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International Development Partnerships and Diffusion of Renewable Energy Technologies in Developing Countries: *Exploratory Study in Costa Rica*

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Abstract

Worldwide, 1.4 billion people virtually live in darkness after sunset. New lighting technologies, such as light emitting diodes, powered by renewable energy allow non-electrified communities to access for the first time in their lives clean, durable, affordable and higher quality lighting service. The international NGOs play an important intermediary role in diffusion of these technologies to off-grid subsistence marketplaces and operate via development partnerships. My PhD research explores the nature of these partnerships and their effectiveness in achieving the development outcomes. This paper presents the exploratory case study in Talamanca, Costa Rica completed as part of the PhD research. The paper presents the background, conceptual framework and methodology for my PhD and then focuses on the case study which contrasted and examined two development partnerships driven by international NGOs. The study acknowledged the catalytic role of the international NGOs and emphasized the centrality of local organizations and their capacities in successful implementation of development interventions. It indicated the criteria for effective partnership in this area and proposed elements of a conceptual framework for the analysis of the development partnership in renewable energy lighting in subsistence marketplaces.

1. Introduction

Sustainable energy services are central to economic development and poverty alleviation, yet 1.4 billion of the world population do not have access to electric lighting sources (EIA, 2010).

Commonly used non-electric lighting sources, such as kerosene, candles, and biomass, are inefficient, expensive, environmentally unsustainable, provide limited and poor quality light, pose significant health and fire hazards (Mills, 2005). New lighting technologies powered by renewable energy allow non-electrified communities to access for the first time in their lives clean, durable, affordable and higher quality lighting service that can have profound impact on their wellbeing (Schultz al, 2088).

The international operational NGOs¹ play an important intermediary role in facilitating diffusion of these technologies in the developing countries and operate via development partnerships². My PhD research deals with the partnership aspect of the NGO's work partly because multi-stakeholder partnerships are increasingly promoted as vehicles to achieve development goals (Caplan et al., 2007). In fact, partnerships have become common practice for organizations in addressing various development challenges and is a common mode for the international NGOs working in developing countries (Horton et al, 2009).

The notion of partnership has received wide attention from the academics and practitioners in various disciplines and professional domains, such as management and organizational development, public policy and public management, international development, social policy, science, technology

¹ International operational NGOs are defined by the World Bank (n.d.) as organizations, which are typically headquartered in developed countries or developing countries and carry out operations in more than one developing country and whose primary purpose is the design and implementation of development-related projects. International NGOs are no longer North-based NGOs alone as we are observing a rise of the international NGOs based in developing countries.

² Development partnership refers to “an agreed relationship based on a set of linkages between two or more agencies within a development project, involving a division of roles and responsibilities, a sharing of risks, and the pursuit of joint objectives...”(Lewis, 1998, p. 326). International development NGOs in case of this research refers to development partnerships driven by international operational NGOs.

and innovation, to name a few. Nevertheless, a lack of empirical analysis of partnership remains a major knowledge gap in this area. For instance, Horton et al, 2009 indicate knowledge gaps at the level of individual partnerships, at the organizational and domain levels. Furthermore, available studies are rooted in particular disciplines that influence their perspectives and lack cross-referencing and cross-fertilization that is needed to enrich our understanding of the phenomenon of partnerships (Horton et al, 2009).

My PhD research addresses the knowledge gaps in the pertinent fields of inquiry and provides insights into the changing roles of international development NGOs, changing structure and dynamics of their relationships with the Southern organizations, drivers and challenges of their partnerships, role and effectiveness of partnerships in addressing development challenges.

The key research questions for my PhD are: 1) What is the nature of international NGO-driven development partnerships involved in the diffusion of renewable energy technologies in the subsistence marketplaces³ in developing countries?, and 2) What makes those partnerships effective?

This paper first presents the conceptual framework and methodology for my PhD and then focuses on the study which examined and compared two development partnerships facilitated by the international NGOs involved in the diffusion of off-grid renewable energy powered lighting technologies in the indigenous communities in Talamanca, Costa Rica.

2. Conceptual framework

I utilize an interdisciplinary approach and build my conceptual framework based on partnership management, development studies and innovation literature. I propose to develop an approach for

³ Subsistence marketplaces are chosen to indicate the type of environments and communities targeted by development partnerships. I focus on remote, rural areas in developing countries where low-income subsistence and semi-subsistence communities are not connected to the electric grid and rely on fuel-based lighting sources (e.g. kerosene).

development partnerships in question which addresses both the level of process and the level of development outcomes. It also views the partnership within larger systems of actors. I introduce two dimensions of partnership effectiveness: partnership dynamics and project sustainability. The partnership dynamics focuses on the process and relationship dimension of a partnership. The project sustainability deals with the issues related to the achievement of development outcomes aimed by these partnerships. The innovation system approach is applied to position the actors in these partnerships within a larger system in which they interact.

a. Development partnership approaches

Development partnerships are commonplace in the context of international development policy and practice (Lewis, 2001). They are widely promoted by international donors and development agencies and are espoused by the state, private sector and civil society. There are a number of reasons why such partnerships are desired. First and foremost, the partners are driven by the desire to improve the results of development interventions (Morse and McNamara, 2006). The nature of the development challenges is often very complex making it impossible to address them in isolation (Brinkerhoff, 2002). From an international NGO perspective, partnerships can help leverage donor funding, increase organizational accountability, gain credibility and legitimacy, build capacity and capabilities, reduce information and transaction costs and access scarce resources. Partnerships depend on and foster trust among stakeholders which enhances the ownership of the development processes which in turn improves their effectiveness and sustainability (Fowler, 1998).

However, North-based NGOs too often criticised for failing to form equitable or “authentic” partnerships with counterparts in the South (Ahmad, 2006, Fowler, 1998). Some of the most common factors for failure relate to matters of power imbalance, lack of accountability and

inequality (Fowler, 1998). These factors receive wide attention in the research on North-South development partnerships (Lister, 2000).

In addition to the North-South partnerships, there has been a growing attention to the role of development NGO partnerships with governments and businesses (Lewis and Kanji, 2009). The Base of the Pyramid (BoP) literature focuses on development partnerships driven by businesses that target pro-poor markets. Serving the BoP requires cooperation between large corporations and small firms, civil society organizations, development agencies, governments and the poor themselves (Prahalad, 2005). The degree of complexity in these partnerships is high. They involve a great diversity of actors and sectors and tend to rely on informal governance mechanisms (Rivera-Santos and Ruffin, 2010).

The cross-sector partnership literature examines partnerships between NGOs and government, government and business (public-private partnerships), NGOs and business, and tri-sector partnerships that address social issues, such as poverty alleviation, education, health, and other. Such partnerships are often approached in a linear way through input-output systems models which help identify functional dimensions of the partnerships and success factors affecting partnerships outcomes, however they “neglect the embeddedness of social processes within the larger institutional structures studied in institutional theory, as well as processes of nonlinear emergence as studied in complexity theory” (Selsky and Parker, 2005, p.865).

These approaches (Chart 1) are useful in expanding our understanding of the development partnerships, their rationale, dynamics, and success factors. However, while there is an underlying logic that the partnerships lead to the development outcomes, these partnerships are most often analysed in terms of their process rather than how they are achieving the development outcomes. How do the development goals shape the partnership? How does the partnership contribute to

development outcomes? How do the actors in the development chain affect these partnerships and their outcomes? What is the role of institutional environment? These questions require an approach that considers the development partnerships within their broader settings, goals and interactions. To aid the development of such approach I bring into conceptual framework the perspective of the innovation studies.

Chart 1: Development partnerships approaches

Partnership Category	Development partnerships approaches			
Type	North-South partnerships (e.g. Fowler, 1998)	Base of Pyramid partnerships (e.g. Rivera-Santos and Ruffin, 2010)	Social issues cross-sector partnerships (e.g. Selsky and Parker, 2005)	NGO development partnerships in subsistence marketplaces (Author)
Common Initiator	North agency: either donor or operational NGO	Business firms, often multinational enterprises	Government, business, NGOs	International NGOs and local actors
Common conceptual constructs	Power and equality, authenticity	Impact of distinct BoP institutional environment, need for intermediaries	Functional dimensions, success factors	Partnership dynamics and project sustainability
Main disciplinary focus	Development studies	Business and management	Multidisciplinary	Interdisciplinary
Performance evaluation	Focus on the process	Focus on the process	Focus on the process	Focus on process and development outcome, linkages within larger system

Source: Author’s compilation based on literature review and own research.

b. Innovation perspective

The partnerships that are the focus of this research are part of the technology diffusion processes that involve a myriad of actors and linkages. At first, we understood technology diffusion as a linear innovation model according to which a straightforward path from basic research and development to technology commercialization and adoption can be followed (Schumpeter, 1911; English edition, 1959). Today, technology diffusion is broadly viewed as a complex process involving a broad range of private and public actors which constitute national innovation systems (OECD, 1997).

National innovation systems (NIS) can be defined as “... a set of interrelated institutions; its core is made up of those institutions that produce, diffuse and adapt new technical knowledge, be they industrial firms, universities, or government agencies. The links between these institutions consist of flows: knowledge, financial, human (people being the bearers of tacit knowledge and know-how), regulatory, and commercial” (Niosi, 2002, p. 291). The relationships between the NIS agents are viewed as carriers of knowledge and through the interaction among them new knowledge is produced and learnt (Johnson and Lundvall, 2003). Regulatory, policy, international, infrastructure and market conditions have major impacts on innovation and therefore are integral part of the NIS (Gu and Lundvall, 2006).

Though the notion of NIS originated in developed countries, it has been expanding to include developing countries (Mytelka, 2003; Muchie et al, 2003; Lundvall et al, 2006). However, the application of NIS in developing countries is mainly untested and the role of NGOs in innovation systems is also not fully understood (Hall et al, 2001).

The IS framework is useful in understanding the diffusion process involving international NGOs and their partnerships as it can help to see these partnerships in a larger system of actors and interactions and how these impact the process and outcome of the partnerships.

3. Methodology

Given the lack of theory on NGO-driven partnerships involved in diffusion of technologies in subsistence marketplaces, this research is exploratory in nature and employs inductive approach. I started this research with the exploratory case study which compared two development partnerships that are implementing off-grid solar energy lighting programs with the indigenous communities in the Talamanca canton, the Limón province, Costa Rica. The case study goal was to understand the

characteristics of international development NGO driven partnerships serving off-grid communities, when and why they are formed and what makes them effective.

I started with the review of documents and archival records of the partnerships. However, I became quickly aware that some projects were not sufficiently documented and therefore other methods were needed to obtain the necessary data for my case study. These data were gathered during my field work through key informant semi-structured interviews of representatives of the respective organizations, with beneficiaries, and other organizations and individuals in Costa Rica working in the off-grid renewable energy area.

My next step is to strengthen the findings of this case study by analyzing other examples of partnerships. I was contemplating to do a global survey of NGOs involved in off-grid energy development work, but dropped the idea as mail, e-mail or on-line survey appeared to be less effective methods than in-person data collection, while the latter is very costly and time consuming to implement. Alternatively, I intend to analyze other (besides Costa Rica) development partnerships driven the Light Up The World, an international NGO active in this field, since their inception ten years ago. Preliminary 25 cases have been identified so far. The research methods for data collection will involve the documentation and archival records review as well as semi-structured interviews with current and former responsible project officers.

4. Exploratory Case Study: Off-grid lighting for Talamanca, Costa Rica

Talamanca is the poorest canton in Costa Rica located in the Limón province south of the country. Similarly to the rest of Costa Rica, poverty in Talamanca is concentrated among the indigenous and Afro-Caribbean populations. The Bribri and Cabécar indigenous territories lack access to basic services, including access to health care, education, transportation and energy. While country-wide electrification rates are high (over 90%), many households in Talamanca have no access to

electricity. One of the reasons is their remote locations and low density of population which make the grid extension difficult. However, even when the grid is being expanded, connecting to this grid is prohibitively expensive.

Off-grid households are relying on kerosene and candles to meet their lighting needs. In addition people use flashlights that are running off dry-cell batteries. Recycling for these batteries is non-existent in the area and many of them are being disposed around the homes and into the rainforest. Lighting expenditures for a family of four can be as high as CAD \$30 per month - up to one third of their annual income. Using kerosene and candles is not only expensive, but these are sources that are inefficient, have negative health, safety and environmental impacts. To address the issue of access to sustainable energy, international NGOs facilitated provision of solar based LED lighting in remote communities in Talamanca through ACEM and APPTA Solar Energy Lighting Initiatives described below.

ACEM Solar Energy Lighting Initiative	APPTA Solar Energy Lighting Initiative
<p>ACEM Solar Energy Lighting Initiative is led by a local NGO called Association for Science and Moral Education (ACEM) which has been running an educational program for development called Preparation for Social Action (PSA) in Talamanca since 2001. Its tutors and learners throughout the Talamanca form a natural network of people from the communities. The solar energy lighting initiative commenced in 2008. ACEM saw a natural fit between solar lighting and education. The organization recruited technicians, most of whom are the PSA tutors who are trusted and well-known by the recipient communities. The initiative adopted a microfinance approach, with families diverting payments previously used for candles toward the ownership of a solar lighting system for their home. The project has realized success with many families re-paying their solar</p>	<p>APPTA Solar Energy Lighting Initiative is implemented by APPTA, an organic producers' cooperative founded in 1987. Currently the association consists of 1067 producers of which 80% is indigenous Bribri or Cabécar. Women constitute 38% of the members of the association. The cooperative has been involved with solar energy since 2004. There is no paid staff dedicated to this initiative. All activities have been performed on a volunteer basis. The organization is fully consumed by the matters related to their main operations as a cooperative and complexities of this business have not allowed to prioritize the solar program so far. There is a full realization on the part of the organization that for this project to move forward it should be integrated into its strategic priorities. Most recent development is that a group of technicians has been trained and the project is</p>

<p>lighting systems in less than two years. Other important outcomes include children spending more time after sunset doing their homework and reading books and families having extended hours for productive and social uses. Beneficiaries who were interviewed were satisfied with the solar lighting and noted a number of positive impacts on their life. ACEM established a formal contract system where a beneficiary signs the contract which specifies responsibilities of the implementing agency – ACEM and beneficiary. There are also receipts used and issued for each purchase. A local coordinator hired by ACEM is fully responsible for administration and management of this project on ground. As of the end of September 2010, ACEM installed 378 systems in 15 communities in Talamanca.</p>	<p>now overseen by the Executive Director of the cooperative. New installations started after I completed my field work. The visit to the homes where systems were installed showed that people are very satisfied with the system and note positive educational and social benefits of having solar lighting. However same households had also the ACEM system and the APPTA system was running of the battery from the ACEM system. If there was no such system in place, the APPTA systems would not work as their batteries were no longer functional. Therefore, it is fair to suggest in the absence of the ACEM project, the beneficiaries of the APPTA project would not be able to continue using their lighting systems. So far the organization has installed 117 systems.</p>
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Important aspect of both initiatives is the partnership driven by two international NGOs: Light Up The World and Y Service Club. Light Up The World (LUTW) has pioneered the use of solid state lighting solutions powered by renewable energy for the world’s poor who do not have access to the electric grid and rely on kerosene, candles and biomass for their lighting needs. Since inception a decade ago, LUTW has been involved in numerous projects that resulted in installations of thousands lighting systems in 50 countries throughout the developing world. At the core of LUTW approach is the partnerships with major manufactures, NGOs, local communities and academia. LUTW as an intermediary bridges the gaps in the technological supply chain which fails to reach the poorest of the poor. On ground, LUTW is working with local grassroots organizations which understand the local environment for technological and social innovations, connected to and trusted by the community members. LUTW contributes to planning and project design, helps to identify and procure necessary equipment, facilitates shipping of the equipment from overseas and logistics of component procurement locally. It equips the local partners and stimulates local social

innovations in distribution and servicing that are essential in the sustainable energy service delivery in the context of poverty.

Y Service Clubs are community service clubs working towards developing global citizens, building culture and peace internationally promoting cross-cultural, cross-border international relationships, building a web of relationships and knowledge about other places and other cultures through connections with clubs all over the world. The club that is involved in this project is the Owen Sound Y Service Club based in Ontario, Canada. Its role is to provide training on solar system concepts and applications as well as infrastructure development for the projects. The organization is also actively involved in fundraising and conducting training and monitoring visits to Costa Rica since March 2007. In case of APPTA, there is one more partner, an individual David Wiwchar, Vice Principal of Vision Lively District Secondary School based in Ontario, Canada. Mr. Wiwchar is the founder of the Light Up Costa Rica program. He runs an educational program where he brings Canadian high school students to Costa Rica during March break to be involved in solar lighting projects. Through this work and his previous experiences and contacts in Costa Rica, Mr. Wiwchar introduced the idea of solar lighting to areas of need and facilitated linkages with the potential implementation partners.

5. Nature of partnerships

a. Drivers

The case study showed that community service was the key driver for the partnering organizations. While responding to specific community needs, an NGO activity is often related to market or government failures. In case of the NGO-driven initiatives in Talamanca, it is a response to the government not being able to extend the grid to these communities to each home, which is primarily

due to economic reasons. It is also about market failure where the market has not acknowledged that there is a demand for certain services.

The international NGOs in studied partnerships play role of “hands-on donors” where they do not only fund development projects but also help local organizations build capacities necessary to sustain these projects. There is a certain level of resource dependencies in technology, capacity and financing which necessitates involvement of organizations that have and can share these resources. In case of the partnerships in question, international NGOs bring project management and technical expertise, access to technology at social pricing level, funding - resources that are required for a local organization to be successful in implementing a project. International organizations need to work with the local organizations as these are close to the communities they serve, they understand their needs and realities, they have the trust of the communities members – these are the prerequisites of a successful project. It is costly in terms of time, human and financial resources for an international NGO without initial local base or presence to build community relationships within a short period of time.

b. Barriers

NGOs are often vulnerable due to financial constraints and reliance on external funding. The funding availability is limited in terms of its amount and duration. Most frequently one-two year grants are available. Every year the NGOs in question are searching for funding, which distracts from their main development operations. This situation is exacerbated by financial crises and economic slowdowns where governments are more likely to cut foreign aid in favour of local spending. Private donors are also turning more towards their local communities. The trend is that securing funding for international development projects is becoming very difficult. The NGOs I interviewed felt they were continuously in a survival mode.

Another set of barriers is related to logistics and infrastructure. The climate in Talamanca is challenging and devastating rains often shut down the communications and flood the communities which make community access impossible. The basic roads were non-existent until a year ago. Right now there are gravel roads available in some communities. However access is still difficult in many cases. Cross-cultural communication can be challenging as well. Phone and e-mail is often not available and/or not appropriate to deal with the project communities in Talamanca which makes it difficult for international NGOs to engage remotely. You have to be face-to-face with people on a regular basis to get things going. Another challenge is the coordination among multiple organizations within a project and managing expectations. Having regular and open communication as well as a formal agreement specifying the roles and responsibilities are central in mitigating this problem.

c. Partner roles

Based on this research, there is a clear distinction emerging in roles among the partners. The international NGOs were more of facilitators playing a catalytic role, while local NGOs played a major role in the solar lighting projects. International NGOs facilitated access to financial, management and technical resources that were needed by local organizations to build their capacities to implement the projects. For example, LUTW as a supply chain intermediary allows organizations like ACEM and APPTA to access best in class solar and LED technology at a lower cost. This is possible due to established industrial partnerships between LUTW and manufacturers. Additionally, LUTW is offering a subsidy on equipment making it more affordable for the beneficiaries. A local organization which has presence in the community is central to the project since it understands local environment for technological innovation, also knows and is trusted by

the users. It is actively involved in the implementation of the projects, monitoring and evaluation activities.

6. Partnership effectiveness

a. Partnership dynamics

The analysis of partnerships dynamics identified the following effectiveness criteria: shared values and goals; complementary expertise and capacities; confidence and trust; clear roles and responsibilities; effective communication; personality match and continuity of staff. These findings confirm much of the partnership management literature and also development studies, but challenged some assumptions in the BoP literature that the dynamics of the partnerships operating in subsistence marketplaces might differ significantly from partnerships in formal markets. However, the case study showed that their effectiveness criteria were similar. Though, the importance of some criteria has differed due to differentiation in the organizational type and context. The partnerships in question were influenced a lot by individual dynamics rather than organizational. Furthermore, contrary to the BoP literature assumptions, these partnerships relied on formal governance mechanisms, while retaining a lot of flexibility.

b. Project sustainability

The analysis of the partnerships showed that the ability to achieve partnership objectives was dependent primarily on three sets of aspects related to the project sustainability: community; local champion and technology. What was critical is to have an established and committed local partner that had experience with the community members and their trust; developed effective network in the community; was able to institutionalize its learning. As for community aspects, what was important is that community members embraced the projects; they were actively involved in them and had strong sense of ownership. Community trust was a key. Understanding natural environment

(climate, terrain, natural resources) was important in terms of developing project delivery strategy and choosing suitable technological solutions. As for technology, the key characteristics that impact the adoption of technologies by users (Rogers, 2003) were observed: solar lighting systems provided significant advantages in terms of quality of light in comparison to kerosene lamps and candles; they were easy to use; potential users could observe the benefits from using the new technology; the payback period was one to two years after which the system was nearly maintenance free. The system design has been changing as the project progressed which directly accounted for the user specific needs.

7. Research implications

This research has shed light on NGO-driven development partnerships in the diffusion of renewable energy powered lighting technologies in the developing countries contrasting the two partnerships in Talamanca, Costa Rica. This study is part of the larger PhD research which adds to the innovation literature by understanding better the role of innovation actors that are largely ignored, such as NGOs. Furthermore, it looks at the role of these actors in technological diffusion in subsistence marketplaces – the context which is not well understood. As for the partnership literature, the research expands an understanding of NGO-driven development partnership in technological diffusion in the context of poverty.

The insights from this research may have important practical implications. The research signals the importance of international NGOs as intermediaries in the technological supply chains and local organizations as the intermediaries with the community. For international operational NGOs it remains essential to partner with reputable local organizations that are close to the community, have or are able to build capacities for delivering renewable energy lighting projects. For local partners

the key is building local capacities, thinking, designing and implementing for sustainability, institutionalizing their learning and securing stable sources of financing.

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