# Development Supply Chains for Solar Lanterns and Solar Home Systems in Low-Income Countries

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*To my wife Silvia and our growing family.*

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# Permissions

# Abstract

This thesis is comprised of three separate but interrelated papers. Their common thread is an investigation of development supply chains and the organizations that participate in them.

In the first paper (Chapter 1), we conceptualize development supply chains – a type of supply chain for development in a post-disaster context, which is distinct from commercial and humanitarian supply chains – using the Stakeholder Resource-Based View. This theoretical framework brings into focus the supply chain's stakeholders, their resources and capabilities, and their respective utility preferences with respect to the supply chain. Conceptualizing development supply chains using this framework helps us to outline descriptive, instrumental, and normative approaches to research not only this type of supply chain but also others.

The second paper (Chapter 2) empirically investigates how development supply chains work, from the donors' viewpoint. We conducted a multiple case study of development supply chains for solar lanterns and solar home systems sold to low-income consumers in Haiti. Using the Stakeholder Resource-Based View as the theoretical lens, we first identify nine groups of stakeholders and their utility preferences. We then show how social enterprise product companies and in-country importers develop specialized resources and capabilities related to the products they sell, the distribution channels they create, and the grants they bring in from donors, that support the flows of material, information, and money along the supply chain. We contribute to the literature with building blocks of new theory about development supply chains.

In the third paper (Chapter 3), we set out to understand how executives of social enterprises that participate in development supply chains develop operations strategies that enable their organizations to pursue social and commercial objectives simultaneously. Using Dunham's (2010) concept of "practical wisdom" and building on the well-established operations strategy literature, we carefully examined executives' operations decision-making processes in response to a particular threat or opportunity. We find a one-to-one relationship between the area(s) of operations onto which the executive mapped the perceived threat or opportunity and the area(s) of operations implicated in the operations strategy they developed as a response to the threat or opportunity. Crucially, the executive's practical wisdom constrained the set of possible responses to the threat or opportunity to those options that would help the organization achieve both social and commercial objectives.

# Introduction

## Motivation

In 2011, I worked as a project manager for MicamaSoley, the social enterprise division of a large Haitian mattress company, which sold solar lights and water filters to low-income consumers throughout Haiti. Half of my job entailed supporting the distribution and sales of these products through a network of microentrepreneurs – primarily women who were clients of a large microfinance organization in Haiti. The other half of my job entailed liaising with the United Nations for the donation, via MicamaSoley's distribution infrastructure, of solar home systems to individuals displaced by the catastrophic 2010 earthquake in Port-au-Prince. This work – the business side, the humanitarian side, and how the two co-existed – captivated me. I wanted to understand how these products made it all the way from factories in China to remote rural homes in Haiti. I wanted to understand who the different supply chain participants were, and why they were participating in the supply chain – that is, what they were getting out of it. These and other questions about supply chains for products and services that help alleviate poverty motivated my decision to pursue a PhD in operations and supply chain management and guided my research in the three papers presented in this dissertation.

## Dissertation Structure

This dissertation consists of three distinct but related papers that progressively narrow their focus on particular aspects of development supply chains. Given the paucity of research on development supply chains, the first paper conceptualizes this type of supply chain, sets up three questions about them that are particularly relevant when taking the perspective of donors wishing to improve development supply chains, and presents the stakeholder resource-based view (SRBV) as a theoretical lens through which to research them. The second paper then empirically investigates one of the three

questions identified in Paper 1 (How do development supply chains work, from the viewpoint of the donor?) by first identifying the different stakeholders along development supply chains for solar lanterns and solar home systems sold in Haiti, as well as their utility preferences. The paper then focuses on the resources and capabilities that social enterprise product companies and in-country importers develop, as these organizations were found to be important to the overall functioning of the supply chain from the donors' perspective. The third paper zooms in on development supply chains at the organization level and investigates the operations strategy development processes of social enterprises that participated in development supply chains.

## Contributions to Operations and Supply Chain Management Research

Development supply chains are both prevalent and important in the real world. They support humanitarian supply chains – a research domain of growing importance – yet they remain relatively overlooked in the operations and supply chain management literature. We viewed this as an opportunity to build a basis for new theory about them and suggest that the three papers in this thesis make the following contributions to the literature on humanitarian operations, social responsibility in supply chain management, and operations strategy.

Our conceptualization of development supply chains based on SRBV in Chapter 1 contributes to the literature by enabling researchers to identify and investigate relevant phenomena, to develop appropriate measures, and to propose normative interventions when studying development supply chains. We show that existing conceptualizations of the supply chain do not adequately accommodate the different entities, objectives, and interactions that occur in development supply chains, and that our conceptualization can provide researchers with the theoretical building blocks necessary to study and theorize about this type of supply chain and indeed the purely commercial variant with sustainability goals. The conceptualization's contribution is threefold: (1) it broadens

the set of relevant stakeholders – buyers and suppliers, donors, communities, beneficiaries, etc. – with each being considered on an equal footing rather than from only the viewpoint of a particular actor; (2) it uses utility to account for the diverse objectives present in development supply chains – commercial, humanitarian, household, and others – based on the different ways different stakeholders are impacted by the supply chain; and, (3) it takes a more generalized view of transactions or interactions in terms of the parties between which these occur. As a result, our conceptualization is useful for descriptive, instrumental, and normative research on development supply chains.

In the second paper (Chapter 2), we contribute to the growing supply chain management literature on the role of social enterprises in supply chains (Pullman, Longoni, and Luzzini, 2018). While prior literature has examined partnerships and non-commercial interactions between organizations in commercial supply chains serving low-income customers (Hahn & Gold, 2014) and in humanitarian supply chains (Beamon & Balcik, 2008; Oloruntoba & Gray, 2006; Pettit & Beresford, 2009), we show specifically how social enterprise stakeholders develop specialized resources and capabilities to exchange with stakeholders that seek to maximize purely *commercial* utility and stakeholders that seek to maximize purely *social* utility, and are therefore important enablers of the flows along development supply chains. In particular, we show how social enterprises – because they pursue both commercial and social objectives – operate revenue-producing supply chains and serve as a key conduit through which donor support flows into the supply chain. This extends existing research on how social enterprises can be supply chain enablers for the poor (Sodhi & Tang, 2011) by showing how social enterprises use their specialized resources and capabilities to bring donor money from wealthy countries to low-income micro-entrepreneurs and households in a way that also creates local economic development.

The third paper, which focuses on the operations strategy formulation process in social enterprises, has several important implications for operations scholars. First, we add nuance to the existing literature about the process for how operations strategy is developed in any company. We suggest that the step in the process in which the operations strategy is actually formulated – step 3 in the Platts-Gregory framework, or steps 4 and 5 in the Hill framework (Hill, 1995; Platts & Gregory, 1990; Slack & Lewis, 2008) – is directly linked to the area(s) of operations the executives perceived as being impacted by the perceived threat or opportunity. We also extend existing literature on the process for operations strategy formulation to the social enterprise context. We show how the executive's practical wisdom constrains the set of possible responses to a perceived threat or opportunity to those responses that aim to produce both social and commercial benefits. This also offers novel insights to extant operations strategy theory, which would predict that organizations make trade-offs between competitive priorities when developing operations strategies, by showing how operations strategies that enable the pursuit of both social and commercial objectives emerge naturally from decision-making shaped by practical wisdom, since the "solution set" from which responses to a particular threat or opportunity are derived contains only those that aim to increase both social and commercial outcomes.

## Charting a Path Forward

While researching and writing the three papers presented in this dissertation, I began to sketch out a research program focused on development supply chains. This research program consists of descriptive, instrumental, and normative research into three fundamental questions related to development supply chains: how they work, how to support them, and how supply chains can transition between commercial, humanitarian, and development. Table 1 below presents research questions that collectively chart a path forward for studying development supply chains.

**Table 1: A Research Program for Development Supply Chains**

| Type of Research | How development supply chains work | How to support development supply chains | How supply chains transition between development, commercial, and humanitarian |
|---|---|---|---|
| **Descriptive** | How do the resources and capabilities of a development supply chain's stakeholders enable supply chain flows, and what impact does this have on the stakeholders' respective utility? (Paper 2) | How do donors support development supply chains in the presence of institutional voids? | How do development supply chains support humanitarian supply chains in the wake of a natural disaster? |
| **Instrumental** | What resources and capabilities do micro-entrepreneurs need in order to participate in a development supply chain? | How effective are grants, subsidies, and impact investment at increasing the utility of low-income stakeholders? | How does a supply chain transitioning from humanitarian to development impact the utility of low-income beneficiary-customers? |
| **Normative** | How should managers use their organization's resources and capabilities to improve the utility of other supply chain stakeholders, given each stakeholders' resources and capabilities? | Where in the supply chain for household solar products sold in Haiti should donors provide grants in order to maximize the utility of the supply chain's low-income stakeholders? | How should a development supply chain transition to a commercial supply chain in order to maximize the utility of low-income beneficiary-customers? |

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# Chapter 1: Conceptualizing Development Supply Chains

**Abstract**:

Supply chains for development in a post-disaster context are distinct from commercial and humanitarian supply chains. Motivated by an example of supply chains for solar lanterns in Haiti, we find "development" supply chains raise several interesting questions for researchers, including: how they work; what the most effective ways to support them are; and, how and when one type of supply chain should transition to another following a disaster. Extant supply chain conceptualizations use network-based theories, transaction cost economics, the resource-based view, or other traditional economic or supply chain theories in the literature and focus primarily on profit-maximizing entities in commercial supply chains. We seek to conceptualize development supply chains by extending existing theory to incorporate stakeholder theory – using the stakeholder resource-based view – which brings into focus the supply chain's stakeholders, their resources and capabilities, and their respective utility preferences with respect to the supply chain. This conceptualization helps us to outline descriptive, instrumental, and normative approaches to research on development supply chains.

**Keywords**: Stakeholder resource-based view; development supply chains; humanitarian supply chains; stakeholder theory; supply chain conceptualization

## 1.1 Introduction

There is growing interest among researchers in humanitarian supply chains established to provide aid after natural disasters or in the wake of humanitarian crises (Holguín-Veras, Jaller, Van Wassenhove, Pérez, & Wachtendorf, 2012). There is also growing interest in how supply chains contribute to development of regions or nations (Gold, Hahn, & Seuring, 2013; Hahn & Gold, 2014; Hall & Matos, 2010; Huq, Stevenson, & Zorzini, 2014; Isaksson, Johansson, & Fischer, 2010; Silvestre, 2015; Sodhi, 2015; Sodhi & Tang, 2011, 2014a, 2014b, 2016; White, Smith, & Currie, 2011). Humanitarian and development supply chains, together with commercial ones, can be viewed as complementary parts of a cycle, beginning with humanitarian supply chains that seek to meet urgent needs following a disaster, continuing to supply chains for poverty alleviation through rebuilding and strengthening the local economy and infrastructure, thereby also reducing the risk of future disasters and crises (Sodhi, 2016; Van Wassenhove & Pedraza Martinez, 2012), finally yielding to commercial supply chains. This paper seeks to conceptualize development supply chains.

The humanitarian supply chain literature stream includes models of coordination among various players (Besiou & Van Wassenhove, 2015), including solving the ground-level challenges that managers face in the context of natural disasters and humanitarian crises, such as vehicle fleet coordination (Pedraza Martinez, Stapleton, & Van Wassenhove, 2011), and addressing practical factors influencing the effective design and implementation of humanitarian aid projects (Bhattacharya, Hasija, & Van Wassenhove, 2014; Kretschmer, Spinler, & Van Wassenhove, 2014; Pettit & Beresford, 2009). The development literature stream aims for alleviating endemic poverty and supply chains for development produce and deliver products or services that help individuals meet basic needs, such as food, water, energy, and shelter. This literature also looks at job-creation for low-income micro-entrepreneurs (Sodhi & Tang, 2014b)

and help for addressing institutional voids in general (Parmigiani & Rivera-Santos, 2015). Research on poverty alleviation and supply chains often falls within the growing research agenda on supply chains and sustainable development (Isaksson et al., 2010; Matos & Hall, 2007), where the goal is positive social, environmental, and economic outcomes.

While humanitarian supply chains are short- and medium-term interventions targeting specific events and consist of ramp-up, sustain, and ramp-down stages (Tomasini & Van Wassenhove, 2009), development supply chains are longer-term interventions targeting persistent poverty especially – but not exclusively – following one or more disasters. The presence of donors and the objective of poverty alleviation sets development supply chains apart from commercial ones, and the treatment of beneficiaries as customers distinguishes them from purely humanitarian supply chains. Yet, both humanitarian and development supply chains include companies like commercial supply chains. There are multiple objectives: profit for the companies; speed, cost, and humanitarian relief for the development agencies; and survival and reducing deprivation for the beneficiaries (Parmigiani & Rivera-Santos, 2011; Tomasini & Van Wassenhove, 2009).

We seek to conceptualize development supply chains in a way that accommodates their unique features as distinct from commercial and humanitarian supply chains, and which allows us to carry out descriptive, instrumental and normative research. Existing conceptualizations, grounded in a commercial understanding of the entities, objectives, and interactions that characterize a (commercial) supply chain, can be extended to include "stakeholders" other than supply chain partners or consumers. To extend RBV with stakeholder theory, we adopt the stakeholder resource-based view (SRBV) (Sodhi, 2015) as the way to conceptualize development supply chains. We identify stakeholders in these supply chains and their utilities, unique resources and

capabilities. Doing so helps us address how these supply chains work; what the most effective ways to support them are; and, how and when one type of supply chain transition to or from another.

As development and humanitarian relief assume growing importance in the literature, we contribute with the theoretical building blocks necessary to study these and indeed any supply chain. In particular, our conceptualization enables researchers to identify the right phenomena, to develop the right measures, and to propose the right normative interventions, when studying development supply chains. The following three aspects of our conceptualization allow researchers to build theory about development supply chains: *First*, we include a broader set of stakeholders – buyers and suppliers, donors, communities, beneficiaries, etc. – than traditional views in commercial supply chain research. Managers have to deal with an increasing number of stakeholders (Gualandris, Klassen, Vachon, & Kalchschmidt, 2015) – our conceptualization allows researchers to do this systematically. *Second*, our conceptualization incorporates diverse objectives, not just a profit-maximizing one, for the different stakeholders. *Third*, our conceptualization takes a more generalized view of "exchange" between stakeholders, going beyond payments for goods and services to incorporate meaningful interactions between stakeholders that have an impact on supply chain flows and on the stakeholders' respective utility.

Our conceptualization can help managers of development supply chains to understand, account for, and communicate the impact the portion of supply chain under their control has on each stakeholder, thereby more thoroughly addressing the impact of their supply chain and thereby improve upon the realized objectives.

## 1.2 An Example of Development Supply Chains in Haiti

In the sections below, we introduce a real-world example and then pose three questions about development supply chains that arise naturally from the real-world

example. We also differentiate development, humanitarian and commercial supply chains with a review of the relevant literature.

### *1.2.1 Solar lantern supply chains in Haiti*

Haiti is one of the poorest countries in the world with a GDP per capita of just US $1,650 in 2015 and over 70 percent of the population living on less than $3.10 per day (The World Bank, 2017). The 2010 earthquake and the 2016 Hurricane Matthew only worsened an already bad situation. Consequently, Haiti received and continues to receive considerable support from the international development community to help Haitians meet their basic needs, particularly for healthcare, infrastructure, and education.

One focus area for development is electricity for low-income Haitians in rural areas where these is no main electricity grid, as well as peri-urban and urban areas where the main grid is unreliable (Climate Investment Funds, 2015). Only 15 percent of the non-urban population in Haiti has access to grid-based electricity (The World Bank, 2017) and those with access to the grid receive only a few hours of electricity per day at non-regular intervals (Climate Investment Funds, 2015).

Solar-powered lanterns and small solar home systems (SHS) are two common solutions that can provide electricity-related services to low-income households. These services include lighting, cell-phone charging, and power to operate radios, fans and other small appliances (Bardouille, 2012). Solar lanterns/home systems increase household savings compared to continued expenditure on kerosene and candles for lighting, increase productivity for micro-entrepreneurs and small businesses, increase at-home study time for young students, and improve general household feelings of safety and security (*Impact Report: Autumn 2014*, 2014; Komatsu, Kaneko, Shrestha, & Ghosh, 2011; Laufer & Schäfer, 2011) . In addition, these products help strengthen community-level commerce: most development initiatives involving these products in

Haiti sell them to the beneficiaries through networks of micro-entrepreneurs, thus supporting local economic activity (Bardouille, 2012; Climate Investment Funds, 2015).

A California-based social enterprise called *d.light design* is one of several companies that makes solar lanterns and SHS that are sold in Haiti as part of this broader off-grid electrification development initiative. The company sells its lanterns in dozens of countries around the world. For its social enterprise goals, *d.light* receives investment from commercial and impact investors seeking a financial and social return, and grants from donors that include the United States Agency for International Development (USAID) (d.light design, 2016). Haiti represents an important commercial opportunity for *d.light*. Because d.light design's mission is to provide light and electricity to low-income individuals in developing countries (while also reducing indoor air pollution and providing other benefits), selling their lanterns in Haiti also represents an important "social," i.e. development, opportunity.

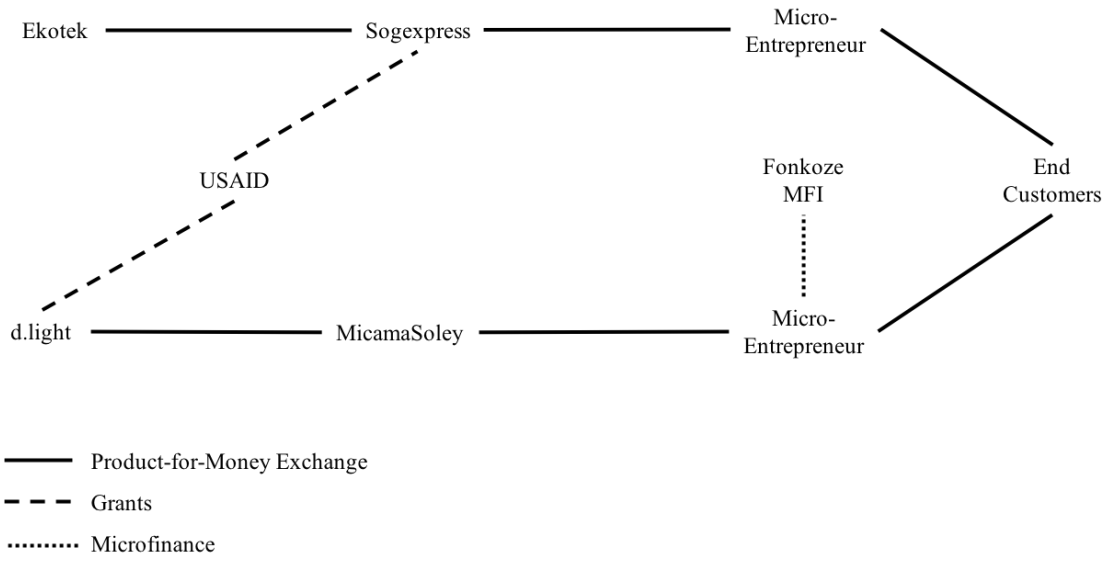
*d.light*'s in-country importer in Haiti is MicamaSoley, the social enterprise division of a Haitian company called SAFICO (MicamaSoley, 2012). MicamaSoley sells *d.light* solar lanterns at wholesale prices to micro-entrepreneur women who are often recipients of microloans. MicamaSoley leverages the networks of Fonkoze, a large non-profit micro-finance institution (MFI) headquartered in Washington, DC and Port-au-Prince, Haiti, who provide these microloans. The micro-entrepreneurs then resell *d.light* products from their homes and local marketplaces at retail prices to beneficiaries (end user customers). Although a non-profit, Fonkoze seeks revenues through interest rates and its borrowers have to earn money from selling products so they can repay their loans to Fonkoze. But Fonkoze also uses donor grants to supplement its revenues to keep its interest rates relatively low compared to purely commercial MFIs.

The micro-entrepreneur resellers of MicamaSoley face competition from a handful of other solar lanterns available on the market, including from Florida-based

Ekotek Energy. Sogexpress, a large money transfer service in Haiti, imports Ekotek solar lanterns and sells them to micro-entrepreneurs and end customers through its money transfer kiosks and branches around the country. The Ekotek products are sold at a significantly lower retail price than that of the *d.light* products and offer more features than the *d.light* products, including a built-in radio. Sogexpress receives financial support from USAID, Arc Finance and the Inter-American Development Bank to cover many of the overhead costs associated with importing and distributing the Ekotek products, which enables it to keep the retail prices low.

Thus, while the *d.light* design and Ekotek supply chains are both supported by donors, including USAID, the donor support occurred at different points along the supply chain – upstream via grants to *d.light*, and downstream for Ekotek products via grants to Sogexpress. These different approaches to donor support for development supply chains may impact the way development supply chains compete, both for resources upstream and downstream, and for customers in their target markets. Figure 1 presents an overview diagram of the *d.light* design and Ekotek supply chains.

**Figure 1: Two Development Supply Chains for Solar Lanterns Sold in Haiti**



### *1.2.2 Commercial, Humanitarian, and Development Supply Chains*

In order to compare and contrast development supply chains like those from the Haiti example with commercial and humanitarian supply chains in a systematic way, we found it useful to do so along three dimensions that supply chain scholars often use to describe supply chains: the *entities* (e.g. buyers and suppliers) involved in the supply chain; the *objectives* (e.g. efficiency, speed, and cost reduction); and, the *interactions* between supply chain entities (e.g., flows of materials, information, and money) (Hugos, 2011; Mentzer et al., 2001; Stock & Boyer, 2009). While supply chain research traditionally focuses on these in the context of commercial supply chains, say, for Apple's iPhones, development supply chains differ from humanitarian and commercial supply chains along these three dimensions.

The *entities* of interest along commercial supply chains are typically buyers and suppliers, and sometimes the end customers as well as the banks providing liquidity and the means for the transactions. For sustainability, other entities like local communities are also of interest in commercial supply chains (Hall & Matos, 2010). The entities in humanitarian supply chains additionally include non-commercial organizations like donors, beneficiaries, and government agencies besides the ones in commercial supply chains (Holguín-Veras et al., 2012) . On top of these commercial and non-commercial entities, development supply chains may also include social enterprises that aim at commercial and social goals, and multinational companies with social sustainability objectives (Dahan, Doh, Oetzel, & Yaziji, 2010).

*Objectives* for commercial supply chains are gaining competitive advantage or exploiting this advantage for profits, or operational profit-related goals, such as efficiency, speed, cost reduction, quality improvement, and flexibility (Boyer & Lewis, 2002). Humanitarian supply chains, however, are established in response to

humanitarian crises or to facilitate post-disaster relief and reconstruction (Holguín-Veras et al., 2012) , with the primary objective of reducing human suffering in the period during or immediately following a disaster. Holguín-Veras et al. (2013) develop the concept of "deprivation cost," based on the idea of a basic level of goods and services to which a person should have access and below which a person is living in "deprivation". The objective of humanitarian supply chains is thus to minimize deprivation cost during and immediately following a disaster. In contrast, development supply chains aim to reduce human suffering, although the objective is to provide longer-term solutions to endemic poverty rather than shorter-term relief. As such, development supply chains aim to exist over an extended period of time to provide products or services that helps beneficiaries meet basic needs such as healthcare, information and communications, water, transportation, housing, energy, food, and financial services (Hammond, Kramer, Katz, Tran, & Walker, 2007). This is particularly true in low-income countries, but development supply chains can also exist in wealthy countries to help low-income individuals meet one or more of their basic needs. The lines between commercial and development supply chains can be blurry with respect to their objectives, as exemplified by the supply chain of Hindustan Unilever Limited (HUL) in India, where socially motivated supply chain structures such as HUL's Shakti Amma program strive for the empowerment of women and for development in general (Hindustan Unilever Limited, 2016).

The *interactions* that are typically considered of interest between entities in commercial supply chains are the commercial transactions entailing the flows of materials, information, and money. However, the beneficiaries of humanitarian relief do not typically pay for the products and services that they receive from aid organizations (Beamon & Balcik, 2008; Oloruntoba & Gray, 2006; Pettit & Beresford, 2009). So the flows along humanitarian supply chains are not all based on commercial exchange

(Tomasini & Van Wassenhove, 2009; Van Wassenhove, 2006). Consequently, humanitarian supply chains depend on grants and donations, effectively making the entities providing grants and donations the "customers" (Beamon & Balcik, 2008), to whom the aid organization(s) orchestrating the supply chain have to devote considerable resources in terms of marketing, customer service, and reporting (Oloruntoba & Gray, 2006). Meanwhile, development supply chains are a hybrid, typically characterized by the sale of a product or service to an end user at a price he or she can afford (Graf, Kayser, & Klarsfeld, 2013). To ensure affordability, however, the supply chain often needs free or subsidized money, goods, or services to bolster the cash flows: subsidized consumer credit from a micro-finance institution (MFI), a subsidy from the government, some form of social impact investment, or, as for humanitarian supply chains, some form of aid or assistance (e.g. grants or training) from a donor, at some point along the supply chain (Gupta, Beninger, & Ganesh, 2015; Rogerson, Whitley, Darko, & Rabinowitz, 2014). In addition, companies, social enterprises and donors may partner with local non-profit, non-governmental organizations (NGOs) in low-income countries to tap into the resources of the local organization for context-specific competencies, legitimacy, and access (Perez-Aleman & Sandilands, 2008). Thus, non-commercial entities become important "exchange" partners for interactions between commercial and quasi-commercial entities along development supply chains.

Table 2 below summarizes the differences between commercial, humanitarian and development supply chains with respect to their entities, objectives, and interactions.

**Table 2: Commercial, Humanitarian and Development Supply Chains**

| | Entities | Objectives | Interactions |
|---|---|---|---|
| **Commercial** | Buyers, suppliers, and customers | Purely commercial: Profit maximization, efficiency | Commercial exchange |
| **Humanitarian** | Companies, governments, donors, NGOs, beneficiaries | Primarily humanitarian; short-term reduction of human suffering, ending in an envisaged time frame | Commercial exchange and donations |
| **Development** | Companies, governments, donors, social enterprises, customers | Both commercial and humanitarian; longer-term alleviation of poverty – supporting commerce helps in achieving this | Commercial exchange, donations, and quasi-commercial exchange (e.g., subsidies, impact investment) |

### *1.2.3 Three Questions about Development Supply Chains*

The example from Haiti and the existing literature on the three types of supply chains described above raise several questions about development supply chains. In particular, *if we take the donor's perspective of aiming to improve development supply chains*, we find the following three questions to be particularly relevant: First, *how do development supply work?* The question of how commercial supply chains work has been extensively addressed, particularly through Transaction Cost Economics (TCE). This theoretical lens suggests that commercial supply chains function because under certain conditions firms choose to outsource certain production activities and keep others in-house in order to reduce costs and therefore maximize profit (McIvor, 2009; Williamson, 1979). TCE seeks to understand commercial supply chains as commercial organizations interacting through commercial exchange in order to achieve profit-

maximizing objectives. However, when we look at the example from Haiti, we could reasonably ask how a development supply chain for solar lanterns works. When MicamaSoley buys lanterns from d.light design and sells them to micro-entrepreneur retailers, it does so both to make money and to create positive social impact, so its make-or-buy decisions may not be adequately explained by TCE. To understand more generally how development supply chains work, we first need to understand who participates in these supply chains and how and why they do so. Indeed, as Holguín-Veras et al. (2012: 494) explain, "to understand the functioning of the entire [humanitarian supply chain] system requires proper consideration of all its components." This would entail a careful examination of the entities, objectives related and unrelated to costs and profits, and interactions along development supply chains.

Second, from donors' and researchers' viewpoints, *what are the most effective and efficient ways to support development supply chains?* Traditional supply chain research is based on profit maximization for the supply chain participants. This would apply to some but not all entities in the development supply chains that have non-commercial objectives with goods being donated or subsidized rather than bought or sold at market prices. Unlike a distributor, a donor like USAID may be more interested in finding the most effective or efficient way to support development: provide a grant to an upstream producer like d.light, or provide subsidies to a downstream distributor like Sogexpress, or do both at the same time? Investigating this would require understanding of the different entities – local communities, and micro-entrepreneurs besides supply chain partners – and how they would be impacted by donations from USAID. Such a question opens up new avenues for research on how donations create (or destroy) value for different stakeholders, given their different objectives. For example, a donor might provide a resource to the supply chain at a below-cost price for publicity, future customer loyalty, reputation enhancement, and future business opportunities (Van

Wassenhove, 2006), but this may also disrupt an existing, if fragile, local market for the same resource.

Third, *how and when should a supply chain transition from humanitarian to development or from development to commercial?* Humanitarian supply chains are short- and medium-term interventions (Kovács & Spens, 2009; Tomasini & Van Wassenhove, 2009) and, consequently, are temporary or even makeshift. Development supply chains, meanwhile, typically aim to achieve longer-term sustained development by rebuilding local economies and infrastructure and reducing the risk of future disasters and humanitarian crises (Tomasini & Van Wassenhove, 2009). As a result, they complement humanitarian supply chains as alleviating poverty can reduce the impact of natural disasters (Sodhi, 2016). This implies that at some point a humanitarian supply chain should transition into a development supply chain if warranted by continued deprivation, and, in turn, a development supply chain should yield to commercial supply chains to allow market forces to take over. Or, the advent of another disaster may warrant a development supply chain transitioning to a humanitarian one temporarily. Thus, we could ask when should the humanitarian supply chains for donated solar home systems after the 2010 earthquake in Haiti transition into development supply chains for solar lanterns to be sold through commercial channels like Fonkoze's micro-entrepreneurs? Or, given the October 2016 hurricane that struck southern Haiti, when and how should the development supply chain for solar lanterns transition into a humanitarian one? How and when transitions like this occur, or when they should occur, remain unanswered in the literature, and represent a critical gap in the knowledge and practice of managing development supply chains.

## 1.3 Existing Conceptualizations of Supply Chains

We now assess three prominent theory-based conceptualizations of the supply chain as a basis for research on development supply chains.

### *1.3.1 Network-based Conceptualization of Supply Chains*

The network-based view of supply chains considers the supply chain as a network of actors – and not a linear chain of activities of buyers and suppliers (Carter, Rogers, & Choi, 2015; Hearnshaw & Wilson, 2013) that produce a product or service, deliver it, and capture value from these activities. As Hearnshaw & Wilson (2013: 444) state: "A supply chain can be modelled as a network by a set of 'nodes' that represent autonomous business units as firms who are able to exercise sovereign choices, and a set of 'connections' that link these firms together for the purposes of creating products or services." These connections, the authors assert, are the material, information, and financial flows that occur as a result of transactions between the actors of a supply chain.

Further, Carter et al. (2015) view the supply chain as a *complex adaptive system*, consisting of a network of actors and the flows between them, relative to a particular product or service, consisting of both a physical supply chain and a "support" supply chain (e.g. the electricity grid, roads and bridges, or the Internet). The objectives of a supply chain's entities in this conceptualization are efficiency, resilience, and adaptability (Hearnshaw & Wilson, 2013), with the umbrella objective of the focal firm being the improvement of the supply chain's performance (Carter et al., 2015).

The network-based view – whether or not a complex adaptive system – typically excludes entities that may be impacted *by* the supply chain even if they are not engaged in the exchange of materials, information, or money. As a result, this conceptualization may not be suitable for answering the three questions presented earlier. This is because measures of effectiveness and efficiency in development supply chains would have to account for impacts on *non-transacting* entities like local communities or microentrepreneurs selling competing products that are not part of the network. In addition, the objectives of the included entities are based primarily on commercial

goals, which reduces this conceptualization ability to understand how and why entities would participate in development supply chains to pursue non-commercial (e.g., humanitarian) objectives. The broader question of how development supply chains work is therefore only partially answerable using this conceptualization.

### *1.3.2 TCE and RBV Conceptualizations of Supply Chains*

Supply chains in the literature are typically conceptualized for increasing shareholder value if the horizon is long or increasing profit if the horizon is short. Transaction cost economics (TCE) and the resource-based view (RBV) have been the dominant lenses for examining phenomena in commercial supply chains (Walker, Chicksand, Radnor, & Watson, 2015). TCE tells us that commercial supply chains work because firms outsource certain activities and keep others in-house as they strive to maximize profits (Coase, 1937; Williamson, 1979). RBV suggests that commercial supply chains function to mobilize resources and capabilities within or outside the company (with supply chain partners) to sustain competitive advantage; under *dynamic capabilities*, the objective for the same is to ensure survival in dynamic industries (Barney, 1991; Teece, Pisano, & Shuen, 1997).

Some supply chain scholars have combined TCE and the RBV in order to explain phenomena that arise in supply chains that cannot be explained by either theory on its own, for example, the practice of strategic outsourcing. This research has developed a framework for describing, understanding, classifying, and predicting the structure of a firm's supply chain (Holcomb & Hitt, 2007; McIvor, 2009). Scholars contend that decisions about outsourcing – not just whether or not to outsource but also to whom – are best analyzed through both TCE and the RBV; namely, asset specificity, small-numbers bargaining, technological uncertainty, capabilities, and resources (Holcomb & Hitt, 2007).

This combination notwithstanding, using TCE and the RBV to understand supply chain structures limits analysis to commercial supply chains if the only objectives that are considered are those related to creating cost reductions and economic value, and if attaining competitive advantage is understood in terms of profit (McIvor, 2009). TCE and the RBV do not accommodate non-commercial objectives and non-commercial entities very well and may be ill-suited to explaining some of the phenomena in development supply chains. For example, managers in development supply chains may prefer to use a less efficient or more expensive distributor because the distributor shares a similar social goal even if the result means lower profits. Non-commercial transactions along the development supply chain are also problematic under TCE and RBV – for example, when a donor provides a grant to a product company to cover part of the cost of manufacturing solar lanterns.

### *1.3.3 Collaborative Advantage, Relational View of Supply Chains*

Chen and Paulraj (2004) adopt a "collaborative advantage" (as opposed to a competitive advantage) and "relational view" of supply chains. In this conceptualization of the supply chain, the focus is on "the dyad/network instead of individual firms as the unit of analysis" and, therefore, the "the buyer–supplier dyadic relationship" is the central focus (Chen & Paulraj, 2004: 121). The interactions of interest are the flows of materials, information, and money between buyers and suppliers and the different types of relationships that can exist between buyers and suppliers. This view of supply chains is useful for commercial supply chains and expands the set of objectives to include improving the "performance" of all supply chain members, not just that of the focal company alone.

If the collaborative advantage, relational view conceptualization is used to focus on buyer–supplier relationships, it misses opportunities to engage with non-commercial stakeholders such as donors and the government and non-transacting stakeholders such

as local communities. However, this conceptualization could be expanded to include these types of non-commercial stakeholders if it broadened the scope beyond traditional buyer-supplier relationships.

## 1.4 Proposed Conceptualization of Development Supply Chains

In assessing the existing supply chain conceptualizations presented above, we observed that a new conceptualization that is stakeholder-oriented could be particularly useful to conduct research on development supply chains. Such a conceptualization would include stakeholders beyond supply chain partners and would accommodate "development" issues such as poverty alleviation in local communities, while continuing to accommodate "commercial" issues such as profit and efficiency. One way to combine stakeholder-oriented and commercially oriented views of the supply chain is the stakeholder resource-based view (SRBV) (Sodhi, 2015).

### *1.4.1 Stakeholder Resource-Based View (SRBV)*

SRBV seeks to conceptualize social responsibility in operations (Sodhi, 2015). SRBV builds on stakeholder theory, the RBV, and objectives of each stakeholder (by way of utility theory, to allow normative discourse), to identify the stakeholders of a particular operation, their resources and capabilities, and their utility preferences. Although it is "a framework to inform the decision-making of managers of a (focal) company towards maximizing their utility" in operations for social responsibility (Sodhi, 2015: 1381), for our purpose here, the SRBV affords treatment of all stakeholders – whether or not a commercial entity – at par.

Stakeholder theory has been brought in to examine how stakeholders influence or are impacted by "sustainable" or "green" supply chain management practices (Carter & Easton, 2011; Sarkis, Zhu, & Lai, 2011). It is sometimes combined with other theories when studying supply chain phenomena (Carter & Easton, 2011) related to

stakeholders such as employees (including those of suppliers) and the members of the community where the supply chain operates.

However, it is not usually clear how stakeholder theory should be incorporated formally – SRBV provides a formal way to incorporate diverse stakeholders in managers' decision making. In line with Donaldson and Preston (1995), SRBV suggests that any analysis of an operation should consider all of the stakeholders who have a legitimate interest in the operation. Under SRBV, stakeholders are those who have the potential to benefit from or be harmed by an operation; and in this, their *utility depends significantly on the managers' decisions*. Stakeholders can include suppliers, employees, shareholders, governments, consumers, and communities, among others (Sodhi, 2015: 1381). Furthermore, because every stakeholder's interest has intrinsic value and "merits consideration for its own sake" (Donaldson & Preston, 1995: 67), researchers using SRBV should consider each stakeholder as being "on a par with other stakeholders from a research perspective" (Sodhi, 2015: 1382) regardless of power and material differences.

To account for diverse objectives of different stakeholders, SRBV builds on utility theory, which explains how individuals and organizations make decisions given a set of preferences *that matter to them* among choices that have uncertain outcomes (Fishburn, 1968). In other words, utility deals with an individual's or organization's preferences, goals, and objectives with respect to certain activities or situations (Dyer, Fishburn, Steuer, Wallenius, & Zionts, 1992). Under the SRBV, utility is not isomorphic across different types of stakeholders – different things matter to different stakeholders. Commercial actors will have utility based on economic factors such as increasing competitive advantage or reducing costs, while beneficiary stakeholders find it important just to survive one day to another. SRBV is able to account for these and other objectives because "maximizing (expected) utility is a powerful idea as

it subsumes maximizing competitive advantage and survival given the absence or presence of uncertainty" (Sodhi, 2015: 1382). For development supply chains, we consider the unique objectives of different stakeholders and how the supply chain impacts each stakeholder's utility – this is what gives the "stake" to each stakeholder in the development supply chain. For some stakeholders, utility is based on economic objectives, for some others such as donors, it is based on improving the well-being of beneficiaries (i.e. a "humanitarian" utility). Yet others may have a combination of both humanitarian and economic objectives.

SRBV retains *resources* and *capabilities* from the existing views. Under RBV, resources are the "tangible and intangible assets a firm uses to choose and implement its strategies" (Barney, 2001: 54), such as financial capital, knowledge, networks, and processes, among others. Resources can also be considered at the level of the individual – a person's money, knowledge, social networks, etc. Capabilities refer to the dynamic capabilities that firms possess that enable them to "integrate, build, and reconfigure" their resources in order to survive in dynamic environments where uncertainty is high (Teece et al., 1997: 516) and to the capabilities that an individual uses to perform tasks, for example as Sen (1983, 1988, 2006) famously demonstrated, to survive in conditions of extreme poverty, or for that matter, humanitarian disasters.

We go beyond SRBV's use to help managers of a focal company to look beyond the company's profit-related objectives in that we use it conceptualize the supply chain as a whole. Our SRBV-based conceptualization falls within Ellram and Cooper's (2014: 13) "philosophy" category of supply chain conceptualizations, in that we consider "the way that the activities within and across organizations come together to satisfy the customer's needs from a supply chain perspective or orientation;" however, we look beyond the needs of customers to consider also the objectives of other supply chain

stakeholders. In the next section, we present a view of supply chains as "seen" through the SRBV lens.

### *1.4.2 Viewing Supply Chains Through the SRBV Lens*

Under an SRBV conceptualization, *a supply chain consists of stakeholders, which are any individual or group whose utility depends significantly on the supply chain's existence.* Each stakeholder in the (development) supply chain has interests, goals, and needs that are taken to have intrinsic value, so we consider not only the core supply chain participants – buyers, suppliers, and customers – but also those who are affected by the supply chain's activities, for example communities or even community-based enterprises (Peredo & Chrisman, 2006). In this way, our conceptualization includes all entities that have an interest in the supply chain. This approach is pragmatic: the supplier of iron ore that sells to the company that makes the screws that hold together the roofing on a mattress company's factory is not a stakeholder of the mattress supply chain because its utility does not depend significantly on the mattress supply chain.

Viewed through the SRBV lens, *each supply chain stakeholder has its own unique utility preferences, which can include efficiency, cost reduction, and competitive advantage as in any supply chain but might also include humanitarian objectives and personal or household well-being, among others pertinent specifically to development supply chains.* Using SRBV can therefore incorporate different and multiple objectives – whether commercial, humanitarian, or otherwise – within the same analytical framework of stakeholder utility.

Finally, under SRBV, *supply chain stakeholder possesses certain resources and capabilities that enable it to exchange money, information, and/or materials with other entities along the supply chain, or which are*

*significantly impacted by its interaction with the supply chain.* For example, commercial stakeholders may use their resources to sell products for a profit to NGOs that manage development supply chains in order to sustain competitive advantage, while micro-retailers or beneficiaries may be focused on simply surviving, meaning that capabilities become important. Meanwhile, the resources of a local community may be significantly impacted by their interactions with a supply chain even if the community does not exchange money, information, or materials with other entities of the supply chain in question. Consider the local community where a large number of households have purchased solar home systems through a development supply chain. Households that did not directly participate in the supply chain – either as resellers of the systems or as end customers – may also benefit from the presence of the supply chain because the addition of light at night increases community safety after dark (Ramani & Heijndermans, 2003), which is an important intangible community resource.

### *1.4.3 Positioning the SRBV Conceptualization Alongside Existing Supply Chain Conceptualizations*

A conceptualization based on the SRBV heeds Pagell and Shevchenko's (2014) call to accommodate competitive advantage and responsibility towards stakeholders as simultaneous objectives. An SRBV-based conceptualization can therefore complement the "network" and "collaborative advantage / relational view" conceptualizations of the supply chain. These conceptualizations tend to consider only those stakeholders who exchange goods/services/money, but, using SRBV, we additionally include other stakeholders who are impacted *by* their interactions with supply chain even if they are not participating in exchanges for money, information, and materials.

Using SRBV, we extend the TCE-RBV conceptualization of commercial supply chains with utility to better describe outsourcing phenomena that occur in development supply chains, or in commercial supply chains that prioritize social and/or environmental responsibility. The interactions – in the TCE-RBV case, the flows of materials, information and money – between nodes in the network, or between dyads/triads, depend on the resources and capabilities and utility preferences of the origination and destination nodes for each flow.

By incorporating stakeholder theory to a conceptualization of the supply chain, we also begin to tackle a salient critique of stakeholder theory as it relates to individual organizations: "Despite all the strident rhetoric about the 'stakeholder corporation' the reality is that stakeholders who do not toe the corporate line are either coopted or marginalized. The stakeholder theory of the firm represents a form of stakeholder colonialism that serves to regulate the behavior of stakeholders" (Banerjee, 2008: 72). An SRBV-based conceptualization allows researchers to take a view of the supply chain that can "open up new spaces and provide new frameworks for organization-stakeholder dialogues, as well as critically examine the dynamics of the relationships between corporations, NGOs, governments, community groups and funding agencies" (Banerjee, 2008: 73).

In Table 3 below, we refer back to the comparison of commercial, humanitarian, and development supply chains that we presented in Section 1.2.2, to show how a conceptualization of supply chains based on SRBV is particularly well suited to study development supply chains as compared with the network-based, TCE-RBV, and collaborative advantage, relational view conceptualizations presented in Sections 1.3.1-1.3.3, although in some cases (as identified in Table 3) these conceptualizations can be extended to development supply chains.

**Table 3: Extant Versus Proposed Supply Chain Conceptualizations**

| | Entities | Objectives | Interactions |
|---|---|---|---|
| **Network-based conceptualization** (Carter et al., 2015; Hearnshaw & Wilson, 2013) | "Autonomous business units as firms" (Haernshaw & Wilson, 2013: 444). | Efficiency, resilience and adaptability (Hearnshaw & Wilson, 2013); and "controlling operations to increase performance" (Carter et al., 2015: 90). | "Contracts and various flow types including material flows, information flows, and financial flows" (Hearnshaw & Wilson, 2013: 444). |
| *Suitable for Research on Development Supply Chains?* | ***Extension needed** to account for stakeholders who do not exchange materials or money* | ***Yes**, if performance is understood according to each stakeholder's preferences* | ***Extension needed** to account for impacts that the supply chain has on non-transacting stakeholders* |
| **TCE–RBV conceptualization** (Holcomb & Hitt, 2007; McIvor, 2009) | "Focal firms and exchange partners" (Holcomb & Hitt, 2007: 466). | Creating "cost economies" and "economic value;" improving "production economies;" gaining "financial advantages" (Holcomb & Hitt, 2007: 468-469); competitive advantage (McIvor, 2009: 45). | Acquiring "capabilities available externally from intermediate markets" (Holcomb & Hitt, 2007: 465) and "selecting the most appropriate relationship strategy" (McIvor, 2009: 46). |
| *Suitable for Research on Development Supply Chains?* | ***Extension needed** to account for non-commercial stakeholders and those who do not exchange materials or money* | ***Extension needed** to account for non-commercial objectives such as poverty alleviation* | ***Extension needed** to account for impacts that the supply chain has on non-transacting stakeholders* |

| | Entities | Objectives | Interactions |
|---|---|---|---|
| **Collaborative advantage, relational view conceptualization** (Chen & Paulraj, 2004) | Buyers, suppliers, and "the buyer-supplier dyadic relationship" (Chen & Paulraj, 2004: 121). | "Satisfying [customer] needs and providing timely service"; improving overall supply chain "performance through better use of internal and external capabilities" (Chen & Paulraj, 2004: 122). | Flows of "materials and information" between buyers and suppliers,"; "interdependent relationships … through strategic collaboration" (Chen & Paulraj, 2004: 121 & 122). |
| *Suitable for Research on Development Supply Chains?* | ***Extension needed** to account for non-commercial stakeholders and those who do not exchange materials or money* | ***Yes**, if performance is understood according to each stakeholder's preferences* | ***Extension needed** to account for impacts that the supply chain could have on non-transacting stakeholders* |
| **Proposed SRBV conceptualization of development supply chains** | Any individual or group whose utility depends significantly on the supply chain's existence. | Stakeholders have unique utility preferences, including efficiency, cost reduction, and competitive advantage, as well as humanitarian objectives and survival, among others. | Stakeholders possess certain resources and capabilities that enable them to exchange money, information, and/or materials, or which are significantly impacted by the supply chain. |
| *Suitable for Research on Development Supply Chains?* | ***Yes:** accounts for different types of entities (e.g., commercial, humanitarian, etc.) as stakeholders.* | ***Yes**: understands objectives in terms of utility, thereby taking into consideration a variety of stakeholder objectives.* | ***Yes**: accommodates traditional exchanges (e.g., materials for money) as well as impacts the supply chain can have on non-transacting stakeholders.* |

As the table above shows, entities, objectives, and interactions have different meanings depending on which theoretical lens is used to view a supply chain. An SRBV-based conceptualization brings to the fore the entities, objectives, and interactions that are particularly relevant for researching development supply chains, whereas the existing theoretical lenses presented above typically do not account for them or view them as peripheral to the supply chain. The entities of interest in development supply chains are not just buyers and suppliers but also non-commercial stakeholders like donors and stakeholders that do not exchange materials, information, or money along the supply chain, such as local communities. The objectives of interest under an SRBV-based conceptualization include commercial objectives as well as non-commercial objectives such as poverty alleviation. The interactions of interest are not just the exchanges of materials, information, and money, but also the interactions that some stakeholders have with the supply chain even if they do not exchange money, information, or materials.

## 1.5 Applying the Proposed SRBV-Based Conceptualization

Conceptualization of development supply chains using SRBV entails the following: (*Step* 1) Determine the scope of the supply chain to study; this could be the supply chain of a particular organization or of a particular product or service; (*Step* 2) identify the stakeholders whose utility is impacted by the existence of the supply chain; (*Step* 3) determine how the supply chain impacts each stakeholder's utility; and (*Step* 4) identify the resources and capabilities that each stakeholder either uses to interact with the supply chain or are impacted by the supply chain. In practical settings, as Gualandris et al. (2015) suggest, it may be helpful to bring in external stakeholders, such as NGOs, to assist with these four steps. For example, researchers studying the supply chain of wood-based post-disaster shelters could collaborate with the Forest Stewardship Council, a well-known entity that monitors and certifies forestry practices, given this

organization's knowledge about forestry stakeholders and their resources, capabilities, and utility preferences. We now apply these four steps to the Haiti example for illustration.

### *1.5.1 Revisiting the Haiti Example*

Focusing on MicamaSoley's supply chain for *d.light* solar lanterns (*Step* 1), we can identify the following stakeholders (among many others, of course) whose utility is impacted significantly by the supply chain (*Step* 2): *d.light* itself and their Chinese contract manufacturers; Ekotek Energy; USAID; MicamaSoley; Fonkoze; Sogexpress; Fonkoze micro-retailers; and end users, who are typically low-income individuals without access to electricity.

Next, we determine how the supply chain impacts each stakeholder's utility (*Step* 3). Several stakeholders along the supply chain seek to maximize both commercial and social utility. These are d.light design, MicamaSoley, Fonkoze, Sogexpress, and Ekotek Energy. The Ekotek supply chain competes with the MicamaSoley supply chain, so it represents a threat to the utility maximization efforts of *d.light*, MicamaSoley, and the Fonkoze-financed micro-entrepreneurs. For the micro-entrepreneurs, the MicamaSoley supply chain represented a largely commercial opportunity – a way for them to maximize commercial utility by earning income. For the end customers, these supply chains represent an important way for them to improve their personal utility: by using the lanterns, they save money on kerosene purchases, charge their cell phones, keep their market stalls open after dark, and stay safe as they travel at night. USAID participates in the supply chains in order to maximize humanitarian-related utility, but by donating to downstream to Sogexpress and upstream to *d.light*, it may also impact the retail price of *d.light* and Ekotek lanterns, thereby impacting the commercial utility of the micro-entrepreneur resellers, Sogexpress and MicamaSoley, and *d.light design* and Ekotek Energy.

Finally, we identify the resources and capabilities stakeholders use to interact with the supply chain (*Step* 4). Each of the stakeholders has unique resources and capabilities that they used to interact with the supply chain in order to maximize (or at least not diminish) their utility. For example, d.light uses its resources to get social impact investment from impact investors and grants from USAID, it has contracts with manufacturers and in-country distributors like MicamaSoley, international sales teams, and product designers, and the ability to learn about new developing country markets worldwide, all of which ultimately allowed it to sell products to MicamaSoley.

MicamaSoley has a warehouse, staff, and trucks that are used to deliver products to Fonkoze branches around Haiti, relationships with d.light design and Fonkoze, and the capability of helping Fonkoze borrowers with marketing and sales techniques tailored to the lanterns. Fonkoze used its resources to get money from donors that allowed them to decrease the interest rates on loans to micro-entrepreneurs, it has branch locations throughout Haiti and know-how to screen borrowers and lend to borrowers, as well as the capabilities of soliciting new funding from donors. The Fonkoze micro-entrepreneurs have access to end customers, access to microloans from Fonkoze, and knowledge about the product gained from MicamaSoley as well as the wherewithal to seek out new customers and order solar lanterns from MicamaSoley. Similar analyses could be conducted for the resources and capabilities of other stakeholders along the development supply chains for solar lanterns described in the example from Haiti.

There are other stakeholders along these development supply chains, such as suppliers of raw materials, the communities in which these upstream factories were located, and logistics intermediaries such as shipping companies, among others. Table 4 presents the SRBV-based conceptualizations of the development supply chains from the Haiti example.

**Table 4: Conceptualizing MicamaSoley's Development Supply Chain for d.light Solar Lanterns**

| Stakeholder | Impact on utility | Resources & capabilities for interacting with supply chain |
|---|---|---|
| USAID | Humanitarian utility maximized through supporting the positive social impact of d.light design and Sogexpress. | Resources: money from US taxpayers; knowledge of humanitarian challenges in Haiti<br>Capabilities: grant application management; measuring impact. |
| d.light design and Ekotek Energy | Commercial utility maximized through sales of solar lanterns and impacted by the presence of each other in the Haitian market; humanitarian utility maximized by providing low-income individuals with solar lanterns. | Resources: relationships with impact investors and donors; contracts with manufacturers; products for sale.<br>Capabilities: international sales & distribution; learning about new markets in low-income countries and solar lantern products. |
| MicamaSoley and Sogexpress | Commercial utility maximized by selling products micro-entrepreneurs and impacted by other solar lantern supply chains; humanitarian utility maximized by providing micro-entrepreneurs with an income-generating opportunity. | Resources: warehousing; trucks; labor; products for sale to micro-entrepreneurs.<br>Capabilities: recruiting micro-entrepreneurs as resellers; identifying and testing new distribution strategies. |
| Fonkoze | Commercial utility maximized by having a product that attracts women to take out microloans to become micro-entrepreneurs; humanitarian utility maximized by providing women with subsidized credit and an income-generating opportunity, which Fonkoze then reports to its donors to maintain legitimacy | Resources: Relationships with donors; bank accounts; subsidized loans to provide to micro-entrepreneurs<br>Capabilities: lending and credit checks; soliciting new donations |

| Stakeholder | Impact on utility | Resources & capabilities for interacting with supply chain |
|---|---|---|
| Micro-entrepreneur | Commercial and household utility maximized by buying a product from the in-country importer and reselling it at a profit, and impacted by other solar lantern supply chains | Resources: subsidized credit; means of transportation; products from in-country importer<br>Capabilities: seeking new markets; purchasing decisions |
| End customer | Household utility maximized by buying a solar lantern at a price less than or equal to the expected utility of owning the lantern | Resources: cash or credit; shelter; access to Fonkoze micro-entrepreneurs<br>Capabilities: learning about a new product |

## 1.6 So What? Revisiting the Three Questions About Development Supply Chains

We suggest that our conceptualization can be useful for descriptive, instrumental, and normative research on development supply chains. We illustrate how in the following paragraphs, where we return to the three questions about development supply chains that we posed in Section 1.2.3 and draw from the example from Haiti to provide real-world context.

### *1.6.1 How Development Supply Chains Work*

If we consider a functioning supply chain one through which materials, information, and money flow, then *descriptive research* about how development supply chains work would consider the theoretical relationships not only between certain stakeholder's resources and capabilities and their utility preferences, but also between both of these constructs and the money, information, and materials that flow between the stakeholder(s) being studied and other supply chain stakeholders. Researchers could reasonably ask: how do the resources, capabilities, and objectives of a supply chain's stakeholders engender flows of materials, information, and money along the supply

chain? From the Haiti example, in the Ekotek development supply chain for solar lanterns sold in Haiti presented earlier, we can see that USAID, Ekotek, Sogexpress, customers, and other stakeholders participated using their respective resources and capabilities to exchange with other supply chain stakeholders in order to maximize their respective utility. Indeed, our SRBV-based conceptualization helps researchers conduct descriptive research on development supply chains by viewing these supply chains as comprising commercial and non-commercial stakeholders, each with their particular resources, capabilities, and utility preferences.

*Instrumental research* on how development supply chains work could study what kinds of resources and capabilities low-income individuals need in order to participate as producers (e.g. micro-entrepreneurs) or consumers of a development supply chain. A survey would be a useful research method for answering this question, and if conducted with the same respondents over time as part of a randomized control trial, the data collected could also be used for additional instrumental research on measuring the impact of the development supply chain on poverty alleviation. Instrumental research about how development supply chains work could also measure, compare, and test the effectiveness of different development supply chains. Under an SRBV-based conceptualization, a development supply chain would be considered effective if it produced and delivered a product or service in a way that improved (or at least did not diminish) the utility of each stakeholder along the chain while also maintaining standards related to traditional measures of effectiveness including speed, cost or accuracy. Thus, our conceptualization leads researchers conducting instrumental research on how development supply chains work to operationalize constructs and metrics used to measure and compare development supply chains against their objectives in terms of the supply chain's stakeholders, their resources and capabilities, and their utility preferences with respect to the supply chain.

Our conceptualization of supply chains allows for *normative* analysis of how development supply chains work by making the stakeholders along a supply chain a critical component of analysis. The normative approach to stakeholder theory suggests that "whatever the ultimate aim of the corporation or other form of business activity [e.g. the supply chain], managers and entrepreneurs should take into account the legitimate interests of those groups and individuals who can affect (or be affected by) their activities" (Freeman, Wicks, & Parmar, 2004: 365). Our conceptualization of supply chains suggests an explicit way for managers and entrepreneurs to do this: they should use their organization's resources and capabilities in a way that helps improve (or at least does not diminish) the utility maximization efforts of other supply chain stakeholders, given their respective resources and capabilities. Such a perspective is useful for commercial supply chains as well, in which managers must account for an increasing number of stakeholders (Gualandris et al., 2015). Our conceptualization allows managers (and researchers) to view supply chains "through a social responsibility lens" (Sodhi, 2015: 1378), and therefore "bakes in" social responsibility into any analysis of development supply chains because of how it defines who is a supply chain stakeholder and how they are impacted by the supply chain (through their utility). Managers will find that some stakeholders' utility maximization efforts may conflict with the utility maximization efforts of other stakeholders along the supply chain. Tantalo and Priem (2016) explore this tension in their work combining stakeholder theory and utility theory and suggest that managers can look for ways to create value for the firm while helping maximize (or at least not diminish) the utility of one or more stakeholders. The SRBV allows us to apply this logic to the level of the supply chain, where supply chain managers can look for ways to make the supply chain successful while also maximizing (or at least not diminishing) the utility of supply chain stakeholders. In this way, the SRBV also helps managers of organizations participating

in development supply chains attend to the goal of poverty alleviation at the right scale (Bansal, Kim, & Wood, 2018) – that is, at the scale of the supply chain's low-income stakeholders rather than at the societal level – so that they deploy resources in an efficient manner given the poverty reduction goal. Helping each supply chain stakeholder maximize (or at least not diminish) its utility is a key responsibility for managers of development supply chains, where stakeholders with conflicting utility preferences are present.

In addition, our conceptualization broadens the scope of who is considered a supply chain stakeholder, and it can therefore be used to examine normative questions related to *how supply chains can or should contribute to sustainable development*. It does so by viewing supply chains in terms of the resources and capabilities of each stakeholder, and the impact the supply chain has on stakeholder utility – which can be based on a combination of economic, social and environmental preferences. A "gold standard" for a sustainable development supply chain would therefore be one that creates net positive utility for each of the supply chain's stakeholders, achieved through the purposeful mobilization of each stakeholder's resources and capabilities.

### *1.6.2 Effective Ways to Support Development Supply Chains*

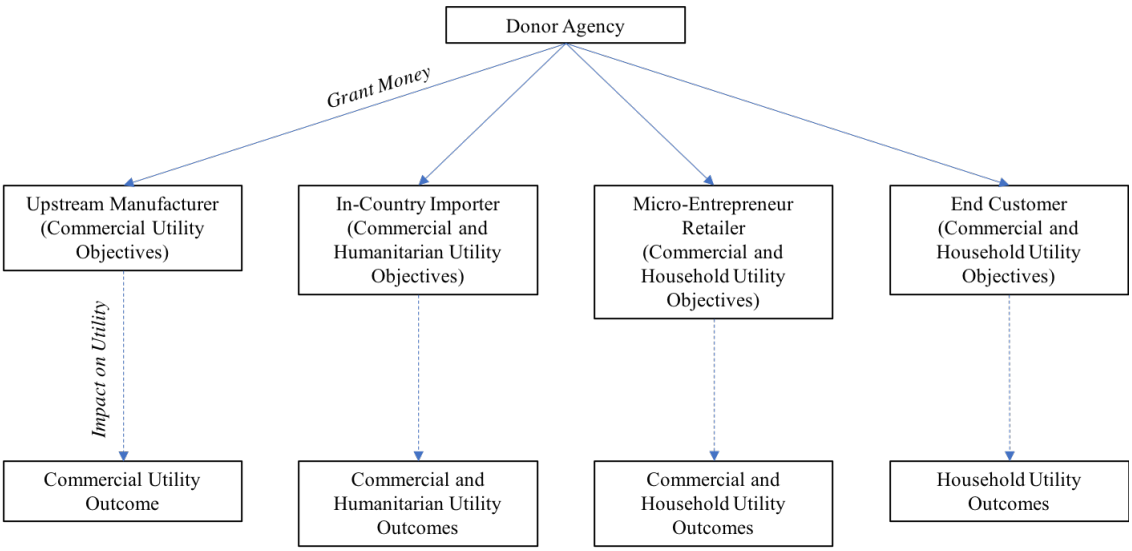
By focusing on the donors' objective of making development supply chains more effective, researchers can use our proposed conceptualization to understand effectiveness in terms of stakeholder utility, as described above in Section 1.4.1. This opens up new avenues for descriptive, instrumental, and normative research. *Descriptive research* could look at how donors support development supply chains in the presence of institutional voids (Parmigiani & Rivera-Santos, 2015), and how this support impacts the supply chain's effectiveness. Researchers could also study whether or not higher-level supply chain strategies developed for fully commercial supply chains, such as how to balance being lean and being agile (Ben Naylor, Naim, & Berry,

1999), hold for development supply chains when supply chain effectiveness is operationalized in terms of stakeholder utility.

*Instrumental research* on donor support to development supply chains using our conceptualization can investigate questions about the effectiveness of donations, grants, subsidies, and impact investment that support development supply chains, where the metric would be utility gains for the end user/beneficiary per amount of money and materials donated along the supply chain. From the Haiti example, researchers could measure the changes in household utility for different levels of donations. If the total donations for a SHS supply chain equal $150 per household and the total donations for a solar lantern supply chain equal $75 per household, the two supply chains would be considered equally effective if the utility gains from having a solar home system were twice as great for the end user as having a solar lantern.

An interesting question for *normative research* on how to effectively support supply chains arises from the Haiti example: where in the supply chain for household solar products sold in Haiti should donors provide grants in order to maximize the utility of the supply chain's low-income stakeholders? A conceptual model to research this question using the SRBV conceptualization would consider the impact of donor grants to some supply chain stakeholders (e.g., to manufacturers and/or in-country importers) on the resources, capabilities, and utility of other stakeholders of interest to the researcher (e.g., micro-entrepreneur retailers and end customers) (Figure 2).

**Figure 2: Example of a Conceptual Model for Researching Donor Support to Development Supply Chains**




### *1.6.3 Transitioning from One Type of Supply Chain to Another*

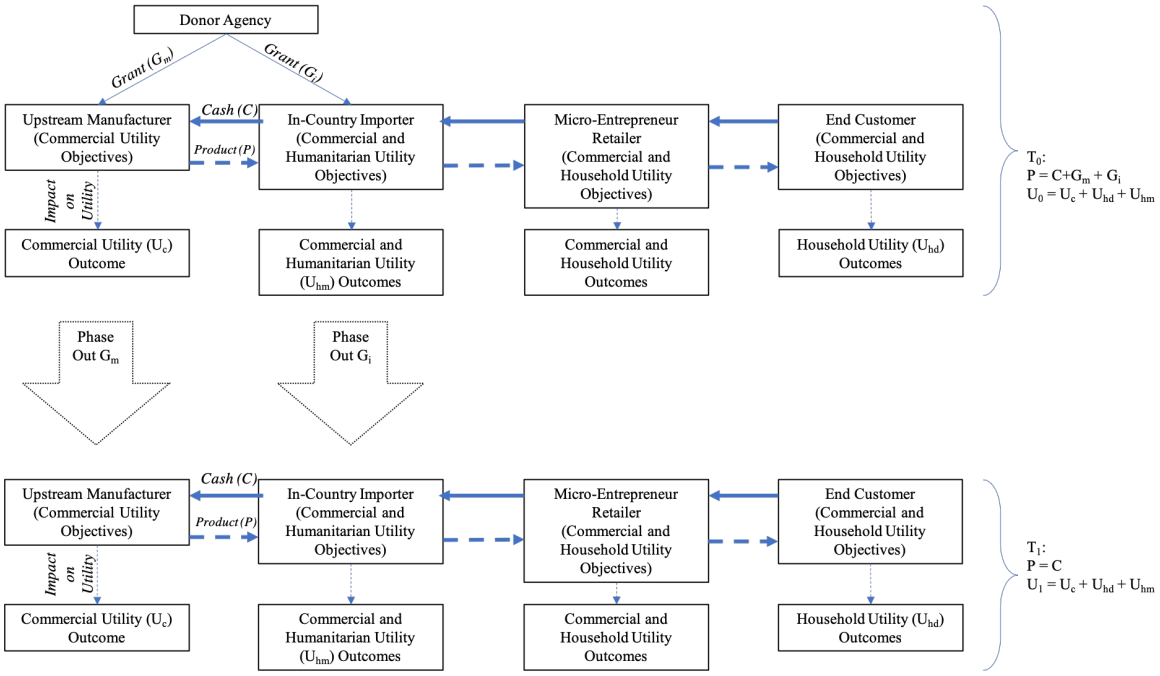
Descriptive, instrumental, and normative questions also arise when considering the transition from one type of supply chain to another. One intriguing line of *descriptive research* here would be to examine how development supply chains create social value in the wake of a natural disaster, such as the earthquake in Haiti. A useful way of measuring "social value" in this context was developed by Kroeger and Weber (2014), who define social value as the difference between how satisfied a treatment group is in one dimension – say, personal safety – and how satisfied the population is along the same dimension after an intervention for the treatment group, for example the installation of solar home systems to provide light at night. By interviewing individuals affected by a natural disaster immediately following the event and then again after the implementation of a development supply chain that served only some of the interviewed individuals, researchers could study how the development supply chain positively (or negatively) impacted social value.

*Instrumental research* could measure the changes in stakeholder utility as one type of supply chain transitions to another. Consider a supply chain transition from fully commercial to development (we will consider the opposite transition in the paragraph below on normative research). Supply chain scholars have become increasingly interested in "sustainable" or "green" supply chains (Sarkis et al., 2011; Walker et al., 2015) within the broader context of sustainable development, where the goal is to integrate economic and environmental sustainability with positive social impact (Seuring & Müller, 2008) . The research focus tends to be on commercial supply chains along which environmental and social concerns are brought to the fore and addressed through a variety of methods such as stakeholder engagement, improved efficiencies, and new configurations of materials, buyers, and suppliers (Ahi & Searcy, 2013). However, as Pagell and Shevchenko (2014: 45) argue: "most supply chains in existence today will not survive unless they change practices and business models to address their negative social and environmental impacts." So, an instrumental approach to studying the transition from a commercial to a development supply chain using our conceptualization could examine what impacts incorporating development practices and objectives into a commercial supply chain have on the utility outcomes of the stakeholders.

*Normative research* on the transition from one type of supply chain to another could examine how a development supply chain should transition to a commercial supply chain. Tailoring this question to the Haiti example, one could ask how a donor-funded development supply chain for household solar products in Haiti should transition to a fully commercial supply chain without grants or subsidies. In a fully commercial supply chain, the flows of money would correspond directly to the flows of materials, so a transition from development to fully commercial would entail phasing out donor support.

However, this transition should happen in a way that does not negatively impact supply chain stakeholder efforts to maximize their respective utility. An SRBV conceptualization would consider the impact of removing donor support from certain supply chain stakeholders (e.g., from manufacturers and/or in-country importers) on the resources, capabilities, and utility of other stakeholders of interest to the researcher (e.g., micro-entrepreneur retailers and end customers). Figure 3 below presents an example of such a conceptual model.

**Figure 3: Example of a Conceptual Model for Researching Development Supply Chain Transition to Commercial Supply Chain**




In the figure above, the supply chain is a development supply chain at $T_0$ and a commercial supply chain at $T_1$. $G_m$ is donor grants to the manufacturer and $G_i$ is donor grants to the In-Country Importer, $U_0$ and $U_1$ are the sums of stakeholder utilities at $T_0$ and $T_1$ respectively, $U_c$ is commercial utility, $U_{hm}$ is humanitarian utility, $U_{hd}$ is household utility, P is the dollar value of products

flowing through the supply chain, and C is the dollar value of non-grant money flowing through the supply chain.

## 1.7 Conclusion

Our conceptualization of development supply chains contributes to the literature by enabling researchers to identify and investigate the right phenomena, to develop the right measures, and to propose the right normative interventions when studying development supply chains. We have argued that existing conceptualizations of the supply chain do not adequately accommodate the different entities, objectives, and interactions that occur in development supply chains. In response, we have proposed a conceptualization of development supply chains using SRBV as a theoretical lens to provide researchers with the theoretical building blocks necessary to study this type of supply chain and indeed the purely commercial variant with sustainability goals. *First*, we now have a broader set of relevant *stakeholders* relative to commercial supply chains – buyers and suppliers, donors, communities, beneficiaries, etc. – with each being considered on an equal footing rather than from only the viewpoint of a particular actor. *Second*, we proposed to use *utility* to account for the diverse objectives present in development supply chains: commercial, humanitarian, household, and others, based on the different ways different stakeholders are impacted by the supply chain. *Finally*, we take a more generalized view of interactions between supply chain stakeholders in terms of the parties between which these occur. Supply chain stakeholders use their resources and capabilities to exchange materials, information, and/or money with other supply chain stakeholders, and they can also interact with the supply chain without exchanging materials, information, or money as in the community safety example we presented in Section 1.4.2.

## 1.8 Chapter 1 References

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# Chapter 2: A Multiple Case Study of Development Supply Chains for Solar Lanterns and Solar Home Systems in Haiti


## ABSTRACT

This paper is motivated by the question, from the donors' perspective, of how to improve the effectiveness of donor support to development supply chains. A first step in answering this question is to carry out descriptive research to understand how development supply chains work. We therefore conduct a multiple case study of five development supply chains for solar lanterns and solar home systems and use the Stakeholder Resource-Based View as the theoretical lens. We identify nine categories of development supply chain stakeholders and by focusing on the social enterprise product companies and in-country importers show how these stakeholders develop specialized resources and capabilities related to the products they sell, the distribution channels they create, and the grants they bring in from donors. These in turn support the flows of material, information, and financial flows along the supply chain, which enable other supply chain stakeholders with different objectives to improve their respective utility: donors meet their development objectives, beneficiaries have some of their basic needs met, and commercial firms make profit. We contribute to the literature with building blocks of new theory about development supply chains.



**Keywords:** Development Supply Chains; Social Enterprise; Poverty Alleviation; Stakeholder Resource-Based View

## 2.1 Introduction

Development supply chains provide low-income individuals with products and services that help them meet basic needs, in a way that strengthens the local economy and "aims to reduce dependence on external support" (Kretschmer et al., 2014: 996). Despite their prevalence in the real world and their importance for poverty alleviation that can directly complement humanitarian relief efforts (e.g., the supply chains for affordable housing in low-income coastal areas where flooding is a disaster risk), research on development supply chains remains limited. As a result, surprisingly little has been written about how they work. This represents an important knowledge gap for donor agencies that aim to support development, for whom improving the efficacy of their aid is a top priority. Such improvements require understanding how the supply chains that transport the desired products and services to the intended beneficiaries while serving as the conduits for the donor's aid work.

Development supply chains also offer fertile ground for supply chain scholars to extend and challenge extant supply chain theories, and to build new theory about how this particular type of supply chain works. In this paper, we aim to develop the building blocks of new theory about how development supply chains work. Given our theory building objective, we took an inductive multiple case study approach to data collection and analysis (Eisenhardt, 1989; Yin, 1984), studying five development supply chains for solar lanterns and solar home systems (SHS) sold to low-income consumers in Haiti. Between 2014 and 2016, we conducted 82 semi-structured interviews with 78 stakeholders of five supply chains for solar lanterns sold in Haiti.

Our analysis revealed nine groups of development supply chain stakeholders and three types of stakeholder utility preference with respect to the supply chain: commercial sustainability (i.e., profit maximization); social sustainability (i.e., poverty alleviation); and household sustainability (i.e., survival in conditions of poverty). We

observed that the social enterprise product companies and in-country distributors – which had both commercial and social sustainability utility preferences – were particularly important from the donor's perspective, as these organizations acted as the conduits through which donor support flowed into the supply chain. By focusing additional analysis on the resources and capabilities of these social enterprises, we developed a conceptual model that describes *how* these social enterprises develop products and distribution networks, and bring in grants from donors, to allow stakeholders with different utility preferences increase their utility with respect to the supply chain. We therefore contribute to the emerging literature on social enterprises in supply chain management by showing how social enterprises support material, information, and money flows along development supply chains.

The rest of the paper is structured as follows: Section 2.2 reviews the literature and Section 2.3 provides the methods including the research setting. Analysis and results follow in Section 2.4 with Section 2.5 concluding with a discussion of these findings.

## 2.2 Literature, Theoretical Lens, and Research Question

Scholars have studied how supply chains can help alleviate poverty (Sodhi & Tang, 2016; White et al., 2011). This research typically focuses on commercial supply chains, and has shown how they can reduce poverty by incorporating local communities and social enterprises in supply chain activities (Hall & Matos, 2010; Sodhi & Tang, 2011), addressing institutional voids in low-income markets (Parmigiani & Rivera-Santos, 2015), promoting social responsibility among developing country suppliers (Gold et al., 2013; Huq et al., 2014), and partnering with non-commercial entities like NGOs (Dahan et al., 2010; Hahn & Gold, 2014). Importantly, although managers of commercial supply chains must account for a growing number of stakeholders beyond

buyers and suppliers (Gualandris et al., 2015), they must still ensure profitability as they incorporate social responsibility (Matos & Silvestre, 2013; Silvestre, 2015).

We can understand development supply chains in contrast with and comparison to commercial, as well as humanitarian, supply chains. In commercial supply chains, a key assumption even for those that incorporate some poverty alleviation activities is that firms in the supply chain seek to maximize profit and sustain competitive advantage (Holcomb & Hitt, 2007; McIvor, 2009). In humanitarian supply chains, profit is conspicuously absent from the objective function, as Tomasini and Van Wassenhove (2009) note, partly because end users typically do not pay for the products and services that they receive (Beamon & Balcik, 2008; Oloruntoba & Gray, 2006; Pettit & Beresford, 2009). For development supply chains, the primary goal is to alleviate poverty. Development supply chains produce and deliver products and services that are sold, not donated, to low-income individuals, with the products or services helping the end users meet basic needs, and the sales price of the final product or service typically being offset by grants or donations somewhere along the supply chain. Importantly, development supply chains seek to generate local economic activity and support local markets, and, like commercial supply chains, aim at sustained existence through commercial viability (Kretschmer et al., 2014).

### *2.2.1 Social Enterprises and Supply Chain Management*

While the literature on social enterprises in supply chain management is still nascent (Lee & Tang, 2018; Pullman, Longoni, & Luzzini, 2018), because of their social and commercial objectives, we would expect to find – and indeed do find – social enterprises as prominent participants in development supply chains, particularly when viewing the supply chain from the donor's perspective. Social enterprises are organizations established for the explicit objectives of addressing a complex social problem and earning revenues to support themselves financially (Battilana & Lee, 2014;

Dacin, Dacin, & Tracey, 2011). Social enterprises "pursue a social goal enabled by an economic activity and manage their supply chains accordingly" (Pullman et al., 2018: 3). In particular, social enterprises develop their supply chains and distribution channels in a way that lets them acquire or develop the necessary resources to pursue their social mission (Dillard, Pullman, & Bernard, 2013).

### *2.2.2 Theoretical Lens*

We found the Stakeholder Resource-Based View (Sodhi (2015) to conceptualize social responsibility in operations, to be well suited to investigating development supply chains. Under SRBV, a supply chain consists of stakeholders "whose utility depends significantly" on the supply chain – this is what gives each stakeholder its stake – and each stakeholder "is treated on par with other stakeholders from a research perspective regardless of power and material differentials" (Sodhi, 2015: 1381–1382) . Here, "utility refers to preferences amongst choices with uncertain outcomes" thus "allowing researchers to focus on and differentiate stakeholder-specific drivers of effort" (Sodhi, 2015: 1382). Each stakeholder "has stakeholder-specific resources and capabilities" that enable it to participate in the supply chain (Sodhi, 2015: 1382), where resources are the "tangible and intangible assets a firm uses to choose and implement its strategies" (Barney, 2001: 54), and capabilities are what enable organizations to "integrate, build, and reconfigure" their resources in order to survive in dynamic environments (Teece et al., 1997: 516) and individuals to survive in conditions of poverty, as Sen (1983, 1988, 2006) famously writes.

SRBV is an appropriate theoretical lens through which to view development supply chains for three reasons. *First*, it lets us accommodate the variety of stakeholders that we would expect to find in development supply chains (e.g., donors, commercial companies, low-income consumers, etc.). *Second*, it accounts for the different ways that different stakeholders can use their resources and capabilities to participate in the

supply chain (e.g., providing grants, leveraging networks of micro-entrepreneurs, etc.) and what they seek to get out of participating the supply chain (i.e., utility preference). *Third*, by focusing on a supply chain's stakeholders, their resources and capabilities, and their utility preferences, the SRBV serves as "a previously identified theoretical framework" that "can provide insight, direction, and a useful list of initial concepts" (Corbin & Strauss, 2008: 41) for our analysis of development supply chains. Indeed, by viewing development supply chains through an SRBV lens, the following concepts emerge *a priori*: (1) stakeholder utility preferences and (2) stakeholder resources and capabilities.

### *2.2.3 Research Question*

Just as some research groups aim to develop a "science of humanitarian logistics" (INSEAD, 2016), there is need for a scientific exploration of development supply chains. As a fundamental starting point, we need to understand how development supply chains work. Holguín-Veras et al. (2012: 494) suggest that "to understand the functioning of the entire system requires proper consideration of all its components." Viewed through the theoretical lens of SRBV and taking the donor's perspective, development supply chains' components are their stakeholders and the stakeholder resources, capabilities, and utility preferences. In addition, a functioning supply chain will consist of materials, information, and money flowing through a set of the supply chains' stakeholders (Carter et al., 2015); thus, we must also consider the flows between supply chain stakeholders. We therefore ask: *how do the resources and capabilities of a development supply chain's stakeholders enable materials, information, and money to flow in the supply chain, and what impact does this have on the stakeholders' respective utility?*

## 2.3 Methods

### *2.3.1 Research Design*

We conducted a multiple case study (Eisenhardt, 1989; Yin, 1984) of five development supply chains selling household solar products to low-income consumers in post-disaster Haiti that was still recovering from the 2010 earthquake. The multiple case study method was appropriate for three primary reasons. *First*, we are studying a phenomenon about which little prior research exists, so using a case study method enables us to discover previously unidentified relationships between concepts (Eisenhardt, 1989; Eisenhardt & Graebner, 2007). *Second*, the multiple case study design, enables us to verify that our findings were not "simply idiosyncratic to a single case" but instead "replicated by several cases," (Eisenhardt & Graebner, 2007: 27), and that relationships between concepts were replicated across cases to ensure external validity (Voss, Tsikriktsis, & Frohlich, 2002; Yin, 2012). *Third*, the case study approach allowed us to ask questions about a real-world phenomenon – development supply chains – in their "natural setting" (Voss et al., 2002: 197). Following similar case study analyses of humanitarian supply chains (e.g., Dube, Van der Vaart, Teunter, & Van Wassenhove, 2016) and principles of grounded theory research (Corbin & Strauss, 2012), we followed an iterative research process, as described below.

### *2.3.2 Research Setting*

We chose supply chains for solar lanterns and solar home systems sold to low-income consumers in Haiti as the setting for our research because the products help households meet the basic need for lighting while also demonstrably reducing household poverty (Chaurey & Kandpal, 2010; *Impact Report: Autumn 2014*, 2014) and they are typically sold, often through networks of micro-entrepreneurs, rather than donated, thus supporting local commerce and the supply chain goal of being self-sustaining (Bardouille, 2012; Graf et al., 2013; Miller, 2009). These factors make them exemplary

cases to study (Yin, 1984). We selected Haiti as the geographic endpoint of the development supply chains not only to focus our research efforts on a low-income country where development supply chains operate in abundance but also because having senior professional contacts there enabled us "to open doors where necessary" to gain access to key informants (Voss et al., 2002: 206).

We theoretically sampled (Eisenhardt, 1989) cases within this setting using the World Bank's Lighting Global list of companies that make approved, high-quality solar lanterns and solar home systems. Lighting Global is a "platform supporting sustainable growth of the international off-grid lighting market as a means of increasing energy access to people not connected to grid electricity" (The World Bank & International Finance Corporation, 2016), which, among other activities, certifies companies who make high-quality solar lanterns and solar home systems. As of December 2016, Lighting Global had certified 46 such companies.

We conducted Internet-based research on the 46 Lighting Global-approved companies and identified for further research five products sold in Haiti: d.light solar lanterns and SHS, Greenlight Planet solar lanterns, Nokero solar lanterns, ovSolar solar lanterns, and (subsequently during our field research in Haiti – see Section 3.3 Data Collection below), Ekotek solar lanterns. The supply chains for these products became the cases in our study.

### *2.3.3 Data Collection*

We collected data through interviews, fieldwork in Haiti, and extensive archival research.

*Interviews*. We conducted 82 semi-structured interviews with 78 different stakeholders of the supply chains for the five products (Table 5 lists informants). We identified and interviewed informants over three successive rounds. In the first round of interviews, conducted over the phone between late 2014 and mid-2015, we focused

primarily on expert informants and CEOs and co-founders of the companies that made the products in our study, as they were likely to have a deep understanding of the whole supply chain, from manufacturers to in-country distribution and sales. During this first round of interviews, we identified several additional and important stakeholders of supply chains for solar lanterns and solar home systems in Haiti. For example, Kiva and USAID emerged as providers of subsidized investment and grants, respectively, to some of the supply chains for solar lanterns and solar home systems in Haiti. During the second round of interviews, conducted over the phone in Spring 2016, we targeted the stakeholders that we identified during the first round of interviews, including NGOs and donor agencies, in-country distributors, and impact investors. From the first and second rounds of interviews, it became clear that fieldwork in Haiti would be necessary in order to interview and observe the critical "last mile" link of the supply chains – the micro-entrepreneur vendors who sold to the end customers. Interviews with these stakeholders, along with others based in Haiti, constituted the third round of interviews that we conducted during our fieldwork in Haiti.

In each interview, we asked questions related to what the stakeholder contributed to the supply chain, and what they received in return, and who they interacted with – who they bought from, sold to, donated to, borrowed from, partnered with, etc. – and where their revenues and/or funding came from, and if they received funding, what type of funding it was and from whom it came. We asked expert informants questions related to their expertise that helped us anticipate topics we should cover in future interviews and confirm or explain what we had uncovered in our previous interviews. All interviews were recorded and transcribed. Appendix 3 provides the interview protocols.

**Table 5: Informants for Chapter 2 Study**

| Stakeholder Category | Informants |
|---|---|
| Product Companies | Co-Founder, Solar Lantern and SHS company |
| | Founder & CEO, Solar Lantern Company |
| | Senior Manager, Solar Lantern and SHS Company |
| In-Country Importers / Distributors | Founder & CEO, Haitian Social Enterprise SME |
| | Co-Founder and CEO, Haitian Social Enterprise |
| | Executive Director, Haitian-US Social Enterprise |
| | Project Director, Large Haitian Financial Services Company |
| | Project Director, Multinational Corporation Social Enterprise Subsidiary |
| Retail Stores | Sales Associate 1, Haitian Company A |
| | Sales Associate 2, Haitian Company A |
| | Sales Associate 3, Haitian Company A |
| Micro-Entrepreneurs and End Users | Micro-Entrepreneur Retailers and End Users of Solar Products in Case Study Supply Chains (n=23)[a] |
| | Micro-Entrepreneur Retailers of Competing Products[b] (n=22) |
| Donors | CEO, International Foundation A |
| | Project Director, International Charity A |
| | Project Manager, International Foundation B |
| | Senior Manager, International Charity B |
| | Sector Specialist, Multilateral Development Bank |
| Impact Investors | Associate Director, Impact Investment Fund A |
| | Senior Associate, Impact Investment Fund A |
| | Director, Impact Investor B |
| Microfinance Institution | Senior Manager, Microfinance Institution A |
| Expert Informants | CEO, International Water and Sanitation Social Enterprise |
| | CEO, Solar Technology Supplier in Haiti |
| | CEO, SHS company in India |
| | Chairman & Co-Founder, SHS Company in Southeast Asia |
| | Co-Founder & CEO, Solar Lantern & SHS Company in India |
| | Co-Founder & CEO, Mini-grid Company in Haiti |
| | Director, Charity Consulting Organization |
| | Director, East Africa MFI |
| | Founder & CEO, Solar Lantern Distributor in Africa |

| | |
|---|---|
| | Founder & CEO, Supplier to Solar Product Companies |
| | Manager, Large Street Market in Haiti |
| | Senior Advisor, Mature SHS company in India |
| | Senior Manager, International Health Charity |

[a] All micro-entrepreneur retailers of solar lanterns and solar home systems sold through the supply chains in our study also owned the solar lanterns or solar home systems that they were selling.

[b] Competing products include low-quality solar lanterns, kerosene lanterns, candles, and cell phone charging services.

*Fieldwork*. During our fieldwork in Haiti, conducted over two weeks in August 2016, we interviewed expert informants, in-country distributors, and the micro-entrepreneur retail vendors of solar lanterns sold through the five supply chains in our study (n = 23) and competing products (n = 22), with a particular focus on retail vendors of low-quality lanterns as these emerged as important competitors of the vendors selling the high-quality products in our case study supply chains. All of the micro-entrepreneur retail vendors also owned a solar lantern or solar home system for use in their homes, so we were able to ask them questions about why they purchased the product and what impacts it has had on their lives. We used a professional, certified translator when the interview was conducted in Haitian Creole as opposed to English or French (the author's native language is English, and he is fluent in French). We also conducted observations of the marketplaces and stores where the products were sold and observed how the products functioned, and we kept a diary of field notes. Interviews with the retail vendors ranged from around 3 to 25 minutes, during working hours in street markets and stores, so we conducted enough interviews until we noticed significantly "diminishing returns" to our theory building from each additional interview with the retail vendors (Voss et al., 2002: 210).

*Archival Data*. Before and during each round of interviews, as well as before and during the fieldwork in Haiti, we conducted extensive archival research of Internet

sources like press releases, industry blogs, organization web pages, and research reports by reputable organizations, to identify additional stakeholders of supply chains in our study, and to triangulate data that we had received from the interviews in order to ensure internal validity (Yin, 2012). Using archival data to triangulate with data from our field observations and interviews in Haiti was particularly important for the Ekotek supply chain, which we discovered during observations and conversations in street markets: we conducted archival research *in situ* to evaluate whether or not the Ekotek products were suitable for our study, to identify relevant stakeholders along the supply chain, and to ensure the validity of what we were learning from our observations and interviews.

Data collection generally proceeded without any major setbacks; however, we did face numerous challenges. First, we had to overcome a language barrier for our fieldwork in Haiti. The native language is Haitian Creole, which the author does not speak, so we worked with a reputable travel agency to find a certified translator. We were fortunate to work with a translator who has translated for a variety of international news outlets in Haiti, so he was skilled at translating interviews in real time. Second, we wanted to respect the dignity of the low-income individuals with whom we spoke, treating them as equals and not as research subjects. We worked with our translator to develop a way to approach and engage with individuals we met in markets around Port-au-Prince that was culturally sensitive and perceived as polite. For Haitians, this meant that we first engaged the informant in an informal conversation – for example, remarking on the variety of different items available for sale from the different vendors in the market – in order to develop a friendly rapport. We then explained the purpose of our visit and requested permission to ask the individual a series of questions, as well as for their permission to be recorded. After receiving their permission, we began the interview and audio recording. A third challenge we faced was ensuring our safety

while conducting our fieldwork in Haiti. Our translator helped us avoid areas of Port-au-Prince that would be unsafe for non-Haitians to visit. Unfortunately, this prevented us from entering the low-income residential areas in and around the city, as these areas have a high risk of crime against non-Haitians including kidnapping and armed robbery. While this meant we were not able to interview households who owned a solar lantern or solar home system, we were able to gain this end-user perspective from our interviews with micro-entrepreneur retailers as all of them also owned the solar lantern or solar home system that they were selling.

Ultimately, collecting data from three different sources in successive rounds strengthened the robustness and validity of our research by enabling us to refine our interview protocol during each successive round of interviews, particularly in order to "probe emergent themes" further (Eisenhardt, 1989: 539), and by enabling us to triangulate among different data sources, which gave us confidence in the objectivity and reliability of the data that we were collecting (Voss et al., 2002).

#### *2.3.4 Data Coding*

During and after each round of data collection, we first deductively and then inductively coded the interview and archival data. Our deductive coding was based on the *a priori* concepts from the SRBV theoretical lens – namely, we identified stakeholder groups that were common across multiple supply chains in our study (e.g., donor agencies), and then deductively coded our data for the resources, capabilities, and utility preferences that were common to that stakeholder group. We then used inductive coding to identify first-order concepts within the deductive codes. Because we were interested in how stakeholder resources, capabilities, and utility preferences affected supply chain flows, we paid particularly close attention to instances when informants and archival sources mentioned how a particular stakeholder interacted with other stakeholders (e.g., a donor providing a grant to the product company) and what they received in return (e.g.,

"evidence" that the product company's activities were supporting the donor's stated social mission). We then developed second-order categories by organizing concepts together that had similar "properties and dimensions" (Corbin & Strauss, 1990: 7). For example, we grouped the concepts of "covering costs," "retaining customers," and "aiming at economic viability" that emerged within the deductive code of utility preferences into a second-order category we called "Commercial Sustainability."

We used each successive round of data coding to test the validity of the categories and the relationships between categories that had emerged from the inductive coding in the previous round(s) of data analysis (Eisenhardt, 1989). We also triangulated between interview data and archival materials during the coding processes, prioritizing categories that appeared in multiple sources (Jick, 1979) and across multiple supply chains in our study. This iteration between our data and identifying categories and the relationships between them enabled us to form robust underlying arguments that contribute to theory building for development supply chains (Eisenhardt, 1989). We used Microsoft Excel to organize and code our data. We carried out the deductive and inductive coding, and to help ensure validity, discussed each code and emergent category until an agreement was reached about their respective meanings, relationships, and fit with the data.

## 2.4 Analysis and Results

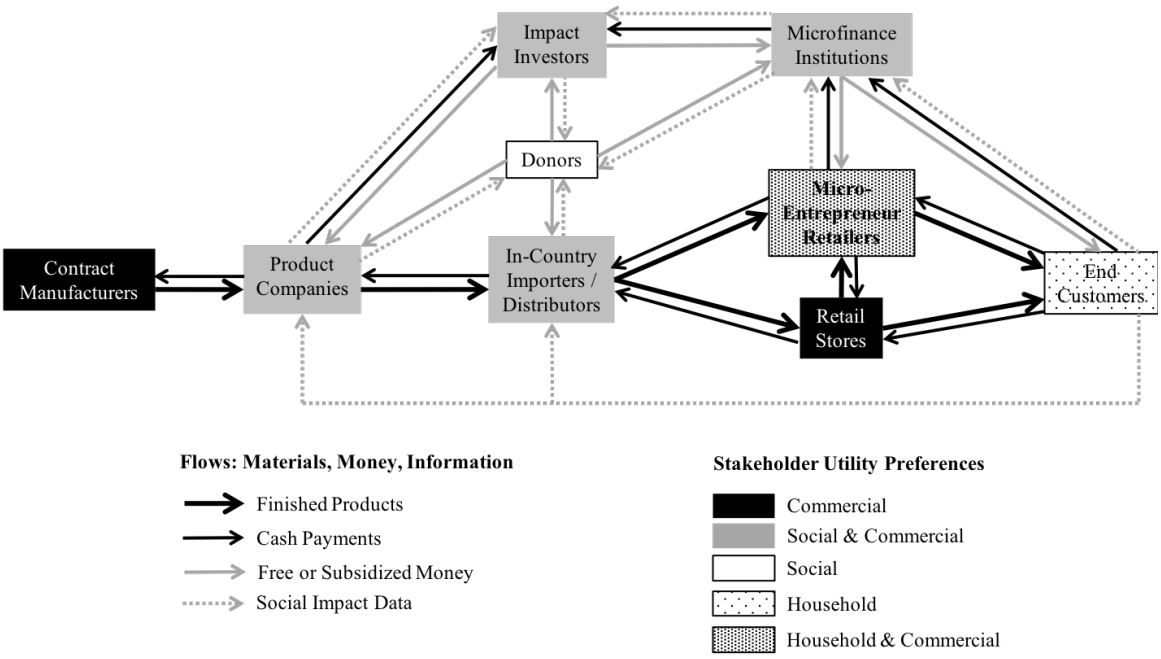
Our analysis consisted of both within-case and cross-case analyses. Within-case analysis enabled us to "become intimately familiar with each case as a stand-alone entity" (Eisenhardt, 1989: 540), which meant we identified the stakeholders involved in each case along with their resources and utility preferences, and also how they fit together to create a functioning supply chain. This analysis enabled us to construct diagrams of each development supply chain (Appendix 1), which demonstrate how each stakeholder interacts with other stakeholders, thus revealing important insights into how

each development supply chain worked. Cross-case analyses helped us to understand whether and how first-order concepts and second-order themes applied to different cases, and mitigated "risks of exaggerating meaning, improve groundedness and enhance the generalizability of the findings" (Dube et al., 2016: 50). In both within- and cross-case analyses, we focused on the stakeholders involved in the development supply chain, along with their resources, capabilities, and utility preferences, and analyzed how these impacted the flows of materials, information, and money along the supply chains.

### *2.4.1 Supply Chain Stakeholders*

We developed a composite diagram of the five development supply chains in our study (Figure 4).

**Figure 4: Composite Diagram of Development Supply Chains in Paper 2**




We identified nine groups of stakeholders (see Table 6) that were common across at least two of the five supply chains in our study.

**Table 6: Supply Chain Stakeholders**

| Stakeholder Group | Stakeholders Identified During Data Collection |
|---|---|
| *1. Contract Manufacturers* | Various unnamed factories in China |
| *2. Product Companies* | d.light; Greenlight Planet; Nokero; ovSolar; Vistle Group |
| *3. Importers / Distributors* | Earthspark Eneji Pwop; MicamaSoley; Palmis Eneji; RE-VOLT; Sogexpress; Total Haiti |
| *4. Micro-Entrepreneur Retailers* | CARE Entrepreneurs; Eneji Pwop Entrepreneurs; Fonkoze Entrepreneurs; RE-VOLT Entrepreneurs; Sogexpress Vendors |
| *5. Retail Stores* | Earthspark Stores; Total Gas Stations; Sogexpress Stores |
| *6. End Customers* | Solar Lantern Customers; SHS Customers |
| *7. Donors* | Ashden; CARE; ChristianAid; Kiva; Earthspark Nonprofit; Entrepreneurs du Monde; Fonkoze Foundation; Gates Foundation; Global BrightLight Foundation; Global Giving; Global Partnerships; Greater Good Haiti; Global Sustainable Electricity Partnership; GSMA; IABD; IndieGoGo; Scaling Off-Grid Energy; Shell Foundation; State of Colorado; United Nations; USAID; US Patent Office; UKAID; World Bank |
| *8. Impact Investors* | Acumen Fund; Arc Finance; Bamboo Finance; Energy Access Ventures; Kiva; Oikocredit; Omidyar Network; Overseas Private Investment Corporation; Yunus SocialBusiness |
| *9. Microfinance Organizations* | CARE Village Savings and Loan Associations (VSLA); Fonkoze; Palmis Mikwofinans Sosyal |

We categorized the stakeholders that we identified according to their role in the supply chain. Of course, other stakeholders existed in the development supply chains in

our study, such as upstream suppliers to the contract manufacturers, but our intention was to focus on those stakeholders that were explicitly mentioned in our interviews and archival research, and that had a prominent role in the overall functioning of the supply chain. Stakeholder groups 1-6 interacted with the supply chains through the physical movement of finished products and money, while stakeholder groups 7-9 provided direct financial support to the supply chains through grants, donations, and subsidized investment (social impact investment and microfinance), in return for social impact data.

### *2.4.2 Supply Chain Flows*

The arrows in Figure 4 represent the movement of "materials, information, and/or finance" that scholars often use to describe the flows that occur along a supply chain (Carter et al., 2015: 90). We again focused on those flows that were mentioned explicitly in our research and that featured prominently as necessary to the functioning of the supply chain. Table 7 below presents these flows.

**Table 7: Supply Chain Flows**

| Categories of Flows | Most Important Type of Flow Identified in the Data |
|---|---|
| *Materials* | Solar Lanterns and Solar Home Systems |
| *Information* | Social Impact Data |
| *Money* | Cash Payments |
| | Free or Subsidized Money (Microloans, "Impact" Investment, Grants) |

The most important material flows common to all five supply chains were the flows of finished solar lanterns and SHS. The financial flows common to all five supply chains were cash payments, financial investments from social impact investors and the financial returns (e.g., dividends) on those investments, microfinance loans and repayments on those loans, and grants and donations. The financial flows of grants,

donations, and subsidized investment (in the form of social impact investment and microloans) were important to the development supply chains we studied because they ensured that the low-income consumers for whom the household solar products were intended could afford the final retail sales prices – around $10-$20 for solar lanterns and around $100 for a SHS, paid in small monthly installments over time. Thus, as the quote below illustrates, grants, donations, and subsidized investment effectively subsidized the final retail prices that the end customers paid:

> *"The price we could sell them for was not really sustainable, because if you take into account all of the costs […] they are essentially subsidized."* (Executive Director, Haitian-US Social Enterprise)

As the quote above describes, the free or subsidized financial flows from donors, social impact investors, and microfinance institutions supplemented the financial flows generated from the sales of the household solar products.

There were a variety of different information flows in the development supply chains that we studied, such as information about the solar lanterns, or information about the interest rate on a microfinance loan. However, the most important information flow we identified was what our informants described as quantifiable data about "Social Impact". Social Impact Data consisted of information about how low-income Haitians improved their well-being by interacting with the supply chain – for example, saving a certain amount of money each month by not having to purchase kerosene –and served as "proof" of an organization's contribution to development, which they could then "sell" to donors and impact investors in exchange for grants or subsidized investment, respectively.

*2.4.3 Stakeholder Utility Preferences*

We next analyzed stakeholders' utility preferences. Through inductive coding, we found three categories of utility preferences (see Table 8): commercial sustainability; social sustainability; and, household sustainability. Commercial sustainability related to maximizing profit, such as retaining customers and covering costs. Social sustainability related to alleviating poverty, for example by supporting the local economy and improving the well-being of the low-income households. Household sustainability consisted of the different ways by which households sought to survive in conditions of poverty – for example, purchasing a solar lantern to charge their phones or provide light at night, or selling solar lanterns as a way to earn money for the family. Combined, the presence of these three objectives illustrates how development supply chains are a hybrid of both commercial supply chains (which pursue commercial sustainability) and humanitarian supply chains (which pursue social and household sustainability).

**Table 8: Stakeholder Utility Preferences**

| **2nd Order Categories** | **1st Order Concepts** | **Example Quotes** |
|---|---|---|
| *Commercial Sustainability Utility* | • Covering Costs / Earning a Margin | • "There are costs that are linked with these activities, in terms of production, transportation, logistics, marketing […] that must be covered by the sales price of the lanterns." (Project Director, Multinational Corporation Social Enterprise Subsidiary) |
| | • Retaining Customers | • "Also, it is an anti-churn device. What does anti-churn mean? The customer would stay with us instead of going to [our competitor]" (Co-founder and CEO, Haitian Social Enterprise) |
| | • Avoiding Over-Reliance on Grants | • "We can't be taking grants solely to operate. We have to be able to stand on our own." (Senior Manager, Microfinance Institution) |

| 2nd Order Categories | 1st Order Concepts | Example Quotes |
|---|---|---|
| *Social Sustainability Utility* | • Provide Access to Electricity | • "What we do as providing clean energy solar solutions to communities that are underserved in the sense of being unelectrified" (CEO, International Foundation) |
| | • Eliminate Kerosene | • "I would like it to work. I would like to be able to eliminate kerosene, you know? Because I think kerosene is evil." (CEO, Haitian SME) |
| | • Help Local Market | • "For donors it's about building the market." (Senior Manager, Solar Lantern and SHS Company) |
| | • Mitigate Vulnerability | • "We are focusing on the vulnerable women and detecting social injustice, poverty, and vulnerability." (Project Director, International Charity A) |
| *Household Sustainability Utility* | • Household Health and Safety | • "People don't have to worry about their house catching on fire if they fall asleep. And the kerosene also hurts the eyes of kids often, so this would help with that. So that's the point of selling these lanterns." (Sales Associate, Large Haitian Financial Services Company) |
| | • Household Savings | • "Families that are using kerosene lamps or torches or batteries, which use a reasonable portion of their income, they'll buy a solar light. And it is an investment; they tend to recoup the cost within 10 weeks, and the lights last 2-3-4 years, so from then on in, they're saving a lot of money." (Associate Director, Impact Investment Fund) |
| | • Household Income | • "Selling these lanterns is a way to make money. Let's say I make 300 Haitian dollars – I will use 100 for food, and then have 200 to bring home to my family." (Solar Lantern Micro-Entrepreneur Vendor) |

Different stakeholders pursued different objectives. Two stakeholder groups exhibited a purely Commercial Sustainability utility preference: contract manufacturers and retails stores. End customers were the only stakeholder group that had purely Household Sustainability utility preferences. Micro-entrepreneur retailers had both Commercial Sustainability (related to their entrepreneurial activities) and Household

Sustainability (related to earning money for their families) utility preferences. Donors had purely Social Sustainability utility preferences.

Of particular interest were the four stakeholder groups that held both Commercial and Social Sustainability utility preferences: product companies, in-country importers / distributors, micro-finance institutions, and impact investors. These stakeholders participated in the supply chain to maximize both utility preferences, even though the two utility preferences were conflicting:

> *"It's a business – which is both social and commercial. The double-goal is very important to [our organization]. […]. We make this a business, and we ensure its social impact by providing solar technology solutions not just to the end customers but also to NGOs."* (Project Director, Multinational Corporation Social Enterprise Subsidiary)

Here, the informant explained how the organization participated in the supply chain in order to maximize Commercial Sustainability utility ("it's a business") and Social Sustainability utility ("we ensure its social impact by…") at the same time. By pursuing Commercial and Social utility preferences through the core activities of the organization, stakeholders in these four groups satisfied the standard definition of a *social enterprise* (Battilana & Lee, 2014; Besharov & Smith, 2014).

Two of these four types of social enterprises – product companies and in-country distributors – participated in the supply chain through the physical movement of the household solar products. The other two types of social enterprises – microfinance organizations and social impact investors – participated in the supply chain by providing subsidized money to other supply chain stakeholders.

As we demonstrate in the sections below, because the social enterprise product companies and in-country distributors pursue both commercial and social sustainability and are directly responsible for the flows of the finished products, we found that they developed unique resources and capabilities that supported the overall functioning of the development supply chain. In particular, they (1) produce a high-quality product that helps low-income customers meet a basic need, (2) orchestrate distribution channels for their products that support the local economy, and (3) bring in money from donors in order to make (1) and (2) possible.

### *2.4.4 Social Enterprise Resources and Capabilities*

Our examination of the social enterprise product companies and in-country importers revealed three sets of resources and related capabilities that these social enterprises had developed to participate in the supply chain. Each directly supports the flows of materials, information, and money that are necessary for the development supply chain to function (Table 9).

**Table 9: Social Enterprise Resources and Capabilities**

| **2nd Order Categories** | **1st Order Concepts** | | |
|---|---|---|---|
| | **Resources** | **Related Capabilities** | **Example Quotes** |
| *Producing and Selling a High-Quality Product That Reduces Conditions of Poverty* | • Relationship with Manufacturer of High-Quality Products | • Identifying & building relationships with manufacturers, negotiating prices, testing products | • "It's a mixture between having a high-quality product, forming a relationship with the manufacturer, testing them in-country to see how well they are accepted, and then negotiating prices." (Executive Director, Haitian-US Social Enterprise) |
| | • Product Guarantee / Warranty | • Collecting, repairing or replacing broken | • "They are good quality and have a guarantee. If you buy one of the cheaper lanterns, you |

| 2nd Order Categories | 1st Order Concepts | | |
|---|---|---|---|
| | **Resources** | **Related Capabilities** | **Example Quotes** |
| | | products, via network of resellers | don't get a guarantee, so if it breaks you can't return it." (Micro-entrepreneur reseller for Haitian Social Enterprise) |
| | • Innovative Functionality to Meet Market Demand | • Prototyping directly with manufacturers, testing prototype in the market | • "I want to see a proper working prototype. What does that mean? By sitting with the Chinese guys, the manufacturers, and going through the product, actually getting to a stage where we can […] get the product to the market." (Co-Founder and CEO, Haitian Social Enterprise) |
| | • Knowledge of Product Impact on Poverty | • Learning about how product can improve end user's well-being | • "We have these lamps that resolve the problem of the blackouts, of kerosene, of candles, problems with fire and with toxic fumes." (Project Director, Large Haitian Financial Services Company) |
| *Managing a Distribution Channel that Supports Local Economy* | • Large Network of Mostly Female Micro-Entrepreneurs | • Recruiting and training female micro-entrepreneurs | • "If you don't include women in the distribution channel, your distribution will not reach […] the people that it needs to reach." (Expert Informant, Founder & CEO, Solar Lantern Distributor in Africa) |
| | • Relationships with and Access to Existing Distribution Infrastructure | • Facilitating relationships, financial flows, and product flows throughout the network | • "The village agent does distribution across their VSLA [i.e., savings]. The role for [us] is often mediation between VSLA and the private sector partner. […]. What you have to do is to ensure the market for |

| 2nd Order Categories | 1st Order Concepts | | |
|---|---|---|---|
| | **Resources** | **Related Capabilities** | **Example Quotes** |
| | | | the private sector, who is importing the solar lamps." (Project Director, International Charity A) |
| | | • Identifying opportunities where leveraging existing distribution infrastructure benefits the organization that set up the channel | • "In terms of distribution […] I piggyback off of existing [large Haitian company] agents. We have quite a close relationship with [the large Haitian company]. They're good agents, and then I also piggyback on their [local shops]. […]. My supply chain is very intertwined with them." (Co-Founder and CEO, Haitian Social Enterprise) |
| *Collecting Social Impact Data and Packaging It for Donors* | • Data on Positive Social Impact Directly Resulting from Social Enterprise's Activities | • Collecting and disseminating Social Impact Data | • "We have this system called MIS, monitoring information systems, where every month we collect data direct from the VSLA group […] related to solar lamps. […]. At the end of June, I will have the report. […]. We are then reporting the progress of the social enterprise back to the donors." (Senior Manager, International Charity A) |

**High Quality Products That Reduce Conditions of Poverty**

The social enterprise product companies and in-country distributors participated in the development supply chains we studied by offering a high-quality solar lantern or solar home system that could reduce the impacts of poverty for the targeted beneficiaries. Product quality was of particular importance to the ability of stakeholders with social

(or social and commercial) sustainability objectives to maximize their utility. A low-quality lantern – that broke after only a short period of time, or that did not work properly – eroded the financial and other benefits that would accrue to end users. As one of our informants explained:

> *"Even if the product is very affordable, if you have to get a new one every six months, that defeats the purpose."* (Project Director, Multinational Corporation Social Enterprise Subsidiary)

The social enterprise product companies and in-country distributors developed four specialized resources and accompanying capabilities in order to produce, buy, and sell a high-quality, poverty reducing household solar product. By pursuing a commercial objective, they were motivated to produce, buy, and sell more products, and by pursuing a social objective, they were motivated to ensure that the products were both affordable and high-quality. Let us briefly consider each of the four specialized resources in turn.

*First*, the social enterprise product companies developed *relationships with manufacturers* of high-quality solar products. Their pursuit of a social objective motivated them to find the right manufacturer, to ensure that the product was high quality and affordable. Each of the three product companies we spoke with had very close relationships with their contract manufacturers. *Second*, the social enterprise product companies and in-country importers had to have a guarantee or warranty on the product. Not only was this important for their brand reputation – and thus good for their commercial utility – it also allowed end customers to return a faulty product and receive a functioning one, thus ensuring the desired social impact of owning a high-quality solar product. It is important to note here that we observed warranties and guarantees for only

those products sold by social enterprises. On our research trip, we repeatedly asked vendors of lower-quality solar lanterns – which come in through large importers of general electronics products – if they offered guarantees or warranties. The responses we received ranged from "no" to "the customer can try it when they buy it – if it doesn't work, they can choose another one." *Third*, the social enterprise product companies developed innovative features for their household solar products – such as a built-in radio or the ability to charge a cell phone – and the social enterprise importers we spoke with sought out products with these types of innovative features. This boosted overall demand for their products, and the more people that bought and owned the solar lantern, the more cash the importers and product companies earned and the more social impact they could record as having achieved. *Fourth*, the social enterprise product companies and in-country importers had deep knowledge of how their products reduced conditions of poverty – the most common benefits that came up during our interviews were financial savings and improvements to health and safety. The social enterprise product companies used this knowledge when designing the products, the social enterprise importers used this knowledge when selecting products to import, and both groups of social enterprises used this knowledge to inform their social impact data collection. The relationship between these resources and their respective capabilities and the flows in a development supply chain can be expressed as follows:

> **Observation 1**: Social enterprise product companies and in-country distributors that participate in development supply chains develop resources and capabilities to produce and sell a high-quality product that alleviates poverty, which directly enables the flows of household solar products through exchanges for cash, and indirectly enables the flows of free or subsidized money from donors through a

relationship that is moderated by the social enterprises' resources and capabilities to collect social impact data and disseminate it to donors.

**Distribution Channel that Supports Local Economy**

We found that the social enterprise product companies and in-country distributors also developed resources and related capabilities specific to setting up distribution channels through which they could sell their products in a way that also helped reduce poverty, either by promoting local economic activity or by selecting distribution channel partners that shared the social sustainability objective.

The first resource was a large network of micro-entrepreneur resellers, many of whom were women. The in-country importers in our study actively targeted and developed networks micro-entrepreneur retailers, usually by working with a microfinance organization that provided micro loans to female borrowers, or by leveraging networks of micro-entrepreneur vendors of other products. The second resource was relationships with, and access to, existing distribution infrastructure such as local chain stores. In order to "piggyback" on this existing infrastructure, the social enterprise importers had to find the right partners for whom selling household solar lanterns would also be beneficial to their business. The most common example was mobile phone companies. These companies were attractive to the social enterprise importers because of their reach throughout Haiti, from rural villages to big cities. Meanwhile, allowing household solar products to be sold alongside mobile phones and airtime top-up cards made sense for mobile phone companies because the household solar products gave people a way to charge their phones and thus continue to be a valuable customer.

The network-based distribution channel that leveraged micro-entrepreneur retailers enabled in-country importers – and therefore also the product companies who

did not have a physical presence in Haiti – to reach the "last mile" low-income customers that would benefit most from the savings derived from owning a household solar product. As a result, product companies sought out in-country importers that had access to a network of resellers, as a senior manager at one of the product companies explained:

> *"We're working with [the in-country importer]. […]. They order from us, and then do distribution – leveraging some of [a local company's] network, so a lot of the guys who work for them are guys from [the local company]. […]. Or, it could be that some of the distribution points are the same distribution points where they have [the local company's] resellers. So, they're leveraging a lot from the existing [local company's] infrastructure.* (Senior Manager, Solar Lantern and SHS Company

Selling the household solar products through networks of micro-entrepreneurs enabled the product companies and in-country importers to increase their commercial sustainability utility and their social sustainability utility by selling more products to low-income households. In addition, these distribution channels supported the local economy because micro-entrepreneur retailers were able to increase their commercial sustainability utility and their household sustainability utility by selling the solar lanterns and solar home systems. As one micro-entrepreneur retailer explained:

> *"Selling these lamps helps me support my family. With the money that I make, that permits me to support my family and get the kids to school, and when people buy from you, you are able to make a little bit of money to support your*

*family. Also, since I have the lamps, I doesn't use any other lights like candles or kerosene."* (Micro-Entrepreneur Retailers of Solar Lanterns)

Because of these distribution channels, materials, information, and money could flow along the supply chains in such a way that each stakeholder could maximize its respective utility. By way of contrast, consider this hypothetical example: An aid organization buys solar lanterns from a product company and then donates the lanterns to low-income households, using its own employees as the distribution channel. While the lanterns would reach low-income households – and the product companies and their contract manufacturers would be paid for the lanterns – no additional local economic activity would take place because micro-entrepreneur retailers would be excluded from the supply chain.

Supporting local economic activity was not only important to the social enterprise product companies and in-country importers, it was also important to the donors:

*"We are working in difficult environments, but the ultimate goal, which is when you meet the micro-entrepreneurs and you see the fantastic work that's being done, and the amount of poverty alleviation that these companies can have long term is absolutely fantastic."* (Senior Manager, International Charity B)

Because it was important for donors to support local economic activity, the social enterprise product companies and in-country importers could report to their donors that they were developing a distribution channel that leveraged micro-entrepreneur retailers. This became another way that these social enterprises could demonstrate for the donors that they were creating social impact.

We can summarize the relationship between the social enterprises' resources and capabilities related to the distribution channel and the flows in the development supply chain as follows:

> **Observation 2**: Social enterprise product companies and in-country distributors that participate in development supply chains develop resources and capabilities to manage a distribution channel that supports the local economy, which directly enables the flows of household solar products through exchanges for cash, and indirectly enables the flows of free or subsidized money from donors through a relationship that is moderated by the social enterprises' resources and capabilities to collect social impact data and disseminate it to donors.

**Collection and Dissemination of Social Impact Data**

We expected to find the presence of grants supporting certain aspects of the development supply chains in our study based on our understanding of development supply chains as having aspects of both humanitarian and commercial supply chains, but we were surprised to find grants, donations, and subsidized investment flowing into the development supply chains at several different levels – both upstream to the product companies and social impact investors, and downstream to the microfinance institutions and micro-entrepreneurs, even within the same supply chain. In fact, it was this flow of free or subsidized money in our study that ultimately made the solar lanterns and SHS more affordable for the intended end customers. Importantly, we found that the social enterprise product companies and in-country importers in our study developed resources and capabilities to bring in free or subsidized money from donors in exchange for social impact data.

In order to bring in the donor's money, social enterprises had to demonstrate they were "eligible" to receive the free or subsidized money by demonstrating their ability to reduce poverty. One informant at a donor organization that we spoke with described this requirement in straightforward terms:

> *"We want partners that share the social mission."* (Project Director, International Charity A)

To demonstrate that they "share the social mission" with donors, the social enterprise product companies and in-country distributors we spoke with had developed as a resource data about their social impact, and the capabilities to package and disseminate this data to donors. Meanwhile, as the quote above suggests, donors were actively seeking social enterprises to whom they could provide grants, subsidized debt, and other types of free or subsidized money. The donors in our study all demonstrated a preference for "partnering" with social enterprises, which was in line with the trend of donors supporting market-based (i.e., revenue-producing) activities with their money (Cooney & Williams Shanks, 2010). As one donor explained:

> *"There was already a shift towards, for example, taking a market approach."* (Senior Manager, International Charity B)

Notably, all of the product companies in our study "advertised" their social impact right on their main websites, and the donors who provided them with free or subsidized money stated a preference for social enterprises either on their main website or in their widely disseminated reports:

**Table 10: Social Enterprise Impact Reporting and Corresponding Donor Support**

| Social Enterprise Product Company's Impact Reporting | Donor Providing Free or Subsidized Money |
|---|---|
| d.light: *"84 million lives empowered; 22 million school-aged children reached with solar lighting…"* (http://www.dlight.com/social-impact/, accessed 14 August 2018) | Shell Foundation: "Our aim is to apply entrepreneurial thinking to catalyse new ways to deliver lasting public benefit. […]. This means working to create social enterprises…" (http://www.shellfoundation.org/Our-Approach, accessed 14 August 2018) |
| Ekotek: *"… impact of the programs so far, including the sale of over 86,000 EKOTEK solar devices, benefitting more than 430,000 people, and the creation of thousands of jobs for solar entrepreneurs."* (http://ekotekenergy.com/projects-home/, accessed 14 August 2018) | Arc Finance: "Arc Finance provides financial support to microfinance and other finance institutions, in addition to energy/water enterprises, to both spur product innovation and to support business incubation" (http://arcfinance.org/the-arc-approach/, accessed 14 August 2018) |
| Greenlight Planet: *"5,525,352 off-grid homes reached; […] 25% increase in household income; 94% families feel safer with Sun King"* (https://www.greenlightplanet.com/mission/, accessed 14 August 2018) | Scaling Off-Grid Energy: "Our vision is to spur a vibrant marketplace of enterprises that provide off-grid energy solutions" (http://www.scalingoffgrid.org/scaling-grid-energy, accessed 14 August 2018) |
| Nokero: "*Nokero's products add three or more hours of increased income productivity per day.* […]. *The cost of a N233 is equivalent to the monthly fuel expenses for a family of four.*" (https://www.nokero.com/, accessed 14 August 2018) | US Patent Office: "The program provides business incentives for reaching those in need […]. The awards showcase how patent holders with vision are pioneering innovative ways to provide affordable, scalable, and sustainable solutions for the less fortunate." (https://www.uspto.gov/patent/initiatives/patents-humanity/learn-more, accessed 14 August 2018) |
| ovSolar*: "Over 2 million people at areas without electricity have benefited from ovSolar."* (http://www.ovsolar.com/ | World Bank Lighting Global: "We facilitate access to finance for manufacturers, distributors, retailers and consumers." |

| | |
|---|---|
| index.php?m=Article&a=show&id=98, accessed 14 August 2018) | (https://www.lightingglobal.org/about/, accessed 14 August 2018) |

Collecting social impact data and reporting it to donors was often an onerous task for product companies and in-country distributors. Consider the quote below from an in-country distributor:

> *"Now, basically, when you're getting grants, you're an open book. You have to report your activations, and you're getting hit – like, why are your activations lower this month, and against your budget. It's like nearly a board that you're up against."* (Co-Founder and CEO, Haitian Social Enterprise).

However, free or subsidized money was essential to the functioning of the development supply chains in our study. Without either one, the high-quality household solar products would be too expensive for the low-income end customers that the products are intended to benefit; the low-income households would instead opt for a lower-quality solar product that would not provide the same long-term benefits as the high-quality products. Several of our informants explained the importance of subsidized financial capital entering the supply chain in order to reduce the price of the end product. For example:

> *"We would not be able to sell at the price we're selling at if it weren't for [donor 1] and [donor 2] and [donor 3]. […]. [The donors] gave us money for marketing, and to help us spread the word about the negative impacts of kerosene and the like." (Project Director, Large Haitian Financial Services Company)*

In essence, by collecting social impact data and disseminating it to donors, the social enterprise product companies and in-country importers could bring in free or subsidized money to the supply chain that helped make the high-quality household solar products affordable to low-income customers. At the same time, donors looking to support solar lanterns and solar home systems were actively seeking social enterprises to receive their money as they sought market-based solutions to poverty reduction. Thus, the "pull" of donor money by social enterprises was made possible by a demand from donors for social impact data. Ultimately, the donor money enabled more products to flow through the supply chain, and as a result, each of the development supply chain stakeholders could maximize its respective utility. Thus:

> **Observation 3**: Social enterprise product companies and in-country distributors that participate in development supply chains develop as a resource data on positive social impact directly resulting from the social enterprise's activities and the capability to disseminate these data to donors, which directly enable the flow of free or subsidized money from donors, which in turn directly enables the flows of household solar products through exchanges for cash.

**Linking Supply Chain Flows to Stakeholder Utility**

When we examined the flows between stakeholders, we noticed that the flows a stakeholder received led to an increase in that stakeholder's utility. Consider the positive impact on the end customer's Household Sustainability utility that resulted from receiving the product in exchange for money to the micro-entrepreneur retailer:

> *"What motivates me: the lamp is good for everything. For blackouts. For a person who just had a baby. It's good for multiple things. Charging phones,*

*playing music, saving money on candles."* (Solar lantern micro-entrepreneur retailer)

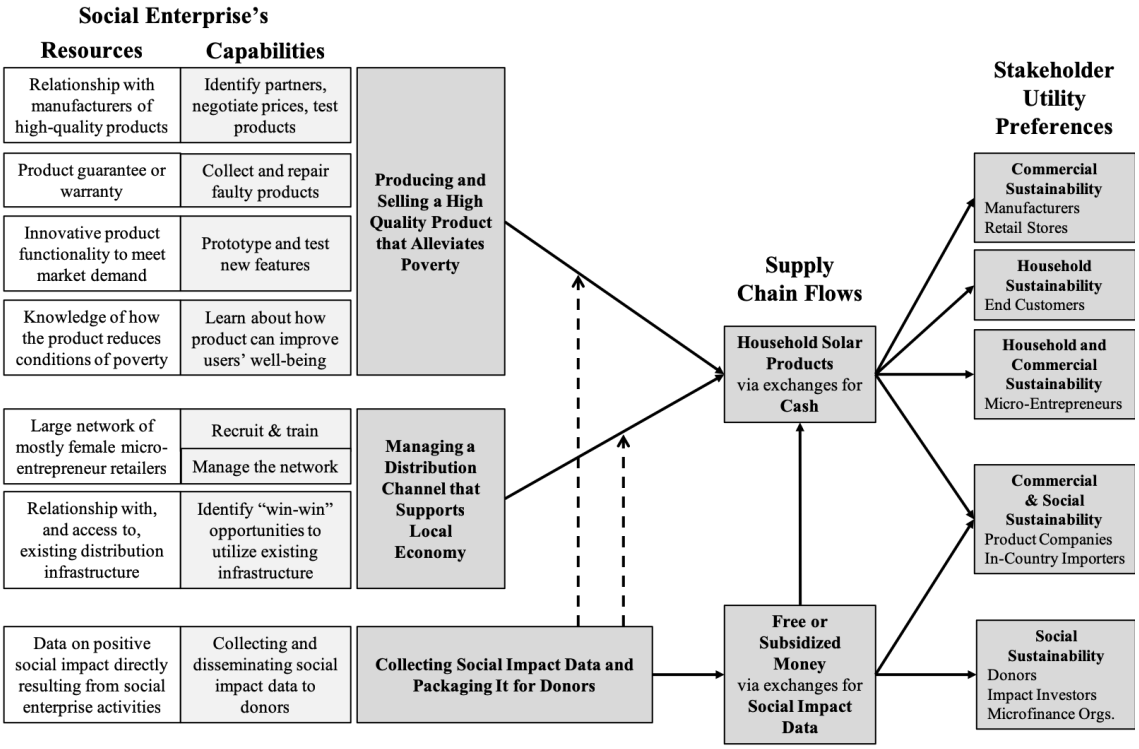
Similarly, for each stakeholder group, we could see how flows that they received through their exchanges with other stakeholders corresponded with increases in their utility. Consider these additional examples: contract manufacturers increased their Commercial utility via the financial flows it receives from exchanging with the product companies; social enterprise product companies increased their Commercial and Social Sustainability utility via the finished product flows to end customers and further increased their Commercial Sustainability utility via the financial flows they received from donors and impact investors; micro-finance institutions increased their Commercial utility via the financial flows of microloan repayments they received from micro-entrepreneur retailers and increased their Social utility via the information they received from the micro-entrepreneur retailers about how the microloan contributed to their income generating activities; and, micro-entrepreneur retailers increased their Household utility via the financial flows they received from end customers as a result of selling solar lanterns and SHS. This leads us propose the following:

**Observation 4**: The flows of finished products, cash payments, social impact data, and free or subsidized money in a development supply chain enable the supply chain stakeholders to increase their respective utility, be it social sustainability, commercial sustainability, household sustainability, or some combination of these.

### *2.4.5 Conceptual Model*

We can combine Propositions 1-4 in a conceptual model (Figure 5) that depicts how the resources and capabilities of the social enterprise product companies and in-country importers enable the supply chain flows which in turn enable the supply chain stakeholders to increase their respective utility.

**Figure 5: Conceptual Model Linking Social Enterprise Resources and Capabilities to Supply Chain Flows and Stakeholder Utility Preferences**




Note: Solid lines represent direct relationships, while dashed lines represent moderating effects.

## 2.5 Conclusion

Development supply chains are both prevalent and important in the real world, and they have been described as supporting humanitarian supply chains – a research domain of growing importance – yet they remain relatively overlooked in the supply chain management literature. We viewed this as an opportunity to build new theory about

them and suggest that our paper makes the following contributions to the literature on humanitarian operations and to literature on social enterprises in supply chain management.

First, we assemble the building blocks of new theory about development supply chains. We identify key stakeholders that participate in this type of supply chain and describe how and why they participate. The limited prior research that does exist on development supply chains has shown how they have the overarching goals of supporting local communities and achieving long-term sustainability. We show that development supply chains comprise a variety of different stakeholders, each participating in the supply chain to maximize Commercial, Social, and/or Household utility. We have also demonstrated the usefulness of the SRBV as a theoretical lens for studying development supply chains. In particular, we have shown how specialized resources and capabilities supported the supply chain's flows that in turn enable stakeholders to increase their respective utility. This constitutes an extension of Holcomb & Hitt's (2007) and McIvor's (2009) work on viewing supply chain interactions through a resource-based view. By incorporating a stakeholder perspective, the SRBV allowed us to account for the non-commercial utility preferences – social sustainability and household sustainability – of the supply chain's key stakeholders.

Second, this paper contributes to the growing supply chain management literature on the role of social enterprises in supply chains. While we expected to find social enterprises participating in development supply chains (the product companies of the solar lanterns and solar home systems in our study are social enterprises), we were surprised to find them operating at multiple levels of development supply chains – upstream as product companies and social impact investors and downstream as distributors and microfinance institutions. While prior literature has examined partnerships and non-commercial interactions between organizations in commercial

supply chains serving low-income customers (Hahn & Gold, 2014) and in humanitarian supply chains (Beamon & Balcik, 2008; Oloruntoba & Gray, 2006; Pettit & Beresford, 2009), we showed specifically how social enterprise stakeholders develop specialized resources and capabilities to exchange with stakeholders that seek to maximize purely Commercial utility and stakeholders that seek to maximize purely Social utility, and are therefore the critical links that facilitate resource flows along development supply chains. In particular, we have shown how social enterprises – because they pursue both commercial and social objectives – operate revenue-producing supply chains in extremely challenging environments and serve as a key conduit through which donor support flows into the supply chain. This also extends existing research on how social enterprises can be supply chain enablers for the poor (Sodhi & Tang, 2011) by showing how social enterprises use their specialized resources and capabilities to orchestrate supply chains that essentially transfer donor money from wealthy countries to low-income micro-entrepreneurs and households in a way that also creates local economic development.

Our study has important implications for managers of social enterprises and donor agencies. For the former, our findings suggest that the ability to collect and disseminate to donors credible data on the positive social impact resulting from the social enterprise's activities is critical to the social enterprise's success. Lacking this capability would likely restrict the social enterprise's ability to bring in donor money, thus impairing not only its own operations but also the overall functioning of the development supply chain. For the latter, our findings suggest that one way to improve development supply chains is to help the social enterprise product companies and in-country importers develop their resources and capabilities for producing and selling high-quality products, managing distribution channels that support the local economy, and collecting and disseminating social impact data.

This paper also opens the door for at least two broad areas of future research on development supply chains. First, what specialized resources and capabilities do other stakeholders develop in order to participate in development supply chains, and how do these impact the supply chain flows of materials, information, and money? Two key stakeholder groups to examine here would be donors and micro-entrepreneurs, given their prominent and important role in development supply chains. For donors, the type of financial support – grants, subsidized debt, impact investment, etc. – would likely influence which resources and capabilities the donor develops. For micro-entrepreneurs, scholars could conceptualize specialized capabilities using Amartya Sen's (1983, 1988, 2006) work on defining and measuring poverty in terms of capabilities. Second, how do development supply chains impact the utility of stakeholders that are not directly engaged in exchanges of materials or money along the supply chain? One interesting stakeholder group to consider here would be micro-entrepreneur vendors of competing products (e.g., kerosene lanterns, candles, and low-quality solar lanterns). The supply chains for their products generally do not receive donor support, which could make their products more expensive than products sold through donor-supported supply chains, leading to reduced sales and reduced commercial and household utility for the vendor.

## 2.6 Chapter 2 References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# Chapter 3: How "Practical Wisdom" Shapes Operations Strategy Formulation in Social Enterprises: A Field Study of Solar Product Companies


**ABSTRACT**

We set out to understand how social enterprises develop operations strategies that enable their organizations to pursue social and commercial objectives simultaneously. Using Dunham's (2010) concept of "practical wisdom" which draws from Aristotle's concept of phronesis, and building on the operations strategy literature, we examine the operations decision-making processes of social enterprise executives through interviews with founders and top executives of companies that sell solar lanterns and solar home systems in low-income countries. We make two observations that contribute to an understanding of the operations strategy formulation process. First, we find a one-to-one relationship between the operations area(s) to which a threat and or opportunity is mapped and the operations area(s) implicated in the operations strategy developed as a result of the threat or opportunity. This finding adds nuance to existing frameworks that describe different steps in the operations strategy formulation process in any company. Second, we extend existing frameworks describing the operations strategy formulation process to the social enterprise context by observing that the executive's practical wisdom constrained the set of possible responses to the threat or opportunity to those that aimed to achieve both social and commercial benefit.



**Keywords**: Operations Strategy Formulation; Social Enterprise; Practical Wisdom; Executive Decision-Making

## 3.1 Introduction

How do executives make operations decisions when their organizations are social enterprises, pursuing both social and commercial objectives? Operations strategy, a well-established field in operations management, deals with the first part of this question: as defined by Boyer et al. (2005: 442), operations strategy consists of the "decisions and plans involving the developing, positioning, and aligning of managerial policies and needed resources so that they are consistent with the overall business strategy." Research on social enterprises, meanwhile, defines them as organizations that embed a social purpose into their core operations and strategy (Alter, 2003; Austin, Stevenson, & Wei-Skillern, 2006; Battilana & Lee, 2014; Besharov & Smith, 2014). Social enterprises pursue both social and commercial objectives simultaneously, and the entrepreneurs and executives at the helm of these organizations making operational decisions that enable them to do so. The question that this paper investigates therefore sits at the intersection of operations strategy and social enterprise, and we use a conceptual framework from the business ethics literature – Dunham's (2010) "practical wisdom" – to investigate it.

The fundamental question behind operations strategy is how to align an organization's operations with its overall strategy. Extant research on operations strategy has generally fallen into two categories: *content*, in which scholars examine capabilities, competitive priorities, and structural choices such as those related to the factory or the distribution channel; and, *process*, in which scholars study the development, communication, and implementation of operations strategies (Boyer et al., 2005). Process-related operations strategy research is relatively under-represented in the operations strategy literature compared to content-related research, and calls to explore

the process of developing or changing operations strategies have been accompanied by suggestions to draw from business strategy literature (Boyer et al., 2005).

Process-related studies in operations strategy research investigate the link between firm-level strategy and "ground-level" operations. Sting and Loch (2016) examine how vertical coordination (i.e., senior management-led decisions on ground-level actions) and horizontal coordination (i.e., ground-level actions are decided at the ground level) impact firm performance. Choy and co-authors (2016) identify a recursive process between business strategy, operations strategy, and operations functions. Kim and co-authors (2014) identify both "bottom-up" and "top-down" processes for operations strategy development. One common thread in the literature on the process of operations strategy formulation is that it aims to "reconcile market requirements with operations resources", wherein executives are aware of, and respond to, factors in the market – for example, an emerging threat or opportunity – that they judge as requiring an operations strategy response (Slack & Lewis, 2008: 227).

Meanwhile, operations management research has recently begun to explore social enterprises – organizations that "pursue a social mission while engaging in commercial activities that sustain their operations" (Battilana & Lee, 2014: 399). The "social mission" can refer to creating positive social and/or positive environmental outcomes for society. By combining activities and objectives consistent with humanitarian organizations like charities (the "social" part) and for-profit companies (the "commercial" part), these organizations are said to be "hybrid" (Pache & Santos, 2013). In operations strategy terms, hybrid organizations can be said to pursue two competitive priorities: earn profits as a business and achieve positive social and/or environmental outcomes.

Operations strategy has traditionally focused on how organizations faced with multiple and competing competitive priorities make trade-offs between them (i.e.,

prioritizing cost over flexibility) and design their operations accordingly (Ward, McCreery, Ritzman, & Sharma, 1998). To understand the operations strategy implications for social enterprises, a business ethics lens can be applied to the decision-making processes of operations strategy development. In particular, Dunham's (2010) concept of "practical wisdom" can be used to understand the decisions that executives make about their operations when pursuing the dual commercial-social objective. Practical wisdom is defined as "the capacity to understand and act upon what is both good and feasible for oneself and others in particular situations" (Dunham, 2010: 523). Entrepreneurs and executives are said to be practically wise if they embed an ethical and moral imperative in their decision-making so as to account for the different utility preferences of different stakeholders and achieve outcomes that benefit themselves (or their organizations) and the "collective well-being" of their stakeholders (Dunham, 2010: 522; Dunham, McVea, & Freeman, 2008).

In this paper, we use the practical wisdom lens to understand the operations strategy formulation processes of social enterprises. We interviewed CEOs and founders of eight social enterprises that sell solar lanterns and solar home systems to low-income customers in developing countries, as the executives were the key decision-makers when formulating the organizations' operations strategy. We focused on instances when they made important changes to their operations, which enabled us to understand how specific operations strategies were developed. By viewing these instances through Dunham's (2010) lens of practical wisdom, we observed how executives mapped a particular threat or opportunity onto one or more of four key operations areas – capacity, supply/distribution network, process technology, and product and organization development (Slack & Lewis, 2008) – and then developed an operational response in the operations area to which the threat or opportunity was mapped. Crucially, the executives used practical wisdom when formulating an operations strategy in response

to the threat or opportunity, which constrained the set of possible responses to the particular threat or opportunity to those aimed at meeting both social and commercial objectives.

The remainder of this paper proceeds as follows. We situate our research within the extant literatures of social enterprise and operations strategy and present our theoretical lens in Section 3.2. In section 3.3, we present our research methods. Section 3.4 presents our analysis and results, and we conclude with a discussion of our results within the broader operations management context in Section 3.5.

## 3.2 Literature

In this section, we position our study at the intersection of the operations strategy and social enterprise literatures and present the conceptual lens – Dunham's (2010) practical wisdom – through which we observed the operations of the social enterprises in our study.

### *3.2.1 Operations Strategy Formulation*

Operations strategy is the practice of aligning an organization's operations such that they support the overall strategy of the firm and thus contribute to the firm's success in the market (Zhao & Lee, 2009). Slack and Lewis (2008: 18) define operations strategy as: "the total pattern of decisions which shape the long-term capabilities of any type of operation and their contribution to overall strategy, through the reconciliation of market requirements with operations resources." Traditional views of operations strategy typically focus on how operations can support the firm's competitive priorities which include quality, cost, flexibility, delivery, service, and innovation (Zhao & Lee, 2009: 1), particularly when there are inherent trade-offs in pursuing multiple priorities. In their study of operations strategies to account for cultural differences in customer groups, Pullman and co-authors (2001) identify ways that managers can balance the trade-off between standardization and customization in a way

that maximizes revenue given high levels of customers' cultural diversity. Da Silveira and Slack (2001), meanwhile, find that in general trade-offs in overall strategic priorities are particularly important considerations for managers when they develop operations strategies if the trade-offs are perceived as having a high impact on overall operations competitiveness and if operational changes made to satisfy one element of the trade-off require significant operational changes to satisfy the other element of the trade-off. Regardless of the presence of trade-offs or not, developing operations strategies to ensure alignment between an organization's operations and its overall strategy remains critical to the sustained success of the organization (Tracey et al., 1999).

Operations management scholars have also studied firms' operations strategies when firms incorporate non-traditional competitive priorities in their overall strategy. The most prominent example is including environmental sustainability as a competitive priority. As firms feel pressure from stakeholders to incorporate environmental considerations into their corporate strategies, environmental sustainability has become another competitive priority for firms and hence they must adapt their operations strategies accordingly (Gupta, 1995). But as Gunasekaran and Ngai (2011) note, there has generally been a dearth of empirical research on the implications for operations strategy of environmental compliance compared to empirical operations strategy research in more traditional areas such as cost, flexibility and quality.

Another strand of operations strategy research focuses on translating traditional operations strategy research to new contexts. Within this research, the context of low-income countries has received growing attention. In their study of manufacturing firms in Ghana, for example, Amoako-Gyampah and Boye (2001) study how managers factor environmental factors arising from doing business in an emerging economy into their operations strategy choices of quality, cost, flexibility, and delivery dependability. The

authors find that high costs of doing business and a hostile competitive environment were the two most important environmental factors that impacted managers' operations strategy choices.

Different views on how operations strategies are developed have emerged in the operations strategy literature, including top-down and bottom-up, vertical and horizontal coordination, and recursion between firm-level strategies and ground-level implementation. In their study of six manufacturing firms in Germany, Kim and co-authors (2014) identify both bottom-up and top-down approaches to operations strategy formulation. In the former, strategies are formulated based on learnings at the ground level which then influence firm-level strategies. In the latter, higher-level firm strategies are developed and then implemented in operations at the ground level. The horizontal and vertical coordination approach to developing and implementing operations strategy (Sting & Loch, 2016) holds that organizations can manage ground-level actions through higher-level strategies (vertical coordination) and through managing ground-level actions only at the ground level (horizontal coordination). When doing both horizontal and vertical coordination simultaneously, though, Sting & Loch (2016) show that firm performance improves when either horizontal or vertical coordination is tightly controlled, but not when both are tightly controlled or when both are loosely controlled. Recognizing that operations strategy development may not be a linear process, Choy and co-authors (2016) identify a recursive process for developing and implementing operations strategy in strategies are first developed at the firm-level, then operations strategies are formulated based on the firm's competitive priorities and policies, and then operations are managed in a way that performance informs the formulation of new firm-level strategies.

Operations scholars have put forward different frameworks to suggest different steps in the operations strategy formulation process. While these frameworks tend to be

normative – recommending how operations strategies should be developed – they are based on the researchers' observations of how firms have formulated operations strategies. Two of the most prominent are the Hill framework for operations strategy development particularly in the context of manufacturing, and the Platts-Gregory framework. The Hill framework presents a multi-step process involving first understanding the corporate objectives of the firm and its marketing strategy, translating these objectives and strategies into operations performance objectives, and then developing an operations strategy to meet the operations performance objectives (Hill, 1995; Slack & Lewis, 2008). Whereas the Hill framework does not by design present developing an operation strategy as a response to some impetus or event, the Platts-Gregory framework outlines *a three step process* (Platts & Gregory, 1990; Slack & Lewis, 2008) that begins with the firm recognizing some opportunity for or threat to the organization's overall objective(s) in terms of demand from the market (i.e., customers) and performance of the firm's operations. The second step of the Platts-Gregory framework involves taking stock of the capabilities of the firm's existing operations in order to understand how the threat or opportunity is relevant to different operations decision areas. The operations decision areas are capacity, supply/distribution network, process technology, and product and organization development (Slack & Lewis, 2008). The third step is "the least structured" of the three and entails formulating an operations response to the opportunity or threat (Slack & Lewis, 2008: 253).

### *3.2.2 Social Enterprise and Operations Management*

Despite considerable academic interest in social entrepreneurship over the past several years, scholars remain divided over the degree to which social enterprises differ from commercial enterprises. On one side of the debate, some scholars argue that social entrepreneurship is not a distinct type of entrepreneurship but rather a context within which traditional entrepreneurship operates (Dacin, Dacin, & Matear, 2010). On the

other side are scholars that see differences between social enterprises and commercial enterprises along several dimensions, from opportunity recognition to the types of deals that they conduct, to their overall mission (Austin et al., 2006). Where most scholars agree, however, is that the primary objective function of social enterprises differs from that of commercial enterprises (Dacin et al., 2011). The objective – the overall strategy – of social enterprises, these scholars argue, is to create social value by providing a solution to a social problem while creating sustained financial value for the firm.

To date, not much research in the operations management field has focused on the operations strategy of social enterprises. In particular, relatively little is known about how social enterprises align their operations to firm-level strategy when that strategy entails pursuing both social and commercial objectives. Extant research has tended to focus on how social enterprises sacrifice some social impact for increased revenues, or vice-versa. For example, in their study of a social enterprise that sought to provide jobs to homeless individuals, Tracey and co-authors (2011) found that the organization allocated fewer resources and capabilities to developing the organization's business practices as a result of prioritizing the social aspects of alleviating homelessness. When the trade-offs swing far enough to the social side, the social enterprise will go out of business (as happened in the homelessness-oriented social enterprise in the example above) or it becomes entirely dependent on donors, thus transitioning to a charity. Conversely, when the trade-offs swing far enough away from the social side, the positive social impact outcomes may fade away or become positive externalities to the primary activities involved in maximizing profit. It has been suggested therefore that pursuing both commercial and social competitive priorities simultaneously is untenable in the long-term (Pullman, Longoni, & Luzzini, 2018b).

Other scholars have studied social enterprises that operate in low-income markets. This context is of interest to operations scholars because operating in low-

income countries presents firms with a myriad of challenges, which are acutely felt at the operational level. Access to cash is often severely constrained, market information is scarce, transport, warehousing and distribution are wrought with logistical challenges that add costs, capabilities and resources of partners (e.g., distributors) are often limited, and the ecosystems and institutions that are present in developed country markets that enable firms and markets to function are often not present or not robust in developing countries (Karamchandani, Kubzansky, & Lalwani, 2011; Sodhi & Tang, 2011, 2014b). The context is also of interest to social enterprise scholars, because in order to succeed in these contexts, firms must account for the basic needs of their customers and key stakeholders and develop products or services, as well as operations practices, that create value not only for the organization but also for its low-income stakeholders (Emerson, 2003; London, Anupindi, & Sheth, 2010). To overcome the challenges of operating in low-income countries, social enterprises have developed a variety of operations strategies. In general, they attempt to leverage the existing strengths of the market, rather than trying exclusively to overcome its weaknesses (London & Hart, 2004). This often means incorporating "native" organizations as partners. Indeed, Seelos and Mair (2009: 51) argue that social enterprises operating in low-income countries should forge "a multitude of relationships and alliances with local non-traditional … partners" to carry out the supply chain activities that occur in the low-income context. Similarly, Dahan and co-authors (2010) recommend that organizations collaborate with nonprofits and NGOs that have complementary capabilities.

Reaching so-called "last mile" customers often constitutes one of the greatest operational costs, so firms – particularly social enterprises – "explore alternative methods of delivering their products and services to even the most isolated" customers (Anderson & Billou, 2007: 15). One way to do this is to offload the inventory and/or logistical costs and risks associated with last-mile distribution by engaging local

entrepreneurs as distributors (Sodhi & Tang, 2011). In addition to helping the firm manage its costs or reach rural customers given its limited resources and capabilities, leveraging local entrepreneurs represents an opportunity for social enterprises to create mutual value for both the firm and the local entrepreneur. Along similar lines, Prahalad and Hammond's (2002) research illustrates the benefits of establishing R&D activities in low-income markets with the specific focus on developing localized innovations – the firm benefits from a product that is appealing to customers, and the local community benefits by receiving outside investment and enjoying employment opportunities.

### *3.2.3 Theoretical Lens: Practical Wisdom*

In order to study the operations strategies of social enterprises, we need a theoretical lens that can accommodate the commercial and social competitive priorities that social enterprises pursue, from the perspective of the entrepreneur's or executive's decision-making process. We identified Dunham's (2010) concept of "practical wisdom" as an appropriate lens as it conceptualizes the decision-making processes of entrepreneurs and executives as they seek to pursue both social and commercial objectives. Dunham's concept of practical wisdom builds on Aristotle's concept of "phronesis", a "reasoned and true state of capacity to act with regard to human goods" (Aristotle, 1999: 95), and is applied through a pragmatist lens to the context of top-manager decision-making. By viewing executive decision-making through the practical wisdom lens, we focus on how executives describe "doing what seems … necessary to get clear – articulate – the precise nature of the particular situation before them, and what opportunities for action it uniquely affords them" (Shotter & Tsoukas, 2014: 387). The process of decision-making, in our case for the development of operations strategies, "involves moving around within a landscape of possibilities, and in so doing, being spontaneously responsive to the consequences of each move, and assessing which one (or combination of moves) seems best in resolving the initial tension aroused in one's initial confusion"

(Shotter & Tsoukas, 2014: 388). We therefore focus on the ways that executives maneuvered within a "landscape of possibilities" when developing particular operations strategies.

A practically wise entrepreneur or executive exhibits five qualities when making decisions about how their organization operates (Dunham, 2010). First, they aim to develop products or services that increase individual and collective well-being in a way that benefits the organization and its stakeholders. Second, they embed ethics into their decision-making process, seeking to act in a virtuous manner. Third, in a departure from pure rationality, they make decisions based on their "analytical, emotional, imaginative, and moral capacities" in order to ensure that the objectives they are pursuing and the means through which they pursue them are morally "right" (Dunham, 2010: 522). Fourth, they understand and seek to maximize the different utility preferences of their stakeholders while acknowledging the complexity and variety of their stakeholders' values and needs. Finally, their decision-making process emphasizes perception, deliberation, experimental action, and reflection" (Dunham, 2010, p. 522). The table below summarizes the qualities of practical wisdom in entrepreneurial or executive decision-making.

**Table 11: Qualities of Practical Wisdom (Dunham, 2010: 522)**

| Practical Wisdom Quality | Description |
|---|---|
| 1. Pursuing Individual and Collective Well-Being | The decisionmaker is "Focused on achieving good ends that support both individual and collective well-being within the context of creating new products, services, and markets." |
| 2. Acting Virtuously | The decisionmaker aims "to act in conformance with virtue." |
| 3. Going Beyond Pure Rationality | The decisionmaker "Draws upon analytical, emotional, imaginative, and moral capacities to determine right goals and means when pursuing entrepreneurial opportunities." |
| 4. Maximizing Multiple Utility Preferences | The decisionmaker "Rejects maximization of mono-utility/acknowledges and acts on plurality of values embedded in options." |
| 5. Emphasizing Complexity and Reflection | The decisionmaker "Engages in a process that emphasizes perception, deliberation, experimental action, and reflection" |

## 3.3 Methods

In order to build new theory that explains how social enterprises formulate operations strategies in order to pursue both social and commercial objectives, we conducted a qualitative study of eight social enterprises that participate in development supply chains for solar lanterns and solar home systems sold in developing countries.

### *3.3.1 Research Setting*

To initiate our study, we theoretically sampled (Eisenhardt, 1989; Yin, 2012) fifteen social enterprises that sell solar lanterns and solar home systems to customers in low-income countries. We identified the fifteen firms through the Global Social Benefit Incubator (GSBI) program of Santa Clara University, a well-recognized and selective incubator for social enterprises. We found the household solar product sector in low-income markets to be an excellent setting for two primary reasons. First, in these markets, firms face a number of challenges, as described in the Literature section above

(Karamchandani et al., 2011). These challenges often necessitate operational changes for survival, which means we were likely to capture instances of operations strategy development by selecting companies operating in these markets. Second, the relatively expensive nature of household solar products, combined with the fact that they are physical products that often require consumer education and/or after-sales service and support, means that executives in this sector must come up with creative operational solutions to challenges they face while trying to simultaneously earn profits and create positive social impact.

### *3.3.2 Data Collection*

Once the fifteen firms were identified, we contacted by email the CEOs or top managers of each of the firms to request their participation in our study. Seven firms ultimately declined to participate. Table 12 provides information on the eight firms that participated in our study.

**Table 12: Social Enterprises in Chapter 3 Study**

| Company | Year Founded | Headquarters Location | Customer Location(s) |
|---|---|---|---|
| Greenlight Planet | 2007 | India | Global |
| Ilumexico | 2009 | Mexico | Mexico |
| Kamworks | 2006 | Cambodia | Cambodia |
| Nokero | 2010 | USA | Global |
| ONergy | 2009 | India | India |
| SELCO | 1995 | India | India |
| Simpa Networks | 2010 | India | India |
| Solar Sister | 2010 | USA | Sub-Saharan Africa |

We began our data collection by conducting in-depth archival research on each of the organizations. This included Internet-based research and an examination of

transcripts of interviews that the founders or senior managers had conducted with GSBI in 2012, in which the informants described at length how their organizations operated. To make sure we had a clear understanding of how each of the eight firms operated, we wrote detailed summaries of their operations based on the archival material we collected for each case. These summaries averaged about 3,400 words each and totaled over 27,000 words. Writing summaries enabled us to begin the process of "within-case analysis" (Eisenhardt, 1989: 533) whereby we were analyzing the data as we were collecting it, and developing an in-depth understanding of each case on its own. We then sent these summaries in 2014 to the CEO or a senior manager at each firm to receive feedback on their accuracy, and we arranged for an in-depth follow-up interview by phone. We were able to interview the CEOs, co-founders, or senior managers of each company. All interviews were recorded and transcribed. We also gathered other archival data in 2014 and 2015 describing the companies' activities and changes to their operations in order to triangulate between interview data and archival data (Yin, 1984). Table 13 presents the informants we interviewed for each firm in our study.

**Table 13: Key Informants for Chapter 3 Study**

| Company | Key Informant |
|---|---|
| Greenlight Planet | Co-founder & CEO |
| Ilumexico | Co-founder & CEO |
| Kamworks | Chairman & Co-founder |
| Nokero | CEO & Chairman |
| ONergy | Co-founder & CEO |
| SELCO | Senior Manager, Communications, Innovation & Policy |
| Simpa Networks | President & Co-founder |
| Solar Sister | Founder & CEO |

Our data collection was informed by Flyvbjerg's (2006) description of "methodological guidelines for phronetic organizational research" (p. 374). Flyvbjerg

describes phronetic organization research as focusing on "practical activity and practical knowledge in everyday situations in organizations" in which "organizational practices are recorded and described simply as events" (Flyvbjerg, 2006: 378). Therefore, our primary goal for the interviews was to ask informants about operations strategy formulation "events", using terms that made sense to the executives. We asked what changes they had made to their operations, and for each instance when they described a change to their operations we asked why they made the change, what had been working prior to the change, what had not been working prior to the change, how they went about making the change, and what impacts the change had on their businesses. In this way, the operations strategy formulation "events" became the discreet cases that we analyzed in detail, since practical wisdom "is best understood through cases – whether experienced or narrated" (Flyvbjerg, 2006: 379). Appendix 3 provides the interview protocols.

We found 21 separate examples of these events, and, following Kim and co-authors (2014), we used these as the embedded units of analysis (Yin, 2012). Certain key phrases served as signposts alerting us that the informant was talking about an event in which they developed an operations strategy. For example, one executive we spoke to said:

> *"As I put in the email, I think the big story here […] is that it's true […] we were actively pursuing both a B2B and B2C model, but since then we made the decision to just focus entirely on the B2C opportunity. […] So, I thought it would be useful if I told you a bit about where we were then, what we saw, and why we decided to switch, and how that decision was made."*

The operations strategy formulation events as described by the informants almost always had a clear beginning, such as "It started when…" or "We were initially…" and end point, such as "and that's where we are today," or "since then, it's been working great." When we had identified such an event, we extracted it, and all references to it, from the interview, to get a comprehensive picture from the executive's perspective of the event.

## 3.4 Data Analysis and Findings

With the data from these interviews and our archival research, we were able to begin a "cross-case pattern search" (Eisenhardt, 1989: 533) in which we identified commonalities that were emerging across the cases, in terms of how the social enterprises developed operations strategies that enabled them to pursue both social and commercial objectives simultaneously. We analyzed our interview and archival data for each of the 21 events using the practical wisdom lens as our previously identified theoretical framing device that provided us with "insight, direction, and a useful list of initial concepts" (Corbin & Strauss, 2008: 41). We looked at how the informant described the event, including what caused them to make the change(s), and what the change(s) was or were.

Our analysis of the events was guided by the literature on processes for operations strategy formulation. In particular, the Platts-Gregory framework (Platts & Gregory, 1990) helped us to focus on the three-step process in which an executive perceives a threat or opportunity, identifies the area of operations that are relevant to the threat or opportunity, and then develops an operations strategy in response to the opportunity or threat. As we show in this section, however, the last step in this process is influenced by the executive's practical wisdom, which constrains the set of possible responses to the threat or opportunity to those that allow the organization to pursue both social and commercial objectives. We also found that the operations strategy developed

in response to the opportunity or threat involved only those operations areas to which the threat or opportunity was mapped. Table 14 below presents representative quotes from a selection of the 21 operations strategy formulation events. In the interest of transparency, we provide in Appendix 2 a table with representative quotes from all 21 events. Read horizontally, both tables provide snapshots of the operations strategy development process: a threat or opportunity is identified, then mapped onto one or more operations areas (from Slack and Lewis, 2008, these are capacity, supply/distribution network, process technology, and product and organization development), and then a response to the threat or opportunity is developed according to the area of operations onto which the threat or opportunity was mapped. Read vertically, the tables provide example quotes for each of the process steps.

**Table 14: Examples of Operations Strategy Formulation Process**

| **Step 1** *Perceive a Threat or Opportunity* | **Step 2** *Map Threat or Opportunity to Operations Decision Area* | **Step 3** *Develop Operations Strategy According to How Threat or Opportunity was Mapped onto Operations* | **Alignment** *How Operations Strategy Aligns with Overall Social+Commercial Strategy of the Social Enterprise* |
|---|---|---|---|
| <u>Perceived Opportunity: Unmet customer need is light not electricity</u><br>"We were looking at village level electrification, so we took diesel generators, converted them into biodiesel and electrified the | <u>Mapped to Product Development</u><br>"So, we went back to the drawing board and figured that people want light and that's a much easier problem to solve than providing them 24-7 electricity." | <u>Product Response: Introduce new product</u><br>"So, we went back, and we designed that solar power light." | The new product helped low-income customers more directly address their need for light and was also a more commercially viable business than village-level electrification. |

| Step 1 | Step 2 | Step 3 | Alignment |
|---|---|---|---|
| entire village. […]. When we came back, we saw that […] people were taking electricity from the generator and they had connected light bulbs. […]. So that's when the realization first kind of came is that for an un-electrified village the primary use of electricity is first, light." (Co-Founder & CEO) | | | |
| Threat: distributors struggle to keep up sales<br>"That's been one of the bigger surprises – just figuring out how to actually affect sales that repeatedly happen over and over and over again. […] Even with the right resellers— but they just— even the best ones have struggled." (CEO & Chairman) | Mapping to Process Technology<br>"It's tough to get people to adopt these technologies as sensible as it is, it's really tough. […] We have supported [our resellers] in some ways but we haven't totally owned it like a franchise or franchisees." | Process Technology Response<br>"We've created some tools that we're going to be running out pretty soon with our public service announcements. [...] We funded a guy who is a specialist in this, and we'll be rolling those out hopefully in the next six months. […]. It's just a way to communicate en masse with people about behavior change." | Public service announcements were viewed as a way to help increase demand for the social enterprise's products – which the executive viewed as recently plateauing – while at the same time educating the public on the hazards of candles and kerosene, thus supporting a social mission as well. |

| Step 1 | Step 2 | Step 3 | Alignment |
|---|---|---|---|
| Perceived Threat: lack of distribution network<br>"The issue is distribution system: the issue is how do you take good products into rural homes that need it. And that does not exist today in India and Africa anywhere" (Co-Founder & CEO) | Mapping to Distribution Network<br>"If I can create the distribution network, I can introduce solar lights into many, many more homes." | Distribution Response: Develop own distribution network<br>"So, we said, hey why don't we incentivize this guy, a happy customer to kind of promote the product himself or herself. […]. Everything is kind of like a machine, […] I can tell you the performance of a salesperson at the end of the week, […] who is selling what, when, why, where, everything." | Developing their own distribution network enabled the organization to reach more low-income households than if they had relied on existing networks, thus enabling them to reach the most in-need customers and increase revenues through selling more products. |
| Perceived Threat: loss of organization leadership<br>"Basically, we had a succession problem at that stage because I was leaving, and we hired a new guy to take my place but then that didn't work out well. And we ended up in quite a serious crisis where we fired this guy and hired another one and it was again the | Mapping to Product Development & Distribution Network<br>"We can't really invest in developing new lanterns or better batteries, to improve our product. […] We are trying to focus purely on the solar home systems at the moment. […] Distribution is difficult for us. So, we're trying to do it, but the distribution is | Product Response: focus only on solar home systems<br>"We had to say, well, we are spread too thin, let's focus on one single thing. We said, ok, what has the best margins – the solar home systems – so we decided to focus on them."<br>Distribution Response: partner with local promoters in communities | In order to support the overall strategy of streamlining the organization around its core activities, the executive decided to focus only on solar home systems and leverage local promoters embedded in communities instead of trying to do promotional activities in-house; this helped reduce costs while maintaining social |

| Step 1 | Step 2 | Step 3 | Alignment |
|---|---|---|---|
| wrong choice, so we got into quite some trouble. We had to really scale down the team and go into survival mode" (Chairman & Co-Founder) | quite tough. We have not really managed to scale it up very much." | "We put a demo solar home system in the house of a promoter in the village. This guy organizes a community meeting, and people come there – people that he thinks or she thinks are eligible for a loan or to pay cash for this system, and then our [sales agents] come and do a presentation and they follow up." | impact not only through the solar home systems but also through income-generating opportunities for locally-based promotors. |

### *3.4.1 Step 1 – Perceiving a Threat or Opportunity*

In our interviews with them, executives would clearly point to a particular moment or realization that led them to perceive they had to develop an operations strategy. For example, one executive said,

> *"I think there is a customer shift. […] It's really changing, what the average customer buys, and so I think it's an area of real focus for us."*

Executives viewed these impetuses for developing an operations strategy as either *Threats* or *Opportunities*. For example, one executive described an opportunity in which he and his team initially did not consider in-country distributors as customers – they were instead focusing on a B2C business model – but then:

*"It probably should have been obvious, but where that clicked for us was that we started getting all these embedded inquiries, and most of them originated in East Africa."*

In the above quote, the executive perceived the incoming requests from in-country distributors as an opportunity to pursue a new distribution channel. Executives we interviewed also viewed threats as impetuses for developing an operations strategy.

In the examples above and across the 21 operations strategy formulation events, executives clearly described the threats and opportunities that served as impetuses for developing an operations strategy.

### *3.4.2 Step 2 – Mapping the Threat or Opportunity onto Operations*

The second step in developing an operations strategy as suggested by the literature, and borne out in our data, is that executives would describe the threat or opportunity in terms of its impact on one or more operations decision areas: capacity, supply/distribution network, process technology, and product and organization development (Slack & Lewis 2008). Essentially, the executives were "mapping" the perceived threat or opportunity onto one or more of these operations areas. Consider the examples below. In the first example, the executive perceived a problem with one of the distribution channels the firm used to sell its products to end customers, and mapped this threat onto the organization's distribution strategy:

<u>Threat</u>

*"We would call up our customers that [our partner] had sourced, and the customer had no idea who we were. They didn't even know that [we] were involved in the transaction."*

Mapping onto Distribution Network

*"That's one of the challenges of selling through the [partner's] channel. You don't really know that that frontline sales person is communicating it correctly. [...] From a scale perspective it was a problem because we weren't getting enough leads, enough customers, from that channel."*

In the example below, the perceived threat was visiting a customer and finding that their solar lantern was not working, which the CEO perceived as impacting operations related to product development – in this case, how the company communicated its product warranty policy to its customers:

Threat

*"USAID was visiting with us to go visit an entrepreneur— We went out to visit one of our entrepreneurs and she took us out to her customer and the customer is a nurse who runs a clinic out of her house and she gets a lot of people who come visit her at night. […] And of course, when we get there the stupid thing [the solar lantern they had sold to the nurse] is not working. […It was] a little embarrassing to be there with USAID watching."*

Mapping onto Product Development

*"She's like 'Oh, it hasn't been working for six months.' [I was like] 'What? Why didn't you say something? It's under warranty! We're talking about saving lives here!' She just didn't really think that that was an option."*

In a third example, we found that the CEO observed changes in the sector involving new technologies that firms were using to offer to their customers the opportunity to pay for the product as they used it – a so-called pay-as-you-go option, and mapped this onto the process technology of being able to provide financing in-house through innovative pay-as-you-go technologies:

Opportunity

*"I think there's a lot of interesting work right now in financing models for this. […] Some of these [pay-as-you-go] enabling technologies are really interesting and potentially very impactful. Could have a huge impact in opening up the category."*

Mapping onto Process Technology Strategy

*"The point is we are selling through MFIs, and they're doing a great job, and the customers are buying larger products, and it skews even more towards the high value product, with MFIs. And the ability just to figure out how to provide direct consumer finance, it could really change the space. […] But the point is the potential for the customer to pay for a product over time is huge."*

By mapping the perceived threat or opportunity onto specific operations decisions, the executive makes it actionable by making it relevant to key elements of their operations.

### *3.4.3 Step 3 – Developing an Operations Strategy in Response to the Perceived Threat or Opportunity*

Our data also provided detailed descriptions of how executives responded to the perceived threats and opportunities by developing operations strategies that enabled

both social and commercial objectives to be met simultaneously. It is important to recall here that operations strategy formulation is about ensuring alignment between an organization's operations and its overall strategy. As a result, the operations strategies that we observed executives formulating were not new overall strategies but instead actions taken to align the organizations operations with the existing overall strategy. Our analysis resulted in two primary observations, as described below.

**One-to-One Relationship Between Operations Areas to Which a Threat or Opportunity Was Mapped and Operations Areas Implicated in Operations Strategy Formulation**

The first trend that we noticed in our data – which also surprised us – was a one-to-one relationship between the area(s) of operations onto which the executive mapped the perceived threat or opportunity and the area(s) of operations implicated in the operations strategy they developed as a result of the threat or opportunity. That is, if an executive mapped the threat or opportunity to operations related to product development, the executive developed an operations strategy related to product development. For example, one co-founder we spoke with described a situation that led him to focus on developing a distribution strategy:

> <u>Threat</u>
>
> *"[The company] burned its fingers a bit with the dealer model, a franchisee model back in the day, where systems were sold through a franchisee but then it became a very sales-oriented kind of pitch"*

Mapped to Distribution Network

*"One of [the company's] strengths is this whole person-to-person interaction, and this kind of networking that we have, and dealers tend to take a very different approach. It's a sales approach to things. And so, it [the franchise approach] didn't really work well for [the company]."*

Distribution-Related Operations Strategy Response

*"The Business Agent came up from that learning, where we said we would have these commission agents, and they're commissioned – they're not on the rolls of [the company], they're paid as per certain milestones that they cross. […] The idea was that they worked very closely with the branch, so they don't really do the installation. The branch still does the installation. […] This person acts like an extend arm of the branch. […] And then in some cases we may train them to a certain extent to take care of basic technical repairs. But by and large, they are closely associated with the branch."*

Alignment with Overall Social+Commercial Social Enterprise Strategy

A core component of the company's strategy is developing relationships with its customers, and when the distribution model based on franchising turned out to be oriented too much towards sales without enough emphasis on developing customer relationships, the executive decided to use business agents who can represent more faithfully the values of the organization and help ensure positive social impact within the communities that the organization targets.

In the example above, the perceived threat was mapped onto the distribution channel ("the dealer model" was too impersonal, too sales-pitch oriented) and as a result, the

response was directed at developing a distribution channel based more on commissioned agents that interacted in a more personal way with customers.

The one-to-one relationship between how an executive mapped the threat or opportunity to operations decisions and developed an operations strategy in response was made even more apparent in several instances when new operations strategies were developed for multiple types of operations decisions (e.g., those related to product development and those related to the distribution channel) and these operations strategies corresponded directly to how the executive mapped the perceived threat or opportunity onto the firm's operations. Consider the following example:

Threat

*"Initially we just started with solar lanterns. And that's when we start getting a lot of feedback that people are not just happy with, say, a lantern"*

Mapping to Product Development and Distribution Network

*"That's when we started looking into larger home lighting systems, larger solar systems. […] So, we also had to develop---- understand about the larger solar systems. […] The challenge was more with the cost, with how we can make it more affordable, and introducing---- looking into different financing models with microfinance institutions, working with rural banks."*

Product Response

*"We want to see how energy can play a role to solve various different social problems. […] We're looking at sort of a more holistic approach where we can provide customized solutions as per the requirements of our customers. So,*

*yeah, we've gone from just a bigger distribution company to a more solutions-oriented company."*

Distribution Network Response

*"So, a lot of focus we started putting into developing the whole system wherein we have the right kind of grassroots partners, […] financing partners, who can ultimately increase the deployment of solar lighting and other solar systems [by offering affordable financing options]."*

Alignment with Overall Social+Commercial Social Enterprise Strategy

By developing a product that could more directly solve social problems and leveraging distribution network partners that can help the company extend its reach to lower-income customers, the organization was able to increase its positive social impact and generate more revenue by selling more products.

In the example above, the initial perceived threat was negative customer feedback about the solar lantern. The executive mapped this onto operations related to the product ("we started looking into larger home lighting systems") and Distribution Network ("different financing models with microfinance institutions, working with rural banks"), and as a result, responded to the threat by developing operations strategies specific to the product ("provide customized solutions as per the requirements of our customers") and to the partnerships supporting the distribution network ("financing partners, who can ultimately increase the deployment of solar lighting").

In another example, presented below, a perceived threat (realization that community-scale electricity companies – microgrids – were not a viable market) was

mapped onto operations decisions related to the distribution channel and organization development, and as a result, operations strategies were developed in these two areas:

Threat

*"We realized that, 'Wow, microgrids are pretty complicated' and all these social and business and technical and government and local political and state political issues that we didn't understand. […]. We had assumed that there were a lot of microgrid companies that were coming up [...] but then we had then come to a realization that there aren't really that many customers out there."*

Mapping to Organization Development and Distribution

*"What I did hear was that a lot of companies wanted to pay us to customize a solution for them. And that meant that this wasn't a product business where we could sell a metering solution. […] Your client comes to you with a problem and you help develop a one-off solution for them."*

Mapping to Organization Development

*"In that business model, you basically just make a mark-up on your engineering time."*

Organization Development and Distribution Response

*"So, I needed to take the board [...] from the viewpoint that 'wow, there's a pure play technology company here' [...] to 'oh my goodness, we need to be more vertically integrated. We need to raise the capital. We need the prepaid metering technology. We need to build our own channel to reach customers. And I guess we need our own solar home system product as well. We need to do all of*

*that.'[…]. And there's no one else who's really going B2C the way we are. No one else that's doing pay as you go solar and selling to consumers."*

Alignment with Overall Social+Commercial Social Enterprise Strategy

The executive viewed the only viable business opportunity in the microgrids market as one based on providing engineering services to other companies, which was not in line with the social mission of the company. As a result, the executive led a shift in organizational development to becoming a solar home system company that has its own distribution network. In this way, the organization could ensure positive social impact while earning revenues from the sales of its products.

In the example above, the executive perceived that the market for microgrids was not a viable opportunity and mapped this onto the firm's operations related to organization development and the distribution network. As a result, the executive developed operations strategies across both of these operations areas.

In all 21 instances (see Appendix 2) where the executives formulated an operations strategy, we identified a direct one-to-one relationship between the operations area(s) an executive mapped a perceived threat or opportunity onto, and the operations area(s) implicated in the operations strategy developed in response to the threat or opportunity. We summarize this finding as follows:

**Observation 1**: There is a one-to-one relationship between the operations area(s) onto which an executive maps a perceived threat or opportunity and the operations area(s) that are implicated in the operations strategy developed in response to the threat or opportunity.

While it may seem trivial that there is such a strong link between how executives map a perceived threat or opportunity onto their operations and how they develop an operations strategy in response to the threat or opportunity, we did not expect to find this relationship, and we suggest that it is both non-obvious and non-trivial. In the "Initially we just started with solar lanterns" example presented earlier, for instance, another response to the same threat – customer dissatisfaction with having "just" a lantern – could have been to sell the same lantern to a different customer group that would find the lanterns to be particularly useful (e.g., wealthy customers to use the solar lantern for camping). However, we observed that the executives in our study displayed practical wisdom when developing operations strategies, and that this shaped how they responded to the perceived threat or opportunity. We arrived at this insight by re-analyzing each of the 21 operations strategy formulation events using the practical wisdom lens. Consider the quote below, from the Co-Founder and CEO of Ilumexico:

> *"One of the most complicated parts of our business is this last mile distribution. Not only getting there, but servicing that for the future. We have to have a permanent presence in these areas. […]. Sometimes we have to use boats, sometimes we have to use horses or donkeys, and sometimes we have to walk […] 7 hours. […]. You have to not only walk this distance but also carry these heavy materials to these communities. In order to reach these places and have a presence, we hire local youth – people from the communities that know the language, know the region, and know how to move around."* (Co-Founder & CEO, Ilumexico, from an interview with Columbia Business School in December 2018. Audio available here:

https://soundcloud.com/columbiabizcast/manuel-wiechers-ecla-17-ilumexico-fights-energy-poverty)

In the quote above, the executive was grappling with an issue of how to reach last-mile customers. The costs and logistics of reaching these customers are significant challenges for Ilumexico: earlier in the interview, the executive describes having to frequently repair and replace vehicles as a result of the bad road conditions leading to remote communities. Instead of focusing on easier-to-reach customers located near urban centers or along roads, Ilumexico specifically targets customers at the "basement of the pyramid" (this quote appears earlier in the executive's interview with Columbia Business School) in remote communities. The executive described how there are over 500,000 households that do not have access to electricity – not all of which occupy the "basement" of the pyramid or reside in such remote locations. However, the idea of *not* serving the lowest-income, hardest-to-reach customers was not considered an option when making decisions about the distribution channel. The solution that the executive developed – leveraging local youth in these remote communities – not only reduced Ilumexico's distribution costs but also provided employment opportunities for a demographic that suffers from high unemployment in Mexico, while ensuring that the company was able to serve even the most remote communities. We suggest that the executive used practical wisdom – in this case, pursuing individual and collective well-being, acting virtuously, and maximizing multiple utility preferences – to formulate his organization's response to the perceived threat of prohibitively costly distribution to remote communities.

**Executives' Practical Wisdom Shapes the Formulation of the Operations Strategy**

As we looked through the operations strategy formulation events, we could see how executives' practical wisdom shaped their operations strategy decision-making. Consider the three examples below, where we have highlighted the elements of practical wisdom that the executive displayed when making the decision.

Example 1: Product Decision:

*"The initial idea was we just start promoting solar lanterns and mini lighting systems because that's what people can afford. Because if we go up a little larger, then where would people have the money to pay? […]. And that's when we start getting a lot of feedback that people are not just happy with, say, a lantern. […]. That's when we started looking into larger home lighting systems, larger solar systems, which could be installed at people's houses which have a longer life. It really creates an asset. And has definitely a much better impact than just lanterns."* (Founder & CEO)

In the example above, the executive sought to **act virtuously** by providing an "asset" to his customers that had more "impact" than just a solar lantern. He used his "**analytical, emotional, imaginative, and moral capacities** to determine right goals and means" (Dunham, 2010, p. 522) – in this case, developing a marketable product that provided positive social impact. In addition, he **rejected "maximization of mono-utility"** when deciding that the products should solve "various different social problems", and **used "a process that emphasizes perception, deliberation, experimental action, and reflection**" to learn from his customers' feedback and develop a different product. The result was a product – larger solar home systems – that increased positive social impact as commercial demand for the product increased.

Example 2: Process Technology Decision:

*"It's tough to get people to adopt these technologies as sensible as it is, it's really tough. […] We have supported [our resellers] in some ways but we haven't totally owned it like a franchise or franchisees. We've created some tools that we're going to be running out pretty soon with our public service announcements that will help with that. […] It's just a way to communicate en masse with people about behavior change."* (Founder & CEO)

Here, the Founder and CEO "**focused on achieving good ends that support both individual and collective well-being**" (Dunham, 2010, p. 522) by developing a new process technology – public service announcements that were released to the wider public – to teach people about the benefits of solar lighting and the drawbacks to alternatives like kerosene and candles. The decision to do so was based on the executive's "**analytical, emotional, imaginative, and moral capacities**" (Dunham, 2010, p. 522). By deciding to use public service announcements, which supported not just his distribution channel and his customers but also people who were not his customers, the executive was **acting virtuously** and able to meet both social and commercial objectives.

Example 3: Distribution Network Decision:

*"As the target group is quite poor it is also necessary to look for solutions for financing. […] We have tried to work with the micro financing institutes a couple of times, but it was not very successful. In [the country where the company operates] there is large number of those networks, organizations, and they are quite expensive. They charge very high interest rates. […] We [now]*

*have a rental scheme. […] It works like this, we have an entrepreneur in the field, it is a revenue sharing scheme, so we provide the lanterns to him free of charge, and half of the revenue would come back to us, and the other half he can keep as his income."* (Chairman & Co-founder)

In the example above, the executive recognized that there were a "**plurality of values embedded**" (Dunham, 2010, p. 522) in the options he was considering: MFIs had large networks and therefore excellent reach to last-mile customers but charged interest rates that were too high for his customers, who valued household savings at least as much as access to finance; meanwhile, the microentrepreneur reseller needs products to sell to generate income, and the company enters a trust-based revenue sharing relationship with the microentrepreneurs. The executive **drew upon his moral capacity** and **acted virtuously** by entering into a relationship with the microentrepreneur that was trust-based and led to mutual benefits. In this way, the executive was able to **maximize multiple utility objectives** by providing commercial benefits to the company and social benefits by increasing household savings for the customer and increasing income generation potential for the microentrepreneur.

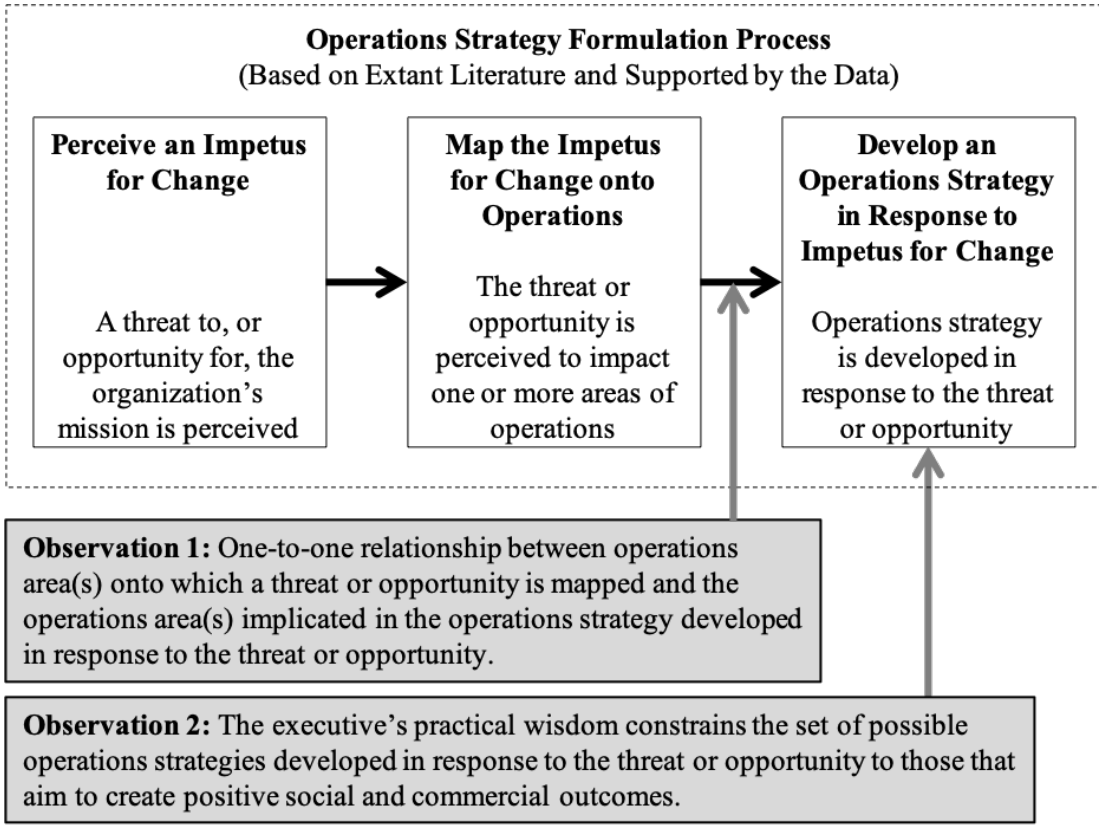
When we looked across the 21 operations strategy formulation events, we observed that multiple elements of practical wisdom appeared in each of the descriptions the executives gave for how they developed their response to a particular opportunity or threat. The operations strategies that the executives developed were shaped by the executives' practical wisdom, in that the universe of possible responses to a particular threat or opportunity was restricted to those potential solutions that supported individual and collective well-being, were virtuous, and accounted for the different utility preferences of stakeholders. The decision-making process itself was rooted not just in rational analysis but also emotion and imagination, and clearly

demonstrated the executives' abilities to perceive, deliberate, experiment, and reflect on different operational strategy options. Furthermore, because the decision-making process was shaped by the executives' practical wisdom, it inherently led to operations strategies that enabled the organization to pursue both social and commercial objectives. We summarize this finding as follows:

> **Observation 2**: The operations strategy developed in response to a perceived threat or opportunity is shaped by the executives' practical wisdom, which constrains the set of possible responses to a particular threat or opportunity to those that aim to create positive social and commercial outcomes.

In the figure below, we position Observations 1 and 2 within the existing three-step strategy formulation process outlined in the Platts-Gregory framework (Platts & Gregory, 1990): an executive perceives a threat or opportunity, identifies the area of operations that are relevant to the threat or opportunity, and then develops an operations strategy in response to the opportunity or threat. Observation 1 adds nuance to the understanding of how an operations strategy is formulated in response to a particular threat (the link between steps two and three), while Observation 2 extends the existing framework to social enterprises.

**Figure 6: Relating Observations 1 and 2 to the Operations Strategy Formulation Process Described in the Literature**




## 3.5 Discussion and Conclusion

The two observations that emerged from our analysis have implications for the literature about how operations strategies are formulated. The first observation adds nuance to the existing literature about the process for how operations strategy is developed in any company. In particular, we suggest that the step in the process in which the operations strategy is actually formulated – step 3 in the Platts-Gregory framework, or steps 4 and 5 in the Hill framework (Slack & Lewis, 2008) – is directly linked to the area(s) of operations to which the executives mapped the threat or opportunity. This observation can also inform research on the bottom-up / top-down (Kim et al., 2014), horizontal / vertical coordination (Sting & Loch, 2016), or recursive (Choy et al., 2016) approaches to operations strategy development by drawing scholars'

attention to the possibility of a one-to-one relationship between the operations areas that are implicated in the operations strategy and the operations areas that were identified as being relevant to a threat or opportunity.

The second observation extends existing literature on the process for operations strategy formulation to the social enterprise context. Social enterprises have both social and commercial objectives – their overall strategy aims to increase financial revenues *and* positive social and/or environmental impact through their core commercial activities (Battilana & Lee, 2014). Operations strategy in social enterprises, therefore, is the alignment of the organization's operations with these dual objectives. Pursuing both commercial and social objectives can present challenges for executives when formulating operations strategies, as the executives must consider how decisions will impact not only the organization's ability to increase its revenues but also its ability to increase positive social and/or environmental impact. In this study, we observe that practical wisdom might explain how executives deal with this challenge when making operations strategy decisions. We suggest that executives' practical wisdom constrained the set of possible responses to a perceived threat or opportunity to those responses that aim to produce both social and commercial benefits. In this way, the executives were able to ensure alignment between operations and overall strategy. This also offers novel insights to extant operations strategy theory, which would predict that organizations make trade-offs between competitive priorities when developing operations strategies, by showing how operations strategies that enable the pursuit of both social and commercial objectives emerge naturally from decision-making shaped by practical wisdom, since the "solution set" from which responses to a particular threat or opportunity are derived contains only those that aim to increase both social and commercial outcomes.

The implications for practical wisdom shaping executives' decision-making can be brought into stark relief by considering alternative operations strategies that executives could have implemented but did not. Consider two executives selling the same solar home system to the same low-income customers. Upon hearing that the systems are too expensive, one executive decides to reduce the system quality to make it more affordable. This leads to the system having an expected life of just a few months instead of a few years, which eliminates the positive social impact that a high-quality product could deliver, and which leads to an operations strategy based on high-volume, low-margin sales. The second and "practically wise" entrepreneur does not reduce the quality but instead offers the customers affordable financing for the high-quality product. This retains the positive social impact that use of a solar home system bestows on the end user, creates an additional revenue stream for the organization through loan repayments, and leads to an operations strategy based on long-term relationships with customers. These are not hypothetical examples. In the study presented in Chapter 2, we observe both high-quality and low-quality solar home systems being sold in Haiti, the former by social enterprises that have developed relationships with their customers and whose brands are based on improving social outcomes, and the latter by purely commercial companies who sell low-quality products without warranties and return policies.

Other theories might offer alternative explanations for how operations strategies are formulated in social enterprises. In particular, institutional theory has been used to explain and analyze phenomena related to social enterprises. Institutional theory would suggest that firms tend to operate under regimes of practices, routines, beliefs, and ways of doing business that have been described as institutional logics (Thornton, Ocasio, & Lounsbury, 2012), which shape organizational practices. Social enterprises and their leadership teams are influenced by the logics of two competing institutions – those of

companies and those of charities – and this helps explain social enterprises' operational and strategic behavior (Battilana & Lee, 2014). Institutional theory describes how institutions put pressure on organizations and managers to act in certain ways, thus removing some of the agency of the individual executive (DiMaggio & Powell, 1983). The phenomenon we were observing –executives identifying and responding to a particular threat or opportunity – seemed to us to warrant an explanation that placed the locus of control with the executive rather than with external institutions and their logics. Dunham's practical wisdom does just this:

> Rather than constraining action through the add-on application of a set of external rules or principles, entrepreneurial decision making as practical wisdom is inherently ethical as wise entrepreneurs seek to judge 'rightly' in the face of complex problems, to choose a course of action that will support the achievement of good for all stakeholders. (2010, p. 523).

Practical wisdom has been used by management scholars to describe and explain entrepreneurial and executive decisions in a variety of fields, including leadership studies, entrepreneurship, decision-making and problem solving processes, strategic management, organizational identity, human resource management, sustainable management, compliance management, and management education (Bachmann, Habisch, & Dierksmeier, 2018). With this study, we have attempted to extend it to the social enterprise context.

As we reflected on our analysis of the data, four important points stood out for us which have implications for managers of social enterprises, particularly those that operate in low-income countries. First, we were struck by how many of the operations strategy formulation processes were driven by perceived threats compared to perceived opportunities. In our study, only three of the 21 operations strategy formulation events were instigated by perceived opportunities – the remaining 18 were instigated by

perceived threats. We think there are at least two explanations for this. First, our cases were selected because they serve customers in low-income markets, which are notoriously challenging environments in which to do business, and therefore likely present more perceived threats than perceived opportunities. Second, executives could be selectively remembering only those operations strategy formulation events that were instigated by a perceived threat, perhaps because responding to the threat required a significant amount of the executive's attention. Regardless of the reason behind this finding, we suggest that it is noteworthy: a perceived threat seems more likely to trigger the development of an operations strategy than a perceived opportunity.

Second, our data show a direct link between how an executive perceives a threat or opportunity to impact the firm's operations, and which operations strategies are developed as a result. Thus, operations strategy development hinges on how executives perceive a threat or opportunity to impact specific areas of their organization's operations. We suggest, therefore, that different executives may perceive the same threat or opportunity to impact the same operations differently. This presents an avenue for further research, particularly through the use of experiments, to better understand how and why executives perceive different threats or opportunities differently. In addition, we would argue that executives may want to consider how a perceived threat or opportunity might impact a wider array of the firm's operations than those the threat or opportunity appears exclusively to impact, as this could open up new possibilities for how to respond to the threat or opportunity. For example, if an executive perceives the ineffectiveness of a particular distribution partner as a threat related to the distribution channel, she may also want to consider how it relates to the product the firm sells, or how the product or service is monetized.

Third, the process of developing operations strategy in social enterprises is not straightforward, as it requires a series of decisions about how to respond to perceptions

of threats and opportunities within the constraints of both social and commercial competitive priorities. It may be helpful for executives to seek an outside perspective when confronted with a threat or opportunity. Which part or parts of my operations are likely to be impacted? How can the executive apply practical wisdom to identify different ways that the organization can respond to the threat or opportunity, given the overarching social and commercial objectives?

Fourth, when reflecting on alternative scenarios like those of the two executives described earlier, we are left with the open question of whether individuals that typically exhibit practical wisdom self-select towards social enterprises. The social enterprise context – which calls for, at a minimum, accounting for the collective well-being of stakeholders and maximizing multiple utility preferences – would seem to be a natural draw for practically wise executives and entrepreneurs. It is also possible that some executives and entrepreneurs adapt to the social enterprise context, making decisions that align more closely with the characteristics of practical wisdom as their experience increases. Put succinctly, practical wisdom seems to be a useful framework to explain executive and entrepreneurial decision-making in social enterprises, but it does not explain whether individuals with practical wisdom are naturally drawn to social enterprises or if leading social enterprises causes individuals to use practical wisdom when they might otherwise not use it.

Our research points to at least three areas for future research. First, experimental research could unpack how practical wisdom shapes decision-making in different contexts by posing the same scenarios to different executives – for example, some from charities, some from social enterprises, and some from companies – and assessing differences in how they would respond to the scenario. To our knowledge, experiments have not yet been deployed to test practical wisdom as a theory, so this represents new territory for scholars to explore. Second, with a larger data set – collected, for example,

via a survey – scholars could study the relationship between different elements of Dunham's (2010) practical wisdom framework, the commercial success of the organization, and the magnitude of social impact that the organization creates. Third, with longitudinal survey data collected from the same cohort of entrepreneurs over time, scholars could begin to study whether practically wise entrepreneurs are naturally drawn to social enterprises or if the social enterprise context creates practically wise entrepreneurs.

## 3.6 Chapter 3 References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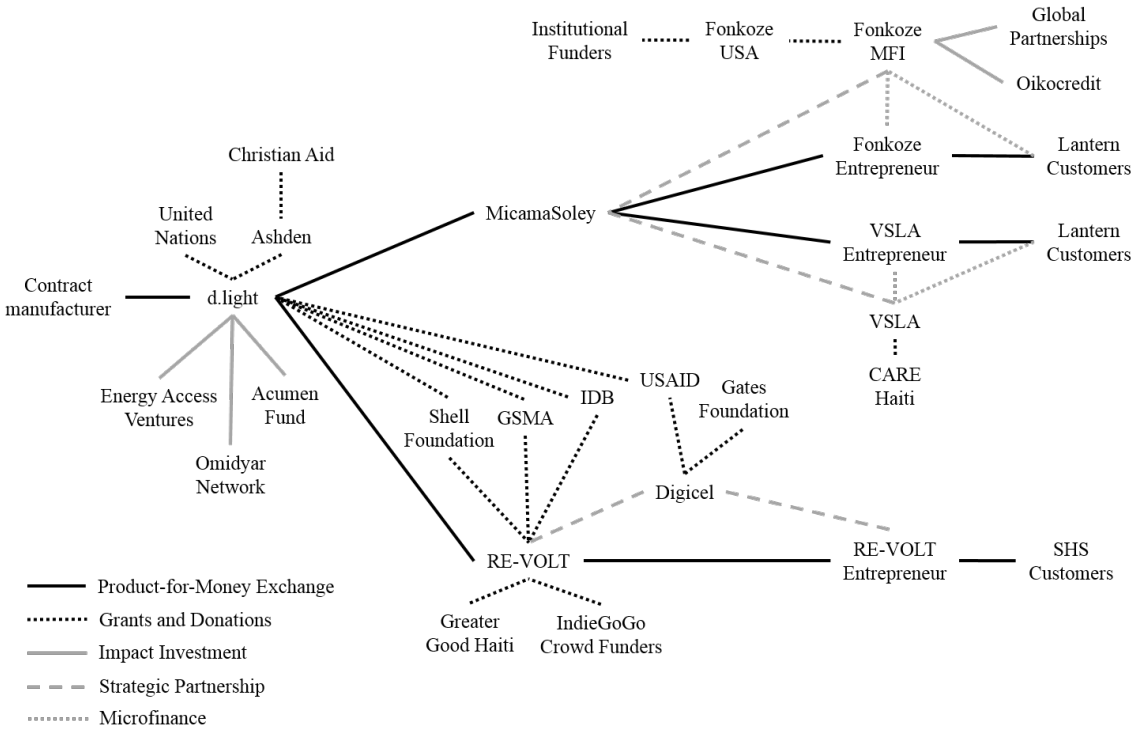
# Appendices

## Appendix 1: Development Supply Chains in Chapter 2

The following diagrams and accompanying descriptions emerged from our within-case analysis for the supply chains we studied in Chapter 2. While protecting the confidentiality of information from our informants, they are nevertheless accurate representations of the supply chains in our study and demonstrate how each stakeholder interacts with other stakeholders.

**Figure : Development Supply Chain for d.light Solar Lanterns and SHS**




d.light is a US-based social enterprise that designs and sells solar lanterns and solar home systems in over 60 countries around the world.[1] They work with a contract

[1] d.light website: http://www.dlight.com/about-us/, accessed 22 December 2016

manufacturer based in China to produce their products.[2] The United Nations, and impact investors Energy Access Ventures and Omidyar Network, provide grants and impact investments to d.light, respectively[3]. The impact investor Acumen Fund, and global charity Ashden, have also supported d.light through impact investments and an award's prize money, respectively.[4, 5] d.light sells its solar lanterns in Haiti through MicamaSoley, the social enterprise division of a large Haitian mattress company, SAFICO. MicamaSoley enters into strategic partnerships with Fonkoze and village savings and loan associations (VSLAs) in order to sell d.light lanterns to networks of entrepreneurs who have received microfinance loans from Fonkoze and the VSLAs. The entrepreneurs then sell the lanterns to end customers, some of whom are also recipients of Fonkoze's microloans.[6] The VSLA is supported by grants from CARE Haiti, the local office of the large international development charity CARE.[7] The MFI Fonkoze is supported by grants and donations from Fonkoze USA, which itself receives donations from a variety of institutional funders, and has received impact investments from Global Partnerships and Oikocredit, two prominent global impact investors.[8]

In addition to its solar lanterns, d.light also sells solar home systems to a Haitian social enterprise called RE-VOLT.[9] For this sales channel, d.light has received grants from the Shell Foundation, GSMA, and the Inter-American Development Bank

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[2] Ashden Awards case study, published May 2010. Available: https://www.ashden.org/winners/Dlight10, accessed 9 January 2017
[3] d.light press release "d.light Raises Over $22 Million to Expand PayGo Business into New Off-Grid Solar Markets," published 21 September 2016
[4] Ashden Awards case study, published May 2010. Available: https://www.ashden.org/winners/Dlight10, accessed 9 January 2017
[5] Acumen website: http://acumen.org/investment/d-light-design/, accessed 22 December 2016
[6] The World Bank's "SREP Investment Plan for Haiti" published 13 May 2015, available online: https://www-cif.climateinvestmentfunds.org/sites/default/files/meeting-documents/srep_13_5_srep_investment_plan_for_haiti_0.pdf, accessed 22 December 2016)
[7] Blog post by MicamaSoley CEO on The Practitioner Hub, published 9 May 2016: http://www.inclusivebusinesshub.org/use-of-partnerships-in-haiti-for-distributing-solar-lamps/, last accessed 9 January 2017
[8] Fonkoze website: http://fonkoze.org/resources/partnerships/, accessed 22 December 2016
[9] d.light press release "d.light Comprehensive Pay-As-You-Go Solar Financing Platform Now Available to Global Partners," published 29 June 2016

(IDB),[10, 11] and RE-VOLT has received donations from US-based charity Greater Good Haiti and individual donors through crowdfunding platform IndieGoGo.[12, 13] In addition, RE-VOLT has a strategic partnership with Digicel, one of the largest cell phone network providers in Haiti, to allow RE-VOLT customers to use Digicel's mobile money to pay the monthly installments of RE-VOLT's rent-to-own payment scheme.[14] To help it establish mobile money in Haiti, Digicel received a grant from USAID and the Bill & Melinda Gates foundation.[15] RE-VOLT sells the d.light SHS to end users through a network of local entrepreneurs.

d.light was the only company we found to be selling rent-to-own solar home systems to low-income consumers in Haiti. Rent-to-own payment schemes like that used by RE-VOLT consist of the end customer making a down payment at the initial time of purchase, and then making a payment each month to keep the system operating. If the customer misses a payment, the system locks and cannot be used until the customer pays. At the end of a specified number of payments, for example after 24 monthly payments, the system is permanently unlocked, and the customer owns it. This rent-to-own model has been used in other low-income markets around the world, particularly in East Africa where mobile money has high penetration levels and is an attractive way to make an otherwise expensive product affordable for low-income consumers. However, as RE-VOLT's CEO notes in a 2015 press release, the rent-to-

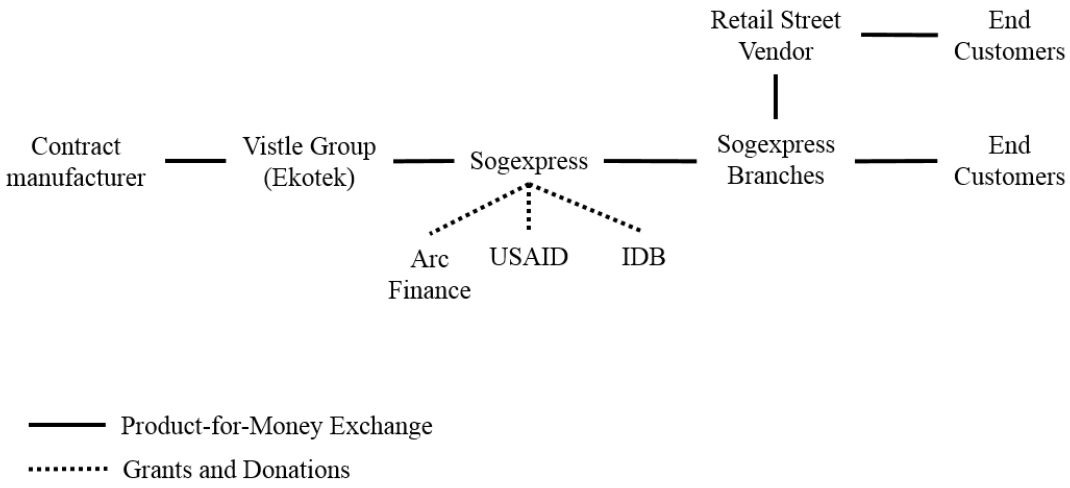
[10] d.light press release "d.light Raises Over $22 Million to Expand PayGo Business into New Off-Grid Solar Markets," published 21 September 2016
[11] GSMA website: http://www.gsma.com/mobilefordevelopment/grantee/d-light, accessed 22 December 2016
[12] Greater Good Haiti website: http://www.greatergoodhaiti.org/uncategorized/haiti-projects-2015/, accessed 22 December 2016
[13] IndieGoGo website: https://www.indiegogo.com/projects/help-bring-clean-affordable-electricity-to-haiti#/, accessed 22 December 2016
[14] The World Bank's "SREP Investment Plan for Haiti" published 13 May 2015, available online: https://www-cif.climateinvestmentfunds.org/sites/default/files/meeting-documents/srep_13_5_srep_investment_plan_for_haiti_0.pdf, accessed 22 December 2016
[15] USAID press release "Gates Foundation and U.S. Government Give $2.5 Million Prize for Transforming Banking Sector in Haiti," 10 January 2011

own scheme has only recently become a viable business model thanks to advancements in technology that enable remote communication with the SHS and remote payments via mobile money:

> *"A few years ago, the economics of RE-VOLT wouldn't have made sense. Today, this is a viable business model".*[16]

The "viable business models" of key stakeholders along d.light's supply chain – enabled by technological advancement – were an important means of how the supply chain can achieve long-term sustainability.

**Figure 7: Development Supply Chain for Ekotek Solar Lanterns**




Vistle Distribution Group, "a family of companies specializing in the wholesale distribution of consumer electronics products" with an office in Port-au-Prince, Haiti,[17] sells its brand of solar lanterns, called Ekotek, to the Haitian-based money transfer

[16] PRNewswire RE-VOLT press release "New Startup Provides Affordable and Reliable Electricity to Those Most in Need with Single-Home Solar Energy Systems," published 19 October 2015
[17] Vistle website: http://www.vistle.com/, accessed 22 December 2016

service company Sogexpress, through a development initiative called "Klere Ayiti," or "Bright Haiti".[18, 19] Vistle buys its Ekotek-branded lanterns from contract manufacturers.[20] From its money transfer shops in Haiti, Sogexpress sells its lanterns directly to end customers and to retail vendors who sell the lanterns to end customers at their street market stands.[21] Arc Finance, USAID, and IDB provide financial support and technical assistance to Sogexpress as part of the Klere Ayiti initiative.[22, 23]

One of the unique features of this supply chain is that the "development" aspects – the goal of alleviating poverty through the sale of solar lanterns in a way that supports the local economy and aims at long-term sustainability – are driven principally by the in-country distributor, Sogexpress, through the donor-funded ongoing development initiative, Klere Ayiti. As Dominique Policard, Executive Commercial Director at Sogexpress explains in a blog post on Arc Finance's website:

> *"This program has not only the advantage of facilitating access to clean energy but also of helping the street agents access financial services. Sogexpress is very proud of this new program and hopes to scale it in the future."* [24]

Vistle Distribution Group, meanwhile, which owns the Ekotek brand of solar lanterns as part of its portfolio of consumer electronics that includes cell phones and accessories, is focused primarily on the commercial aspects of selling inexpensive solar lanterns, as their website homepage describes:

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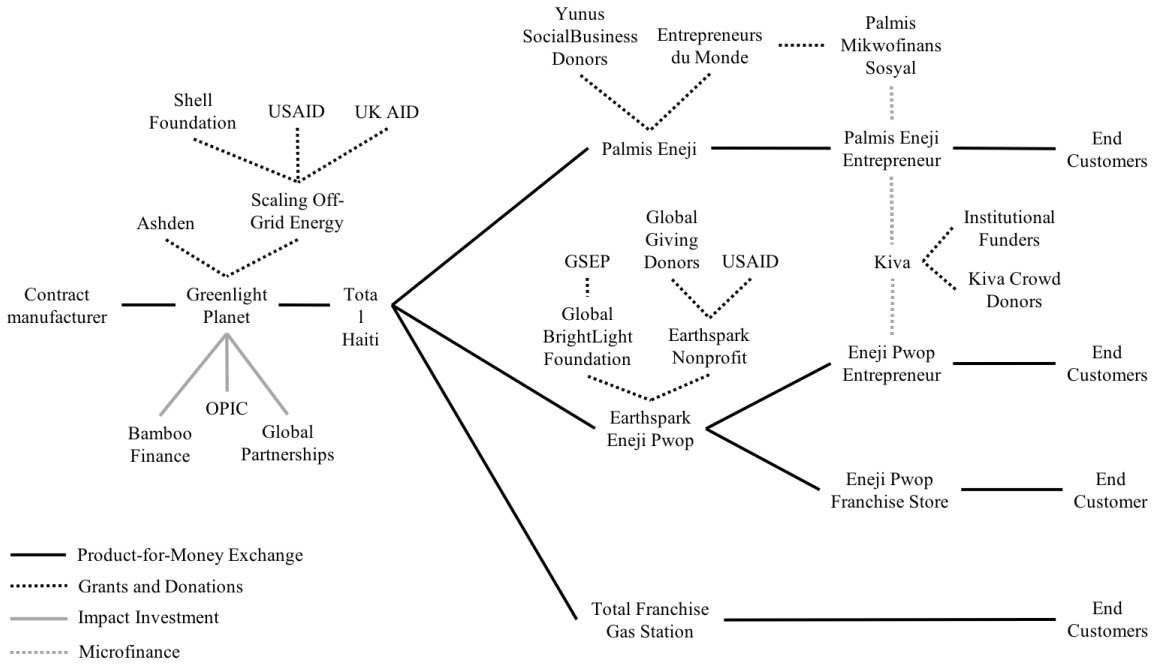
[18] Klere Ayiti website: http://klereayiti.com/ekotek-onix-solar/, accessed 22 December 2016
[19] Vistle Distribution Group website: http://www.vistle.com/, accessed 22 December 2016
[20] Vistle Distribution Group website: http://www.vistle.com/, accessed 22 December 2016
[21] Author's field observations, August 2016
[22] Klere Ayiti website: http://klereayiti.com/about/, accessed 22 December 2016
[23] Arc Finance blog: http://arcfinance.org/news/blog/arc-finance-and-sogexpress-launch-klereayiti-com/, accessed 22 December 2016
[24] "Sogexpress' Consignment Model Innovates in Inventory Supplier Financing for Solar Street Agents in Haiti," published 17 September 2016

*"Our aim is to provide maximum value on products at an entry level price-point." (Vistle website: http://www.vistle.com/, last accessed 22 December 2016)*

That these two stakeholders participated in the same development supply chain indicates that the supply chain offered them both opportunities to achieve their objectives even if these objectives are not necessarily aligned or based on the same utility preferences.

**Figure 8: Development Supply Chain for Greenlight Planet Solar Lanterns**




Greenlight Planet is "a for profit social business" that contracts with a manufacturer in China[25] to produce solar lanterns and solar home systems "designed to help people

[25] "From Gap to Opportunity: Business Models for Scaling Up Energy Access," International Finance Corporation, 2012

living off the electric grid," which it then sells in 54 countries.[26] Like d.light, the company won an Ashden Award, and has received investments from a number of impact investors, including Bamboo Finance and the Overseas Private Investment Corporation,[27] and from Global Partnerships.[28] The current distributor of Greenlight Planet products in Haiti is Total, the French oil and gas multinational corporation, as part of their brand Awango, "a line of innovative, reliable solar lighting and phone charging solutions" that "enable off-grid, low-income communities to meet some of their most basic everyday needs." [29]

As part of its Haitian operations, Total imports Greenlight Planet solar lanterns and sells them through three different distribution channels: to its network of franchised service stations; to Palmis Eneji, a Haitian organization supported by the French NGO Entrepreneurs du Monde[30] and individual donors through the Yunus SocialBusiness platform[31] and to Eneji Pwop, a Haitian social enterprise spun off from the US non-profit Earthspark.[32]

Eneji Pwop sells products to its franchise stores[33] and to micro-entrepreneur resellers.[34] Palmis Eneji also sells products through micro-entrepreneurs.[35] Kiva, a non-

[26] Greenlight Planet website: https://www.greenlightplanet.com/en/about/, accessed 22 December 2016
[27] Greenlight Planet press release "Greenlight Planet Announces $5MM Financing from OPIC To Serve 30% Off-Grid Households Worldwide," published 26 February 2016
[28] Global Partnerships press release "GP invests in Greenlight Planet to bring more solar lights to rural poor in Latin America," published 2 December 2014
[29] Total press release "Total Introduces Awango by Total: Solar Solutions to Improve Access to Energy," published 12 November 2012
[30] Entrepreneurs du Monde website: http://www.entrepreneursdumonde.org/espace-media/edm-dans-les-medias/du-programme-dong-a-lentreprise-palmis-eneji/, accessed 22 December 2016
[31] Yunus SocialBusiness website: http://www.yunussb.com/portfolio/palmis-eneji/, accessed 22 December 2016
[32] Eneji Pwop's "Gid pou Revandè Enèji Pwòp yo," published online 04 January 2015; Earthspark website: http://www.earthsparkinternational.org/, accessed 22 December 2016
[33] Earthspark blog post "Achieving Scale with EarthSpark," published 08 November 2009
[34] Earthspark website: http://www.earthsparkinternational.org/clean-energy-retail.html, accessed 12 December 2016
[35] Entrepreneurs du Monde website: http://www.entrepreneursdumonde.org/espace-media/edm-dans-les-medias/du-programme-dong-a-lentreprise-palmis-eneji/, accessed 22 December 2016

profit crowdfunding-based impact investor, provides zero- or low-interest loans to Eneji Pwop and Palmis Eneji, which in turn provide subsidized microloans (in the case of Palmis Eneji) or stock on consignment (in the case of Eneji Pwop).[36] The Haitian MFI Palmis Mikwofinans Sosyal, which is supported by Entrepreneurs du Monde, also provides microloans to Palmis Eneji entrepreneurs.[37] The Palmis Eneji and Eneji Pwop entrepreneurs use the microloans to purchase products from Palmis Eneji and Eneji Pwop, respectively, and resell them to low-income end customers around Haiti.

One of the important features of this supply chain is that an oil and gas multinational corporation was the in-country focal firm for this development supply chain. While it would be easy to dismiss these efforts as a corporate social responsibility (CSR) project to increase Total's goodwill and brand equity, Total's Chairman and Chief Executive Officer, Christophe de Margerie, said of the Awango brand in a 2012 press release:[38]

> *"We're aiming to sell one million solar lamps by 2015, which will improve the living standards of around five million people. Total has expert teams worldwide and financial capacity that allows us to test the most innovative solutions before deploying the most robust ones on a larger scale."*

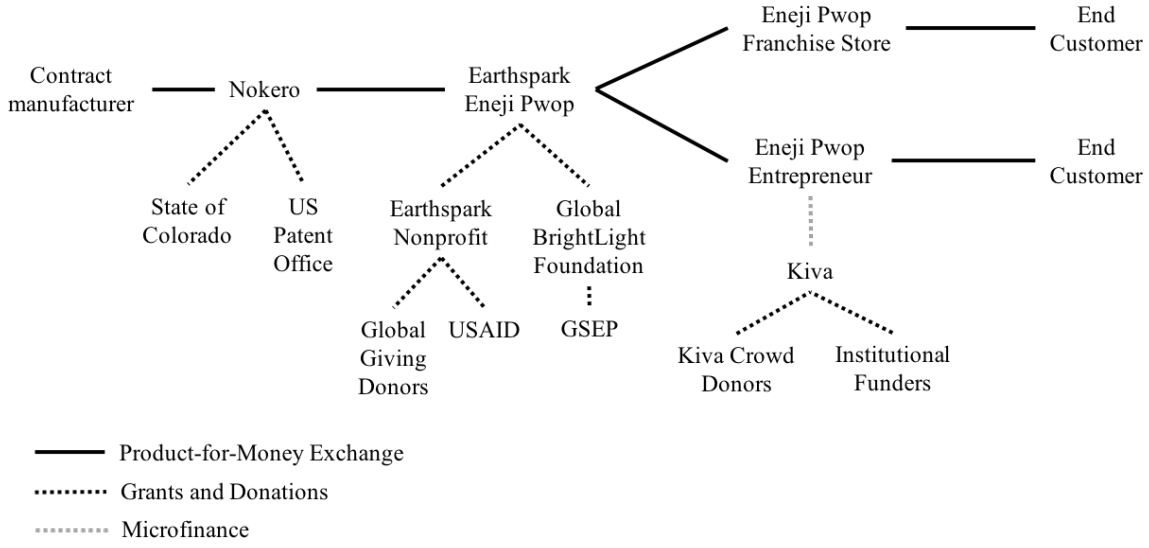
The press release also states:

[36] Kiva websites: https://www.kiva.org/about/where-kiva-works/partners/442 and https://www.kiva.org/about/where-kiva-works/partners/260, accessed 22 December 2016
[37] Entrepreneurs du Monde website: http://www.entrepreneursdumonde.org/espace-media/edm-dans-les-medias/du-programme-dong-a-lentreprise-palmis-eneji/, accessed 22 December 2016
[38] Total press release "Total Introduces Awango by Total: Solar Solutions to Improve Access to Energy," published 12 November 2012

*"Total is committed to fostering the emergence of innovative technological and marketing solutions to develop a more efficient, reliable and affordable lineup that is also economically viable enough to be sustainable and widely adopted."*

While these are public relations statements, they indicate a clear objective of Total to operate its Awango program in an "economically viable" way, with the recognition that solar lanterns can help alleviate poverty. In addition, Total sells its lanterns through networks of entrepreneurs, which helps stimulate the local economy. Rather than treating Awango as a CSR project, Total saw it as a brand of products to sell as part of development supply chains for household solar products.

**Figure 9: Development Supply Chain for Nokero Solar Lanterns**




Nokero, from "no kerosene," is a US-based company that sells solar lanterns in over 120 countries, with the mission to "remove kerosene lamps" from use in low-income countries.[39] Nokero works with contract manufacturers in China to produce its Nokero-

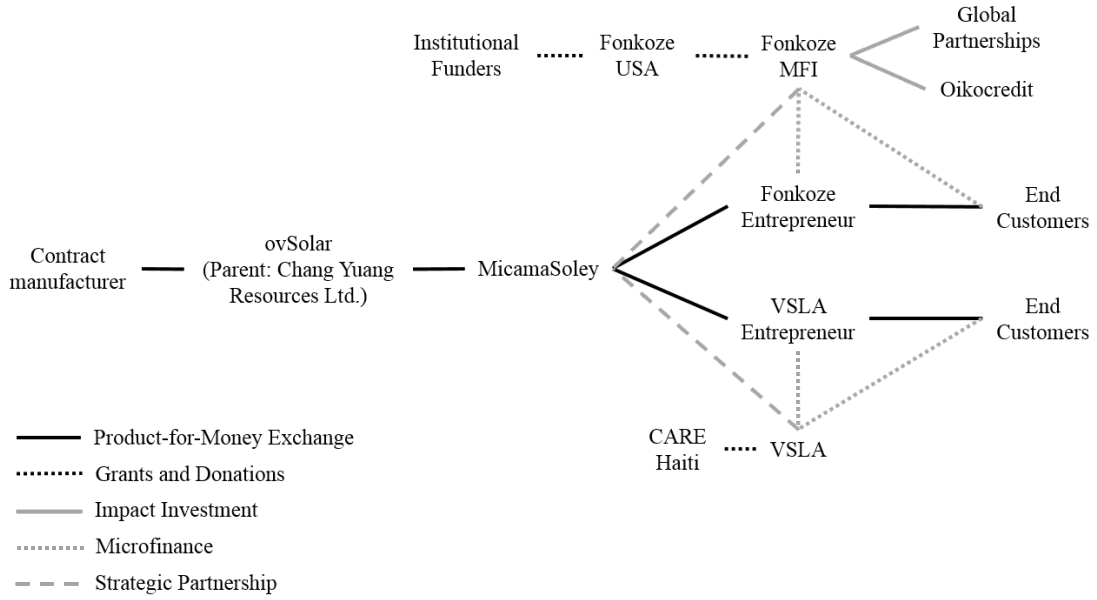
[39] Nokero website: http://www.nokero.com/, accessed 22 December 2016

branded solar lanterns.[40] The company recently received a grant from the State of Colorado "to develop new products",[41] and is "the only solar company to win the United States Patent and Trademark Office's Patents for Humanity Award".[42] Nokero's distributor in Haiti is Eneji Pwop,[43] the same social enterprise spinoff from Earthspark that distributes Greenlight Planet solar lanterns. Although Nokero does not actively control any of the distribution activities in Haiti, it views its products as "a catalyst for economic and community growth," listing some of the quantifiable impacts they can have on end customers (e.g., increased study hours for students and enabling people to work at night).[44]

One of the noteworthy features of this supply chain is the relationship between Nokero and its contract manufacturers. Nokero's Founder and CEO Steve Katsaros notes that he "has worked with his contract manufacturers for 13 years," and that "they're actually equity shareholders in the company." [45] This was an interesting example of a relationship between a buyer and its suppliers along a development supply chain.

[40] CompanyWeek article: https://companyweek.com/company-profile/nokero, published 8 November 2015, last accessed 22 December 2016
[41] Fox31 Denver article "Nokero solar light bulbs safely light up the world," published 14 October 2015
[42] Nokero website: http://www.nokero.com/, accessed 22 December 2016
[43] Nokero press release "Eneji Pwop 'Fills the House' in Haiti, published 2 December 2011
[44] Nokero website: http://www.nokero.com/, accessed 22 December 2016
[45] CompanyWeek article: https://companyweek.com/company-profile/nokero, published 8 November 2015, last accessed 22 December 2016

**Figure 10: Development Supply Chain for ovSolar Solar Lanterns**




Hong Kong-based ovSolar, previously known as Omnivoltaic until a rebranding on 15 June 2016,[46] "is a specialist product provider for Off-Grid products used by customers worldwide, especially for people who live in under- or unelectrified regions" with a mission to "make products that give people anywhere access to electrical services, for basic needs or for lifestyle choices."[47] ovSolar, owned by its Hong Kong-based parent company Chang Yuang Resources Limited, designs and manufacturers its products in China, and sells them to over 30 countries.[48] ovSolar sells its solar lanterns in Haiti through MicamaSoley, the social enterprise division of the Haitian mattress company SAFICO that also distributed d.light solar lanterns.[49]

One of the unique features of this supply chain is ovSolar's parent company, Chang Yuang Resources Limited. Before launching Omnivoltaic/ovSolar, Chang Yuang

[46] ovSolar press release http://www.ovsolar.com/index.php?m=Article&a=show&id=86: "Omnivoltaic Power Co., Ltd. has Officially Started Using Brand-New LOGO," published 15 June 2016
[47] Omnivoltaic website: http://omnivoltaic.com/about/, accessed 23 December 2016
[48] ovSolar website: http://www.ovsolar.com/index.php?m=Page&a=index&id=1, accessed 23 December 2016
[49] MicamaSoley CEO blog post: http://www.inclusivebusinesshub.org/use-of-partnerships-in-haiti-for-distributing-solar-lamps/, published 9 May 2016

Resources was primarily active in completely unrelated industries, including: "high-end ecological care and tourism for the seniors [sic], [and] new biological technology." [50] In 2008, Chang Yuang Resources "noticed the crisis caused by the glabal [sic] excess capacity of steel" and "gradually abandoned" its previous focus on "the iron ore business". It perceived "new energy" (i.e., solar energy technologies) as an interesting market segment for growth potential, but "instead of aiming at the silicon wafer market" (i.e., solar panel manufacturing) because of "serious excess capacity" in that segment, Chang Yuang Resources saw a business opportunity in providing "solar energy lighting in regions without or lacking electricity": [51]

> *"At that time, over one quarter of the global population were living in countries and regions without or lacking electricity. In those countries and regions, there were often sufficient sunshine and solar energy resources, which meant a large market and a great business opportunity. [sic] The application of solar lights can satisfy the household lighting needs of the local residents in those regions in a safe, environmental-friendly and sustainable manner, which is significant."*

Chang Yuang Resources perceived the market for household solar products sold to low-income individuals as an opportunity to create both economic and social value. As a result, it has devoted "substantial resources to support new product and market development" in order to pursue its goal of having ovSolar "be a leader in off-grid power solutions for people in places with no or insufficient access to electricity grid." [52]

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[50] ovSolar website: http://www.ovsolar.com/index.php?m=Page&a=index&id=1, accessed 23 December 2016
[51] ovSolar website: http://www.ovsolar.com/index.php?m=Page&a=index&id=1, accessed 23 December 2016
[52] Lighting Asia website: http://lightingasia.org/Pakistan/business-support/, accessed 23 December 2016

## Appendix 2: Example Quotes from all 21 Operations Strategy Formulation Events in Chapter 3

The following table presents representative quotes from all 21 instances in which a social enterprise in our study developed an operations strategy, illustrating the robust evidence for the one-to-one relationship between the area(s) of operations onto which a particular threat or opportunity was mapped, and the area(s) of operations implicated in the operations strategy developed as a response to the opportunity or threat. Because this table presents all 21 observations from our data, it necessarily includes the observations presented in Table 14.

**Table 15: Representative Quotes from All 21 Operations Strategy Formulation Events Observed in the Data**

| **Step 1** *Perceive a Threat or Opportunity* | **Step 2** *Map Threat or Opportunity to Operations Decision Area* | **Step 3** *Develop Operations Strategy According to How Threat or Opportunity was Mapped onto Operations* |
|---|---|---|
| Threat: shift in customer preference away from current product offering<br>**Organization A**: "I think there is a customer shift. […] It's really changing, what the average customer buys, and so I think it's an area of real focus for us." | Mapping to Product Development<br>"So, what does the average off-grid house in [the country of operations] buy in 2019? And we think it'll be – or, you know, just steps along the way, the point is, it's always changing – we think it will be a home system, and we think it will be a solar system that provides more than just lighting and phone charging but probably entertainment and | Product Development Response<br>"I think we're really intently trying to figure that out. And we've actually just launched our first home system product, and that's priced at about $85 and for us that's sort of the top of our market in terms of the customer segments that we access today" |

| Step 1 | Step 2 | Step 3 |
|---|---|---|
| | perhaps a fan, and things like this." | |
| Threat: copycat products stealing market share<br>**Organization A:** "[Customers] say "you know, I want the yellow one, too." So I think that's a little bit of a challenge for us: how do you turn this from "the yellow one" into "the [Product Name]" because at some point someone just needs to make a yellow one and that could be a problem for us." | Mapping to Organization Development<br>"This brand question is […] not an issue for us today, but we kind of fear it. We fear the copycat product. I think we realize there's sort of a window of opportunity to get this right, or we're just going to be the ones that created the category and then kind of forgotten about." | Organization Development Response<br>"On the branding side, six months ago we didn't have a marketing function. And while I wouldn't say over six months we've got a robust full function here, it's been a big focus" |
| Opportunity: Unmet customer need is light not electricity<br>**Organization A:** "We were looking at village level electrification, so we took diesel generators, converted them into biodiesel and electrified the entire village. […]. When we came back, we saw that […] what people were doing instead is that they were taking electricity from the generator and they had connected light bulbs. […]. So that's when the realization first kind of came is that for an un-electrified village the primary use of electricity is first, light." | Mapped to Product Development<br>"So, we went back to the drawing board and figured that people want light and that's a much easier problem to solve than providing them 24-7 electricity." | Product Development Response<br>"So, we went back, and we designed that solar power light." |
| Threat: product not working properly<br>**Organization B:** "USAID was visiting with us to go visit an entrepreneur— We went out to visit one of our entrepreneurs | Mapping to Product Development<br>"She's like 'Oh, it hasn't been working for six months.' 'What? Why didn't you say something? It's under | Product Development Response<br>"And that's one of the things we started doing. After you install one of these larger systems, you do put in that |

| Step 1 | Step 2 | Step 3 |
|---|---|---|
| and she took us out to her customer and the customer is a nurse who runs a clinic out of her house and she gets a lot of people who come visit her at night. […] And of course, when we get there the stupid thing [the solar lantern they had sold to the nurse] is not working. […It was] a little embarrassing to be there with USAID watching." | warranty! We're talking about saving lives here!' She just didn't really think that that was an option. You have to teach warranty – warranty skills – to our entrepreneurs so that they do know to follow up." | phone call: 'hey how's it going? Is it still working for you?' We had to teach some of our entrepreneurs even Customer Service 101." |
| Opportunity: new demand from East Africa<br>**Organization A:** "It probably should have been obvious, but where that clicked for us was that we started getting all these embedded inquiries, and most of them originated in East Africa" | Mapping to Distribution Network<br>"In our very earliest stages, we saw the entire company as a direct sales business and we never even considered that there could be large orgs out there that would just want to buy and distribute it." | Distribution Network Response<br>"And then we said, ok, this is clearly an important route to market. There's a lot of very capable last mile channels already; we should figure out how to work with them. […] And I think now, you know, if I were to guess, I'll take some of our largest channels, most of them are MFIs." |
| Threat: lack of existing distribution network<br>**Organization A**: "The issue is distribution system; the issue is how do you take good products into rural homes that need it and that does not exist today in India and Africa anywhere" | Mapping to Distribution Network<br>"If I can create the distribution network, I can introduce solar lights into many, many more homes but if I do this well, and if I do this correctly, then I am not going to stop with solar lights. I am going to continue developing other socially relevant products and make them available to the same customer, things like cook stoves, water purifiers, | Distribution Network Response<br>"Now, how do you develop it? Really, it's kind of, it is somewhat the idea was that how do you empower each person to promote the products in their own social network because we saw really happy customers and they would go and tell everyone that hey this is cool product. […] So, we said, hey why don't we incentivize this guy, a happy customer to kind of promote the product himself or herself. |

| Step 1 | Step 2 | Step 3 |
|---|---|---|
| | nutrition products whatever have you." | […]. When we kind of developed this model, it wasn't just kind of an organic development. […]. The amount of investments we made in getting that structure right was ridiculous. […]. Right now, we have a five-tier management structure. […] Everything is kind of like a machine, […] the performance metrics and tracking metrics, and I can tell you the performance of a salesperson at the end of the week, […] who is selling what, when, why, where, everything." |
| Threat: lack of outreach to distributors<br>**Organization C:** "To date, 100 percent [of our dealers] have approached us, and that might be a bad situation." | Mapping to Distribution Network<br>"We might be better off getting more strategic about our outbound. […] We get so much press and we get a lot of interest as a result coming towards us. That causes a lot of people to fill out a lot of dealer apps, and then we have six sales people that go through those dealer apps and respond" | Distribution Network Response<br>"We're in the middle of a big pivot towards---- or, away from that model, because now after four years we kind of have a better view of what works. [...] Just looking at who really does buy, and how – it's Sales 101 stuff, right – like, how do you avoid the time-wasters." |
| Threat: weak capabilities in distribution<br>**Organization D**: "The sales and distribution part, and also the marketing part that is where we are still lacking expertise and skills. I think that is where we are still weak, which is reflected by the fact that we are | Mapping to Distribution Network<br>"The problem with distribution is that we find it hard to identify the right person in the village to become our distributor and to train and to support him or her. It takes a | Distribution Network Response<br>"So, if there is a partner, a potential partner with large distribution network already set up and running it is much easier for us to tap into their network and cooperate and sell through such a network. It saves lot of time. It saves lot of |

| Step 1 | Step 2 | Step 3 |
|---|---|---|
| still trying and testing various approaches and we are not making too much progress there" | tremendous effort to grow such a person." | resources. It may even help the distribution partner to improve the productivity of his entrepreneurs in the field by adding another product to the range that they already have. So that is how we hope to be able to go through and speed up the source processing and the expansion process." |
| Threat: distributors struggle to keep up sales<br>**Organization C:** "That's been one of the bigger surprises – just figuring out how to actually affect sales that repeatedly happen over and over and over again. […] Even with the right resellers— but they just— even the best ones have struggled." | Mapping to Process Technology<br>"It's tough to get people to adopt these technologies as sensible as it is, it's really tough. […] We have supported [our resellers] in some ways but we haven't totally owned it like a franchise or franchisees." | Process Technology Response<br>"We've created some tools that we're going to be running out pretty soon with our public service announcements that will help with that. [...] We funded a guy who is a specialist in this, and we'll be rolling those out hopefully in the next six months. So, once we have them ready— it's just a way to communicate en masse with people about behavior change." |
| Threat: Unable to capitalize on marketing push<br>**Organization G:** "We did a big marketing program, and we generated 1,000 leads and we didn't have enough people to go and follow up with those leads, so we wasted them. You know, the leads go cold if you don't follow up within 24 hours." | Mapping to Distribution Network<br>"We grew sales very quickly, and then we didn't have enough solar technicians to provide the level of service that we needed. We grew sales very quickly; we didn't have enough people even in our call center to respond to calls." | Distribution Network Response<br>"For the model to work a number of different pieces need to come together and work very well in harmony. And very often you need technology to harmonize those things. […] How much longer can we use brute force, you know duct tape or things like that, to hold it together while we continue to grow? [...] I believe strongly that for this model to work we have to |

| Step 1 | Step 2 | Step 3 |
|---|---|---|
| | | apply technology to it in many places." |
| Threat: dealer model did not work<br>**Organization H:** "[The company] burned its fingers a bit with the dealer model, a franchisee model back in the day, where systems were sold through a franchisee but then it became a very sales-oriented kind of pitch" | Mapping to Distribution Network<br>One of [the company's] strengths is this whole person-to-person interaction, and this kind of networking that we have, and dealers tend to take a very different approach. It's a sales approach to things. And so, it [the franchise approach] didn't really work well for [the company]." | Distribution Network Response<br>"The Business Agent came up from that learning, where we said we would have these commission agents, and they're commissioned – they're not on the rolls of [the company], they're paid as per certain milestones that they cross. […] The idea was that they worked very closely with the branch, so they don't really do the installation. The branch still does the installation. […] This person acts like an extend arm of the branch. […] And then in some cases we may train them to a certain extent to take care of basic technical repairs. But by and large, they are closely associated with the branch." |
| Threat: customers not aware of product company<br>**Organization G:** "We would call up our customers that [our partner] had sourced, and the customer had no idea who we were. They didn't even know that [we] were involved in the transaction." | Mapping to Distribution Network<br>"We didn't know that, but that's one of the challenges of selling through the [partner's] channel. You don't really know that that front line sales person is communicating it correctly. [...] From a scale perspective it was a problem because we weren't getting enough leads, enough customers, from that channel." | Distribution Network Response<br>"We need to build our own sales channel, and own that conversation with the customer. [...] That was going to be a big investment to go and build that channel." |
| Threat: new tax increased costs | Mapping to Distribution Network | Distribution Network Response |

| Step 1 | Step 2 | Step 3 |
|---|---|---|
| **Organization C:** "While [a container of our product] was on the water the [national] government reversed a long-standing zero VAT position for solar lights and solar lamps and cost us $42,000 while the container was shipping. Because they ran it through parliament – the MPs – very fast." | "It really froze the market for about six months because all of our pricing model was built on a certain level of cost, and it went up by 18%. […] We had a lot of commercial interest and a lot of people interested in [that country], in distributing there, but we weren't actually affecting any sales because by the time small trade-level products – I'm talking about LCL shipments, less than a container load – all those sample sales get to be cost prohibitive, moving them through customs, getting them to the end customer could mean double the price." | "We made a decision to invest in a container product that we held and moved it all the way into [the capital city]. Having the product in [the country] could mean that customers could buy it direct and not have to wait the 30 days for production and 30 days for shipment and 2 weeks for customs clearance. So that was the theory of why we moved that inventory into [the country] – was to be better for the retailers there." |
| <u>Threat: Prospective distributors do not understand the business proposition</u><br>**Organization B:** "Even if you go to a women's group and make a presentation about here's this great business opportunity, "do you want to sign up?" You know, if you get 50 hands raised in there, you know that they're not really signing up because they want to, they're signing up because they think it might be a free t-shirt or a free lamp or even tea that afternoon. […] Because there aren't 50 people in a room together, with every single one of them truly | <u>Mapping to Distribution Network</u><br>"So, going from consignment to micro-franchise was a little bit of a shift at getting at that real answer. […] If I say, "Can you sell $500 worth of this?" they say "Yeah, if you want, I'll try," versus if I say "will you buy $500, and when you sell it, pay me?" you're going to think a little bit more about saying "yeah"." | <u>Distribution Network Response</u><br>"The first step away from it was changing it from a micro-consignment project like that to a micro-franchise project. So, the difference being – zero difference in how things physically acted – but the big difference being the point of sale then became between us and the entrepreneur. We sold to her. And at the same time, entered into a 30-day credit for that sale. The point behind that was shifting philosophically and emotionally the ownership of the product that she had in her possession" […] So [the microfranchisee] would buy |

| Step 1 | Step 2 | Step 3 |
|---|---|---|
| wanting to start a business. […] So, when you get that kind of response, you go "Ok, we didn't get the real answer here. How do we get at that real answer?" | | something and have to pay for it in 30 days with the idea that that gave her a period of time to sell it so that she would have the cash to pay [us back] for it. […] So, it's like a rolling inventory loan." |
| Threat: customers have very low income levels<br>**Organization D**: "As the target group is quite poor it is also necessary to look for solutions for financing." | Mapping to Distribution Channel<br>"We have tried to work with the micro financing institutes a couple of times, but it was not very successful. In [the country where the company operates] there is large number of those networks, organizations, and they are quite expensive. They charge very high interest rates and we felt that our clients were not really inclined to take out a loan from an MFI to buy our product." | Distribution Channel Response<br>We [now] have a rental scheme. […] It works like this, we have an entrepreneur in the field, it is a revenue sharing scheme, so we provide the lanterns to him free of charge, and half of the revenue would come back to us, and the other half he can keep as his income, so in that way we have a payback time of around 15 months for the lanterns." |
| Opportunity: new technologies emerging to enable pay-as-you-go<br>**Organization A:** "I think there's a lot of interesting work right now in financing models for this. […] Some of these enabling technologies are really interesting and potentially very impactful. Could have a huge impact in opening up the category." | Mapping to Process Technology<br>"The point is we are selling through MFIs, and they're doing a great job, and the customers are buying larger products, and it skews even more towards the high value product, with MFIs. And the ability just to figure out how to provide direct consumer finance, it could really change the space. […] But the point is the potential for the customer | Process Technology Response<br>"So, these kind of PAYG models are very interesting. For us the objective is not 'figure it out' or, rather, it's not 'do it,' it's kind of 'test it, understand it, and decide whether it can work or not, and then go from there.'" |

| Step 1 | Step 2 | Step 3 |
|---|---|---|
| | to pay for a product over time is huge." | |
| Threat: customer non-payment<br>**Organization E:** We've realized through some studies that we've made that [...] if we are able to get a good payment recollection, then it's better to [offer financing] ourselves. And if we're not as successful, then it's better to get a third party to take the risk." | Mapping to Distribution Network<br>"So, I think payment – the recollection portfolio – is really important. [...Collecting money from customers is] a huge challenge that's upon us. […] We have to have in our model at least 10-12 [percent] default, and historically it's not been that way. So, I think the payment – our portfolio performance is really important if we're going to continue doing credits [in-house]." | Distribution Network Response<br>"So, I think that it is a huge challenge for us to make our credit process much more professional and increase our capability of monitoring and supporting customers in payments. […]. "One thing we're doing right now is we're partnering with different social MFIs, [...] to give better conditions and subsidies for our kind of products. So, we're trying to get as many credits as possible done through third parties. […] So right now, we're trying to get a mix of at least 30 percent third parties in the [consumer finance] equation." |
| Threat: distributors maxed out their credit<br>**Organization B:** "Eventually we ran into an issue that by providing credit [...] increasingly our entrepreneurs got themselves maxed out on their credit limit with us and got themselves gummed up. Basically, we started seeing over time this--- everything kind of grinding to a halt because everyone was getting maxed out on their credit for one of a hundred different reasons." | Mapping to Distribution Network<br>"[The resellers] would sell the product, which would be great, but they would then use the money for what they really wanted to use the money for. And then of course when it came time to repay us, they were like 'oh, I don't have the money. I can't repay you.'" | Distribution Network Response<br>"We're doing everything on cash sales. […] And it started, and from day one, we've been doing it without credit, and it's been beautiful. […The resellers] can start with 1, 2, 10 products, whatever they can get started with. […]. So we've partnered up, in loose ways, nothing formal – we've never done any formal partnerships – but we have--- where we have relationships in a community and can point women towards, "here's a savings group" or |

| Step 1 | Step 2 | Step 3 |
|---|---|---|
| | | "here's a microfinance organization that will work with women like you" and we do that." |
| Threat: customers unhappy with just a lantern<br>**Organization F:** "Initially we just started with solar lanterns. And that's when we start getting a lot of feedback that people are not just happy with, say, a lantern" | Mapping to Product & Distribution Network<br>"That's when we started looking into larger home lighting systems, larger solar systems […] So we also had to develop--- understand about the larger solar systems. […] The challenge was more with the cost, with how we can make it more affordable, and introducing--- looking into different financing models with microfinance institutions, working with rural banks." | Product Response<br>"We want to see how energy can play a role to solve various different social problems. […] We're looking at sort of a more holistic approach where we can provide customized solutions as per the requirements of our customers. So, yeah, we've gone from just a bigger distribution company to a more solutions-oriented company."<br>Distribution Network Response<br>So, a lot of focus we started putting into developing the whole system wherein we have the right kind of grassroots partners, […] financing partners, who can ultimately increase the deployment of solar lighting and other solar systems." |
| Threat: loss of organization leadership<br>**Organization D:** "Basically, we had a succession problem at that stage because I was leaving, and we hired a new guy to take my place but then that didn't work out well. And we ended up in quite a serious crisis where we fired this guy and hired another one and it was again the wrong choice, so | Mapping to Product Development and Distribution Network<br>"We can't really invest in developing new lanterns or better batteries, to improve our product. […] We are trying to focus purely on the solar home systems at the moment. […] We set up a deal with a couple MFIs – microfinance institutes – to finance our systems, and | Product Response<br>"So, from that moment, we had to cut activities – we had to say, well, we are spread too thin, let's focus on one single thing. We said, ok, what has the best margins – the solar home systems – so we decided to focus on the solar home systems."<br>Distribution Network Response |

| Step 1 | Step 2 | Step 3 |
|---|---|---|
| we got into quite some trouble. We had to really scale down the team and go into survival mode" | we were already preparing that with this director that left us, or that we chucked out. […] We're more like a product company – we're engineers – and this is hard. Distribution is difficult for us. So, we're trying to do it, but the distribution is quite tough. We have not really managed to scale it up very much. […] We actually make the fiberglass boxes locally, but when we get to scale, we have to get away from that because it's a lot of work and again, it's another activity, so we really have to cut activities and focus on sales." | "We set up a deal with a couple MFIs – microfinance institutes – to finance our systems. […] Currently we have sales reps selling solar home systems in– – we're just about to start the 4th province. […] These sales guys they do village meetings, community meetings, where they present the product. We put a demo solar home system in the house of a promoter in the village. This guy organizes a community meeting, and people come there – people that he thinks or she thinks are eligible for a loan [from an MFI] or to pay cash for this system, and then our guys come and do a presentation and they follow up." |
| Threat: microgrids not a viable market<br>**Organization G:** "We realized that, 'Wow, microgrids are pretty complicated' and all these social and business and technical and government and local political and state political issues that we didn't understand." | Mapping to Distribution Channel and Organization Development<br>"We had assumed that there were a lot of microgrid companies that were coming up [...] but then we had then come to a realization that there aren't really that many customers out there. [...] It didn't feel like an opportunity to productize metering yet. […] What I did hear was that a lot of companies wanted to pay us to customize a solution for them. And that meant that this wasn't a product business | Distribution Response<br>"So, I needed to take the board [...] from the viewpoint that "wow, there's a pure play technology company here" [...] to "oh my goodness, we need to be more vertically integrated. We need to raise the capital. We need the prepaid metering technology. We need to build our own channel to reach customers. And I guess we need our own solar home system product as well. We need to do all of that."<br>Organization Development Response |

| Step 1 | Step 2 | Step 3 |
|---|---|---|
| | where we could sell a metering solution. [...] Your client comes to you with a problem and you help develop a one-off solution for them. [...] In that business model, you basically just make a mark-up on your engineering time." | "We made the decision to just focus entirely on the B2C opportunity. The intention was, by focusing on that, we could do better at it – really put all of our resources on that. […]. There's no one else who's really going B2C the way we are. No one else that's doing pay as you go solar and selling to consumers. There are different ways of thinking about what we do. I think of it as basically asset financing." |

## Appendix 3: Interview Protocols

In the sections below we present the interview protocols for Chapters 2 and 3.

**Interview Protocols for Chapter 2**

*Guiding Questions for Round 1 Interviews with Product Company CEOs*

- What products do you make?
- How long has [company name] been in business, and have you always been [person's title]?
- Where are the products sold?
- Where are your headquarters?
- Why is your organization in this business in the first place?
- Who manufactures your products, and how did you select your manufacturer?
- Describe the supply chain, starting from the manufacturer in [country] all the way to the end user in Haiti.
- Who are the key stakeholders of that supply chain?
- What does [key stakeholder mentioned] contribute to the supply chain, and what do they receive in return? [Repeat this question for the stakeholders that the informant mentioned in response to the previous question.]
- What would you say are your core strengths as an organization that enable you to produce and sell [solar lanterns or solar home systems] that are ultimately sold in Haiti?
- Where do your revenues come from?
- Have you received any grants, impact investment, or other subsidized financial capital? If so, what type of funding was it, who was it from, and what did the funder or donor want in return?

- What do you look for when selecting organizations you work with – either as suppliers or distributors?
- Ultimately, what does your organization get in return for producing and selling [solar lanterns or solar home systems]?

*Guiding Questions for Round 1 Interviews with Expert Informants*

- What is your experience with [the solar lantern / solar home system sector; poverty alleviation; microfinance; impact investment; social enterprises; Haiti]?
- Why do you think donors and impact investors are interested in financially supporting organizations that make or sell solar lanterns and solar home systems?
- What is it that holds the supply chain together when you have such a variety in types of organizations along the chain – commercial companies, donors, micro-entrepreneurs, distributors, product companies, manufacturers, etc.?
- What do you think are the key stakeholders we should speak with along the supply chain for solar lanterns and solar home systems sold in Haiti?

*Guiding Questions for Round 2 Interviews with Key Supply Chain Stakeholders*

- How long has [company name] been in business, and have you always been [person's title]?
- Where are your headquarters?
- Why is your organization in this business in the first place?
- How and why did you partner with [stakeholder along the supply chain]?
- What do you contribute to this partnership, and what do you receive in return?
- Where do your revenues come from?
- Have you received any grants, impact investment, or other subsidized financial capital? If so, what type of funding was it, who was it from, and what did the funder or donor want in return?

- What do you look for when selecting organizations you work with – either as suppliers or distributors?
- What would you say are your core strengths as an organization that enable you to participate as a/an [insert their organization's role – e.g., distributor, donor, impact investor, micro-finance organization] in the supply chain for [solar lanterns or solar home systems] sold in Haiti?
- Ultimately, what does your organization get in return for participating in this supply chain?

*Guiding Questions for Round 3 Interviews with Micro-entrepreneur Retailers of Solar Lanterns and Solar Home Systems*

- What types of products do you sell?
- From whom do you buy the [solar lamps or solar home systems]?
- Do you have access to credit, either from a microfinance organization or from [the distributor mentioned in response to the previous question]?
- Who are your customers?
- Why did you start selling [solar lanterns or solar home systems]?
- How do you attract clients?
- How does selling the lanterns help you and your family?
- Do you own a lantern yourself? If so, how has the lantern impact you and your family?
- What do your customers like about the lanterns? Why do you think they buy them?
- What do you need in order to sell solar lanterns – in terms of personal skills and tangible things like money, a place to sell them, etc.?
- About how many lanterns do you sell per week?
- At what price do you sell the lanterns?

- Do you offer a warranty on the lanterns?
- What challenges have you faced in selling lanterns?
- How did you overcome [the challenge mentioned in response to previous question]?

*Guiding Questions for Round 3 Interviews with Micro-entrepreneur Retailers of Competing Products*

- What types of products do you sell?
- From whom do you buy the [products]?
- Have you heard of [brand names of products in five supply chains being studied]?
- Do you have access to credit, either from a microfinance organization or from [the distributor mentioned in response to the previous question]?
- Who are your customers?
- Why did you start selling [products]?
- How do you attract clients?
- How does selling these products help you and your family?
- Do you own a solar lantern or solar home system yourself? If so, how has the lantern impact you and your family?
- What do your customers like about the products you sell? Why do you think they buy them?
- What do you need in order to sell [products] – in terms of personal skills and tangible things like money, a place to sell them, etc.?
- [If selling solar lanterns or solar home systems:] About how many lanterns do you sell per week?
- [If selling solar lanterns or solar home systems:] At what price do you sell the lanterns?

- [If selling solar lanterns or solar home systems:] Do you offer a warranty on the lanterns?
- What challenges have you faced in selling [products]?
- How did you overcome [the challenge mentioned in response to previous question]?

**Interview Protocols for Chapter 3**

*Guiding Questions for Interviews with CEOs / Senior Manager*

- How long has [company name] been in business?
- [If the person is not a founder/co-founder:] How long have you been [person's title]?
- What are some of the major changes that you've made to your business, or the way you do business, over the past two years?
- [For each of the changes mentioned:] Could you describe [the change mentioned] in a bit more detail? In particular:
    - Why did you decide to make the change?
    - What had been working prior to the change?
    - What had not been working prior to the change?
    - How did you go about actually making the change?
    - What impacts has the change had on your businesses?