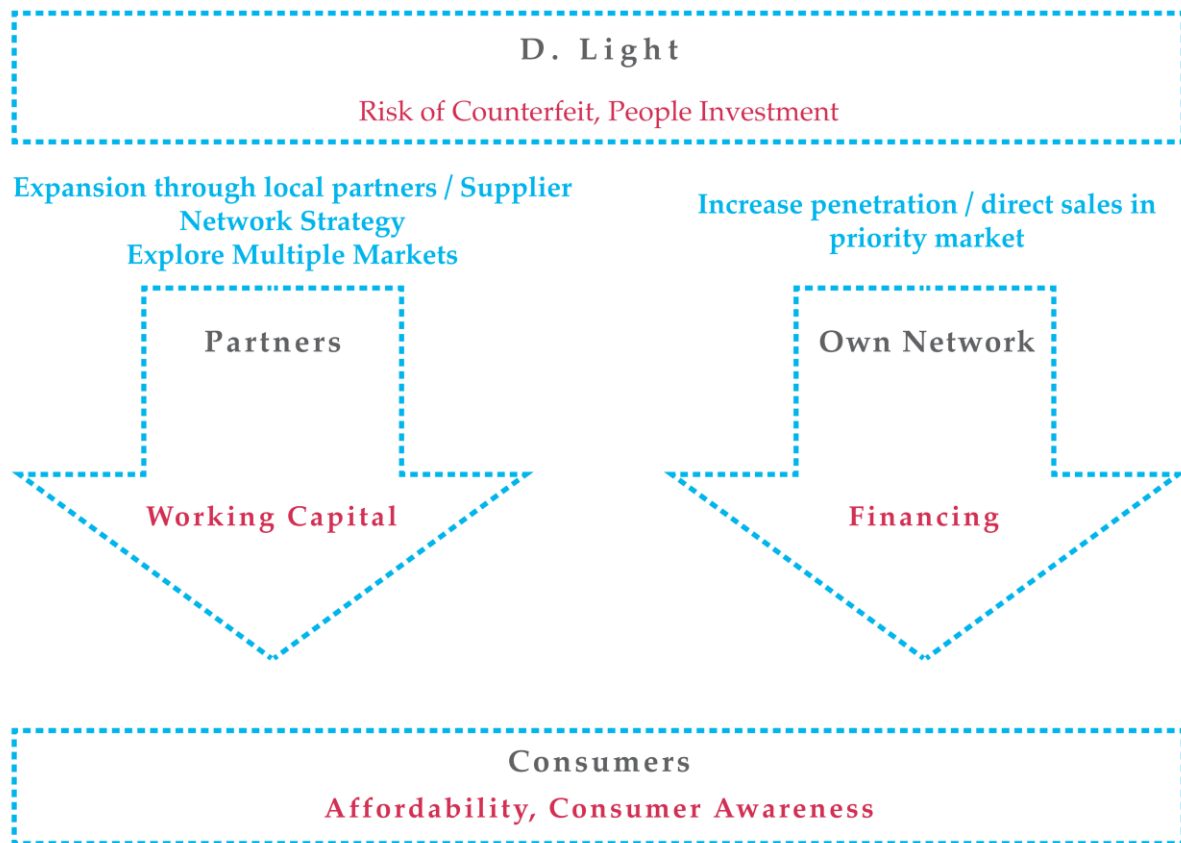


Figure 4.7 Summary of D.light barriers and strategy

D.light has existed in the market for about 8 years, and since then they have grown as one of the leading solar lantern company that focuses on the base of pyramid market. Product scaling-up has been the target that the company aims since founded and is represented in the products, which are relevant with the global market, and also in the expansion model of working with many local partners all over the world. While the expansion will be continued in the future, the company also understands the need to penetrate certain markets, where the business starting to develop. In this market, the company is going to need different strategy for distribution and marketing by developing their own network and investment, which requires a financial capital.

In addition, as the company grows into a global scale, a risk of counterfeiting is increasing. From the internal company, the company growth may create a challenge in term of people development. The culture of the company needs to be adapted, from the small social enterprise into a big multinational company.

4.9 Case Analysis & Summary

The aim to find the barriers and strategies from case analysis reveals several important factors. One of the most pertaining indication is that barriers and strategies are context specific, in term of time (dynamic barrier), and also region and product range. In term of strategy, the starting point or competence of a company can affect the way the company solves the barriers. Several important notion from the case studies as follows:

First, in term of barriers as context-specific, it is understood that barriers change overtime. In several of the interviews, companies indicate that they had several problems in the past which no longer a concern at the present time. The condition for instance, happens in relation to *high-tech product* and *knowledge of application* barrier. The example can be seen from the quote below:

"Our product (now) is functioning really well. In terms of, we have a previous model, in which in a field we have couple of issues, none very serious. I mean those are the thing we improved with this (product) one" - (Walker, 2014)

"..in 2008 at first, but when we promote this to the market the responds is negative because the stove still using electricity, the society wants the stove to be powered with no electricity at all" – (Nurhuda, 2014)

Thus, barriers seem to emerge relative to time or in some orders / sequence. The evidence can also mean that barriers that companies encounter are dynamic depending on the situation and also condition of the company.

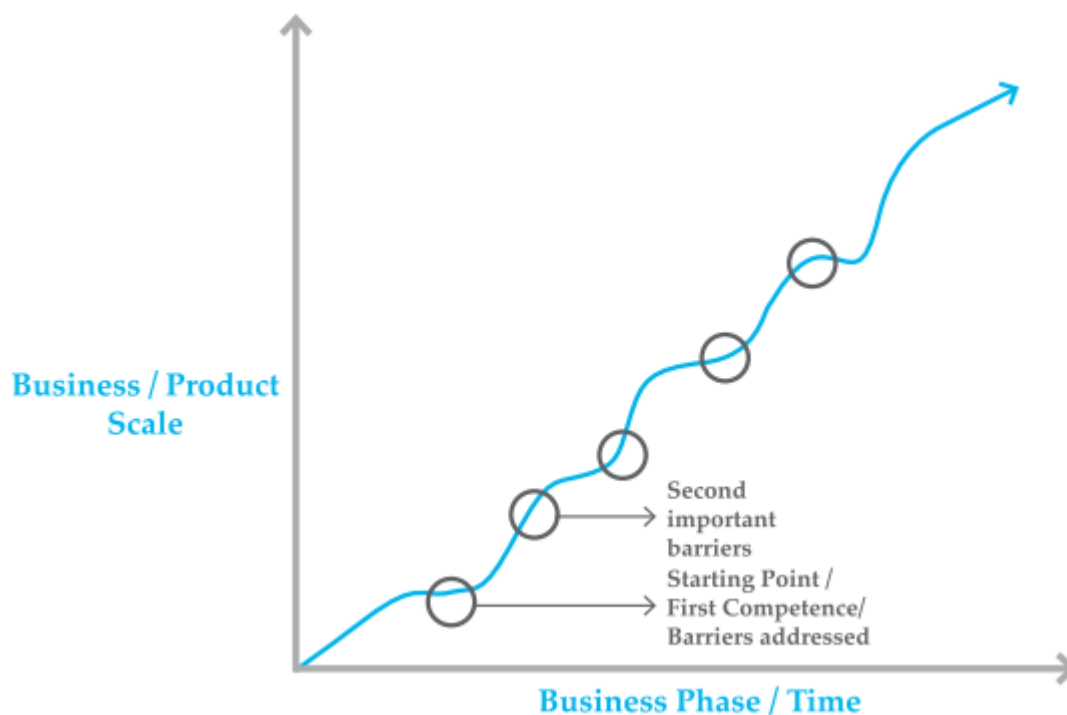


Figure 4.8 Illustration on dynamic barriers on time

Moreover, the barriers that the companies encounter at the beginning will be different depending on the starting point of the companies. This starting point can be affected by several factors such as the company's core competence and partners they acquire at the early stage. This starting point will shape how the company react and thus, will relate to the kind of barriers they consider important. To illustrate this, several quotes can be seen below.

“We are kind of manufacturing experts, that’s what we are good at. Distribution is a new capability, but we are working on that” – (Walker, 2014)

“(at first)I do not really intend to sell the product anyway it’s just my side project as researcher. So we then introduce the products to the market without blower in the market, and the responds is quite positive.” – (Nurhuda, 2014)

“I come from engineering background, the quality of the products, should be the first thing.” – (Kepguep, 2014)

In three cases from ACE, CV Karya Mandiri and Ndassie, all of the companies have expertise in product development and manufacturing. The situation has made the first barrier of *new high tech product* become their first main barriers that are relevant and need to be tackled first. ACE and CV Karya Mandiri currently sell the third version of their product, while Ndassie just finished their pilot project in Cameroon. The pattern indicates that the product solution seems to be the barrier that the companies found at the beginning, but their expertise help them to grow up until now. The effect of starting point or competence can also change the way companies choose a strategy to solve certain barriers. It will be further elaborated in detail in the next chapter, when barriers and strategies across case studies are compared.

There are also some barriers found to be context-specific for certain regions and not applicable to other regions. Some of the examples can be seen from the quotes below:

“For Institutional and regulation it’s really context specific, in India it is a problem because of the kerosene subsidy. In Nigeria it is a different problem, while in Kenya tariffs and subsidies are not a problem (Montgomery, 2014)

At the level of beneficial countries, the price of the product can vary due the custom fee which is different for each country (Kepguep, 2014)

“The import regulation in Indonesia can sometimes be troublesome” (Heederik 2014).

“It’s not really a problem that we have, we are in South Africa and Lesotho, the road is fine” (Walker, 2014)

From the quotes we can see that several barriers such as institutional aspects and infrastructure are quite regional specific. The kerosene subsidy or import regulation as mentioned in the quotes can be troublesome in some countries, while it is not an issue in other countries. Similarly with the infrastructure issue that seems not a problem in several countries.

From this chapter, it can be concluded that each company that have been interviewed can indicate the barriers and strategies that they encounter in the market. Specifically, each of the company has a notion on the relative importance in which they know the most important barriers and also the important strategies that they need to execute to solve each barrier. But on the other hand, this chapter also reveals the notion on context specific barrier where barriers can be specifically related to company, region, product or time. In the attempt to understand the barriers that are relevant to the BoP, it is important to understand this notion as a barrier which may be considered important for the whole BoP market, or only for the specific company, market, and region or time constraint. In order to understand about context specific barriers, the barriers and strategies will be further analyzed in the cross-case analysis in chapter 5.

Cross-case analysis

This chapter will continue to analyze the result of the six primary case studies. In previous chapter, the analysis of case studies is conducted separately, while in this chapter the analysis will be carried out more holistically across case studies. From the Figure 5.1 the phase that is covered in this chapter is highlighted in grey color.

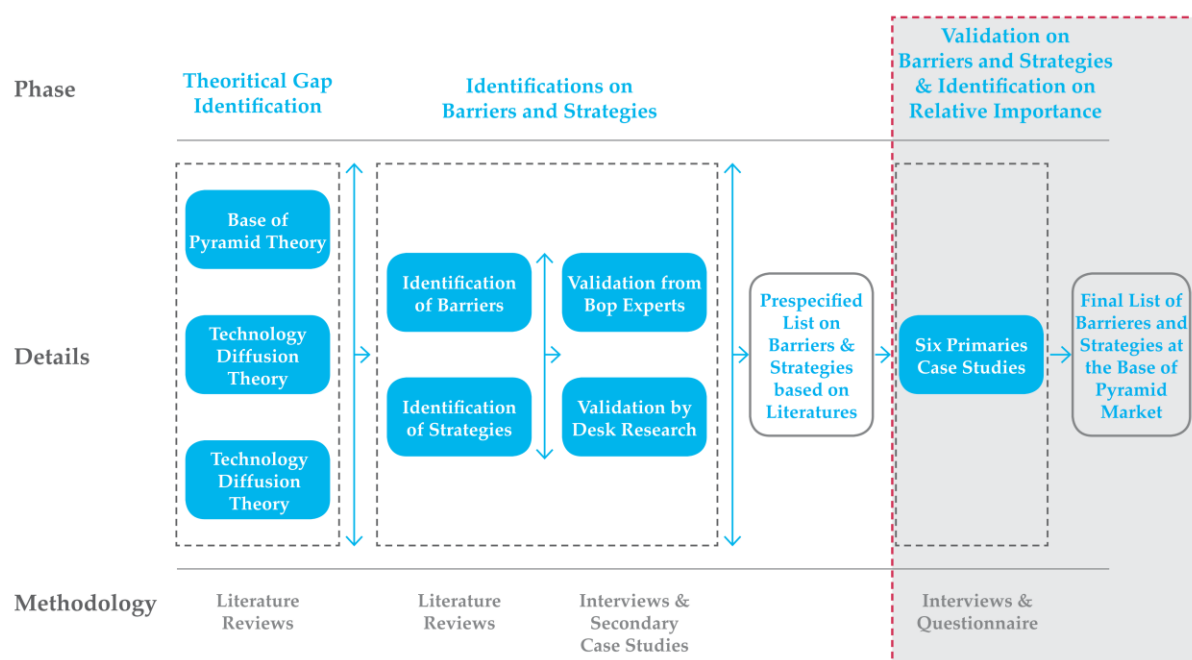


Figure 5.1 Focus on research approach in chapter 5

Cross-case analysis will be conducted by analyzing the answers from both open questions and close questions from interviews. From both answers, the comparison such as similarities and differences among cases will be analyzed. Specifically, the relative importance on each barrier and strategies will be observed. Last, the linkage between barriers and strategies will be constructed based on the interviews.

5.1 Barriers Analysis

In this section, the findings about the barriers at the BoP will be further elaborated. Answers from the non-aided section in the interview from open questions will be first analyzed. Next, answers from aided questions part of the interview from questionnaires will be analyzed.

5.1.1 Codification on Barriers from Open Questions

From open questions part, all of the companies answer the questions based on their own interpretation. Some of their answers can actually fit the pre-specified barriers that have been set previously, but however, some answers need to be coded first. It can be analyzed that there are three types of answers. First, the answers of barriers fitly match the barriers that have been identified and mentioned in the pre-specified barriers. Second, the barriers mentioned are enriching the definition of barriers which have been identified previously. In this condition, the barriers mentioned by companies fit the pre-specified barriers but are not 100% similar. Last, the barriers mentioned are totally new and thus, can be added to the pre-specified barriers list.

Each company reveals several answers that are required to be coded and defined although the answers actually meet the definition of barriers which have been developed in the list. Answer from companies and the categorization of all barriers can be seen in the Table 5.1.

No	Company	Barriers (Open Questions)	Barriers Code/Category	Condition	Details
1	ACE	Finding reliable partners	Suppliers availability	Enrich previous definition	Expanding the definition of suppliers availability
		Working capital	Financial Capital	Matched	The definition is covered
2	CV Karya Mandiri	Existing Product	Consumer's Demand	Matched	The definition is covered
3	Kopernik	Consumer's Demand	Consumer's Demand	Matched	The definition is covered
		Existing societal network	Suppliers Availability	Enrich previous definition	Expanding the definition of suppliers availability
4	PT Holland for Water	Consumers' Income	Affordability	Matched	The definition is covered
		Awareness of water quality	Awareness	Enrich previous definition	Expanding the definition of awareness
		Fund to grow business	Financial Capital	Matched	The definition is covered
5	Ndassie	Consumers' perception	Socio-cultural	Enrich previous definition	Expanding the definition of socio-cultural
		Financial Fund	Financial Capital	Matched	The definition is covered
6	D.light	Working Capital / Financing	Financial Capital	Matched	The definition is covered
		People investment	Natural resources & labor	Enrich previous definition	Expanding the definition of awareness natural resources & labor
		Risk of Counterfeit	Inferior product	Enrich previous definition	Expanding the definition of inferior products

Table 5.1 Cross-case analysis on Barriers at the BoP

5.1.2 Relative importance Barriers

One of the objectives from the research is to find the relative importance of barriers at the BoP. For this purpose, the open question about the important barriers mentioned by the companies will be analyzed first, then, the barriers from the close questions/questionnaire will be analyzed next.

Barriers from open Questions

From the open questions, it can be seen in Table 5.2 that financial capital is the most important factor mentioned by companies. Four out of six companies directly mentioned *financial capital* as the most important barriers. The second most mentioned factors are *consumer's demand* and *socio-cultural & education* factors.

No	Barriers Identification	Company
1	Financial Capital	Ndassie
		ACE
		PT Holland for Water
		D.light
2	Suppliers availability	ACE
		Kopernik
3	Consumer's Demand	CV Karya Mandiri
		Kopernik
4	Socio-cultural & Education	Ndassie
		Kopernik
5	Inferior product	D.light
6	Natural resources & labor	D.light
7	Affordability	PT Holland for Water
8	Awareness	PT Holland for Water

Table 5.2 Barriers Identification from open questions

Barriers from closed Questions

From the questionnaires, categorization of barriers will be made based on their relative importance. First category is for the barriers that are very relevant to business at the BoP, the second one is for barriers that are context specific to region or products, and last one is for barriers that are not very relevant. The full categorization scheme of barriers can be seen in Table 5.3

No	Category	Rules
1	Essential barriers at the BoP	Barriers are mentioned as at least 'Relevant (Scale 5)' from questionnaires by at least 4 companies
2	Context-specific Barriers	Barriers are mentioned as at least 'Relevant (Scale 5)' by more than 1 companies, but less than 4 companies
3	Less Relevant barriers	Barriers are mentioned as at least 'Relevant (Scale 5)' by only one or less companies

Table 5.3 Categorization scheme for barriers importance

The interpretation and reasons of categorization scheme of each category of barriers are as follows:

1. Essential barriers at the BoP

Barriers included in this category are mentioned as at least important or relevant by majority of the companies that have been interviewed (four out of six). Thus, the barriers at this category are considered essential for the BoP market as a whole, regardless the factors of regions, industry, and companies.

2. Context-specific barriers at the BoP

Barriers included in this category are mentioned as at least relevant by at most three companies, but not by the others. Barriers mentioned in this category are positioned at the middle as some companies consider the barriers important while others have different opinion on their importance. Thus, it is interpreted that the barriers in this category may be considered important for some companies due to context-specific factors, such as regions, industry, and companies.

3. Less relevant barriers at the BoP

Barriers in this category are considered less relevant by majority of the companies. With at least 5 out of 6 companies mention the barrier as ‘moderately relevant’ (scale 4) at most. It needs to be highlighted that although the barriers are categorized as less relevant barrier, they might be considered relevant or important for at least one company, this might indicate to certain extent that barrier in this category is a company-specific barrier.




Table 5.4 shows the list of result from the questionnaires. The first column of this table shows the name given to the 21 barriers. The second until the seventh column shows the indication of relevance/importance from each respective company’s answer in the questionnaire; the last column shows the results of summation of all the points from the second to seventh column. The barriers in the first column are sorted by the result of the summation of the total answer from the last column. The reason to sum all of the answers is because it can be an indication of importance of the barriers in the market.

In addition, the first column is also highlighted by different color according to the category of each barrier based on the categorization scheme in Table 5.3. Green color indicates that the barrier is categorized as an *essential barrier at the BoP*, Dark blue color indicates that the barrier is categorized as *context specific barrier*, and last the red color is for barrier that is categorized as *less relevant barrier*.

Pre-specified Barriers	Interviewee						Total
	ACE	CV Karya Mandiri	PT Holland for Water	Kopernik	Ndassie	D.Light	
1. Financial Capital	7	5	7	7	7	7	40
2. Affordability	5	7	7	6	5	7	37
3. Consumer's Awareness	5	6	7	6	3	6	33
4. Institutional aspects	5	5	7	2	7	4	30
5. Knowledge of Application	3	7	5	6	3	5	29
6. Production System	6	7	5	2	3	5	28
7. Consumer's Demand	1	5	5	6	6	5	28
8. Infrastructure	2	5	5	4	5	4	25
9. Natural Resources & Labor	5	5	5	5	2	3	25
10. After Sales Service	6	4	2	2	6	5	25
11. Inferior products	7	1	2	3	6	5	24
12. Socio Cultural & Education	3	4	5	6	2	2	22
13. New high-tech product	4	5	1	6	4	1	21
14. Suppliers Availability	6	4	2	2	3	4	21
15. Knowledge of Technology	6	5	1	4	3	1	20
16. Collaboration Issue	5	6	1	2	5	1	20
17. Macro-Economic aspects	2	5	1	6	5	1	20
18. Complementary products and services	6	5	1	1	1	1	15
19. Undesirable social & environmental effects	7	2	1	2	2	1	15
20. Laws, rules and standards	3	4	1	2	3	1	14
21. Accidents or events	3	1	1	1	7	1	14

Table 5.4 Result on barriers importance from closed questions/questionnaires*)

*)7: Extremely relevant, 6: Very Relevant, 5: Relevant, 4: Moderately relevant, 3: Somewhat relevant, 2: Slightly relevant, 1: Not relevant.

	Essential barriers at the BoP
	Context-specific barriers at the BoP
	Less relevant barriers at the BoP

From the result of close questions, similar pattern can be seen from the questionnaires given to companies. The recap of the questionnaires and the rank of the total points each barriers obtained can be seen in Table 5.4. From the table, financial capital is mentioned as one of the most important barriers that inhibit the scale-up of business which five out of six companies considered it extremely relevant. Other factors that are also very relevant to the business are affordability and consumer awareness. Three companies mentioned that affordability as extremely relevant barrier while consumer awareness is mentioned by three companies as very relevant.

From the Table 5.4, it can be seen that nine barriers, highlighted by green color, can be categorized as essential barriers, and eight barriers, highlighted by blue color, can be categorized as context-specific barrier. In addition, based on the table, it needs to be highlighted that although supplier availability barrier has a total amount of 21, which is higher than other context-specific barriers such as knowledge technology, collaboration issue, macro-economic aspects, and complementary products and services, is still categorized as less relevant barrier. This happens because supplier availability barrier is considered at least relevant (scale 4) by one company (ACE), while the other 5 companies considered the barrier moderately relevant. Therefore, although the total point from the questionnaires is high, the barrier is still considered less relevant. However, the supplier availability is mentioned as one of the most important barriers from open question. This issue will be addressed in the next sub-section.

5.1.3 Barriers Result Analysis

In this sub-section, the result of barriers from open and closed questions will be analyzed. There are two things to be analyzed here, first, regarding some contradictory answers from open and closed questions and second, regarding contradictory result from the interviews and secondary case studies.

One issue to be pointed out is the contrast of answers for a barrier, specifically *supplier availability* barrier. Supplier availability is mentioned as an important barrier based on top of mind answer from two companies ACE and Kopernik. On the other hand, from the open questions, the strategy is only considered at least ‘relevant’ (score 5), by ACE, while Kopernik only mentioned the strategy as slightly relevant (score 2). The differences of result might be explained due to several reasons: first, during the codification stage, we codified the activity of Kopernik of working with local informal organizations as *supplier network strategy* because organizations working with Kopernik help them to ‘supply’ / distribute the product to their consumers. This idea might not be understood or misinterpreted by Kopernik, where the scope of supplier availability might be interpreted to be constrained by the technology supplier definition. The issue results in discrepancy of the answer from both closed and open question. For this fact, based on above reasons, the supplier availability is moved to context-specific barrier category, instead of less relevant barrier category. Moreover, the wordings of *supplier availability* will be changed into a broader term of *partner availability*.

Next, from the interviews, it is understood that several barriers need to be adjusted due to slight different definition compared to the condition at the BoP. Based on that reason, the name of each barrier will be changed to better represent the condition at the BoP. The update of the definition can be seen in Table 5.5 with factors that are adjusted from previous definition are highlighted in light blue color.

Category	Factors name on Pre-specified	Adjusted Factors Name	Definition
Essential Barriers at the BoP	Financial Capital	Financial Capital	Upstream / upfront financing for actors in the product value chain such as working capital
	Affordability	Affordability	Concern of price due to low-income

Category	Factors name on Pre-specified	Adjusted Factors Name	Definition
	Consumer's Awareness	Consumer's Awareness	Consumer awareness on the products and also environmental or health issue in relation to the products
	Institutional aspects	Institutional aspects	Laws and policy that are imposed by the government to regulate supply and demand of the market
	Knowledge of Application	Knowledge of Application	Understanding from both of producer and consumer of the product regarding the new technology usage for the practical application
	Production system	Production system	The whole production facilities especially in a factory
	Consumer's Demand	Consumer's Demand	The consumer's willingness to buy the product to fulfill their need, depending on existing products/technology availability
	Infrastructure	Infrastructure	All the infrastructures that are needed to sell or use the new products to function / be distributed
	Natural Resources & Labor	Natural Resources, Labor & Employee	Required resources , labor & employee in the production across the supply chain processes
Context Specific Barriers	Lack of After Sales Service	Lack of After Sales Service	All of the services provided after the products sold to the consumer
	Inferior products	Inferior products	Low-quality / cheap / free / counterfeit products swarming the market
	Socio Cultural & Education	Socio Cultural & Education	Norms, values, habit and culture condition of the consumer
	New high-tech product	New high-tech product	All factors related to the new-product such as function, technology principle & main components
	Knowledge of Technology	Knowledge of Technology	Firms' technological knowledge regarding the products
	Collaboration Issue	Collaboration Issue	All the involved parties need to collaborate well to sell the products

Category	Factors name on Pre-specified	Adjusted Factors Name	Definition
	Macro-Economic aspects	Macro-Economic aspects	General economic condition
	Complementary products and services	Complementary products and services	All complementary products and services required to support the products to function well
	Suppliers Availability	Partners Availability	Availability of local partners with required capability
Less Relevant barriers	Undesirable social & environmental effects	Undesirable social & environmental effects	Side-effect from the products
	Laws, rules and standards	Laws, rules and standards	Rules and standard imposed by local society or organization that can influence the supply and demand of the market
	Accidents or events	Accidents or events	Situation outside the prediction or the control of the firms and consumers

Table 5.5 Results on list of Barriers from open and close questions

From the table, the barrier of *suppliers' availability* is changed into broader term of *partners availability*. The change is based on the various suppliers and partners that are evident at the BoP. In addition, including the change of definition of *partners availability* barrier, there are five barriers definition are changed: *Consumer's Awareness*, *Consumer's Demand*, *Natural Resources & Labor*, *Inferior products*, and *Partners availability*.

Another point to be highlighted is the contradictory result of the interviews and desk research about relative importance of barriers. In chapter 3, a secondary literatures research has been conducted to find the relative importance of barriers. The result of the secondary sources, which can be seen in Table 3.8, shows that *Affordability* is the most important factor contributing to the inhibition of products scale-up at the BoP, while financial capital is only ranked 9th, as it is only mentioned by two researches. The result is quite contradictory to what have been found in the in the interviews which show that financial capital is the most important barriers for the technology scale-up. There are several possible explanations for this. First, the secondary sources are only used as indicators, while they might not quite represent the real condition of researches, especially on barriers for scale-up. None of the researches gathered are specifically intended to focus on finding barriers at the BoP, especially for technology products. Second, many of the researches come from business literatures which are more focus on the demand side of the BoP, and thus, waive the technology producers who are more concerned about the financial capital. It might also explain why *affordability* is highlighted as the most important barriers because *affordability* is the concern from the demand side of the consumer. The result might also indicate the lack of research on financial capital at the BoP at the moment.

5.2 Strategies Analysis

In this section, the findings about the strategies at the BoP will be further elaborated. Similar with the barriers section above the answers from both non-aided section and aided section from the interviews will be analyzed.

5.2.1 Codification on Strategies from Open Questions

Similar with the previous sub-sections, the answers from the open questions part will be coded first. It can be analyzed that there are three similar conditions from their answers; the answer matched the strategies which have been identified previously, the answers which enrich the definition of strategies, and last, the answers which are definitely new. The answers from companies and the result of the categorization of each strategy can be seen in Table 5.6.

No	Company	Barriers (Open Questions)	Barriers Code/Category	Condition	Details
1	ACE	Finding reliable partners	Supplier Network Strategy	Enrich the previous definition	Expanding the definition of suppliers to partners
		Constant innovation on the product	Product redesign	Enrich the previous definition	Expanding the product redesign definition
2	PT Holland for Water	Increase Resellers	Supplier Network Strategy	Enrich the previous definition	Expanding the definition of suppliers to partners
		Financing	Access to Finance	Matched	The definition is covered
		Affordability	Affordability	Matched	The definition is covered
3	Kopernik	Work with local partners	Supplier Network Strategy	Enrich the previous definition	Expanding the definition of suppliers to partners
		Provide payment options	Access to Finance	Matched	The definition is covered
		Explore different markets/ways	Explore multiple market strategy	Matched	The definition is covered
4	Ndassie	Finding entrepreneurs	Supplier Network Strategy	Enrich the previous definition	Expanding the definition of suppliers to partners
5	D.Light	Expansion through local partners	Supplier Network Strategy	Enrich the previous definition	Expanding the definition of suppliers to partners
		Increase penetration/direct sales in priority market	Supplier Network Strategy	Enrich the previous definition	Expanding the definition of suppliers to partners
		Pay-as-you-go strategy	Access to Finance	Matched	The definition is covered

Table 5.6 Strategies identification from open questions

5.2.2 Relative importance Strategies

The most important strategies for each company based on the open questions and also questionnaires given to companies will be elaborated next.

Strategies from open questions

From the open questions answer about strategies that the companies considered important, *Supplier network strategy* is mentioned by five companies and *access to finance* is mentioned by three companies. The result in Table 5.7 indicates that both strategies are the most important strategy for all of the companies.

No	Coded	Company
1	Supplier Network Strategy	PT Holland for Water
		Kopernik
		Ndassie
		D.Light
		ACE
2	Access to Finance	PT Holland for Water
		Kopernik
		D.Light
3	Explore multiple market strategy	Kopernik
4	Product redesign	ACE

Table 5.7 Rank of strategies based on the answer from open questions

Strategies from close questions

Moreover, strategies based on their relevance will be categorized similarly to the analysis in the barriers section. First category is for strategies that are very relevant to business at the BoP, the second one is for strategies that are context specific to region or products, and the last one is for strategies that are not very relevant. The full categorization scheme of strategies can be seen in Table 5.8 below.

No	Category	Rules
1	Essential strategies at the BoP	Strategies are mentioned as at least 'Relevant (Scale 5)' from questionnaires by at least 4 companies
2	Context-specific strategies	Strategies are mentioned as at least 'Relevant (Scale 5)' by more than 1 companies, but less than 4 companies
3	Less Relevant strategies	Strategies are mentioned as at least 'Relevant (Scale 5)' by only one or less companies

Table 5.8 Categorization scheme for strategies

The interpretation and reasons of categorization scheme of each category of strategies are as follows:

1. Essential strategies at the BoP
Strategies that are put in this category were mentioned as at least important or relevant by majority of the companies which have been interviewed (four out of six). Thus, strategies at this category are considered essential for the BoP market as a whole, regardless the factors of regions, industry, and companies.
2. Context-specific strategies at the BoP
Strategies that are included in this category are mentioned as at least relevant by some companies, but not by some of the others. Strategies that are mentioned in this category are positioned at the middle as some companies considered the strategies important while others considered it less important. Thus, it can be interpreted that strategies in the category may be considered important for some companies due to context specific factors, such as regions, industry, and companies.

3. Less relevant strategies at the BoP

Strategies in this category are considered less relevant by majority of companies. With at least five out of six companies mentioned the specific strategy as ‘moderately relevant’ (scale 4) at most. Although the strategy is considered less relevant, it might be considered relevant or important for at least one company, which might indicate to certain extent that strategy in this category is a strategy that suitable for specific company.




Table 5.9 shows the result of the questionnaires about niche strategies sent to all of the companies. The first column shows the list of the 15 strategies gathered from the literatures. In the second to seventh column, score of importance that each company gave to respective strategy is shown. In the last column, the total for each score given is shown as an indication of strategy importance. The strategies in the first column are sorted by the result of the summation of points from the last column.

The first column is also highlighted by different color according to the category of each strategy, based on the categorization scheme which has been set in Table 5.8. Green color indicates that the strategy belongs to *essential strategies at the BoP* category, blue color indicates that the strategy belongs to *context-specific strategies* at the BoP and red color indicates that the strategy belongs to *less relevant strategies* at the BoP.

Pre-specified Strategies	Interviewee						Total
	ACE	CV Karya Mandiri	PT Holland for Water	Kopernik	Ndassie	D.Light	
1. Access to Finance	7	6	5	7	5	7	37
2. Education Approach	4	5	7	7	7	6	36
3. Demo, experiment and develop	7	6	1	6	7	7	34
4. Explore multiple markets	5	2	7	7	6	7	34
5. Supplier Network Strategy	6	6	1	7	6	7	33
6. Top of Pyramid Approach	6	4	7	5	7	3	32
7. Product Redesign	6	6	4	5	7	4	32
8. Geographic Approach	7	5	2	6	5	6	31
9. Technology Complementary	6	5	1	5	5	6	28
10. Gender Market Approach	6	2	7	4	3	3	25
11. Dedicated System or stand-alone strategy	6	2	1	2	6	2	19
12. Lead user Approach	4	6	2	2	3	1	18
13. Hybridization or adaptor strategy	5	2	1	5	3	1	17
14. Product Subsidy	3	4	1	1	5	1	15
15. Government-lead supply strategy	2	6	1	1	2	2	14

Table 5.9 Result on Strategies importance from questionnaires

7: Extremely relevant, 6: Very Relevant, 5: Relevant, 4: Moderately relevant, 3: Somewhat relevant, 2: Slightly relevant, 1: Not relevant

	Essential strategies at the BoP
	Context-specific strategies at the BoP
	Less relevant strategies at the BoP

5.2.3 Strategies result

The result of the interview and open questions has shown that the most important strategies to solve barriers are different for each company. From the result of strategies from close questions in Table 5.9 it can be seen that the top four strategies, which are *Access to finance*, *education approach*, *demo*, *experiment and develop*, and *explore multiple markets* are mentioned as the most relevant strategies for the companies. All of the four strategies are mentioned as *extremely relevant* in the questionnaire by at least three companies. Following those strategies is the *Supplier network strategy* and *Top of Pyramid Approach* that are mentioned as *extremely relevant* by at least two companies.

Supplier network strategy that is positioned as the most important strategy in the open questions is only ranked 5th in total points from questionnaires. This happens due to differences in labeling the strategies; the *supplier network strategy* does not well represent the condition at the BoP where there are various partners, not specifically as suppliers for components or products. To be specific, PT Holland for Water indicating that this strategy is not important for them makes the total points of the *supplier network strategy* is significantly lower. PT Holland for Water mostly works with resellers, who they do not consider as ‘supplier’ in their network. On this finding, the definition of *supplier network strategy* is expanded to cover the definition of individual resellers and from the wording of *supplier network strategy* is changed into *partner network strategy*. Even so, the answer from the open questions are quite clear in showing the need for the companies to find the partners in the form of local organizations, entrepreneurs, informal organizations, and distributors to become their local representatives in the region. In addition, *access to finance strategy* is also very important as it is considered at least *relevant* for all companies.

Moreover, the definition of *top pyramid approach* does not quite fit well because although most of the companies admitted targeting the higher level of income/status of consumer, they do not aim at the top of pyramid, but rather the upper level of the BoP market segment. The naming of the strategy can affect the company’s answer about relevance of strategy, to be specific, D.light in the interview suggested changing the name of the top of pyramid approach to *upper income market segment approach* to better represent what the company is doing at the moment. The company answers the strategy as ‘moderately relevant’ (score 4), but as the name of the strategy is changed into *higher income level approach*, the strategy will be categorized as essential strategies at the BoP.

Thus, in addition to *access to finance strategy* and *supplier network strategy*, *Education Approach*, *Demo*, *experiment and develop*, *Explore multiple markets*, *Geographic Approach*, *Technology Complementary*, and *Upper income market segment approach* are categorized as *essential strategy* at BoP. Nonetheless, it needs to be emphasized that the result needs to be taken cautiously as in most cases the company’s answers are quite varied. For instance, the *Demo*, *experiment and develop strategy* are considered *very relevant* for five companies but the last company considers the strategy *not relevant*. Thus, the variation might exist due to company, region or product specific reason.

Moreover, from the interviews, it is understood that several other names of our strategies need to be adjusted to better represent the real application of the strategies by companies. The result of the strategies’ name changes can be seen in Table 5.10. In the table, the first column shows the list of interpreted category of strategies, the second column shows the list of strategies according to its original name, the third column shows the list of the adjusted name based on the interviews, and the last column shows the updated definition of each strategy. In addition, the strategies which the name and/or definition have been changed are highlighted in light blue color.

Category	Strategies	Adjusted name Strategies	Definition
Essential strategies at the BoP	Supplier Network Strategy	Partner Network Strategy	Parties such as distributors, resellers, NGOs and local organization collaborate with each other's to expand their network and sell the products
	Access to Finance	Access to Finance	Partners and/or consumers are funded with financial capital to help them access the products
	Education Approach	Education Approach	Transfer of knowledge to customers and suppliers
	Demo, experiment and develop	Demo, experiment and develop	Consumers and producers are demonstrated with the technology to get more knowledge regarding the technology application and possible development
	Explore multiple markets	Explore multiple markets	The products are sold into different kind of markets in order to gain understanding of the technology or find the best way to expand the business
	Geographic Approach	Geographic Approach	The products are sold in a region where it can be more easily accepted or diffused
	Technology Complementary	Technology Complementary	Use other available technologies in the market to enhance the process to introduce the new technology
	Top of Pyramid Approach	Upper income market segment approach	Sell the products to people with higher social income / status expect the products to trickle to larger target market
Context-specific strategies	Product Redesign	Product Redesign	Change of product specification to approach a specific market
	Gender Market Approach	Gender Market Approach	Selling the technology to specific market segment because they have higher influence regarding technology purchase and development
	Dedicated System or stand-alone strategy	Dedicated System or stand-alone strategy	Product is first used in a constrained system, for example in laboratory setting
Less Relevant strategies	Lead user Approach	Lead user Approach	The products are sold to the people/institution with specific technology expertise/demand
	Hybridization or adaptor strategy	Hybridization or adaptor strategy	Combination of the new product with the existing available product
	Product Subsidy	Product Subsidy	The consumer can pay for less price in order to push for diffusion
	Government-lead supply strategy	Government-lead supply strategy	Government provides technology to society even though the demand from the market is not yet articulated

Table 5.10 Result of strategies from open and close questions

From the table, it can be seen there are three strategies which the definition and/or label are changed: *Partner network strategy* and *upper income market segment approach* and *access to finance*. The latter strategy expands its definition to covers partners, where previously partners are constrained to producers or suppliers.

5.3 Barriers and Strategies Linkage

In this section, a link between important barriers and strategies at the BoP will be made. The first link which has been previously compiled from the literature will be used as can be seen in Table 3.16. From that initial table, a linkage based on the answer from each companies and a linkage between barriers and strategy obtained in chapter 4 will be made. The comparison between barriers and strategies can be seen in Table 5.11. The first column shows nine of the essential barriers taken from section 5.1. The second column shows the respective strategy suggested solving the respective barrier based on literatures which have been previously discussed in section 3.4. The third column shows the source of literature. In the fourth column, a quote from the interviews is shown to emphasize the relevance of each barriers and strategies and the last column shows the name of the company source. In addition, the green color highlight indicates new strategies that have not been mentioned previously in the literature, while the red color highlight indicates several strategies that are mentioned in the literature but not found during the interview. The color highlight is an important indication of the theory or strategy application gap, between what it is founded in the literature and the real application of strategy by the BoP companies.

Barriers	Strategy	Previous Literature	Quote	Company
1. Financial Capital	Access to Finance	(Lighting Africa, 2012)	"I got some grant from the government; we are currently busy to get more capital and investor on board, so that we can increase our inventory and marketing."	Ndassie
	Partner Network Strategy	(Lighting Africa, 2012)	"Resellers need to buy (on cash), the products for the first three times, after that they can apply to loans from Kiva through Nazava"	PT Holland for Water
2. Affordability	Upper- income market segment approach	(Ortt, Langley, & Pals, 2013)	"They (higher level income segments of consumers) have the money so they are people who can buy the product immediately then they make it attractive for people who have so less money. Then, people with less money are easier convinced"	PT Holland for Water
	Partner Network strategy	(Lighting Africa, 2012)	"..if you're selling to MFI then they give credit to their customers."	D.light
	Technology Complementary strategy	(Lighting Africa, 2012)	"The pay-as-you go model is going to be very important to address affordability."	D.Light
	Product Redesign	(Ortt, Langley, & Pals, 2013)	"The price of filtered water is nine times cheaper than boiling water with LPG"	PT Holland for Water
	Product Subsidy	(Ortt, Langley, & Pals, 2013)	-	-
3. Awareness	Lead user Approach	New Strategy	"We sell to university in Malawi, which is during a very high tech research on the impact of this stove on children' lungs because of the smoke are so bad it causes a lot of pneumonia with children"	ACE
	Partner Network strategy	(Lighting Africa, 2012)	"The target market is <i>arisan</i> and <i>ibu-ibu</i> PKK (informal woman organization that promote health)"	PT Holland for Water
	Education Approach	(Lighting Africa, 2012)	"Besides just selling the products we have to do a lot of education to create awareness about water	PT Holland for Water

Barriers	Strategy	Previous Literature	Quote	Company
			quality and how water quality relates to health”	
4. Government Policy	Geographic Approach	(Ortt, Langley, & Pals, 2013)	"For Institutional and regulation it's really context specific, in India it is a problem because of the kerosene subsidy. In Nigeria it is a different problem, while in Kenya tariffs and subsidies are not a problem"	D.Light
	Government-lead supply strategy	Kemp	"(Indonesian Ministry of Energy and Mineral) usually buy us the products, through tender...The government subsidy the LPG at the moment"	CV Karya mandiri
	Product Redesign	(Ortt, Langley, & Pals, 2013)	-	-
	Education Approach	(Ortt, Langley, & Pals, 2013)	-	-
5. Knowledge of Application	Product Redesign	(Ortt, Langley, & Pals, 2013)	"We find it more important that you design your product so the people automatically know how to use it"	ACE
	Explore multiple markets	(Ortt, Langley, & Pals, 2013)	-	-
	Partner Network strategy	Kemp	-	-
	Lead user Approach	(Ortt, Langley, & Pals, 2013)	-	-
6. Production System	Product Redesign	(Ortt, Langley, & Pals, 2013)	"We can flat pack our products so in term of production capacity we almost unlimited"	ACE
	Geographic Approach	(Ortt, Langley, & Pals, 2013)	-	-
	Upper-BoP market segment approach	(Ortt, Langley, & Pals, 2013)	-	-

Barriers	Strategy	Previous Literature	Quote	Company
	Product Subsidy	(Ortt, Langley, & Pals, 2013)	-	-
7. Consumer's Demand	Product Redesign	(Ortt, Langley, & Pals, 2013)	"So we then introduce the products to the market without blower in the market, and the responds is quite positive."	CV Karya Mandiri
	Education Approach	(Ortt, Langley, & Pals, 2013)	"So, besides just selling the products we have to do a lot of education to create awareness about water quality and how water quality relate to health "	PT Holland for Water
	Geographic Approach	(Ortt, Langley, & Pals, 2013)	"Where the fuel or LPG is rare they can easily accept the biomass stove for instance in Kupang the LPG is very expensive, the biomass stove is easily accepted."	CV Karya Mandiri
	Explore multiple markets	(Ortt, Langley, & Pals, 2013)	"We also work with other organizations. The partner can be individual or society group. For example there are 18 (different) community groups"	Kopernik
	Lead user Approach	(Ortt, Langley, & Pals, 2013)	"In 2010, the ministry of energy invited us to do a testing and benchmarking, in which our stove results in the best test."	CV Karya Mandiri
	Government-lead supply strategy	(Kemp & Schot, 1998)	"The government buys the stoves because they have a program. Such as the Program Desa Mandiri. Or for example in Sumba Island, it makes as a showcase for a region of independent source of energy"	CV Karya Mandiri
	Partner Network Strategy	(Kemp & Schot, 1998)	"On average the group members are 70 people, and they usually sell the product to their group members first and then to people outside of their group"	Kopernik
8. Infrastructure	Hybridization or adaptor strategy	New Strategy	"Our product can connect to AC (alternate current electricity) source"	D.light

Barriers	Strategy	Previous Literature	Quote	Company
	Product Redesign	(Ortt, Langley, & Pals, 2013)	"Our product can connect to AC (alternate current electricity) source"	D.light
	Education Approach	(Ortt, Langley, & Pals, 2013)	-	-
	Lead user Approach	(Ortt, Langley, & Pals, 2013)	-	-
	Government-lead supply strategy	(Kemp & Schot, 1998)	-	-
9. Natural Resources & Labor	Geographic Approach	(Ortt, Langley, & Pals, 2013)	"Because labor is not cheaper in China, labor in Lesotho is cheaper than in china. So there is a balance to find there. But we do not really want to find the component in China"	ACE
	Upper- income market segment approach	(Kemp & Schot, 1998)	-	-
	Product Subsidy	(Kemp & Schot, 1998)	-	-
	Product Redesign	(Kemp & Schot, 1998)	-	-
	Hybridization or adaptor strategy	(Kemp & Schot, 1998)	-	-

Table 5.11 Linkage of barriers and strategies with respective quotes from companies

Table 5.11 gives a better understanding of the relation between strategies and barriers where the results will be elaborated below:

First, the linkage between barriers and strategies is important in providing the reason why such strategies are important to be implemented. From the table, it can be seen that the most important barrier, which is *financial capital*, is linked with two strategies, which are *access to finance* and *partner network strategy*. The link between the barrier and strategies are aligned with the position of the relative importance of both barriers and strategies because from the case studies, it is found that financial is the most important barrier, which is now aligned with *partner network strategy* and also *access to finance*, which is the two most important strategies from the case studies. The understanding of the situation is an important notion that the companies need to implement these two strategies first in order to scale-up their business.

The second notion is that the *partner network strategy* is important not only to solve financial capital, but also other three other important barriers: *awareness*, *affordability* and *consumer's demand*. The former two barriers are positioned in the top three barriers from the questionnaires and thus, it makes the *partner network strategy* more important. On the other hand, *access to finance strategy* is only applicable to solve financial capital, which is also important for the company.

Third, the barrier-strategy link manages to find two new strategies that are not linked previously from literatures. The two barrier-strategy links are: *lead user niche strategy* to overcome awareness barrier, and *hybridization or adaptor niche strategy* to accommodate the barrier of *infrastructure*. On the other hand, there are many strategies that evident in the literatures are not picked up during the interviews.

Fourth, the importance of *geographic niche strategy* to overcome several barriers of *government policy*, *consumer's demand* and *natural resources and labor* needs to be highlighted. The fact that such strategy is able to solve several barriers at once may also indicate that companies operating in several region at once is to take the advantages provided by those several regions. The application of such approach, as can be seen in the quotes in Table 5.11, for instance, is useful to target a market where the government policy or demand is better.

Last, from the Table 5.11, it can be seen that many strategies are highlighted in red, which are not found during the interviews. These findings can indicate several things, for example, that there is a discrepancy between literatures that mostly come from western technology and the BoP real condition. It may indicate that the linkage that happens at the BoP is different from general market. This can happen due to the market condition or the condition of the company that has not yet matured and thus, the need of several strategies to solve certain barrier is not yet emerged. Another simpler explanation is simply that the strategies are not emerged or mentioned during the interviews.

Some of these strategies are required to be emphasized, for instance, *product subsidy strategy* to solve *awareness barrier*, that is explicitly not endorsed by some companies as can be seen from below quotes:

*"We do not put artificial subsidies on our products; we think it will ruin our market" –
(Montgomery, 2014)*

"This is not for me. I don't like just give subsidy because you distort the market" – (Walker, 2014)

Other strategy such as *product redesign strategy* to address *affordability*, although not specifically mentioned, can be seen in the practice of D.light, in which they have a product that has a low price and are meant to target the lowest-income people.

5.4 Barriers and Strategies across Case Studies

As it mentioned previously, it is understood that barriers and strategies are context specific. It has been discussed that each of the barriers depend on time or business stage. On this sub-section, the reason on why barriers might be industry specific will be elaborated.

5.4.1 BoP Specific Barriers and Strategies

During the interviews, the interviewees are asked about their opinion on the differences between selling their products to the BoP specific market, compared to other products in general markets. The most important differences from selling the products such as bio-mass cook stove at the BoP from other products in general market are two things: *Awareness* and *Consumer's demand*. It can be seen from the quote below:

"Who needs education about mobile phone? Nobody, right?" - (Heederik, 2014)

"The product is new, thus there is lack of awareness from people. If you compared it to mobile phone, the society is already understand with the product, thus we need to socialize about the products." - (Nurhuda, 2014).

"If I compare it with soap, soap is cheap. So everyone can buy the products. People have the money to buy the product on the spot. It is also consumer products that can be used weekly. It is easier for promotion and does not require training like our training." -(Sihotang, 2014)

"Most of the consumer products such as soap or shampoo is existing product that people mostly know"- (Kepguez, 2014).

"For our products, some partners have tried selling through modern retail, however if there is no customer engagement it will not work" - (Montgomery, 2014)

lack of awareness of the product compared to other technology products such as mobile phone. The condition is affecting how the company should engage with consumer, such as the necessity to give education through training. The market channel where engagement is lacking such as supermarket does not work best to serve the consumer to sell BoP technology product. This is further emphasize the need of the local partner, that help provides engagement with local consumer.

Furthermore, the above quotes show the fact that most of the products and technology that are sold serve the basic need of the consumer, and therefore, they are different from other products such as television that can be considered luxury products.

5.4.2 Product Specific Barriers and Strategies

Moreover, also it is noticed that there is an indication of differences among technology products of biomass stove, drinking water purifier and solar lantern. In term of product development, both ACE and CV Karya Mandiri go through several processes before they finally succeed to get the products that are able to serve their target market. On the other hand, PT Holland for Water does not seem to have problem with their products, especially at the early stage of the product development. Similarly, D.light and Ndassie do not seem to find any problem regarding the products. This might be an indication that biomass cook stove is harder to develop compared to drinking water purifier and solar lantern, which affects the companies' strategies. This might happen because biomass cook stove is a specific product with each of the components is purposely built for the BoP market as biomass cook stove does not have

a large market in the developed nation. In contrast, solar lantern has a huge market at the developed nation and also the technology has already been developed for quite sometimes there. The challenge for the biomass companies, especially ACE, is how they can assemble it effectively to serve their market.

In addition, Kopernik, one of the source for interview, is an organization that sells various products such as drinking water purifier, solar lantern and also biomass cook stove. During the interview, the question about the different barriers that might result in differences success between technologies sold is asked, the quote of their answer can be seen below:

"First I think the difference is price, the cheaper the price it is much easier to sell even if there is need in the product. You also need to make a system for the partner through (making differences) for the profit margin. If the margin is the same between each product, the seller will sell products that are smaller in size, because it will be much easier for them to bring around for promotion. So we need to make differences (of profit margin) in term of logistic, or weight of the products" - (Sihotang, 2014).

Kopernik notices that the above notions happen in the condition where one sales person needs to sell more than one product. Sales person might choose to sell a product that is smaller in size, because it is easier to move. The other notion about price also relates to the condition where sales people need to sell more than one product. This condition does not apply to most companies at the moment, but might happen once the company decides to diversify their product portfolio.

5.5 Chapter Summary

From the cross-case analysis section, some of the important notions can be summarized as follows. First, nine barriers are found to be categorized as essential barriers: *Financial Capital, Affordability, Consumer's Awareness, Institutional aspects, Knowledge of Application, Production system, Consumer's Demand, Infrastructure, and Natural Resources & Labor*. Moreover, eight context-specific barriers are found: *Lack of After-Sales Service, Inferior products, Socio Cultural & Education, New high-tech product, Knowledge of Technology, Collaboration Issue, Macro-Economic aspects, Complementary products and services*.

Second, eight strategies are found to be categorized as essential strategies: *Access to Finance, Education Approach, Demo, experiment and develop, Explore multiple markets, Partner Network Strategy, Geographic Approach, Technology Complementary and Upper-income BoP market segment approach*. Moreover, Three strategies can be categorized as context-specific strategies: *Product Redesign, Gender Market Approach, Dedicated System or stand-alone strategy*

Third, several relations between barriers and strategy can be made from the interviews. The relation of barriers-strategies, which can be seen in Table 5.11, reveals that there are several strategies that do not come-up during the interview to solve several specific barriers. In addition, new strategies to solve a barrier are found which have not been mentioned previously in the literature.

6

Concluding Remarks

In this chapter the conclusion of the research will be given. The conclusion is based on the research objective and research question that have been posed in the first chapter. Moreover, a discussion will be opened about several related things and what have been learned during the research. Next, a self-reflection from personal experience conducting this research will be shared. Lastly, a recommendation for managers and further research will be given.

6.1 Conclusion

The research objective is to find the previously-researched barriers and strategies for technology scaling up and to further compare them to the real condition in the Base of Pyramid Market. To meet this objective, a main research question with several sub-questions is formulated. The conclusion of the research is presented in the form of answers to the defined research questions.

6.1.1 Sub Questions 1

a. What are barriers that can inhibit the scaling of products to a wider market from theories?

From the literature reviews and expert interviews, there are 21 factors that can inhibit the scaling of products as can be seen in Table 6.1 below.

Factors	Details
1. New high-tech product	All factors related to the new-product such as function, technology principle & main components
2. Knowledge of Technology	Technological knowledge regarding the products
3. Production system	The whole production facilities especially in a factory
4. Complementary products and services	All complementary products and services required to support the products to function well
5. Infrastructure	All the infrastructure that is needed to sell or use the new products to function/be distributed
6. Natural Resources & Labor	Required resources and labor in the production across the supply chain processes

Factors	Details
7. Suppliers Availability	Availability of suppliers with required capability
8. Collaboration Issue	All the involved parties need to collaborate well to sell the products
9. Financial Capital	Upstream / upfront financing for actors in the product value chain
10. Lack of After Sales Service	All of the services that are provided after the products sold to the consumer
11. Knowledge of Application	Understanding from both of producer and consumer of the product regarding the new technology usage for the practical application
12. Socio Cultural & Education	Norms, values, and culture condition of the consumer
13. Consumer's Demand	The willingness from the consumers to buy the product to fulfill their needs
14. Consumer's Awareness	Consumer awareness regarding the products
15. Affordability	Concern of price due to low-income
16. Inferior products	Low-quality / cheap / free products swarming the market
17. Institutional aspects	Laws and policy that are imposed by the government to regulate supply and demand of the market
18. Laws, rules and standards	Rules and standard that are imposed by local society or organization that can influence the supply and demand of the market
19. Undesirable social & environmental effects	Side-effect from the products
20. Accidents or events	Situation that is outside the prediction or the control of the firms and consumers
21. Macro-Economic aspects	General economic condition

Table 6.1 List of Barriers identified from literatures

From the table above, it can be seen that the factors that can inhibit the product scale-up can be broadly grouped into three main categories. First group of barriers can come from the company resources and network such as *new high-tech product, knowledge of technology, production system, complementary products and services, infrastructure, natural resources & labor, suppliers availability, collaboration Issue, financial Capital, lack of After Sales Service*. Second group of barriers can come from the consumers' condition such as: *Knowledge of Application Socio Cultural & Education, Consumer's Demand, Consumer's Awareness and Affordability*. And last group can be

group of barriers that come from market condition such as *Inferior products, Institutional aspects, Laws, rules and standards, Undesirable social & environmental effects, Accidents or events, and Macro-Economic aspects*. Visualization of different group of barriers can be seen in Figure6.1.

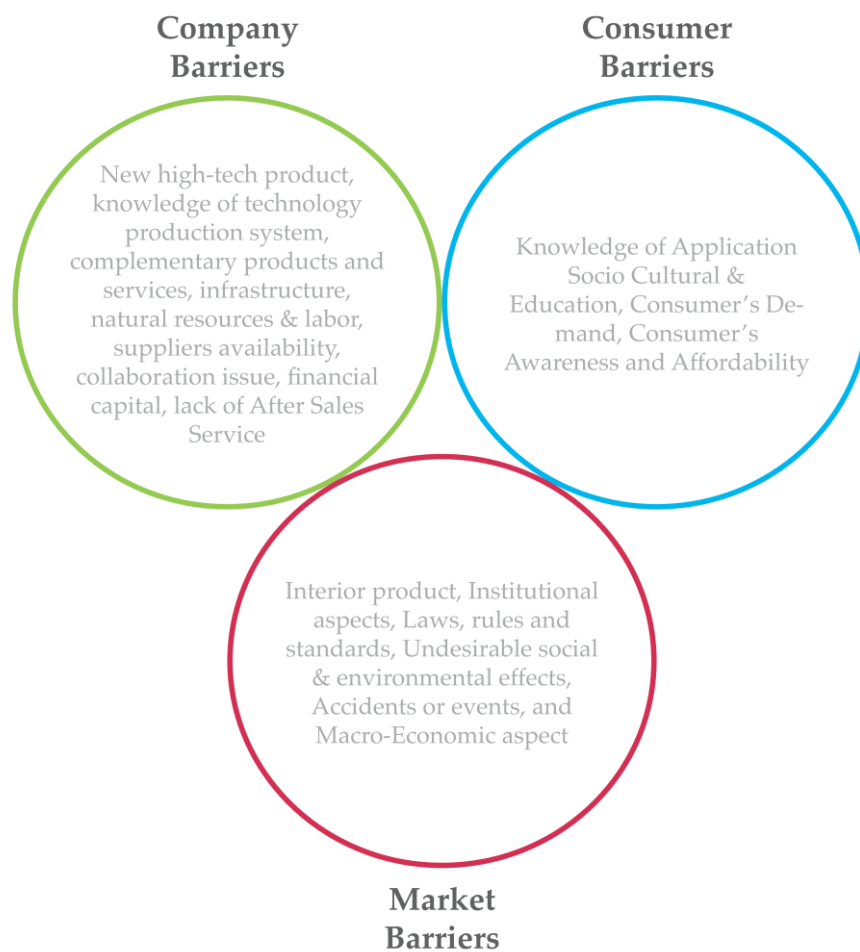


Figure6.1 Categorization of Barriers

From the figure, it can be seen that most of the barriers that the research has identified mostly come from company barriers, which can come from the company itself, such as the financial capital or the other parties such as suppliers' availability. On the other hand, consumer barriers are coming from the condition of the consumer, specifically concerned with the BoP condition, such as affordability. And last, market barriers are related to the BoP market in general that are outside the company ability to influence the result, such as the institutional aspects.

b. What are barriers that can inhibit the scaling of products to a wider market from case studies in the BoP market?

From the literature reviews and the interviews / the factors that inhibit the scaling of products can be categorized as can be seen in Table 6.2 below

Adjusted Factors Name	Definition
1. Financial Capital	Upstream / upfront financing for actors in the product value chain such as working capital
2. Affordability	Concern of price due to low-income
3. Consumer's Awareness	Consumer awareness on the products and also environmental or health issue in relation to the products
4. Institutional aspects	Laws and policy that are imposed by the government to regulate supply and demand of the market
5. Knowledge of Application	Understanding from both of producer and consumer of the product regarding the new technology usage for the practical application
6. Production system	The whole production facilities especially in a factory
7. Consumer's Demand	The consumer's willingness to buy the product to fulfill their need, depending on existing products/technology availability
8. Infrastructure	All the infrastructures that are needed to sell or use the new products to function / be distributed
9. Natural Resources, Labor & Employee	Required resources , labor & employee that are needed in the production across the supply chain processes
10. Lack of After Sales Service	All of the services that are provided after the products sold to the consumer
11. Inferior products	Low-quality / cheap / free / counterfeit products swarming the market
12. Socio Cultural & Education	Norms, values, habit and culture condition of the consumer
13. New high-tech product	All factors related with the new-product such as function, technology principle & main components
14. Knowledge of Technology	Firms technological knowledge regarding the products

Adjusted Factors Name	Definition
15. Collaboration Issue	All the involved parties need to collaborate well to sell the products
16. Macro-Economic aspects	General economic condition
17. Complementary products and services	All complementary products and services required to support the products to function well

Table 6.2 List of relevant barriers identified at the BoP

From the case studies, 17 barriers are found quite relevant with the condition of company that focusing on the BoP. In relation to previous research question, four strategies are identified as less relevant strategies for the BoP market: *Lead user Approach*, *Hybridization or adaptor strategy*, *Product Subsidy and Government-lead supply strategy*. Although this strategy considered less relevant, it can happen that these strategies are also used by companies at the BoP.

From the case studies, it is found out that the companies can encounter several barriers at one time. There is a change or development that the companies encounter depending on time which means the company can have different barrier at the present time compared to the past. Some barriers may be important for the companies in the past but is no longer a crucial thing at the moment. It creates a notion of *dynamic barrier*, in which barriers can change over time depending on the companies' condition and situation.

c. What is the relative importance of each identified barriers to inhibit the scaling of products to wider market from case studies in the BoP market?

It is found that *financial capital* is the most important barriers that the companies encounter in the BoP market. The other essential barriers are *Affordability*, *Consumer's Awareness*, *Institutional aspects*, *Knowledge of Application*, *Production system*, *Consumer's Demand*, *Infrastructure*, and *Natural Resources*, *Labor & Employee*. In addition, several barriers are identified to be context specific such as *Lack of After Sales Service*, *Inferior products*, *Socio Cultural & Education*, *New high-tech product*, *Knowledge of Technology*, *Collaboration Issue*, *Macro-Economic aspects*, and *Complementary products and services*.

Financial capital is required by the BoP companies for several purposes. The main need is for working capital, which is related to credit scheme that the companies need to give to distributor/resellers and also to capital that is needed in form of product inventory. The need for this working capital, which is related to upstream funding, is mentioned the most during the interviews about financial capital. Other need of financial capital is related to downstream capital such as funding that is needed for consignment of the product to consumers and/or funding that is needed for marketing initiatives.

In addition, it needs to be highlighted that some barriers are context specific that may depend on the company, region and/or products. The specific condition of the above three factors can affect the barriers that a company encounters. This issue can be illustrated by the *knowledge of technology* barrier. Based on the interviews, the barrier is very influenced by the kind of product that company sold, in this case, two biomass cook stoves companies mentioned the barrier is very important or relevant to them but not for the other companies of drinking water purifier and solar lantern. This might be an indication that such problem is context-specific which is embedded in biomass cook stove product.

6.1.2 Sub Questions 2

a. What are current niche strategies that are applied based on the theories?

From literature reviews from Strategic Niche Management, Technology diffusion and BoP Literatures, 15 strategies are found that can be seen in table below. On the first column, the names of strategies are listed while on the second column definitions of the respective strategies are listed from the literatures.

Proposed strategy list	Definition
1. Demo, experiment and develop niche strategy.	Consumers and producers are demonstrated with the technology to get more knowledge regarding the technology application and possible development
2. ToP niche strategy	Sell the products to people with higher social income / status and expect the products to trickle to larger market
3. Gender Market Approach	Selling the technology to specific market segment because they have higher influence regarding technology purchase and development
4. Access to finance Strategy	Producers are injected with funding to develop technology or grow their business
5. Product Subsidy strategy	The consumer can pay less price in order to push diffusion
6. Redesign niche strategy	Change of product specification to approach a specific market
7. Dedicated System or stand-alone niche strategy	Product are firstly used in a constrained system
8. Hybridization or adaptor niche strategy	Combination of the new product with the existing available product
9. Technology Complementary strategy	Existing or other technology, which is more familiar to consumer, is used to introduce the new technology
10. Educate niche strategy	Transfer of knowledge to customers and suppliers
11. Geographic niche strategy	The products are sold in a region where they can be more easily accepted or diffused
12. Lead user niche strategy	The products are sold to the people/institution with specific technology expertise/demand
13. Explore multiple markets niche strategy	The products are sold into different markets in order to gain understanding of the technology or to find the best way to expand the business
14. Government-lead supply strategy	Government provides technology to society even though the demand from the market is not yet articulated
15. Supplier Network Strategy	Parties collaborate with each other's to expand their network and better stimulate technology acceptance and development

Table 6.3 List of niche strategies identified from literature

b. What are current niche strategies that are applied in the BoP market?

From the literature and interviews with companies in the BoP market, 11 relevant strategies can be identified as can be seen below:

No	Adjusted name	Definition
1	Partner Network Strategy	Parties such as distributors, resellers, NGOs and local organization collaborate with each other's to expand their network and sell the products
2	Access to Finance	Partners and/or consumers are funded with financial capital to help them access the products
3	Education Approach	Transfer of knowledge to customers and suppliers
4	Demo, experiment and develop	Consumers and producers are demonstrated with the technology to get more knowledge regarding the technology application and possible development
5	Explore multiple markets	The products are sold into different kind of markets in order to gain understanding of the technology or find the best way to expand the business
6	Geographic Approach	The products are sold in a region where they can be more easily accepted or diffused
7	Technology Complementary	Use other available technologies in the market to enhance the process to introduce the new technology
8	Upper-income BoP market segment approach	Sell the products to people with higher social income / status and expect the products to trickle to larger target market
9	Product Redesign	Change of product specification to approach a specific market
10	Gender Market Approach	Selling the technology to specific market segment because they have higher influence regarding technology purchase and development
11	Dedicated System or stand-alone strategy	Product is firstly used in a constrained system, for example in laboratory setting

Table 6.4 List of relevant niche strategies in the BoP market

From the case studies, 11 strategies are considered relevant to BoP market. In relation to previous research question, there are four strategies which considered less relevant to BoP market: *Lead user Approach*, *Hybridization or adaptor strategy*, *Product Subsidy*, *Government-lead supply strategy*.

c. What is the relative importance of each identified niche strategies application in the BoP market?

From the primary case studies that are summarized in the Table 6.4 above, it is found that *partner network strategy* is the most important strategy for companies focusing on the BoP market. The other essential strategies are *access to finance*, *education approach*, *demo experiment and develop*, *explore multiple markets*, *geographic approach*, *technology complementary*, and *upper-income BoP market segment*. Several strategies are also identified as context specific such as *product redesign*, *gender market approach* and *dedicated system or stand-alone strategy*.

The most important strategy, *partner network strategy*, is firstly needed by the company to help them scale and distribute their product to the consumers located at the BoP region. All of the respondents from interviews are working with partners in different regions. It also needs to be emphasized that partners here are coming in different forms, varied among organization and location. One company might work with formal organizations such as NGOs or MFI in one location and in another location work with informal organizations such as religious meeting group, social group consist of farmers or other informal meetings.

In addition, similar with the condition of barriers, it is also found out that several strategies are context specific that may be influenced by the region, product or companies. For instance, the *gender market approach* is very relevant for two companies in the research, but not very relevant by the others. Such variation might be related to the companies' resource to access women social group, the socio cultural in the region where the company is active, or the kind of products that the company sold. In essence, there can be several reasons why the companies have different opinion of such strategy, which are factors such as region, product and the company itself.

6.1.3 Sub Questions 3

How are the linkages between barriers and niche strategies applied in the BoP market?

From literature reviews and case studies, it can be revealed that there is a linkage between barriers and strategies at the BoP. The summary of the linkage can be seen in Figure 6.2. On the left side, the figure lists the *essential barriers* at the BoP comprises of 9 barriers, while on the right side of the figure, 11 strategies at the BoP are listed.

The linkage between barriers and strategies is built on the basis of the implicit answers from case studies interviews with the foundation from the desk research of secondary case studies. The strategies that are listed in the figure 6.2 are only strategies that are found to have a link with barriers. Lead user approach, government lead supply strategy and hybridization or adaptor strategy are listed even though they are not considered essential strategies at the BoP.

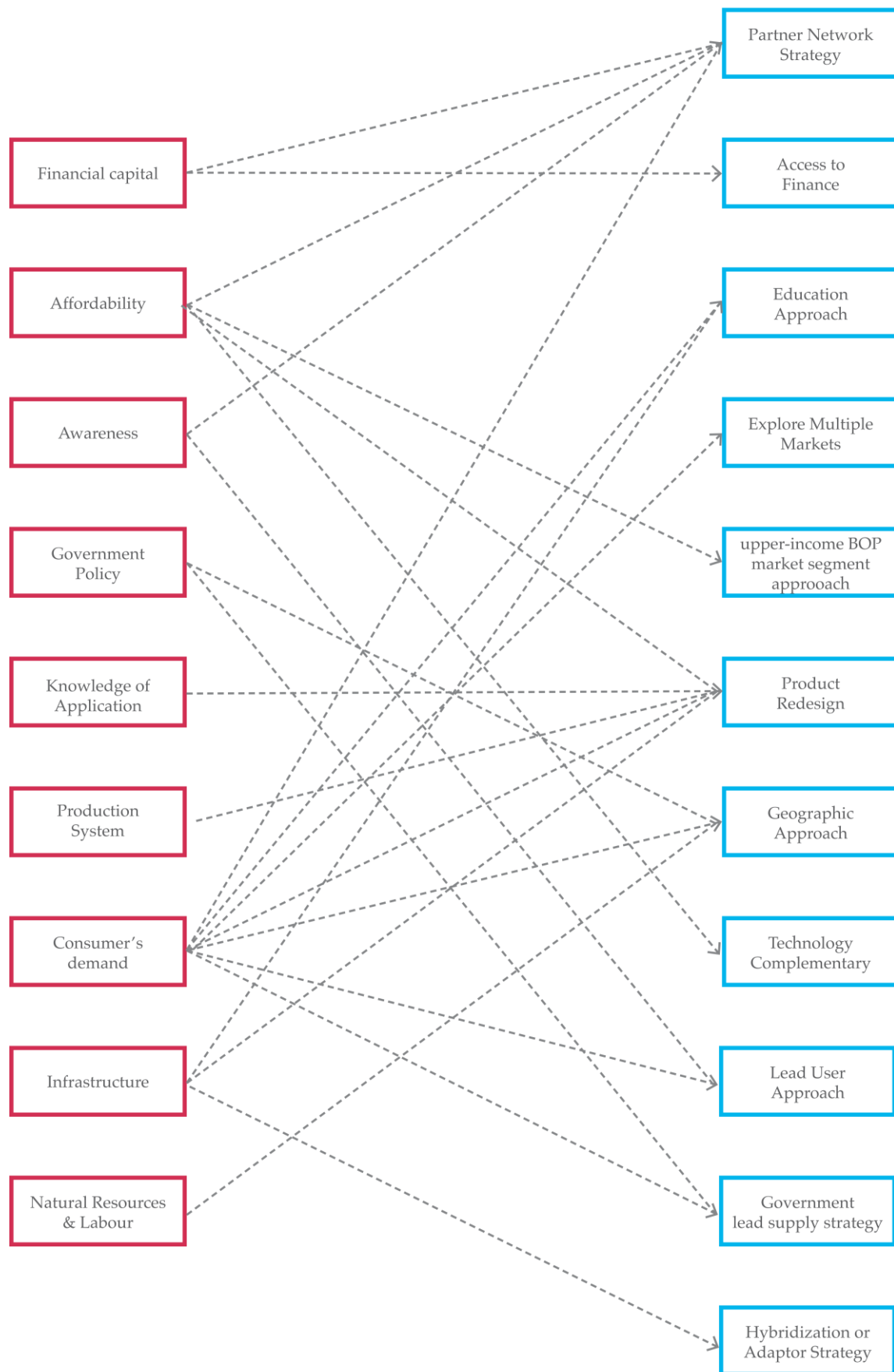


Figure 6.2 Visualization on Barriers and Strategies Linkage

There are several things that need to be highlighted from the linkage between barriers and strategies.

First, the most important barrier of financial capital is linked with two essential strategies of *partner network strategy* and *access to finance strategy*. The knowledge of this condition emphasizes that the companies at the BoP should implement both strategies to tackle the barriers.

From the linkage, it is also understood that a strategy can solve more than one barrier. For example, the most essential strategy of partner network strategy is able to solve the barrier of *financial capital* and *affordability*, where both of them are considered to be essential barriers.

Moreover, the *product redesign* is found to be quite effective strategy that is able to be linked with the most barriers found at the BoP such as *knowledge of application*, *production system*, *consumer's demand* and *infrastructure*. In addition, the *geographic approach* is able to be linked with three barriers such as *government policy*, *consumer's demand* and *natural resources & labor*. In contrary, it is found that a barrier can also be solved by more than one solution of strategy.

For example, the most essential barrier of *financial capital* can be solved by other two essential strategies of *supplier network strategy* and *access to finance strategy*. This revelation creates an option for firms to solve certain barriers that may emerge at the BoP. Both of these understanding of the linkages help us to identify which barrier and strategy to be prioritized to be implemented by companies.

The barrier-strategy link manages to find three new strategies that are not linked previously from literatures. The three barrier-strategy links are: *lead user niche strategy* to overcome *awareness* barrier, and *hybridization or adaptor strategy* to accommodate the barrier of *infrastructure*. On the other hand, there are many strategies in the literatures are not picked up during the interviews. This may indicate that either there is a discrepancy between the information from the literatures and the case studies or the BoP market itself has not yet developed, and thus, several linkages between barrier and strategy have not yet been found.

6.1.4 Main question

“How technology firms focusing on Base of Pyramid market can implement niche strategies to grow business into a large-scale market?”

In the effort to answer the above main research question, the research use the premises of barriers-strategies approach to solve the challenges on growing business into a large-scale market. By using this notion, the research is first try to understand the barriers that the companies at the BoP encounter. From the barriers understanding, the research then identify several strategies to solve the companies issues of growing business into a large-scale market, which is the main research question of this research. This premise of barriers-strategies approach, a list of barriers and strategies are understood to be important to help company scaling-up their product in the BoP market.

In the research, the linkage between barriers that the company at the BoP encounters and the strategies that they choose is able to be identified. The visualization of the linkage between barriers and strategies can be seen in Figure 6.2. The left side of the figure shows the list all essential barriers at the BoP, while the right side shows the list of all strategies that have been identified to be implemented by the companies to solve respective barriers.

From Figure 6.2, it can be highlighted that *financial capital barriers*, which are the most important barriers that the companies need to focus on, can be solved by two of the most essential strategies: *access to finance* and *partner network strategy*. It is also found in the case studies the relation between these three factors in which the two strategies has relation to solve the main barrier of *financial capital*. Moreover, it also needs to be pointed out that the *partner network strategy*, different from *access to finance* strategy, is also important to solve other barriers such as *awareness*, *affordability* and *consumer's demand*.

This understanding gives a new perspective on why companies consider finding local partners very important. The factor of *awareness* for instance might be closely related to local knowledge that the company can only acquire by working with their partners. Another barrier of consumer's demand is related to the fact that local partners can help to access social group to trigger the demand for the new product. In short, this is where the necessity of finding and working with partner are very important for companies focusing on the BoP. In addition, other essential strategies such as *education approach*, *demo*, *experiment and develop*, *technology complementary*, *explore multiple markets* and *geographic approach* need to be implemented parallel with the two main strategies. The latter two approaches are important especially at the early stage of business where the company is still developing and finding the right distribution method or channel.

On the other hand, the research also found that there are several barriers that are context specific such as related to company, region, product or time. These context-specific barriers are emerged in various companies apart from the common barriers that are emerged at the BoP. Companies need to take into account these barriers and apply specific strategies to solve the barriers.

Thus, in an attempt to provide a solution to help scale products, companies need to apply *partner network strategy* and *access to finance* in order to solve several important barriers such as *financial capital*, *affordability* and *consumers' awareness* which is a common barriers that are emerge in the BoP, while on the other hand BoP companies need to take into consideration several barriers that are context specific to their own companies. These barriers thus need to be solved with other strategies, on top of the essential strategies that are mentioned above.

6.2 Discussion

In this section, several things that are not covered in the research objectives but taken in during the research will be discussed. This chapter does not aim at answering the problem, but rather to open up a discussion based on the indication of several things that have been understood during the research. The discussion will cover three important areas: the result of the research which will be mainly discussed in the first two subsections on *financial capital* barrier, managerial discussion which will be mostly related to the subsection of Dynamic Barrier and Niche Strategy Sequence, and academic discussion which will be mostly related to Research Relation with Previous Theory.

6.2.1 Understanding Companies Operation at the BoP

The findings from several case studies reveals that the specific conditions experienced by companies determined by the market situation make the companies need to be flexible in order to scale-up their business. The interpretation of the situation and how the barriers and strategies emerge can be seen in Figure 6.2. The three boxes show the parties that are important in the BoP market: BoP companies, consumers and local partners. The writing/line in blue colors shows the flow of the product, while the while the writing/line in red colors shows the issues/barriers that happened between parties.

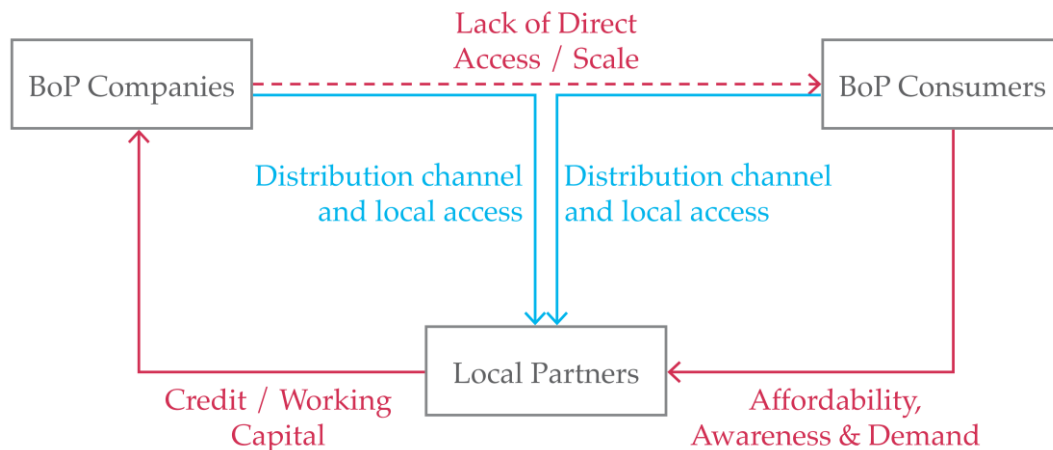


Figure 6.3 Illustration of general barriers and strategies at the BoP.

The explanation on the above figure is as follows:

1. Company that focuses on the BoP tries to reach their consumers located in BoP regions, in which many of these companies do not have the necessary funding to build their own infrastructure (e.g. distribution channel & warehouse) and thus, need the help from their local partners to distribute their products. Distributing the company products through their local partners can be considered less expensive and more manageable (e.g. less fixed or sunk cost).
2. Later, the company also realizes the importance of BoP context-specific knowledge to reach their consumers located at BoP areas. The fact there is a concern of awareness, affordability and consumer's demand can affect the best way to approach the consumer. The mentioned barriers can result in different business model that is easier to understand by the local partners.
3. The fact that the companies need to work with various local partners in different region or countries, increases the need of credit or working capital that BoP companies need to afford. Each of local partners needs the credit in form of financial or product to enable them to perform their operation or to sell the products in the regions.

4. The issue of financial capital is exacerbated by the fact that the consumers have low-income and thus, have a problem of affordability. Most of the time, the consumer needs a consignment or pay-as-you go model that requires company to give the product prior to receiving the money. The mechanism also requires a longer term of payment, which can be troublesome for companies which short of cash flow.
5. Thus, it increases the burden of the company to have financial capital that might be higher than the other companies that do not focus on the BoP market.

In relation to above explanation, the attention must be focused on the discussion of the need of financial capital as the crux of the barriers to scale-up business at the BoP. From the research, it is found that financial capital has played the biggest part in inhibiting the product scale-up in the BoP market. The need of the financial capital is mostly related to working capital, the money needed for inventory or to buy raw material from suppliers. This gives us a notion that financial capital barriers might be only relevant to the technology products that has higher price and material from suppliers. Other sectors such as food or agriculture at the BoP, might not face the same concern due to low cost of inventory and price of their products.

To expand our discussion, the traditional solution for the financial capital problem is through access to finance, in which companies explore more funding from donors, lenders, venture capital or crowd funding in order to find more capital that later can be used to pay the supplier or give credits to their distributor. While this solution works, it is believed that the strategy does not really answer the crux of the problem itself. The need of working capital in form of cash is currently solved by the obvious solution for the problem, which is receiving more money from external sources. Another discussion of whether there is another alternative solution for this is opened. *Is there really any replacement for money to accommodate the much needed working capital?*

A solution that has emerges from consumer side has been implemented by NGOs such as Kopernik in the way they provide consignment payment for their consumer. Through the local informal organizations Kopernik can give the product upfront to the people and later receive the payment in installment. This can work because there is a social pressure, a trust that is already built between the members of the social group. A chance of the member to run away with the product without paying can be suppressed because the other members of the group already know the people personally. The implementation of this practice is also supported by the collectivism society, in which people feel close to each other, which is a common condition in the BoP market.

A further idea of this is whether we can leverage this trust into distributor, supplier or reseller level. *Can suppliers give product upfront to the technology provider without expecting upfront payment? Or can distributor receive the products first, without having to pay the product upfront?* While ideally, the answer “yes” for both questions is preferred, condition in business environment and social custom is completely different. The business risk can be much bigger at the higher phase in the value chain. In addition, currently there is an emergence of social capital providers such as Kiva and Acumen fund (Acumen | Who We Are), who provide capital for early social enterprises. The trend is more and more similar fund is growing and expectantly, this can also address the financial capital barrier. Moreover, in relation to the *partner network strategy*, a creation of business group or association can be suggested, in which the companies can work together by creating a cooperation, in which one of them probably allows another party to pay lower working capital because they have known each other quite well.

Other possible idea is by changing the model of business, especially in value chain process. In an extreme solution, the *direct business model* made famous by Dell Computer can be suggested. In this business model,

the company directly sells to customer and build products to order. The company is supported by a top factory facility, only creates the products once there is an order from customer and thus, can have lower inventory. In relation to the finding, the business model can lower the working capital which is needed for the inventory. However, the solution is only going to work once the company has a really fast producing capability and customer is already familiar with the products. The latter is an important notion to the BoP as the customers have less capability for abstract thinking and thus, are willing to buy the product once they see it by their own eyes (Kepguez, 2014).

Another idea that emerges from one of the interview is to couple a BoP company with a multinational company. The idea of such collaboration will give the small companies focusing on the BoP a great financial backing to execute and implement their ideas. Nonetheless, it turns out that such ideas need to be taken cautiously. The fact that BoP market needs a huge flexibility, due to context-specific approach, requires big multinational companies to follow the flexibility of the small companies. In the experience of one of the company that we interviewed, such flexibility is hard to be implemented. Moreover, the fact that an investment at the BoP requires a long term, as can be understood from the financial capital barrier, needs to be understood by multinational companies. Long-term commitment needs to be made, or otherwise multi-national companies approach can only happens for Corporate Social Responsibility (CSR) purpose rather than the objective of partnership to get profit.

6.2.2 Intra-relation & Inter-relation of Barriers and Strategies

The research has found some linkages between barriers and strategies through the literature review and also case studies. One of the understandings is that a barrier can be approached to be solved by several strategies by firms. In this sub-section, the relation among barriers will be further observed, with several conditions and simplification that have been put on the research will be scrutinized.

The first matter to discuss is the mutually exclusiveness of the barriers and strategies. The research simplifies at the early phase on the barriers and strategies identification, that each barrier is assumed to be mutually exclusive especially during the segregation processes. While the research does not specifically test the nature of the exclusiveness of each barrier, qualitatively it can be understood during the interviews, both the expert and case studies interviews that none of the interviewee has a problem understanding the barriers and strategies that have been posed to them. This is a strong indication that the barriers and strategies list constructed in the research is mutually exclusive.

To expand the discussion, the research also waives the concern of interrelation of barriers and/or strategies. The interrelation matter on barriers and strategies can be defined as possible relationship that happens among barriers. The relations can be each barrier has correlation with other barriers, or has causal relationship where one barrier can be the cause of other barriers to emerge, stop, halt or other possible conditions. For example, barrier X can emerge because of barrier Y. Other possible relation is through perquisite condition, which means that a specific barrier will not happen because other barrier is emerging or not emerging. Such conditions are not covered in the research.

To expand the discussion, the research takes a stance to actually position all of the barriers in one layer, all positioned equally despite the order of the importance that the research indicates, but it is not in any intention to identify the relation among barriers. In several conditions, such relation of barriers might depend on the industry and specific market and thus, a relation among barriers need to take into account the specific condition.

In similar manner, the inter-relation between barriers and strategies is depicted as one way relations. To pose an intriguing discussion, *can one strategy actually create a barrier for a company?* Or other condition that may happen between the barrier and strategy relation.

In conclusion, the researcher realizes that the relation between barriers and strategies that are posed in this report is still a simplification of a condition that may happen in the real life state. However, this research can be a good start to understand the BoP circumstance and thus, a further research will be recommended in last sub-section of the report.

6.2.3 Dynamic Barrier and Niche Strategy Sequence

In the attempt to answer the research questions related to barriers and strategies in the BoP market, it is understood that there is an indication of change or development of barriers that each of the companies encounter. Each of the companies that have been interviewed mentioned some of the barriers they encountered in the past and an indication of a pattern connected with stage of business can be seen.

From Table 4.2 in chapter 4, it is understood that each of companies has differences in term of the company's scale. Specifically, the differences can be categorized into three categories of companies, depending on the number product sold: Ndassie, Majority companies (CV Karya Mandiri, PT Holland for Water and Kopernik) and D.light. Among these companies, three different business stages can be categorized as follows

- 1. Product Development (Product Focus)**

The company is at the stage where they strive to develop the best product that can serve their target market. In most condition, the problem is not whether to find products that can work properly, but rather to develop the products that can be relevant for global consumers, and thus, able to scale-up.

- 2. Distribution and Expansion (Distribution Focus)**

The second stage for the business is finding the distribution process that works. In most cases for companies that focus on BoP, this is related to finding the right partners. This is important as companies will not be able to invest in distribution infrastructure, especially in BoP countries.

- 3. Balance between products/distribution process to penetrate market (Penetration Focus)**

The next phase is to increase penetration in the market. At this stage, the company already feels the need to internalize the competence, which previously outsourced to their partners. By internalizing the competence such as through investment in distribution infrastructure, companies can be better accommodate the need for their target market.

The above business stages differences in the context of the companies will be explained as follows:

Ndassie (Product Focus)

It is understood that Ndassie at the moment is still at the stage of finding the right products that can serve the need of the people globally. It needs to be emphasized that at this stage, the concern of BoP products is not about finding the products that succeed, but rather finding the products that can serve consumers all over the world; specific to Ndassie is about their plan to serve 20 countries by next year. Their concern of the fitness of their product to serve their market can be implicitly understood from below comment:

"There is a chance that the end product is not acceptable by the user...the reason that it's not acceptable by the user. At the level of production, we need to make sure that we have high quality products" - (Kepguep 2014).

Most Companies: ACE, CV Karya Mandiri, PT Holland for Water, Kopernik (Distribution Focus)

Next, there are majority of organizations and companies that are currently selling 25,000 – 40,000 of their products. From the interviews, companies at this stage are already able to find the right products that they believe able to serve global market to help them finding the amount of scale that they need. This is especially valid for ACE and CV Karya Mandiri as can be seen from below comments:

"We are kind of manufacturing experts, that's what we are good at. Distribution is a new capability, but we are working on that." – (Walker, 2014)

"Our product (now) is functioning really well. In terms of, we have a previous model, in which in a field we have couple of issues, none very serious. I mean those are the thing we improved with this (product) one." – (Walker, 2014)

"We first invent the biomass stove using blower in 2008 at first, but when we promote this to the market the responds is negative because the stove still using electricity, the society wants the stove to be powered with no electricity at all. Also probably the design is not really attractive. So we then introduce the products to the market without blower in the market, and the responds is quite positive". – (Nurhuda, 2014)

"I sell the product mainly in Indonesia and also lately in Africa, which we sell it through our distributor Prime. This (Africa market) is still new. I do it because I want to know whether my product is suited with the market there (Nurhuda, 2014)"

"We try for the first three years to sell it (the Water Filters) through many (distribution) channels. At this moment it is not so relevant, although it's important to keep trying."- (Heederik, 2014).

D.Light (Penetration Focus)

With about 7 million of products already sold in the market, D.light has already reached a different market scale compared to other companies. Nonetheless, the company has only reached low penetration in its main market such as Kenya. It shows that the company still has barriers stopping them to reach a scale. On the other hand, the company has been able to solve the barriers that are encountered by other companies which can be understood from below comments:

“We also do well in balancing the product development and distribution investment. At the beginning the company was really focus on designing the right product, making sure that it was highly quality and affordable. Then we swing to invest mostly in building distribution. Luckily, now we are at the point where we can invest in both, in product development and distribution and marketing. For example, in our first year we were not pushed to be profitable immediately. We were able to keep investing in growth scaling-up our business- (Montgomery, 2014).

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In summary, it is believed that the differences of barriers can be separated into three kinds of business conditions that can be described in the Figure 6.4. The figure below shows that there are three stages of company development, with each of the stages has its own pertinent barriers. Thus, companies need to apply different strategies on each stage that are translated into a strategy sequence. On the other hand, there are strategies that are always evident in the whole business stages. These barriers are called as *core barriers*. Accordingly, companies need to implement *core strategies* to circumvent these core barriers.

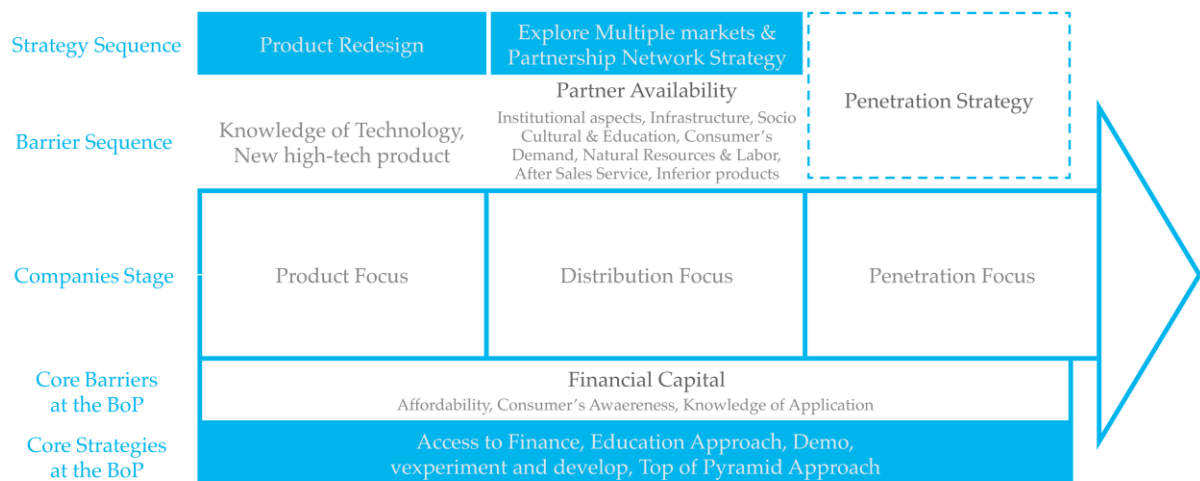


Figure 6.4 Indication of Barriers and Strategy Sequence at the BoP

To describe the ideas based on the case studies, for example, during the product focus stage, the main problem found by ACE, D.light and especially CV Karya Mandiri at the early stage is finding the right products that can be accepted by the market, specifically relevant to global market. At the moment, except Ndassie and D.light, most of the companies are currently finding a way to be able to sell their products to the foreign market. The main strategy for this is *explore multiple markets strategy* coupled with *partner network strategy*. Finding partners to help them scale has been proven to be a bottleneck for some companies at this stage.

To further explore the ideas, from the Figure 6.4, the last stage of niche is the penetration focus which requires penetration strategy. At this stage, the company has already understood its own product and distribution model, thus, their only concern is on how they can expand it into a scalable business. The idea is that this stage is no longer can be categorized as *niche* phases. To relate this idea to the innovation stages that have been discussed in chapter 2, this stage is already entering the early stage of market stabilization phase. A framework that may be fit to the company at this stage is Porter Five forces (Porter, 1998), in which the company needs to start analyzing the condition of *suppliers, potential entrants, product substitutes, buyers and industry competitors* rather than using framework of niche such as strategic niche management.

It needs to be emphasized that the above barriers and strategies sequence is more of an indication rather than a well-researched process. However, it is believed that this will be a good foundation for the next research that will be described later in recommendation section.

6.2.4 Research Relation with Previous Theory

Base of Pyramid market provides a unique landscape for research as in this market condition, the past assumptions from ideal conditions that are available in the developed nation market could not be used. Moreover, the fact that a well-researched paper about BoP market is not yet available, specifically on technology diffusion, the past literatures based on different market conditions must be used as references. In the process, it is realized that there are some phenomena that emerge quite different with the past theories which will be discussed briefly in this sub-section. The three main phenomena are as follows:

1. Company can achieve large-scale within different market located in different regions. In current global landscape, it is possible that a company can sell to more than 50 countries and sell large number of products, while in reality, they achieve only small penetration of products in several countries.
2. Many companies at the BoP do not rely on government involvement such as subsidy and or protection in the market. Companies can drive their own business without direct involvement or help from the government to promote their products.
3. The product created by the company is not region-specific but rather universal and can be accepted by consumer in different locations.

The relation to the theories of the above points will be elaborated. The first thing to be raised is about the difference of focus and point of view between both researches by Rogers (2003) and the internal process of SNM which aim at understanding specific product or technology within specific region, and this research, in which the point of view is shifted from the perspective of region, to the perspective of company, which can orchestrate several niches in different region at one time. To illustrate the point, Figure 6.5 describes the phases of emerging of niches according to past theories.

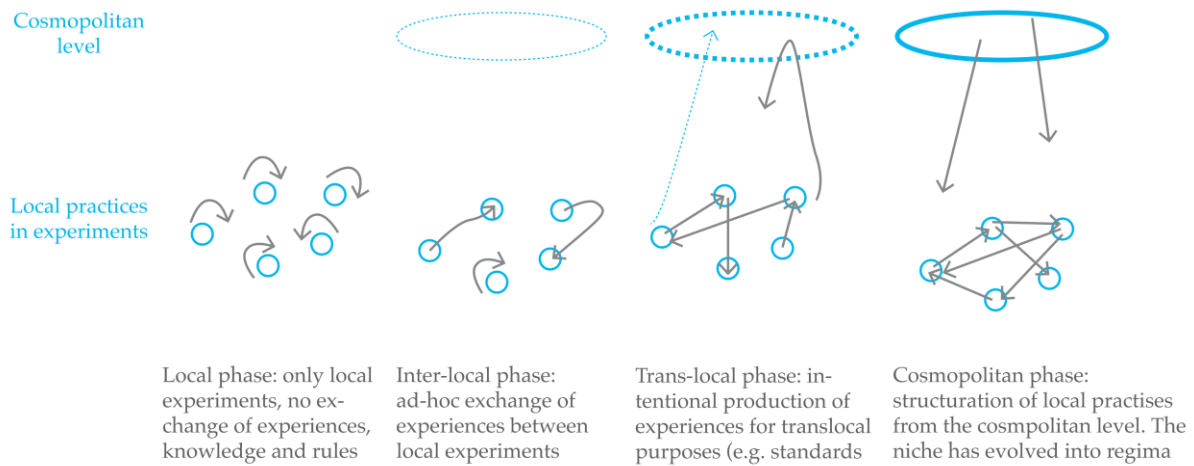


Figure 6.5 Emerging level of niches in relation to local practices in experiments (Source: Raven, 2005)

The figure shows that technology can be developed from different niche experiments interacting with each other and developed into a structural local practice at the cosmopolitan level. First, technology is developed in local phase where independent local actors create experiment. Then there is inter-local phase where actors interchange their knowledge and may share their knowledge to other locations (Raven, 2005). In the trans-local phase, actors start to be involved to consolidate knowledge although their involvement is still ad-hoc. And last, in the cosmopolitan phase, local practices are structured by dedicated actors in cosmopolitan level.

In the context of BoP market, it is found that how the technology develops is somewhat different from the way technology develops according to the theory that may happen in the context of developed nation. In this research, the approach conducted by the company at the BoP will be called as *global scale niche market strategy*. It is illustrated in Figure 6.6 the development of technology before it finally spreads into a wider market.

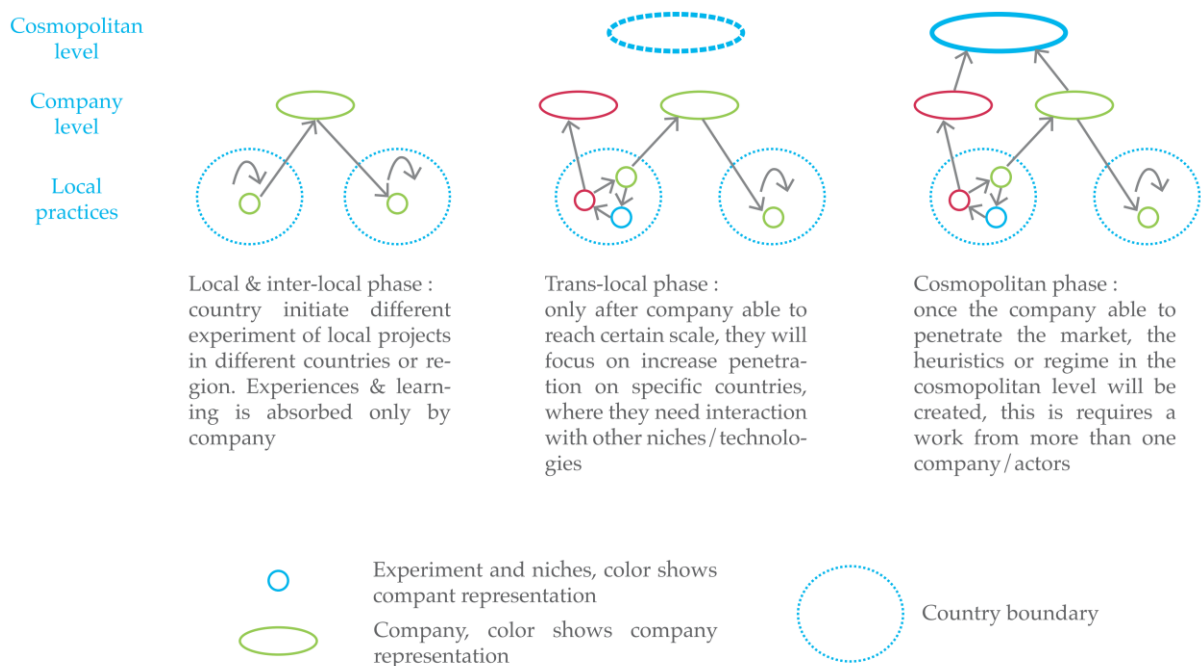


Figure 6.6 Global scale niche market strategy from the companies focusing on the BoP market

In the BoP case, the fact that companies can change their strategies by selling in small numbers to different countries has changed the paradigm from past theories. The niches in these different countries do not interact with each other, except through the companies that position themselves in the cosmopolitan level, creating its own structure of the products. The interaction described in Figure 6.6 might happen once the company decides to penetrate the market and thus, need to cooperate with other actors and niches, but at that time they already have a universal product that is accepted by different market niches in different countries. The notion of such technology diffusion is important and the importance of this in relation to product design development will be described.

The development of technology described in Figure 6.6 might be possible in the current BoP context of technology diffusion due to several reasons. First, the fact that globalization has played its part. The current network of people can easily connect with each other with the advancement of information technology. The condition creates a possibility for instance, for company that based in China, to access more than 50 countries located mostly in developed nation. Such possibility makes the company able to actually acquire the technology development knowledge by themselves without the strong involvement of other actors in the specific local region. Second, the fact that the industry at the BoP is not yet matured and thus, there are no massive competitions in the BoP market. When a company tries to sell their products in a small scale without properly building their distribution or sales infrastructure, there is no resistance from the local competition to stop the activity. The factor might be the reason why such strategy may not work in a competitive market. Third, the fact that the need of the BoP product such as solar lantern, drinking-water purifier and biomass cook stove is enormous. There is no doubt that such products are needed by the consumers and thus, the products find no resistance from the consumer.

The huge need coupled with the low competitive landscape might be the reason why companies can sell their technology with minimum interaction with actors, or more in a technology-push approach. The condition is also supported by the fact that the companies only aim at the low-hanging fruit consumers at first in form of *upper- higher level income approach* to waive the concern of affordability as an entry to enter a country's market.

On the other hand, it also needs to be mentioned that the past theories are also still very relevant in the context of this research. The diffusion theory from Rogers (2003), reasons that firms need to aim at early adopters, which are seen as people with higher income or social status. Moreover, Rogers (2003) also mentions the need of system context, in which there is a need of social pressure to help the product diffusion in the market. The approach for firms with *partner network strategy*, in which companies work with entrepreneurs or informal organizations, or *upper- higher level income approach*, in which firms approach people with higher income, align with this reasoning.

In the context of niche in SNM, the three internal processes, which are learning processes, building of social networks and voicing and shaping expectation may still happen during the technology diffusion process. From Figure 6.4, it is defined that the entire niche internal process will still happen at the penetration market stage. At this point, the company needs to focus on certain region or country and might find resistance from the competition or policy maker. At this point, interaction among actors in the network may be needed and thus, the three internal processes in the niche are required. However, at this point the company already has a well-defined product that works at the global scale, and thus, it will be interesting to know how the process of niches will affect the technology itself and whether the interaction among actors can shape the technology to meet the specific need of the people in the region. In addition many of the companies do not require help from government to introduce their products to the market. This finding is quite different with the notion of necessary protection from the government. Although

further research is needed, it is believed this it is quite related to the different kind of niche types that have been discussed previously in chapter 2. BoP market provides different characteristics in which the technology is not totally new as it comes from developed nation, while the need from consumers is relatively new.

To introduce another point of discussion, in this research, barriers to strategy approach is used, in which barriers are defined as ways to find a strategy, and thus, by identifying and understanding barriers that the companies encounter in the market, it is believed that a complete list of strategies that the companies need to implement can be obtained. It is believed that the application of this barriers-strategies approach is also quite relevant to explain past theories and possibly to create future theories. For instance, in the context of SNM, the theories mention three things that are important for niche creation: learning processes, building of social networks and voicing and shaping expectation. If the notion is shaped to barriers and strategies approach, each process might be broken down to find the barriers that hinder the process. For instance, the learning process distinguishes five aspects to focus on (Hogma et al, 2002): *Technical development and infrastructure, development user context, societal and environmental impact, industrial development, and government policy and regulatory framework*. SNM emphasizes that actors need to be able to articulate their ideas to be able to make sure that those five aspects are articulated clearly. Shifting the approach to barriers-strategies approach, the condition could be phrased as making sure that all of the above mentioned five aspects can be considered as barriers, and thus, if appropriate strategies can be identified for all of the five aspects, it is expected that learning processes can happen successfully. Similarly, the thinking can be applied to other internal process in niches.

In similar fashion, other theories of technology diffusion of Function of Innovation System can be approached, in which it mentions 7 functions: *Entrepreneurial activities, Knowledge development, Knowledge diffusion, Guidance of the search, Market formation, Mobilization of resources, and Support from advocacy coalitions* that can contribute to the success of technology introduction in certain region (Negro, Hekkert, & Smits, 2007). In barriers-strategies approach, each function can be drilled down to find the barriers and propose a strategy respectively. The idea is to have barrier-strategies as general approach, rather than having a specific framework that fits only certain region, technology or context.

The last point to be discussed is related to product design at the BoP. Many of literatures from product design in general emphasize the importance of understanding the users need, in form of user-empathy (Bill Moggridge, IDEO). The understanding of consumer's need can be really important to the product success (Callahan & Lasry, 2004), but on the other hand, a designer sometimes can have lack of knowledge about users' need (Bruseberg & McDonagh-Philp, 2002). Thus, in order to gather that knowledge, the designer works closely with market researchers (Bruseberg & McDonagh-Philp, 2002). In the context of BoP, several BoP literatures mention the importance of having a product that is relevant to the user or consumer socio cultural habit by immersing in customer life and work styles (Prahalad, 2012), but not mentioning the importance of creating product design that relevant for the global market to achieve scale (Castillo, Diehl, & Brezet, 2012).

In BoP case, it is found that all of the companies that have been interviewed at some point sell their product to different countries, where they may have different needs and requirement from the home market. Specific to one of the case of D.light, who has already succeeded in selling to many countries all over the world, the company mention that they have aimed at achieving global scale from the start. While it is not explicitly mentioned by the company, it is believed to be possible because the product they sell has a global relevance, rather than specific to one market only. It is believed that in the long term, companies need to find a universal design that meets the need of people in many different countries. This

is where the current literature of BoP probably is lacking, in having a mechanism to find a product that can be accepted in global scale.

Lastly, looking back to the result of this research, it can be summarized that several thoughts are quite align with other theories that have been discussed in relation to technology market at the developed nation.

- The analysis in Figure 6.4 to understand strategic sequence at the BoP is possibly related to the notion of difference in product and process innovation (Utterback & Abernathy, 1975). Although in this context, process innovation is far more related to the distribution process. This is also related to the notion of technology niche and market niche (Weber, Hoogma, Lane, & Schot, 1999) (Hoogma, Kemp, Schot, & Truffer, 2002).
- The notion of starting point is very affecting the context and ways on how company solves and approaches certain barriers has been mentioned. This will further affect how the company develops in the future, which might be related to the notion of path dependency. Specific for this research case, the competence that the companies have at the beginning, such as manufacturing expertise, might shape the strategy and path of development of the companies. The expertise that the company required then might be relate with the notion dynamic capability (Teece, Pisano, & Shuen, 1997).
- Last, the notion of having universal design is related to the technology push approach (Dosi, 1982) . While such approach is becoming irrelevant in the context of technology development in developed nation, such approach might be applied in the context of BoP, where social awareness of technology knowledge is still lacking.

6.3 Reflection

In this section, some reflections will be shared from the personal experience during conducting the research. In the effort to find barriers and strategies at the BoP, some things are found to be learned. In addition, in this section, the reflection covers several things that might be conducted differently if more resources such as time and funds are available. Last, some of the research limitation based on the scope of the research will be mentioned.

6.3.1 Reflections on research methodology

The research approach is divided into three steps: theoretical gap identification, identification on barriers and strategies and validation on barriers & strategy identification of relative importance. The steps are conducted with different nature. The first two phases are very literature approach in nature. At some point of the research during the first two phases, there is a concern that the objective of this research will not be reached as expected. Only after finishing the last phase of the research of primary case studies, rich information and insight from the interview can be obtained. At this stage, it can be said that finally an outcome that fit the objectives can be synthesized and the result can be connected with the previous two phases. In a sense, the research requires to go back and forth during each phase to be finally able to link-up all of the information and synthesize it into a well-thought research outcome.

Second, in relation to practical execution of the interview, the fact that each of the interviews can be only conducted for an hour is insufficient because the context of 21 barriers and 15 niche strategies must be explained to the interviewees which sometimes require long time. The fact that there is only limited time might make the interviewee misinterpret the definition of a barrier or a strategy. The time constraint is also the reason why the research only gathers the information about linkage between barriers and strategies from implicit answers instead of directly answers the linkage. With 21 identified barriers and 15 strategies, it will take a 315 combination of barriers and strategies to be verified by the companies that will take quite a long time.

The condition also worsened by the fact that the questionnaire cannot be given beforehand as a top of mind (TOM) answers from the interviewee are required, which cannot be gathered if the questions are given beforehand. If practically possible, holding two different sessions of barriers and strategies questions with around 45 minutes take for each session is suggested. It will not only provide more time to explain about several concepts of barriers and strategies, but also will minimize the influence from the interviewer related to the answer for the interviewee's barriers and strategies.

Third, in term of research domain, the Base of Pyramid market has pushed to waive the presumption which has been obtained in the past based on the developed nation. The fact that there is no experience living in BoP society might make the grasp of several interpretations on the literature or interviews is not as strong or intended as it is supposed to mean. Regardless, the involvement of BoP experts can solve the concern to a certain extent.

Fourth, finding the company for interviews posed a challenge for this research because of the limited personal contacts at the BoP field. Companies that are managed to be interviewed come from the personal contacts, referral from expert interviewees, or from an effort such as cold-calling and cold-emailing although this result in small success. The fact that the process of the interviews can take about an hour can be also the reason why several companies refused to be interviewed.

Fifth, the fact that the research is conducted in exploratory manner with interviews has helped to go beyond the research scope defined at the early stage. As have been mentioned in the discussion chapter, the indication of dynamic barrier and niche strategies sequence come up during the interview even though

it is not the initial research objective. But on the other hand, as the research is done qualitatively, especially at the first stage, many of the barriers that have been identified are based on the interpretation of the researcher. Although at one stage, this interpretation is validated by the expert interviews, it will also be helpful if during the process, there is more than one main researcher to validate the interpretation of the findings. Moreover, the barriers and strategies that have been identified are based on the answers given by the company representatives. It may be possible that the company is unable to identify its own barriers and strategies. To address this issue, another method of research such as through observation can better represent the main issue that the company encounters.

Last, during the interviews, it is also found that both the term 'barriers' and 'strategies' have very general meaning, that are very different from one interviewee to others. The approach in which the interviewee is asked by using aided and non-aided questions have helped to guide the interviewee to answer as expected. In two of the interviews during the open questions part, the interviewee mentioned that they do not really find any barriers and/or implement any strategies to scale-up their business. Only later once the list of strategies in questionnaires is shown, they finally are able to answer some of the barriers and strategies. This kind of issue is anticipated by first giving them understanding on the context of the research which is sent prior by e-mail, and also during the interview, the interviewees are asked to mention some of the success factors to help them think of the challenges that they encounter.

6.3.2 Research Limitation

In this sub-section some the research limitations that are closely related with the research scope and boundaries will be mentioned, such as:

The research only selected 6 companies that might not represent the whole companies that focusing on the BoP market. For instance, the market only covers mainly Indonesia and several African countries. Thus, the research may not be generalized to other market of BoP, especially in specific to context-specific barriers and strategies.

The kind of technology that has been chosen is only retail/household technology products that may have different nature from other technology products. This technology is chosen as a foundation for more complex technology that may be used in this BoP region. For instance, specific to the provision of solar lighting, the technology is only able to provide the lowest need of electricity source to the community. In the context of the theory of energy ladder, a consumer may need higher level of electricity aligned to the increase of their income, the consumer that lives in higher ladder might need higher consumption of electricity such as for mobile phone recharging or for heater. Such technology is increasingly provided in the BoP market, and will need different approach. However, it is a certainty that this study can be used as a foundation for such technology need.

It needs to be highlighted that the focus is for the companies that have already started their business at the BoP. Thus, the barriers which are covered are those occur during the operation but not prior to the start of business operation. Moreover, although a notion of business development and stages is shown in the discussion chapter, it needs to be emphasized this research does not aim at providing a solution, framework or guidance to develop business at different business cycle/stages. For such research, the work of Thapa (2013) can be used as a reference, which creates a framework for that purpose. Moreover, the companies covered in the research solely focuses on the BoP market. At the moment, there are already several multinational companies that try to do their business in the BoP market. These companies can provide different barriers and strategies that are not covered in this study. On the other hand, the small companies can provide a more transparent condition about what a company might find in the

market, then again, this study can be a good foundation for multinational companies approach in the market.

The strategy covered in the research is only applicable to companies' initiative but not to the initiative that comes from the government entity, in which they try to promote technology diffusion in certain BoP region. More specifically, the research only covers the case in which the consumers are obliged to give part of their income to buy certain technology, and thus, grant or free product strategy is not discussed. It is considered to more represent the spirit of the Base of Pyramid market as first raised by Prahalad (2004). For the technology diffusion provision by government at the BoP market framework, the study by (van Alphen, Hekkert, & van Sark, 2008).

The end-consumer of the technology is defined as Base of Pyramid community. The research does not cover the condition where the technology is produced in the BoP market, but sold in developed nation. This, for instance, comes from the BoP to Top of Pyramid (ToP) market, where company tries to take advantage of resource availability at the BoP, but their main market ToP.

The research only focuses on the relation between barriers and its linkage with strategies. In one of the step in categorizing the barriers and strategies in Chapter 3, for simplification, it is assumed that all of the barriers are mutually exclusive which does not really represent the real condition. Thus, the relations among barriers and/or strategies are not covered in this research. This is important for instance, when company want to understand the correlation among barriers or strategies.

The revelation of the dynamic of barriers indicates that there is a change of barriers that might happen over time. The data collection is only conducted within specific time, thus, the only thing to rely on is the information from the interviewees regarding the things that happened in the past; this might not completely represent what happens in reality.

Generalization of the research, especially to other domain outside the BoP, needs to be taken cautiously due to limited sample and the nature of the studies which is quite exploratory. The caution of generalization of result is applied for using the result in different kind of market outside the scope of the research.

6.4 Recommendation

In this section, some recommendations covering both managerial and academic will be given. The managerial recommendation will focus on how companies should address the result of this research. On the other hand, the academic recommendation will focus on the further research. By applying both recommendations, the research can be developed further for both theoretical and practical tool.

6.4.1 Managerial recommendation

The research on the company focusing on the BoP market opens up a discussion for both companies that focus on the BoP and other companies active at the general market. The result of important barriers and strategy at the BoP will be first discussed before later broaden the recommendation to cover companies active in general market.

The fact that *financial capital* is mentioned as the most important barrier by most of companies, specifically also by larger companies, reveals a condition that might sound unappealing for social companies. From the interviews, it seems that the financial barrier will always cloud the company no matter what stage of business is the company at. This understanding should be seen as a challenge rather as a burden, and most importantly, the condition should be seen as a predicted challenge rather than as an unsurprising problem. The fact that many companies stop their mission or shift their attention from the BoP

consumer might be driven by this barrier. If the companies understand this problem from the get go, they will focus their attention on solving this problem and most importantly, understand that most of companies at the BoP are facing the same problem. Moreover, it has been identified that there is a possible cooperation among big multinational companies and smaller companies focusing on the BoP. From one of the case studies, it is found that such cooperation is not working so well, but it will be interesting if such cooperation can be implemented as it can possibly address the huge issues of financial capital in the market.

The research also finds out that the local partners are very important element for the company to help them scale their business. The fact that many companies still say that it is difficult to find a partners, can constrain their growth. The BoP community needs to address this condition by working together and possibly create network that can assist each other. For instance, a local partner in country A, might help to sell a product that come from country B, and vice versa. This can help cooperation and solve the huge needs of partners in the market. In addition, the BoP community must be convinced to shift their attention to the provision of financial capital to help the issue of lacking financial capital that the BoP companies facing at the moment. For the last few years, most of the attention has been focused on finding or developing the right product at the BoP. At the moment, the market has been filled by ranges of good products that are able to solve problem at the community. The bigger problem is to make sure that these companies that provide these products get the appropriate funding to be able to sell and distribute their products.

The research also reveals that the companies need to aim at product scale from the first go. The strategy is possible due to the trend of globalization, in which information is easily accessed. The fact that companies can now easily access and understand the need of their consumer, which is located very far from their headquarter, makes such strategy is possible. The realization of such scale goal and objective will implicate the whole strategy and vision of the companies, from the product design, distribution channel, personnel recruitment and many other things. Such goals and mission are important for the companies to set from the start. In the case of start-up companies, it might be positioned in the middle of helping the community and finding the higher profit, which then later can result in change of vision, then translates into a failure to develop business.

The point of discussion regarding strategic sequence also can be important for the companies. The fact that at different stages the company encounter different barriers and thus, need to solve different strategies, needs to be acknowledged to scale-up their products in stepwise manner. The companies need to solve the problem of products development first, before they later concentrate on finding the right distribution channel.

6.4.2 Academic recommendation

The academic recommendations will focus on the suggestions for further research. The first recommendation to be addressed is the one more closely related to the research, before expanding to cover other possible future researches.

The first recommendation is related with expanding the research result, which is important to achieve the generalization of the research. The fact that the current research is only based on six case studies constraint the possible generalization of the results. In order to achieve a better generalization, larger samples of companies need to be analyzed.

In addition quantitative research with surveys to many more companies may be conducted to check the importance of the barriers and strategies. To execute such research, the construct of each

barriers/strategies, that are required to build the questions may be come from this research as this research has provides some of the real examples of the condition where each barrier applied in the real condition.

The research has revealed that there is a strong indication that barriers and strategies that a company experiences are relative to time. The barriers are dynamic depending on company condition and also business stage. The research has not really covered in detail for this revelation and would recommend further research on the topic, specific to BoP topic or even further to more general market. The research question that can be posed for example:

“How does the development of a company’s barriers and niche strategies for technology scaling-up change over time?”

Based on the primary case studies for this research, it is suggested to ideally conduct a longitudinal research which means that the research will take 3-5 years to understand the development or changes of barriers and niche strategies over time. Another approach is to ask different company staffs that have stayed for a long time within the company. The approach will give more understanding on both dynamic barriers and strategies, especially how companies can address the different needs and requirement to solve barriers and implement the strategies over time.

Specific to the result of understanding the financial capital and partner network strategy, it can be also interesting to find the network relation of each company. The companies at the BoP have been able to survive due to funding from many different parties and methods such as crowd funding, government grant, social business competition and many other sources. To actually understand how the network of companies grows in the context of BoP will be crucial to understand the partner network strategy in more detail, and moreover, to solve the crux of financial capital barrier.

“How do the companies at the BoP grow their partner’s network to solve the problem of financial capital need?”

The answer for the above question can possibly reveals what is lacking from the current companies’ effort to fulfill the huge need of financial capital. By identifying the answers for the question, companies can possible look-up some solutions that might not be thought at the moment, for example, by applying a new creative business model. One example is by cooperating with multinational companies that have been discussed in managerial recommendations.

The next research may also focus on the relationship between barriers and strategies. The research does not fully focus on real example of connection. The answer only comes from implicit answers, and thus, a fully focused research may be an interesting topic. In part of the research discussion, it specifically discusses the intra-relation and inter-relation among barriers and strategies. This research has not yet fully analyzed the kind of relation that can happen. To expand the notion of relation of barriers and strategy, there may be the case that several barriers and strategies are related to certain event or condition that may be influenced by the event in the past, or affect the company’s decision in the future.

This condition may affect the barriers or strategy that firms decide to execute. In understanding such condition, a research may ask questions that are more drilled down into a causal understanding. A line of reasoning that can be posed for the future research is for example *“Why does barriers X do not appear in the case of company A but appear in company B?”* or *“Why does company A decide to implement strategy X, and not strategy Y?”* to actually understand the full reason why several companies make their decision.

Another possible future research is to find the relation among all barriers and strategies by quantitative research. The barriers and strategies that have been found are quite related among others and thus, it will

be interesting to find how the companies perceive and see this interrelation. Quantitative research will give a better indication on how strong a barrier connected with each other's and thus, will help the company to better develop a strategy to solve a barrier. An objective of such research ideally is to find the most important problem quantitatively.

Specific to Base of Pyramid market context, it is predicted that in the coming years that there is an influx of more complex technology such as solar home system. This kind of technology will give a more complex condition in both upstream such as production system and downstream such as business model for consumers. It is believed that the research is a foundation that can be used to understand the complexities that might happen when a company wants to introduce such more complex technology to the market.

Another possible research context is the field of product design in its connection to product scale-up. The fact that there is a huge need of having a universal product design which can be used to scale-up to many regions contradicts with the notion that BoP consumers have different needs from different regions and countries. It is understood that there is currently no research that focusing on creating a universal product design in the BoP market and thus, this is recommended as a further research. Possible research question can be:

"How do companies focusing on the BoP market create a universal product design that can be accepted by people living in different regions?"

Another recommendation is to further explore the application of barrier-niche strategies approach. As have been described in the discussion approach, it is believed that this approach opens up a more general method to understand the technology diffusion and development. Current methodologies such as Strategic Niche Management and Function Innovation System are quite context-specific and thus, a general method or framework will be useful to be introduced in the context of technology introduction.

In term of generalization of the research, it might be interesting to understand whether such scale-up model from the companies at the BoP can be replicated by any companies that aim for global scale. In this *global scale approach*, firms aim at selling the products in small numbers to different market located in different regions or countries. These small sales can be accumulated into a huge sales number, which can help the company to achieve a certain growth. The approach is different from the common strategy, where a company usually focuses the first their growth on specific countries or region, before expanding to other markets or regions.

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Appendix

Interview questions

Main Questions

1. Could you briefly explain of your company activities regarding technology provision for the poor / Inclusive Innovation / Base of Pyramid Market?
2. What role do you personally have in this activity?
3. Could you tell me how your company sells the products to your consumer?
4. What do you think the factors that can influence of your company success in selling the products?
5. What do you consider the barriers for the scaling-up of your business?
6. Based on the mentioned barriers which one do you think the most important barriers to your business?
7. Based on the list (questionnaire), in your experience how relevant each barrier inhibits the product diffusion to the market?
8. What are your company strategies to scale-up your products at the market?
9. We have listed several possible strategies (now based on the list in the questionnaire), can you please indicate the relevance or important of the strategies to your business?

Additional Questions

- What do you consider the differences of barriers from selling your product to other technology products and/or consumer product at BoP?
- What are the company strategies to solve several important barriers that you have mentioned?
- Based on the list, are there any strategies that your company willing to implement in the future? Why?
- Based on your experience, is there any strategies that are not worked? Why it did not work?

Questionnaire

Please note that different questionnaire layout, using Google Form, was used for interviews via Skype.

First Questionnaire

No	Barriers	Possible Examples of Barriers at the BoP	Not Important	Slightly Important	Somewhat Important	Moderately Important	Important	Very Important	Extremely Important
			1	2	3	4	5	6	7
1	New high-tech product	Your company have problem selling the product, because the technology is new, and still have a small glitch	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2	Knowledge of Technology	Your company knowledge is still lacking to develop the products on industrial scale	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3	Production system	The factory do not have enough capacity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4	Complementary products and services	Your consumers have difficulties in finding fuel	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5	Infrastructure	Road is not available or in bad condition	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6	Natural Resources & Labor	Raw material & workers are not available in the region	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7	Suppliers Availability	No suppliers in the region are able to provide parts of products	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

8	Collaboration Issue	The organizations are unable to work together	O	O	O	O	O	O	O
9	Financial Capital	Capital for market expansion or stock replenishment for manufacturers , wholesalers and small retailers is not available	O	O	O	O	O	O	O
10	Lack of After Sales Service	Your company has a problem to provide product maintenance service, and it inhibit business growth	O	O	O	O	O	O	O
11	Knowledge of Application	Your consumers have difficulties to know how to use the product	O	O	O	O	O	O	O
12	Socio Cultural & Education	Society does not trust the products & low education level of consumer	O	O	O	O	O	O	O
13	Consumer's Demand	The demand for the existing technology products is still high, thus consumer does not need the new product	O	O	O	O	O	O	O

14	Consumer's Awareness	Lack of information regarding product availability/information in the market	O	O	O	O	O	O	O
15	Affordability	Product price too expensive	O	O	O	O	O	O	O
16	Inferior Products	Consumer lack of trust or bad perception because there are low-quality products in the market that are easily broken)	O	O	O	O	O	O	O
17	Institutional aspects	Import tariff & subsidies	O	O	O	O	O	O	O
18	Laws, rules and standards	Standard for products quality is not exist	O	O	O	O	O	O	O
19	Undesirable social & environmental effects	Your/other products create side-effect that may harm consumers	O	O	O	O	O	O	O
20	Accidents or events	War that may prevent consumer to access the products	O	O	O	O	O	O	O
21	Macro-Economic aspects	Consumers' general income decrease due to macro-economic condition	O	O	O	O	O	O	O

Second Questionnaire

No	List of Strategies	Definition	Not Important	Slightly Important	Somewhat Important	Moderately Important	Important	Very Important	Extremely Important
			1	2	3	4	5	6	7
1	Demo, experiment and develop	Consumers and producers are demonstrated the technology to get more knowledge regarding the technology application and possible development	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2	Top of Pyramid Approach	Sell the products to people with higher social income / status and expect this will trickle to larger market	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3	Gender Market Approach	Sell the technology to specific market segment, because they have higher influence regarding technology purchase and development	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4	Access to Finance	Producers injected with funding to develop technology or grow their business	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5	Product Subsidy	The consumer pay less price, in order to push for sales	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6	Product Redesign	Change of product specification to approach a specific market	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7	Dedicated System or stand-alone strategy	Product used in a constrained system/region firstly for example in a laboratory setting	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8	Hybridization or adaptor strategy	Combination of the new product with the existing available product	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

No	List of Strategies	Definition	Not Important	Slightly Important	Somewhat Important	Moderately Important	Important	Very Important	Extremely Important
			1	2	3	4	5	6	7
		e.g. hybrid car							
9	Technology Complementary	Use other available technologies in the market to enhance the process to introduce the new technology e.g mobile payment	O	O	O	O	O	O	O
10	Education Approach	Transfer of knowledge to customers and suppliers	O	O	O	O	O	O	O
11	Geographic Approach	The products are sold in a region where it can more easily accepted	O	O	O	O	O	O	O
12	Lead user Approach	The products first sold to the people/institution with specific technology expertise/demand (e.g. university)	O	O	O	O	O	O	O
13	Explore multiple markets	The products sold into different markets/region in order to gain understanding of the technology or find the best way to expand the business	O	O	O	O	O	O	O
14	Government-lead supply strategy	Works with government, to provide technology to society even though the demand from the market is not yet articulated	O	O	O	O	O	O	O
15	Supplier Network Strategy	Parties collaborate with each other's to expand their network and better stimulate technology acceptance and development	O	O	O	O	O	O	O

List of Literatures for Desk Research

No	Research Title	Author / Year
1	Product innovation for the people's car in an emerging economy	Ray, S., Kanta Ray, P, 2011
2	Corporate-Led Sustainable Development and Energy Poverty Alleviation at the Bottom of the Pyramid: The Case of the CleanCook in Nigeria	Sesan, T., Raman, S., Clifford, M., Forbes, I, 2013
3	Capability accumulation, Innovation, and Technology Diffusion :Lessons	Silvestre, B.S., Neto, R.e.S., 2013
4	Implementing Technologies for Financial Service Innovations in Base of the Pyramid Markets	Berger, E., Nakata, C, 2013
5	Innovation and scaling of ICT for the	Foster, C., Heeks, R. 2013
6	Innovation pathways at the Base of the Pyramid : Establishing	Hall, J., Matos, S.V., Martin, M.J.C. 2013
7	Profitable business models and market creation in the context of deep poverty: A strategic view	Seelos, C., Mair, J. 2007
8	PROMASOL: Democratizing Access to Solar Water-Heaters	Allali,B, 2011
9	SELCO: Solar Lighting for the Poor	Mukherji, S. 2011

List Case Studies Interviews

Name	Company / Affiliation	Location	Type	Date
Ruben Walker	African Clean Energy	Netherlands	Personal Interview	7-Aug-14
Lieselotte Heederik	PT Holland for Water	Indonesia	Skype Interview	18-Aug-14
Muhammad Nurhuda	CV Karya Mandiri	Indonesia	Skype Interview	27-Aug-14
Lincoln Rajali Sihotang	Kopernik	Indonesia	Skype Interview	31-Aug-14
Jean-Seraphin Kepguez	Ndassie Solar Engineering	Netherlands	Personal Interview	2-Sep-14
Kate Montgomery	D.light	Kenya	Skype Interview	1-Oct-14

Note: interview summaries were removed in the public version of this report.