

BARRIERS AND STRATEGIES FOR INNOVATIONS ENTERING BOP MARKETS

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ABSTRACT

Companies that bring a new product to the market or enter a new market with an existing product, come across a number of barriers that prevent large-scale diffusion. In order to circumvent or remove these barriers, they can adopt alternative strategies. This paper looks into these barriers and focuses on niche-strategies for innovative technological products aimed at “Base of the Pyramid” (BoP) markets. The paper builds on existing literature describing barriers and strategies for introducing innovative technological products in western markets.

The information sources are fourfold: (1) literature study, where literature is combined from the fields of Strategic Niche Management, Innovation Management, Innovation Systems and BoP markets; (2) interviews with experts on BoP markets; (3) secondary case studies on barriers for technological products on BoP markets; (4) interviews with companies that sell technological innovative products on BoP markets. We look at three types of products: cookstoves, solar lanterns and water purification technology in Africa or Asia.

Based on these information sources we come to a list of 17 barriers and 11 niche-strategies that are adapted to the specific context of innovative technological products in BoP markets. Some examples of barriers are a lack of after sales service, lack of consumer awareness, and a lack of distribution channels. The barriers are also ranked in terms of their relative importance. Some of these niche strategies, which are further explained in the paper are the lead user niche strategy, the educate niche strategy and the redesign niche strategy.

In the conclusion and discussion section we discuss, among other things, the generalizability of the relative importance of the barriers and the selected niche-strategies for introducing innovative technological products in BoP markets and how the insights in this paper can be extended to become more dynamic.

Key words: barriers, strategies, Base of the Pyramid, technological innovations.

1. INTRODUCTION

This article focuses on Base of the Pyramid (BoP) markets and explores how products can be introduced in these markets that improve the daily lives of people belonging to the BoP. The term “Bottom of the pyramid” was introduced by Prahalad and Hart in 2004 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 and Hart, 2004). The main notion of the Bottom of Pyramid is that companies need to see the poor not just as consumers, but rather as creative entrepreneurs who are actively trying to solve the problem that they have (Prahalad and Hart, 2004). In 2007, the World Resource Institute introduced the term “Base of Pyramid”, which is defined as people who live on less than \$3,000 a year in terms of their local purchasing power (World Resource Institute, 2007) and does not only include the poorest segment of the population, estimated around 1 billion of people, but also a larger segment of population estimated around 4 billion of people, who live well below the western poverty line standard (World Resource Institute, 2007).

The existence of the BoP reflects the problem that many households have a limited income and, as a result, have problems in terms of health, education, living conditions, *etc.* (Alkire and Santos, 2010), (Banerjee and Duflo, 2011). Different solutions are suggested to deal with these problems. Firstly, development aid can temporarily overcome the most urgent needs but is criticized for the fact that its effect fades away soon after the developmental aid is stopped (Sachs, 2005). Secondly, another solution is to facilitate entrepreneurial activities among BoP households in order to stimulate them to improve their own income (Moyo, 2007), (Easterly, 2006), (Banerjee and Duflo, 2011). Thirdly, adapted and often low cost products are developed that can fulfill some of the basic needs and thereby improve the daily lives of people in BoP households. These adapted products are sometimes referred to as frugal innovations (Van Beers *et al.*) and in practice range from cooking appliances, communication appliances, water cleaners, electricity provision, lighting and so on. This article focuses on the third approach to deal with BoP-markets, with a specific focus on innovative technological products.

Many barriers have to be faced before large-scale diffusion of innovative technological products in BoP-markets is possible. A way to deal with these barriers is to introduce the product in a small part of the market first – a niche market. The term niche market refers to a relatively small group of customers with specific wants and demands regarding a product (Dalgic and Leeuw, 1994), (Shani and Chalasani, 1993). Parrish *et al.* (2006) contrast niche and mass marketing in terms of the size of the market (small or large) and product characteristics (specialized or generic functionalities). Several types of niches exist. We define an “early niche” as a niche that emerges prior to industrial production and large-scale diffusion of a new high-tech product in a mainstream application. A typical early niche is the use of digital imaging in satellites for military surveying. This early niche appeared prior to the use of digital imaging in ordinary photo cameras. Niches can also emerge later on i.e., during large-scale diffusion of a high-tech product, when the market has matured. In the latter case we refer to these niches as “mature niches”. Another distinction that is made in the literature is that between “market niche” and “technological niche” (Raven, 2005), where a market niche is a part of the market with a relatively small group of customers with specific wants and demands regarding a product and a technological niche is a part of the market that is sheltered from the mainstream market, e.g. by way of subsidies or special regulations.

This article investigates the types of barriers that exist for the introduction of innovative technological products in BoP-markets and their relative importance, and explores how these barriers can be dealt with by means of specific niche strategies that either break away or circumvent these barriers. Therefore, our three research questions are as follows:

1. What are the most important barriers that prevent large-scale diffusion of technological products in BoP-markets?
2. What are the most important niche strategies that can be adopted to deal with these barriers?
3. How are these barriers and strategies related?

Not all technological products in all BoP markets are addressed in this article. The scope is limited to three types of products in two parts of the world: cookstoves, solar lanterns and water purification technology in Africa or Asia.

This article is scientifically relevant in a number of ways, as it addresses five gaps in the literature. To start with, it addresses three gaps in the Strategic Niche Management literature. In this literature, which originated in the late 1990s, introduction of new technologies in technological niches, sheltered by way of subsidies or special regulations, is studied. However, specific barriers to enter niches and come out of niches have hardly been addressed so far. Only Kemp *et al.* (1998) goes into barriers and formulates a few of them, in a quite aggregated way. In section 3 of this article these barriers will be listed and explained, after which they will be built upon further. Secondly, recent publications in the field of SNM (Quist, 2007), (Schot and Geels, 2008), (Smith and Raven, 2012) agree that not sufficient insight has been created so far on how new technologies can come out of these protected niche environment and enter the mainstream market. Only a few publications in the field of SNM, such as (Kemp *et al.*, 1998), (Raven, 2007), and (Smith and Raven 2012) refer to strategies that can be used to get new technologies out of their niches. In section 3 of this article these barriers will be listed and explained, after which they will be built upon further. Thirdly, this is the first article that addresses barriers and strategies related to BoP markets. In recent years, quite some papers, such as (Van Eijck and Romijn, 2008), (Caniëls and Romijn, 2008) and (Kamp and Vanheule, in press) have been published that apply SNM in developing countries. However, these papers all look into sociotechnical processes that take place within niches and do not pay attention to barriers and strategies related to coming out of the niche.

The fourth and fifth gap that this article addresses are in the field of innovation management. Recently, a few papers have been published on barriers and strategies related to introduction of innovations, such as (Ortt *et al.*, 2013). However, as is the case with SNM, this field is still very much in development and therefore the lists of barriers and strategies that have been published so far may not be fully complete yet. Also, no publications in the field of innovation management related to barriers and strategies have focused on BoP markets or developing countries yet.

In terms of practical relevance, a number of aspects can be listed. Firstly, managers in companies that are active on or want to enter BoP markets, can make use of the barriers and strategies that are identified in this paper in order to improve their market strategy. Secondly, policy makers that want to stimulate introduction of new technologies, for example sustainable innovations, can use the insights from this paper about important barriers to formulate policy measures that can help to remove or

decrease these barriers. Also, as will become clear in section 3 of this article, policy makers can adopt a number of the strategies listed in this paper to play a direct role to remove barriers, e.g. as launching customers.

The remainder of this paper is organized as follows. Section 2 describes the research methodology. In section 3, the research findings with regard to barriers and strategies are presented. Section 4 presents the conclusion, discussion and recommendations.

2. RESEARCH METHODOLOGY

The research methodology used in this article consists of two parallel sequences of four steps that are in the end combined in a fifth step. The research methodology is represented in Figure 1 below. In the text below Figure 1, we explain these two sequences one by one.

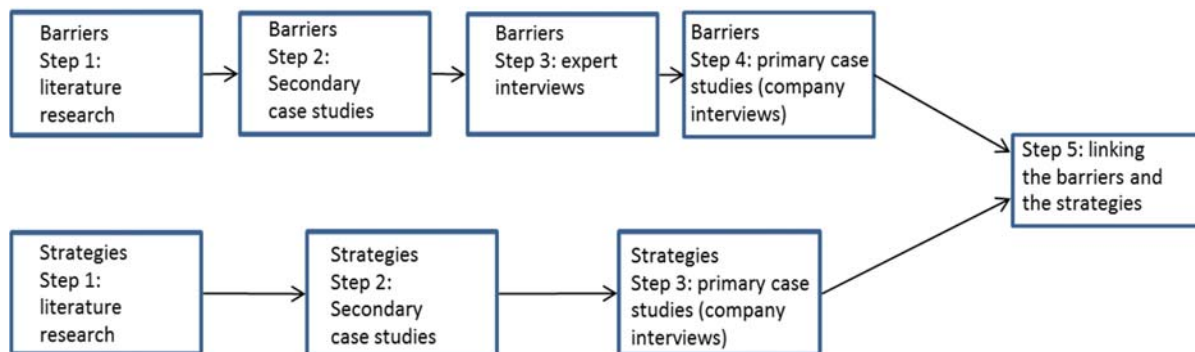


Figure 1: The research methodology

The first sequence consists of the method to identify barriers that prevent large-scale diffusion of innovative technological products in BoP-markets. The four steps are as follows:

- Step 1 consists of literature research. Based upon literature from the fields of Strategic Niche Management, Innovation Management, Innovation Systems and BoP a search for barriers that prevent large-scale diffusion of products in BoP-markets is conducted. Out of this first step comes a first preliminary list of barriers.
- Step 2 consists of secondary case studies from the literature. To find relevant case studies, we use the search string BoP & Pyramid & Case in Scopus. This results in nine secondary case studies. These case studies are carefully analyzed, to find out whether the second preliminary list of barriers is complete. If a new barrier is found then one out of three possible routes is followed. First, if the newly found barrier fully overlaps with a barrier that is already on the list, then the list remains the same. Second, if the newly found barrier partly overlaps with a barrier already on the list, then the barrier on the list is adjusted, renamed or redefined. Third, if the newly found barrier does not overlap at all with a barrier already on the list, then it is added to the list. This results in a second, revised, preliminary list of barriers. Also, during step 2, the barriers are categorized in terms of relative importance. The more often a certain barrier is mentioned in the literature, the more importance is adhered to it.

- Step 3 consists of presenting the first preliminary list of barriers to a limited number of experts on BoP markets during an open semi-structured interview. The goal of this step is to test whether the second preliminary list of barriers out of Step 2 is complete and whether it is clear. This results in a third, again revised, preliminary list of barriers.
- Step 4 consists of primary case studies. In this step, semi-structured interviews are conducted with managers in companies that sell innovative technological products on BoP markets. As explained in section 1, the case studies focus on three types of products in BoP markets in two parts of the world: cookstoves, solar lanterns and water purification technology in Africa or Asia. Per technology, two companies in two different markets are interviewed. These companies are represented in Table 1 below. In the interviews, company representatives are asked firstly in open questions about which barriers they find important with regard to selling innovative technological products on BoP markets. Secondly, they are confronted with the preliminary list of barriers out of Step 3 and asked whether this list is complete and whether it is clear. Finally, they are asked to scale the barriers in terms of their relative importance.

Out of these four steps comes a list of barriers that prevent large-scale diffusion of innovative technological products in BoP-markets. This list of barriers has been checked twice on clarity and three times on completeness. Furthermore, based on inputs from secondary and primary case studies the list of barriers is ranked in terms of importance.

Table 1: Interviewed companies

Company name	Interview	Product focus	Company location	Main Market	Number of products sold
African Clean Energy	Walker, 2014	Biomass cook stove	Lesotho	Rwanda, Zambia and Malawi	35,000
CV Mandiri	Nurhuda, 2014	Biomass cook stove	Indonesia	Indonesia	25,000
Holland for Water	Heederik, 2014	Drinking water purifier	Indonesia	Indonesia	30,000
Kopernik	Rajali Sihotang, 2014	Drinking water purifier (among others)	Indonesia	Indonesia	40,000 (including other products)
Ndassie Solar Engineering	Kepguep, 2014	Solar Lantern	Netherlands	Cameroon	0 (so far trials in five countries but no product sold directly to customers)
D.light	Montgomery, 2014	Solar Lantern	China and India	India and Kenya	7,000,000

The second sequence focuses on the niche strategies and is set up completely similar to the first one which focuses on the barriers, except that no expert interviews were held regarding the niche strategies:

- In Step 1 out of a literature study a list of niche strategies is composed. For this literature search, literature from Strategic Niche Management, Innovation Management and on the BoP is studied. Out of this first step comes a first preliminary list of strategies.
- Step 2 consists of secondary case studies from the literature. To find relevant case studies, the search string BoP & Pyramid & Case in Scopus is used. The case studies are carefully analyzed, to find out whether the second preliminary list of strategies is complete. If a new strategy is found then one out of three possible routes is followed. First, if the newly found strategy fully overlaps with a strategy that is already on the list, then the list remains the same. Second, if the newly found strategy partly overlaps with a strategy already on the list, then the strategy on the list is adjusted, renamed or redefined. Third, if the newly found strategy does not overlap at all with a strategy already on the list, then it is added to the list. This results in a second, revised, preliminary list of strategies. Furthermore, in step 2, the strategies are categorized in terms of relative importance. The more often a certain strategy is mentioned in the literature, the more importance is adhered to it.
- Step 3 consists of primary case studies. In this step, semi-structured interviews are conducted with companies that sell innovative technological products on BoP markets. In the interviews, company representatives are asked firstly in open questions about which strategies they find important with regard to selling innovative technological products on BoP markets. Secondly, they are confronted with the second preliminary list of strategies out of Step 2 and asked to check this list on completeness and clarity. Finally, they are asked to scale the strategies in terms of their relative importance.

Out of these three steps comes a list of strategies to circumvent or remove barriers for the introduction of innovative technological products in BoP-markets. This list of strategies has been checked twice on clarity and three times on completeness. Also, based on inputs from secondary and primary case studies the list of strategies is ranked in terms of importance.

- Step 5 consists of linking the strategies to the barriers. Both during the literature search and during the secondary case study research, statements relating to which strategy can be or is used to deal with which particular barrier are categorized in tables. During the interviews with experts and during the primary case study interviews, interviewees are not explicitly asked to link strategies to barriers, because otherwise the interviews would have taken too much time. But whenever they mentioned something about which particular strategy can be used to deal with which particular barrier(s), this is carefully noted. In this way, a preliminary check is conducted on the outcomes of the literature search on linkages between barriers and strategies.

We look at three types of products: cookstoves, solar lanterns and water purification technology in Africa or Asia.

3. FINDINGS

3.1 Findings regarding the barriers and their relative importance

In the literature we found many different barriers. In the domain of strategic niche management Kemp et al. (1998) distinguished several factors important for large-scale diffusion. If problems arise with these factors, barriers emerge. These factors are: Technological factors, Government policy and regulatory framework, cultural and psychological factors, demand factors, production factors, infrastructure and maintenance, and undesirable social and environmental effects of new technologies. These factors were later on reformulated in a set of 12 different factors by Ortt *et al.* (2013) after checking the completeness of the list provided by Kemp et al (1998), after exploring different articles in innovation system literature and by summarizing their own empirical research. The result is a generic list of factors that is important for the large-scale diffusion of all new high-tech products. For large-scale diffusion it is important that these factors are available and properly arranged. The list is as follows: New high-tech product, Production system, Complementary products and services, Suppliers (network of organizations) Customers, Institutional aspects (laws, rules and standards), Knowledge of technology, Natural resources and labour, Knowledge of application, Socio-cultural aspects, Macro-Economic aspects, Accidents or events. These barriers are also defined in Table 2.

To check the completeness of the resulting list in the context of a developing country, the BoP-literature and secondary cases were studied and expert interviews were held. From the BoP literature for example the following extra five factors were extracted: awareness, affordability, availability and acceptability (Anderson and Markides, 2007) and access (Prahalad, 2012). All experts we interviewed stressed the factor “market spoilage by inferior products” (Blom, 2014; Kroesen, 2014; Vastbinder, 2014). The secondary case studies we studied did not add any additional factors but showed that all previous factors do play an important role in the studied cases.

In total, after combining the factors from the literature, the secondary case studies and the expert interviews, we formulated 17 relevant barriers that prevent large-scale diffusion of products in a BoP-environment. The most important barrier that resulted from these three steps (literature study, expert interviews and secondary case study research) turned out to be the lack of financial capital for new entrepreneurial activities. This barrier is interesting because it turns attention from the lack of spending power among consumer households to the lack of financial capital of starting companies. These companies can be seen as a mechanism by which relatively poor people can escape poverty by providing products that, in turn, can help other consumer households to facilitate their lives and also escape poverty.

The next step consisted of primary case studies in which we interviewed six companies. Based on these primary case studies, we identified nine essential barriers out of the 17 relevant barriers. These barriers are considered essential because they are mentioned in at least one of the nine studied secondary case studies and they emerged in at least four out of six companies that we investigated in the primary case studies. These essential barriers are respectively: Lack of financial capital, Lack of affordability, Lack of consumer awareness, Insufficient knowledge of application, Insufficient consumer demand, Inhibiting institutional aspects, Gaps in production system, Insufficient infrastructure, Lack of natural resources, labour and/or employees. These barriers are defined in Table 2.

Besides these nine essential barriers, we found eight context-specific barriers. These barriers are context-specific because they emerged in particular cases only depending on the company product or

region. These barriers are respectively: Lack of after sales service, Market spoilage by inferior products, Inhibiting socio-cultural aspects and education, New high-tech product, Insufficient knowledge of Technology, Collaboration Issues, Inhibiting macro-economic aspects, and Lack of complementary products and services. These barriers are also defined in Table 2.

Table 2: Important and context-specific barriers

No	Category	Barrier Name	Definition
1	Important Barriers	Lack of financial capital	Availability of upstream / upfront financing for actors in the value chain such as working capital
2		Lack of affordability	The extent to which consumers are able and willing to buy the product for a certain prices
3		Lack of consumer awareness	The extent to which consumers know about or have knowledge of the product
4		Inhibiting institutional aspects	Laws and policy that are imposed by the government to regulate supply and demand
5		Insufficient knowledge of application	Understanding from both producer and consumer regarding the application and usage of the new technology
6		Gaps in production system	All production facilities for example in a factory
7		Lack of consumer demand	The consumer's willingness to buy the product
8		Insufficient infrastructure	All the infrastructures that are needed to distribute, sell or use the new product
9		Lack of natural resources, labour and/or employees	Resources, labor and employees that are needed in the production processes across the supply chain
10	Context Specific Barriers	Lack of after sales service	All services that are provided after the products have been sold to the consumer
11		Market spoilage by inferior products	Low-quality / cheap / free / counterfeit products that swarm the market
12		Inhibiting socio-cultural aspects and education	Norms, values, habit and cultural aspects of the consumer
13		New high-tech product	All factors related with the new-product such as function, working principle and main components
14		Insufficient knowledge of Technology	Firms' technological knowledge regarding the products and related technology
15		Collaboration Issues	All involved parties need to collaborate well to produce, distribute and sell the products
16		Inhibiting macro-economic aspects	General economic conditions
17		Lack of complementary products and services	All complementary products and services required to support the products to function well

3.2 Findings regarding the strategies and their relative importance

The literature on niche strategies is very limited. In the domain of Strategic Niche Management (SNM), Raven (2007) distinguished a generic transition process and indicate that two specific niche strategies can be distinguished: niche accumulation and niche hybridization. A niche accumulation strategy refers to the application of a radically new high-tech product in different niches outside a mass market, allowing this product to develop without strong competition from incumbent products. The accumulation of customers in several niches can create economies of scale and learning effects, which allow the building of networks of complementary actors to create a mass market. In a niche hybridization strategy, the new product is combined with an existing product in an enhanced product design. This strategy creates a mass market because it benefits from the incumbent product's existing market (Raven, 2007; Ortt *et al.*, 2013).

A completely new set of ten different niche strategies was identified by (Ortt *et al.*, 2013). These niche strategies were found by distinguishing different market situations resulting from combinations of barriers and by studying historical cases in which companies adopted strategies to face these market situations. The ten niche strategies are: 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, Lead user niche strategy, and Explore multiple markets niche strategy. The definitions of these strategies can be found in Table 3 below.

To check the completeness of the resulting list of strategies in the context of a developing country, the BoP-literature and secondary case studies were studied. From the BoP literature strategies were extracted such as "increase access to finance", "increase marketing efforts", "approach government for regulation changes", "adoption and incorporation of quality standards", "implement retail and distribution network" and "supply working capital". The secondary case studies research resulted in three main strategies: "approach higher income levels", "geographic approach" and "gender market segmentation".

In total, after combining the strategies from the literature and the secondary case studies, we found 11 relevant strategies to deal with barriers that prevent large-scale diffusion of products in a BoP-environment. The most important strategy that resulted from these two steps (literature study and secondary case study research) turned out to be the "partner network strategy". Again, as we already noticed by identifying the most important barrier, the most important strategy does not deal with the lack of income of consumer households but instead focuses on the inability to start entrepreneurial initiatives. Both the most important barrier and strategy imply that stimulating entrepreneurial activities by facilitating access to financial capital and by facilitating network formation among potential partners are crucial. The more traditional development aid approach focused on the lack of spending power of consumers and tried to alleviate this by providing help. This approach failed because its effect turned out to be unsustainable once the aid stopped. With the focus on entrepreneurial activities a self-sustaining and therefore more sustainable mechanism of development might be initiated.

The next step consisted of primary case studies in which we interviewed six companies. Out of the 11 relevant strategies found in the previous steps, we identified seven important strategies. These strategies are considered important because they are mentioned in at least one of the nine studied secondary case studies and they emerged in at least four out of six companies that we investigated in the primary case studies. These important strategies are respectively: Partner network strategy, Access to finance, Education approach, Demo, experiment and develop, Explore multiple markets, Geographic approach, Use of complementary technologies. These barriers are defined in Table 3.

From the 11 relevant strategies, we could identify three strategies as context-specific. These strategies are context-specific because they emerged in particular cases only depending on the company product or region. These strategies are respectively: Upper income market segment approach, Product redesign, Gender market approach, and Dedicated system or stand-alone strategy. These strategies are also defined in Table 3.

Table 3: Important and context-specific strategies

No	Category	Strategy name	Definition
1	Important strategies at the BoP	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		Provide 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 the technology to get more knowledge regarding the technology application and possible development
5		Explore multiple markets	The products 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 another region where it can more easily accepted or diffused
7		Use of complementary technologies	Use other available technologies in the market to enhance the process to introduce the new technology
8	Context-specific strategies	Upper income market segment approach	Sell the products to people with higher social income / status and expect this will 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 first used in a constrained system example in laboratory setting

3.3 Findings regarding the linkages between barriers and strategies

In the previous sections we describe that we found 17 barriers and 11 strategies for implementation of high-tech products in BoP market. In practice, niche strategies are adopted to deal with a particular barrier.

We will first discuss how these barriers are addressed in the literature. In the SNM literature barriers are identified in order to design a generic transition process. In this process, the new products are first applied in technological niches, then in market niches, and finally in the mass market. Technological niches are described as “protected spaces that allow the experimentation with the co-evolution of technology, user practices, and regulatory structures” (Schot and Geels, 2008, 537). Technological niches are a kind of seedbed from which market niches can emerge, the combination of which can contribute to the transition to a more sustainable society. Market niches are “niches in which technology design and user demands have become stabilized” (Schot and Geels, 2008, 539). So, SNM describes barriers that generally block large-scale diffusion and on the basis of these barriers design a generic transition process.

Similar generic transition processes are distinguished by other authors. (Adamson, 2003) proposes that market mechanisms are important and that a market can be created by carefully entering subsequent market segments with limited competition. (Jørgensen, 2007), (Little *et al.*, 2010) and (McFadden *et al.*, 2009) agree with the notion that radically new products require some protection but disagree that governments should intervene. These authors describe how alternative economic mechanisms in small groups are used to temporarily shield off market competition.

In contrast with these generic processes and following the line of reasoning in Ortt *et al.* (2013), in this study we tried to assess specific barriers in specific cases and on the basis of that analysis select specific niche strategies that can address these barriers. In this way, combinations of barriers and subsequent strategies dealing with these barriers can be made. Theoretically, we can make $17 * 11 = 187$ combinations of barriers and strategies. In practice, we found only some of these combinations. As explained in Section 2 of this article, this part of our research represents preliminary findings that were not based on the same thorough approach adopted to identify barriers and strategies separately. We did a literature research on the linkage between the barriers and the strategies but did not ask questions about this in the interviews explicitly. However, from the statements in the interviews regarding strategies we could often deduct which barriers these strategies were aimed at. The linkages that we found between the most important barriers and strategies are represented in Figure 2.

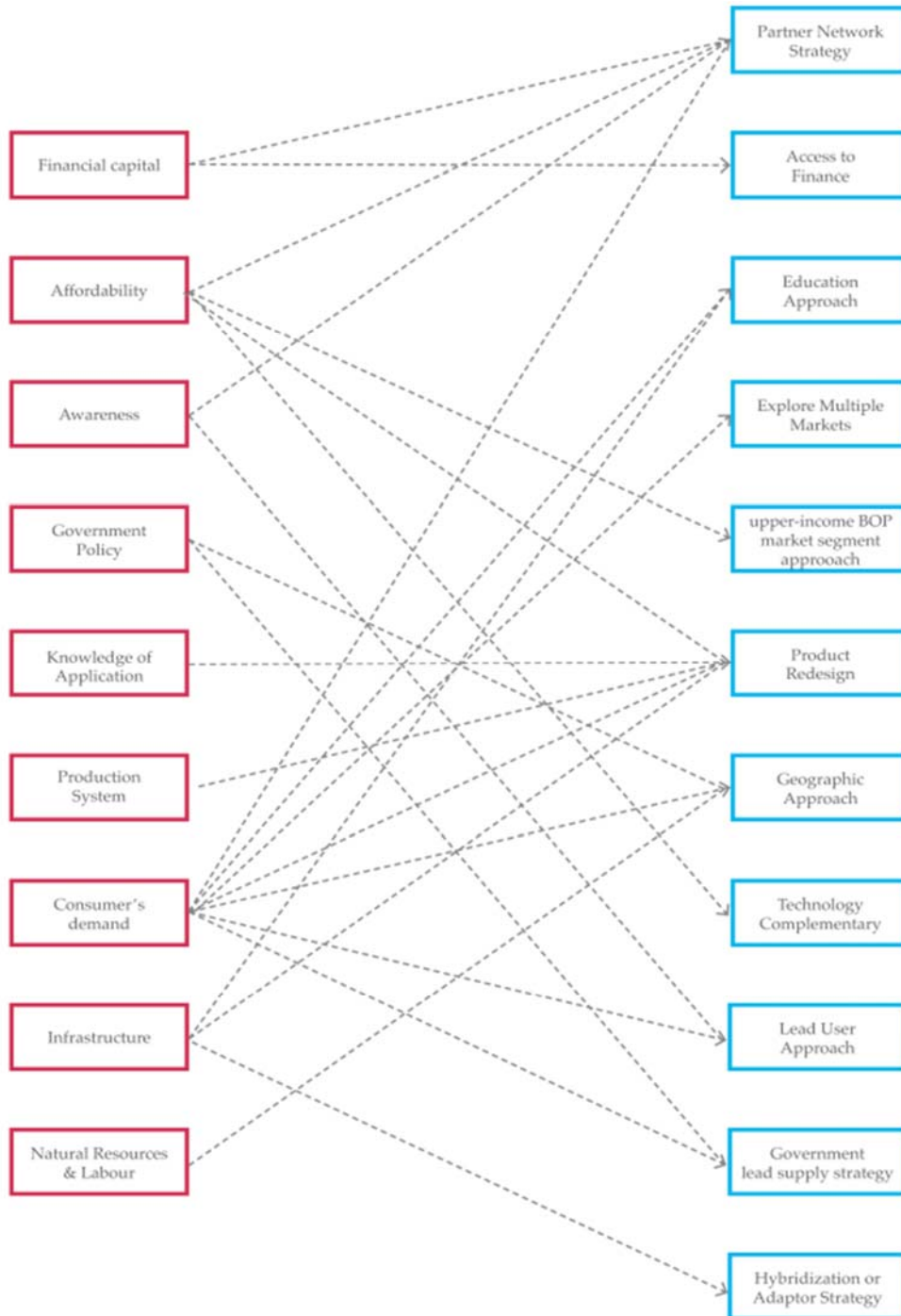


Figure 2: The found linkages between most important barriers and strategies

4. CONCLUSION AND DISCUSSION

4.1 Answers to research questions

To recapitulate, our research questions were formulated as follows:

1. What are the most important barriers that prevent large-scale diffusion of technological products in BoP-markets?
2. What are the most important niche strategies that can be adopted to deal with these barriers?
3. How are these barriers and strategies related?

In order to avoid repetition, we will not fully describe the answers to our research questions here. The full answer to question 1, what are the most important barriers, can be found in Table 2 of this article, in section 3.1. The main barrier we found is “lack of financial capital”. The full answer to question 2, what are the most important niche strategies, can be found in Table 3 of this article, in section 3.2. The main niche strategy we found is the “partner network strategy”. The full answer to question 3, how are these barriers and strategies related, can be found in Figure 2 of this article, in section 3.3. Here we can see that most barriers are linked to more than one strategy and vice versa.

4.2 Discussion, reflections and recommendations for further research

What is interesting about our findings of the most important barrier and the most important niche strategy is that they both do not deal with the lack of income of consumer households but instead focus on the inability to start entrepreneurial initiatives. Both imply that stimulating entrepreneurial activities by facilitating access to financial capital and by facilitating network formation among potential partners are crucial. The more traditional development aid approach focused on the lack of spending power of consumers and tried to alleviate this by providing help. The latter approach failed because its effect turned out to be unsustainable once the aid stopped, as also pointed out by (Sachs, 2005). With the focus on entrepreneurial activities a self-sustaining and therefore more sustainable mechanism of development might be initiated, as also pointed out by (Moyo, 2007), (Easterly, 2006), and (Banerjee and Duflo, 2011). This also provides the direct link between this article and the theme of the IAMOT 2015 conference: Technology, innovation and management for sustainable growth.

Another insight from our study is that a number of the companies we interviewed sell to countries where the company itself is not based while the barriers they face are very much local and/or context specific, such as lack of consumer awareness, lack of consumer demand, insufficient knowledge of the application and inhibiting institutional factors. The best strategies to deal with these barriers such as the “partner network strategy” and the “educate the user approach” can only be used locally, which means that it is important for such a company to have a local basis or a local partner as well.

A third topic for discussion is the interrelation between the barriers. Our list of separate barriers is obviously a simplification. Both for analytical clarity and for clarity during the interviews, we chose to treat the barriers as if they are completely separate and mutually exclusive. However, in reality, as other research we currently perform also indicates, there are relationships between the barriers. For example,

lack of consumer demand can be caused by inhibiting macro-economic aspects. It would be interesting to investigate this matter further.

The fourth topic that we want to raise in this discussion is the static nature of the approach used in this article. Although the literature research, secondary case study research and the interviews with experts were of a generic nature, the primary case study research (the interviews with companies) predominantly focused on one moment in time: the current situation within the company. However, a company that has just started introducing a product in a niche (such as Ndassie Solar Energy (see Table 1)) will most probably have to deal with different barriers than a company that has already sold a large number of products (such as D.Light (see Table 1)), or at least rate the barriers differently in terms of relative importance. Since the companies we interviewed were in different phases of the technology diffusion process, we did cover these differences to some extent in this article. However, it would be interesting to investigate this matter further by way of longitudinal research and/or by way of a larger sample of involved companies, so that insights can be generated on which barriers are most important at which phase of the technology diffusion process. Preliminary insights from the current research are represented in Figure 3 below. From the interviewed companies that are already further in the technology diffusion process, we received answers such as “this barrier was important some years ago”. We based our preliminary insights on such information. According to these insights, companies first focus on the development of the product, during which phase barriers such as “knowledge of technology” and “new high-tech product” are relatively important. Here, a strategy such as “product redesign” seems to be relatively important. During the second phase, in which companies focus on installation of distribution channels, barriers such as “lack of after sales service”, “lack of infrastructure”, “lack of consumer demand” are relatively important. Here, a strategy such as “partner network strategy” seems to be relatively important. Obviously, more research is needed to increase insights into this more dynamic nature of barriers and strategies.

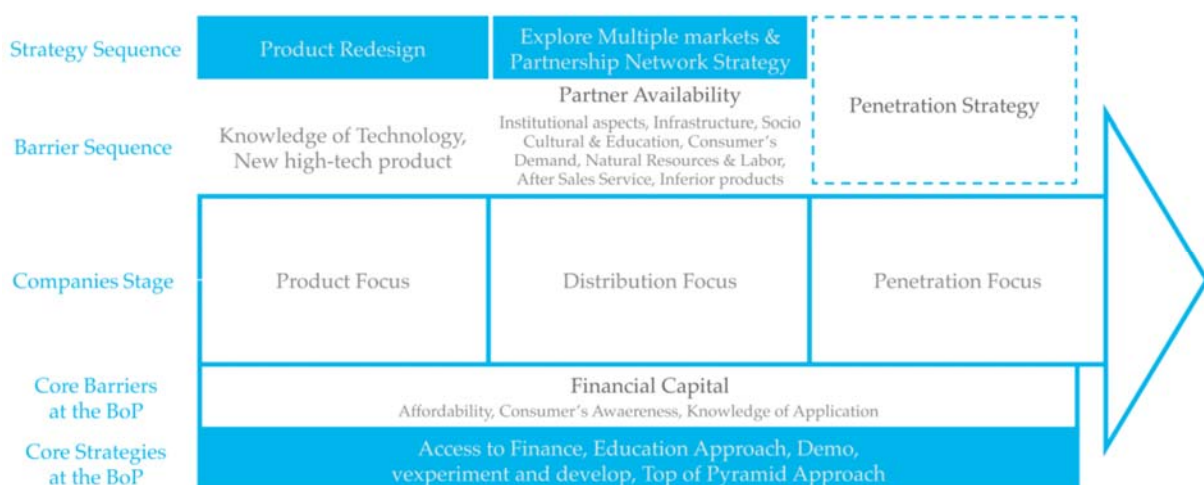


Figure 3: Preliminary insights in dynamic nature of barriers and strategies

The fifth point that we want to touch upon here is that of the international aspects we found in the cases. As we described in section 3.3 above, the standard SNM theory rests on the assumption that

innovations are first introduced in technological niches, then in market niches and then in the mass market. During this process, local niches are getting more and more interlinked until finally the technology is part of the so-called regime, which is a synonym for the mass market with its established companies, sunk investments and embedded infrastructures (Raven, 2005). However, our case studies show a different pattern. Here, the companies do not increase the number of products sold by interlinking local niches and penetrating the local regime but by selling a relatively small amount of products to different countries. A large number of niches in different countries develop, which are not interlinked in the sense that no knowledge and experiences are shared and all actors in the different niches are different except for the company that sells the product. Also here, this is just a preliminary insight based on this research which needs further research including a larger number of companies.

The last point that we want to discuss here is the nature of the companies involved in this research. Only companies are included that already started their business in BoP markets. Thus, the barriers covered in this article are those that occur during business operation but not prior to the start of business operation. Furthermore, only SME's that only focus on BoP markets are included in this research. Currently, also several multinational companies such as Philips have started doing business in BoP markets. Since such companies are of a totally different character, it could be that for them different barriers and strategies are relevant. These barriers are not particularly covered in this study. It would be interesting to extend the research to also include multinationals, the barriers they face and the strategies they can adopt to deal with these barriers. Also more in general, including a larger number of companies in the primary case studies, a larger number of expert interviews and a larger number of secondary case studies would increase the solidity and therefore the generalizability of our findings.

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