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Toward A Theory on the Reproduction of Social Innovations in Subsistence Marketplaces*

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Social innovations and their diffusion are critical in bridging the multiplicity of deprivations experienced by those in subsistence contexts. Yet they often do not diffuse as expected. To better understand this prevalent problem, this article develops a theory of diffusion that explains the reproduction (duplication) of social innovations in subsistence contexts. The theory utilizes a bottom-up perspective that considers what attributes of innovations and capacities of actors matter to reproduction, particularly for subsistence user-producers. Adopting an inductive, case-based approach, the authors draw on examples of social innovations in sub-Saharan Africa. Based on the authors' research and extant literature, this article builds a typology that captures different modes of reproduction. The typology delineates three archetypes of reproduced social innovations: mimetic, facilitated, and complex, and notes how frugal innovations can emerge from these archetypes. These archetypes are based on the interactions of: (1) a product's resource and knowledge complexities, and (2) the knowledge capabilities or resources of various actors, including subsistence user-producers and bridging agents. The typology thus illuminates the conditions under which subsistence user-producers might independently reproduce a social innovation (mimetic innovations), when they need assistance from bridging agents (facilitated innovations), and when the mix of resources and knowledge are beyond their capacity (complex innovations). Moreover, by exploring reproduction experiences of subsistence users, this article recognizes the implications of low literary, close social networks, and physical limitations. By examining who controls the knowledge and resources imperative to reproduction, the authors go beyond a focus on the social benefits of innovations to consider how intellectual property and profits matter to different actors. This article pulls together these various insights and identifies key implications that social innovators and intermediaries should consider when working to reproduce social innovations in subsistence contexts and with subsistence user-producers.

Practitioner Points

- The article develops a theory of the reproduction of social innovations (SI) from the perspective of subsistence producer-users, noting how literacy, closely linked relationships, physicalities, and access to resources and knowledge can affect the reproduction process.
- A typology is created to help practitioners understand why SI do or do not "go viral" through reproduction and when bridging agents are needed. (Un)Successful reproductions hinge on whether subsistence user-producers can feasibly acquire/manage two intersecting dimensions of SI—complexities of resources and complexities of knowledge.
- Three archetypes of SI are proposed. Complex: subsistence users may consume but will likely not produce (e.g., MPesa). Mimetic: subsistence users can readily produce on their own (e.g., simple solar cookers). Facilitated: subsistence users require bridging agents to enable reproduction (e.g., water ponds).
- Practitioners need to consider the heterogeneity in subsistence users' resources, knowledge, and physical capabilities, train for the "know-hows" *and* the "know-whys" in reproduction, address subsistence user-producers' potential risks/costs, support bricolage behavior, and recognize trade-offs in the competitive accrual of social and economic benefits.

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Introduction

Small water storage ponds dug in the ground litter the landscape of rural Kenya. Some are properly functioning, bringing about myriad benefits. Rather than spending two to six hours a day collecting water, children can spend that time attending school or women can pursue income-generating ventures (UNICEF, 2016). Water ponds improve farmers' livelihoods and resilience to climate change, allowing them to maintain or increase their agricultural productivity (UNCTAD, 2011). As the authors' fieldwork reveals, self-owned ponds enable families to grow kitchen gardens, and to thus supplement household diets with nutritious vegetables and incomes through the sale of surplus crops. Yet despite these benefits, many water ponds, which are typically built by subsistence users, have become dried-up holes in the ground, acting as deadly traps into which livestock and young children can fall. *Why is this the case?* The premise of this article is to explore this query. The authors consider why some innovations can be effectively reproduced by subsistence users while others cannot. The central question explored is thus: *What is it about the innovation and actors, and the interaction of these aspects, that matter to the effective reproduction of social innovations in subsistence communities?*

Social innovations, unlike pure commercial innovations, have at their core a desire to address social or environmental needs instead of merely profits (TEPSIE, 2015; The Young Foundation, 2012). Whether entirely new inventions or the redeployment of prior innovations in new contexts, they seek to "engage and mobilize … beneficiaries and help to transform social relations by improving beneficiaries' access to power and resources" (TEPSIE, 2015, p. 14). These types of innovations are often viewed as essential to overcoming many of the difficulties faced by subsistence or "base-of-the-pyramid" communities. Subsistence communities are characterized by chronic resource constraints, inadequate infrastructure, and undereducated consumers living near subsistence levels ($1–$2 a day) (Sheth, 2011; Viswanathan and Rosa, 2007).

Social innovations in subsistence markets have taken a range of forms. They include: products such as water ponds, energy-saving stoves, or solar lights (Holt and Littlewood, 2015; Prabhu and Jain, 2015); enterprise models like social franchises (McKague, Wong, and Siddiquee, 2017); and the creation of new markets such as mobile money markets (Onsongo, 2019). They address a range of social or environmental issues from inadequate access to electricity, housing, safe water, and sanitation services, through to unmet basic human rights such as education, formal financial services, and health care (European Commission, 2013).[1] As this article relates, some innovations are simple to reproduce; some complex; and others, like the water pond, deceptively complex. A review of the literature, however, finds that an understanding of the attributes of the social innovations themselves and how they impact reproduction (versus mere purchase, adoption, or usage), is rarely considered.

What the literature does stress is that the creation and diffusion of social innovations involve a range of actors—corporations, civil society, governments, community organizations, and social enterprises. Social innovations are often brought about by leveraging the strengths of relationship partners. Yet as the authors and other scholars note (George, McGahan, and Prabhu, 2012; Kolk, Rivera-Santos, and Rufin, 2014), although increasing attention is being paid to the various examples of social innovations in subsistence marketplaces (e.g., the Grameen Bank's microloans, biomass stoves) and the enterprises that generate

[1]While the authors recognize that there are myriad definitions of social innovations including whether it is an idea or a product, or relates to a legal or policy reformation or a process of developing an innovation that is social in nature (such as open source coding) (see Edwards-Schachter and Wallace [2017] for an overview), for the purpose of this article, the authors use the output (a product, business model, or market) as the basis of analysis.

BIOGRAPHICAL SKETCHES

Dr. Laurel Steinfield (DPhil, University of Oxford) is an assistant professor of marketing at Bentley University. Her research focuses on social stratifications, including gender, racial, and global North–South hierarchies. As a sociologist, transformative consumer researcher, and marketing professor, she studies how social stratifications interact with marketplace dynamics and how resulting injustices may be transformed through policy or market-based solutions. She has published in numerous journals including the *Journal of Business Research*, *Journal of Public Policy and Marketing*, *Consumption, Markets & Culture*, as well as in various edited books.

Prof. Diane Holt is the director of the Centre for Enterprise and Entrepreneurship Studies and holds the Chair in Entrepreneurship at the University of Leeds, UK. She has published over 100 articles, book chapters, and conference papers focused on sustainability, social enterprises, social innovation, and the role business can play in the alleviation of multidimensional poverty. She was the principal investigator for the ESRC-funded Trickle Out Africa project exploring social and environmental enterprises in 19 counties in sub-Saharan Africa. Her current research includes exploring resilience and agricultural practices among women farmers in Kenya (funded by a variety of sources including the U.K. GCRF fund) and a study exploring value chains among producer communities in the Amazon (funded by the Newton Fund).

them, little work appears that builds a theoretical understanding of how *users* in subsistence marketplaces can effectively adopt and—imperatively—possibly *reproduce* social innovations.

Reproduction involves attempts to *duplicate* social innovations. It is one mode in which social innovations may be diffused. Diffusion, in this article, relates to the spread of social innovations that may occur through subsistence users adopting, promoting, supporting, or building a social innovation through either a social franchise model or through their own production efforts. The ability of subsistence users to reproduce social innovations is intriguing given the interaction of resource constraints and underdeveloped formal institutions (such as inadequate provisioning of basic infrastructure), as well as the under-education or limited literacy and numeracy skills of subsistence users (Viswanathan, Seth, Gau, and Chaturvedi, 2009). If social innovations in their various forms are to facilitate inclusive growth and alleviate multidimensional poverty, a deeper understanding is needed of how these elements interact. The insights this article offers are particularly valuable given that many social enterprises, governments, and businesses attempt to "empower" community members to reproduce social innovations in hopes of achieving sustainable solutions that do not create a level of dependency (London, 2011; Pansera and Owen, 2015). The assumption seems to be that for some social innovations, demonstrating to subsistence users the benefits and how to use or re-create the product or involving them in the design process is sufficient for its diffusion. Yet as the case of the water ponds illustrates, this is not a simple equation. There are added layers of complexity that need to be considered if social innovations are to diffuse effectively and be adopted by the communities where they are most needed.

This article accordingly makes three contributions to existing theories and studies on social innovations. The first contribution stems from the adoption of Viswanathan, Seth, et al.'s (2009) and Viswanathan, Sridharan, Ritchie, Venugopal, and Jung's (2012) recommendation to take a bottom-up perspective: instead of viewing those in subsistence markets as merely end-users or beneficiaries (per a top-down perspective), this article views them as capable reproducers of social innovations. This leads to the articulation of a typology of social innovation reproduction that classifies innovations according to a combination of their: (1) complexities of knowledge, and (2) complexities of resources. The typology helps explain what types of social innovations subsistence users may be capable of reproducing given the constraints they face in accessing required resources, knowledge, or skills.

The second contribution adds to understandings on the role various actors, especially bridging agents, play in enabling subsistence users to overcome limitations, and to reproduce social innovations. This responds to George et al.'s (2012) call to expand the literature on bottom-up insights and top-down (organizational) approaches by integrating the two. As detailed, bridging agents can enable access to resources, reduce costs of experimenting, impart critical knowledge, and support subsistence users-producers' recombination of resources (bricolage). In the absence of these agents or inadequacies in their ability to fully understand their target markets' resource and knowledge-based limitations, attempts of subsistence users to reproduce social innovations may fail or incur debilitating consequences.

The third area of expanded insights considers the *sustainability* of reproducing social innovations, demonstrating important trade-offs that merit further consideration. These include trade-offs that arise among the various actors as they accrue social benefits, profits, intellectual property (IP) rights, and potential costs. By situating the analysis in an under-researched area—subsistence communities within sub-Saharan Africa—the authors are able to bring to the fore these overlooked concerns. They thus answer George, Corbishley, Khayesi, Haas, and Tihany's (2016) entreaty to use these under-explored contexts to "generate new theory and frameworks" on prevalent, pressing problems (p. 386).

To position these contributions, this article starts by framing the context under study—subsistence markets—and the implications this has for: (1) social innovations and involved organizations, and (2) subsistence users' involvement in reproduction. Although the majority of this literature informed the analysis only *after* initial data collection and examination, the authors choose to highlight the majority of the scholarship in the literature review so that readers can draw more significant meanings from the cases and quotes in the findings. After describing the inductive, comparative case method, and data analysis, the authors answer the overarching research question by drawing on evidence from a variety of social innovations. In the discussion section, this evidence is used to map out the typology of reproduced social innovations, to explore

the role of various actors, and to consider the accrual of benefits and costs. This article concludes with a discussion on the broader implications stemming from the analysis, including what the findings mean for researchers and practitioners and perceptions on the sustainable reproduction of social innovations.

Literature Review

The Environmental Context of Subsistence Marketplaces and Implications for Social Innovations and Organizations

A wealth of scholarship demonstrates that there are important differences between the well-resourced markets of affluent countries and the resource-constrained markets of subsistence communities. Subsistence marketplaces, defined as areas of exchange where "individuals and communities … struggle to fulfill their most basic of needs" (Viswanathan and Rosa, 2007, p. 5), are often hampered by inadequate physical infrastructure (roads) and limited provisioning of resources (water, electricity, education, transportation) (Prabhu and Jain, 2015; Viswanathan, Seth, et al., 2009). This in turn can affect the implementation and diffusion of social innovations as there is a lack of complementary assets (e.g., energy or water) (Berger and Nakata, 2013; Ramani, SadreGhazi, and Gupta, 2017). When working in these resource-constrained contexts, the often taken-for-granted existences of essential resources cannot be assumed.

The lack of basic resources and infrastructure are in part a product of institutional voids in formal structures. Institutional "voids," or what this article refers to as "gaps,"[2] reflect conditions in which formal structures, regulations, or policies that support markets are "absent, weak, or fail to accomplish the role expected of them" (Mair and Marti, 2009, p. 422). These gaps can lead to the under-provisioning of resources, and a marketplace governed by a sizable informal economy (e.g., informal saving group schemes). The informal economy dominates these markets because of limited suitable formal market mechanisms (e.g., banking) and decent employment opportunities (Holt and Littlewood, 2014). Interestingly, institutional gaps can act as both a catalyst and impediment for social innovations: they create opportunities for social entrepreneurs and organizations to address gaps in the market but can also impede the diffusion of innovations unless actors can find ways to overcome the gaps (Desa, 2012; Kolk and Lenfant, 2015; Mair and Marti, 2009; Onsongo, 2019).

In addition to these market conditions are localized social challenges and dynamics. As scholarship on the diffusion of innovation stresses, isomorphic pressures to conform can increase the legitimacy of innovations and their uptake by users. These pressures can include normative structures, like patronage systems (Pansera and Owen, 2015; Rivera-Santos, Holt, Littlewood, and Kolk, 2015), and/or sociocultural elements such as myths or traditional practices (Berger and Nakata, 2013; Rogers, 2003; Sesan, 2014). As detailed later, social relations are a defining aspect of subsistence users' lives. They are thus an imperative dynamic that implementers of social innovations can leverage to their benefit or ignore to their peril.

A summary of this literature is contained in Table 1. These studies, and the challenges and success factors they note, suggest that to make and deliver appropriate social innovations, actors need to: (1) leverage relationships and alliances, (2) engage in bricolage, and (3) account for the nuances of subsistence users' lives.

Leveraging relationships and strategic alliances. Forming strategic or social alliances (Sakarya et al., 2012) or developing a "relational capacity" (Murphy et al., 2012, p. 1700) allows resources to be shared according to the strength of each actor. Alliances in turn help to offset the institutional challenges and resource constraints that may impair the (re)production and diffusion of an innovation. For example, corporate players can provide financial resources to test and implement social innovations. Government or community officials can provide legitimacy to social enterprises, change problematic policies, or overcome cultural beliefs. Social enterprises can also provide local knowledge, expertise, access to networks, and locally based project management skills, which can improve the value appropriateness and uptake of social innovations (George et al., 2012; Kolk and Lenfant, 2015; Sakarya et al., 2012;

[2]The authors recognize Bothello, Nason, and Schnyder's (2019) critique of institutional "voids" as being a pejorative term that reflects a Western bias and that overlooks the informal mechanisms that exist in non-Western contexts. However, the authors use this term to initially connect their research to prior studies, but then re-name it to be "gaps" in formal institutions. The authors make apparent these gaps as the gaps do affect the reproduction of social innovations. However, the authors do *not* suggest that there is a complete absence of institutions. Indeed, their findings reveal many informal institutions (e.g., relationships) that enable the reproduction of social innovations.

Table 1. Summary of Literature on Subsistence Markets, Social Innovations, and Implementing Organizations

			Aspects Discussed													Success Factors							
Author, Date	Method	Focus/From the Perspective of:	Organization's Dynamics/ Capabilities	Institutional Gaps (Gov't Policies, Limited Complementary Assets)	(Mis)trust of Consumers	Socio-Cultural Practices and Beliefs	Limitations on Rights (e.g., Property Rights for Women)	Limited Resources	Financial Deprivation of Consumers	Knowledge Deprivations of Consumers	Physical Deprivations of Consumers (Health, Safety, Mobility)	Psychosocial Deprivations of Consumers (Low Confidence, Anxiety)	Intra-Community Relationships & Isomorphic Pressures	Lack of Incentives	Attributes of the Product	Immersion in Local Context	Involve Subsistence Users	Partnerships (Transfer Resources, Access, Knowledge)	Building Legitimacy/ Trust	Bricolage/ Strategic Use of Resources	Incentive Strategies	Appropriate Implementation Strategies	Monitor/ Measure Progress & Impact
Berger and Nakata (2013)	Case study	Implementing org. (business) & recipient users		x	x	x				x				x		x		x				x	
Desa (2012)	Databases	Social enterprises		x															x	x			
Ernst, Kahle, Dubiel, Prabhu, and Subramaniam (2015)	Surveys	Implementing org. (businesses)	x						x						x	x		x		x		x	
George et al. (2012)	Lit review	Implementing orgs		x		x		x		x								x		x		x	
Holt and Littlewood (2015)	Interviews	Social enterprises	x												x							x	x
Kolk and Lenfant (2015)	Case study	Implementing orgs & recipient users		x				x	x	x	x		x				x	x	x			x	
London (2011)	Multiple cases	Implementing orgs & recipient users	x	x				x	x	x					x	x	x	x	x		x	x	
Mair and Marti (2009)	Case study	Social enterprise	x	x	x	x	x	x										x	x	x		x	
McKague and Oliver (2012)	Case study	Implementing org and recipient subsistence producers	x	x				x	x	x	x						x	x				x	
McKague et al. (2017)	Case study	Implementing org (social enterprise)	x	x				x										x				x	
Meyskens, Robb-Post, Stamp, Carsrud, and Reynolds (2010)	Content analysis	Social entrepreneurs	x																	x			x
Murphy, Perrot, and Rivera-Santos (2012)	Case study	Implementing orgs (business & social enterprises)						x		x							x	x	x	x		x	
Nakata and Weidner (2012)	Lit review	Implementing orgs & recipient users							x	x	x	x	x		x	x		x					
Onsongo (2019)	Interviews	Implementing org. (business)		x		x		x	x									x	x				
Pansera and Owen (2015)	Interviews	Social enterprise & recipient users		x		x	x	x					x		x			x		x		x	
Prabhu and Jain (2015)	Case studies	Implementing org. (businesses)	x												x			x		x			
Prahalad (2012)	Case study	Implementing org (business) & recipient user			x			x	x						x	x		x					
Ramani et al. (2017)	Case study	Social enterprise	x	x		x		x	x	x				x				x			x		x
Rao-Nicholson, Vorley, and Khan (2017)	Case study	Implementing org (social enterprise) & recipient users	x													x		x	x				
Rivera-Santos et al. (2015)	Survey	Social enterprises	x	x		x		x	x				x										
Rogers (2003)	Multiple case studies	Implementing orgs & recipient users			x	x		x		x			x		x				x				
Sakarya, Bodur, Yildirim-Öktum, and Selekler-Göksen (2012)	Interviews	Implementing orgs (business & social enterprises)	x															x				x	

Table 1. Continued

			Aspects Discussed															Success Factors								
Author, Date	Method	Focus/From the Perspective of:	Organization's Dynamics/ Capabilities	Institutional Gaps (Gov't Policies, Limited Complementary Assets)	(Mis)trust of Consumers	Socio-Cultural Practices and Beliefs	Limitations on Rights (e.g., Property Rights for Women)	Limited Resources of Consumers	Financial Deprivation of Consumers	Knowledge Deprivations of Consumers	Physical Deprivations of Consumers (Health, Safety, Mobility)	Psychosocial Deprivations of Consumers (Low Confidence, Anxiety)	Intra-Community Relationships & Isomorphic Pressures	Lack of Incentives	Attributes of the Product	Immersion in Local Context	Involve Subsistence Users	Partnerships (Transfer Resources, Access, Knowledge)	Building Legitimacy/ Trust	Bricolage/ Strategic Use of Resources	Incentive Strategies	Appropriate Implementation Strategies	Monitor/ Measure Progress & Impact
Seelos and Mair (2007)	Interviews	Implementing orgs (business & social enterprises)	x					x	x	x					x	x		x							
Sesan (2014)	Participant observations, interviews	Social enterprises & policy makers		x		x									x	x	x	x		s		x			
Van den waeyenberg and Hens (2012)	Case study	Implementing orgs (business & social enterprises)	x					x								x		x	x			x			
Varadarajan (2014)	Lit review	Implementing orgs		x														x				x			
Viswanathan and Rosa (2007)	Commentary	Subsistence consumers		x		x		x	x	x				x		x	x								
Viswanathan, Sridharan, Gau, and Ritchie (2009)	Interviews	Subsistence consumers/ entrepreneurs						x	x	x	x			x	x	x	x	x	x				x		

Van den waeyenberg and Hens, 2012). Social innovations are accordingly viewed as possible and scalable through this ecosystem or network environment of actors (Meyskens et al., 2010; Rao-Nicholson et al., 2017; Seelos and Mair, 2007; Varadarajan, 2014). Notably, however, in this networked environment of social innovations, the majority of the literature remains centered on organizations that implement the social innovation. The role of subsistence users to help with the diffusion or potential reproduction of social innovations is rarely considered. Subsistence users tend to be seen as willing recipients whom organizations can help if organizations structure their implementation strategies and products appropriately (e.g., London, 2011; McKague and Oliver, 2012; Pansera and Owen, 2015). Consequentially, less attention has been paid to the role of relationships from the *perspective* of the subsistence user. Understanding these relationships is key to unlocking how subsistence users might play a more active and successful role in reproducing social innovations, particularly in light of existing resource constraints and gaps in formal institutions.

The role of bricolage. Originating from the works of Lévi-Strauss (1962), bricolage captures the practice of individuals or firms making do with available resources (either tangible or intangible) and combining them in a way to find a workable, although perhaps not optimal, solution to problems or opportunities (Baker and Nelson, 2005). It represents the potential for actors to engage in creative thinking. As studies relate, bricolage is one way social entrepreneurs or social ventures mobilize scarce resources, earn legitimacy, and gain support that can help them overcome gaps in formal institutions (Desa, 2012; Ernst et al., 2015; Mair and Marti, 2009; Prabhu and Jain, 2015). It often works in tandem with relationships, and can involve the redeployment of existing relationships in new ways. A bricolage mindset can also help organizations identify opportunities created by institutional gaps (Mair and Marti, 2009). While this body of literature is informative, it tends to concentrate on higher level organizations or social enterprises that initially produce and disseminate the innovation. Whether subsistence user-entrepreneurs might be able to effectively engage in bricolage is rarely considered. (Notable exceptions are discussed in the section, "Involvement of Subsistence Users.") Indeed, as the data analysis and findings of this article demonstrate,

bricolage is key to understanding successful and unsuccessful reproduction.

The nuances of subsistence users' lives. The third area of scholarship contains numerous studies that urge organizations to recognize subsistence users' ways of living, deprivations, and endowments. Nakata and Weidner (2012), for example, emphasize four aspects that can inhibit the likelihood, speed, and proper uptake of social innovations. These involve: (1) physical deprivations (problems in health and with securing safety), (2) psychosocial deprivations (stress, anxiety, and uncertainty that result in social isolation and low confidence), (3) knowledge deprivations (low literacy, low numeracy), and (4) financial deprivations (limited financial resources) of subsistence users. These deprivations interact to produce nuances of subsistence users' lives that can impact their willingness and ability to adopt or purchase social innovations. For example, low literacy and poor health can heighten precariousness in incomes, which can exacerbate anxieties and low confidence. These, in turn, can contribute to heightened price sensitivities (Ernst et al., 2015), risk avoidance tendencies (McKague and Oliver, 2012), and short-term planning horizons of one to two days (Viswanathan and Rosa, 2007). In order to overcome these challenges, organizations are advised to flip the innovation cycle: prior to idea generation, actors should immerse themselves in the context (Nakata and Weidner, 2012) and/or work with locally embedded partners who understand the local context and challenges (Rao-Nicholson et al., 2017; Sesan, 2014). By doing so, organizations might develop affordable products that have value to consumers and that accommodate restrictive aspects of consumers' lives that may prevent uptake (London, 2011; Prahalad, 2012; Viswanathan, Seth, et al., 2009).

Another line of scholarship expands the focus beyond deprivations to recognize the endowments of these communities. As scholars note, although subsistence community members may be resource poor in certain dimensions, they are resource rich in the dimension of social relations. These network-rich environments have social ties that enable the facilitation of information sharing (often orally), which is used by subsistence consumers to develop marketplace skills and to compensate for challenges of low literacy (Viswanathan, Sridharan, et al., 2009; Viswanathan et al., 2012). Of significant importance are familial and friendships networks, which community members view as the most trusted sources for product information or business advice (Viswanathan, Sridharan, and Ritchie, 2010). As discussed in the subsequent section, these conditions can at times impede or act as catalysts to the adoption and diffusion of social innovations.

While this body of literature provides important insights into practitioners, it tends to exhibit a top-down approach: scholars often view subsistence users as recipients rather than active producers. The focus remains on how *organizations* can create affordable and valued products or use social networks to disseminate information. But what about the subsistence users? What type of products might they (re)create? As detailed in the next section, while there is a limited body of scholarship that captures the involvement of subsistence users, knowledge gaps remain.

The Involvement of Subsistence Users: Impediments and Opportunities

Studies on subsistence users' involvement in social innovations predominately take two forms. As detailed in Table 2, one stream captures those who produce the social innovation as a means of entrepreneurial endeavors. These endeavors may be motivated by necessity (Holt and Littlewood, 2017) or by a desire to achieve social or environmental impacts (Ramani, SadreGhazi, and Duysters, 2012; Sarkar and Pansera, 2017). The majority of these studies focus on examining the implementation process rather than the reproduction of social innovations. The second stream of studies assesses factors that affect subsistence user's ability and motivation to adopt and continue using a social innovation (Dey, Pandit, Saren, Bhowmick, and Woodruffe-Burton, 2016; Jürisoo, Lambe, and Osborne, 2018; Tigabu, 2017).

What becomes readily apparent from the studies in Table 2 is the need for actors—what this article terms "bridging agents"—to provide access to key inputs to subsistence user-producers, such as financing and training. However, when this relationship is needed for subsistence users to (re)produce social innovations and why needs a clearer understanding.

Additionally, studies in Table 2 demonstrate how some subsistence user-producers have an aptitude for repurposing or creatively adapting products (i.e., engaging in bricolage) to suit their lives (see: Dey et al.,

Table 2. Summary of Literature on Subsistence Users' Involvement with Social Innovations

			Subsistence User			Factors Influence Adoption/Reproduction								Key Success Factors						
Author, Date	Method	Social Innovation	(Re)Produces Social Innovations	Adapts Innovations to Fit Livelihood	Motivations Driving (Re) Production/ Usage	Limited Access to Financing	Lack of skills	Lack of Technical Knowledge	Limited Resources	Socio-Cultural Barriers	Managing Trade-Offs	Institutional Gaps (Limited Access to Complementary Assets)	Intra-Community Networks Important	Engages in Bricolage (as an End User)	Engages in Bricolage with Aid of Bridging Agent	Product Attributes (Affordable Value?)	Co-creation with Bridging Agent	Financing Facilitated through Bridging Agent	Leverage Connectors to Local Users	Social Marketing by Bridging Agents to Increase Awareness of Opportunity
Holt and Littlewood (2017)	Interviews	Repurposing waste materials	x		x	x	x						x		x					
Ramani et al. (2012)	Observations & interviews	Ecologically friendly toilets	x			x	x	x	x			x				x	x		x	x
Sarkar and Pansera (2017)	Interviews	Variety of ecopreneurs	x		x	x			x						x	x				
Dey et al. (2016)	Focus group & interviews	Mobile phones		x		x	x	x				x		x						
Jürisoo et al., (2018)	Interviews	Biomass cookstoves		x	x	x	x	x		x	x					x		x	x	x
Tigabu (2017)	Survey	Fuel cookstoves		x				x											x	x

2016; Holt and Littlewood, 2017; Sarkar and Pansera, 2017). While informative, the authors posit that this body of literature could be augmented in two ways. First, a more encompassing consideration of what type of products subsistence user-producers are capable and are not capable of reproducing with and without bridging agents and why, has yet to be articulated. Addressing this query could help practitioners/scholars understand how and when it might be appropriate for subsistence users to play active roles as reproducers, and when bridging agents become critical to this reproduction process. Second, by assessing reproduction from a subsistence user's perspective, the authors deepen the scholarship on subsistence users' capacity for (re)producing or repurposing *social innovations*. They do so by drawing from and linking their findings to the wider body of literature on subsistence "consumer-entrepreneurs." While this latter literature does not focus specifically on social innovations, it does detail how various deprivations shape marketplace engagements.

The remaining part of this section thus pulls from this wider literature on subsistence markets and discusses insights that helped the authors interpret their findings. These insights are detailed here to help provide readers with a deeper comprehension of how and why key elements of this article's findings are important. These elements include: (1) the interaction of relationships and access to resources, and (2) the interaction of knowledge and how this might affect subsistence user-producers' capacity to engage in bricolage.

Relationships and resources. To understand how relationships and resources shape the lives of subsistence users, it is important to note that many living at subsistence levels operate as necessity-based entrepreneurs in the informal economy. Their resource acquisition and management of their business tend to be focused not on achieving economic growth or pursuing innovations but rather on obtaining or maintaining a basic standard of living (McKague and Oliver, 2012; Toledo-López, Díaz-Pichardo, Jiménez-Castañeda, and Sánchez-Medina, 2012). The business acumen of these subsistence consumer-merchants (Viswanathan, Rosa, and Ruth, 2010) or consumer-entrepreneurs (Viswanathan, Sridharan, et al., 2010) is often directed toward navigating closed-loop relationship dynamics with known vendors and customers. These one-to-one interactions of

close-knit relationships help them to access resources, obtain short-term loans, or to pressure consumers to remain loyal and to pay outstanding dues. Relationships are critical given the absence of viable, formal financial service providers, and the similarities of unbranded products and services that consumer-merchants sell (George et al., 2016; Sheth, 2011; Viswanathan et al., 2012). The cycle of commitments that arise from these relationships allows subsistence consumer-entrepreneurs to sustain their business and possibly improve their livelihoods. However, meeting obligations of vendors to repay loans or a sizable business crisis can also have negative effects on livelihoods: consumer-entrepreneurs often redirect money away from basic family needs (e.g., food, education) (Viswanathan, Rosa, et al., 2010).

In the social innovation literature, when scholars consider the social dynamics that influence diffusion or adoption, they tend to focus on isomorphic pressures (e.g., Rogers, 2003). However, as Viswanathan, Sridharan, et al. (2010) allude to, understanding how these social networks relate to the management of key resources is also critical if practitioners/scholars are to understand the capacity of subsistence users to (re) produce or implement social innovations. This is particularly important if one thinks about the trade-offs that might need to be made in order to reproduce a social innovation, such as the resources needed to dig a water pond. How might subsistence users amass resources or knowledge that falls outside of the closed-loop systems? Moreover, under what conditions might these close-knit relationships be beneficial versus detrimental to successful reproduction?

Knowledge and bricolage. A second element that may affect the involvement of subsistence users is that of knowledge capabilities, specifically low literacy and low numeracy (Viswanathan and Rosa, 2007). Existing scholarship on social innovations largely explores the consequences low literacy has on consumers' adoption. Scholars note a need for organizations to use more visual modes when educating subsistence users about why they should adopt a product or how to use it (Mair and Marti, 2009; Nakata and Weidner, 2012). Less studied is the importance of low literacy on subsistence users' involvement in (re)producing social innovations and engaging in bricolage.

Pulling from the wider literature on low-literate consumers, scholars mention the notion of "cognitive predilections." This may impact the reproduction process. Low literacy, for example, is associated with a diminished working memory span, which in turn, can reduce performance on memory tasks (Viswanathan, Torelli, Xia, and Gau, 2009). Low-literate individuals tend to make decisions on pictorial information and think in concrete terms instead of symbolic or abstractive terms. For instance, if shown a product or an accurate pictorial representation of a product, such as a hammer, they relate the product to what they would use it for, rather than describing symbolic meanings or more higher level concepts, such as a hammer being a tool (Viswanathan, Duncan, Grigortsuk, and Sreekumar, 2018). Low-literate individuals struggle to engage in abstractive trade-offs, and consequently base their decisions or understanding on one concrete piece of information. For example, if forced to choose between the "quality" of a product (an abstract concept) and price (a concrete concept), they would choose price. If forced to make a trade-off between the price, size, or ingredients of a product, rather than comparing these concrete attributes, they will focus on only one (Viswanathan, Torelli, et al., 2009). This can also result in more short-term thinking as envisioning future possibilities requires a more abstractive contemplation (Viswanathan and Rosa, 2007). As elaborated in this article's findings, these cognitive predilections mean subsistence users tend to comprehend *how* versus *why* something is done in a given way (Viswanathan et al., 2012, 2018), and often struggle to think about the longer term consequences and ripple effects of not successfully (re)producing or maintaining social innovations.

When subsistence entrepreneurs are able to engage in more abstract thinking, studies show a capacity for more "transformative" entrepreneurship. Entrepreneurs are able to adjust product offerings or their business models to achieve a greater level of business growth, which can lead to personal and community benefits. This can also allow them to escape the closed-loop relational system, providing them with the means to navigate a more open system at the community level (Sridharan, Maltz, Viswanathan, and Gupta, 2014). This type of transformative entrepreneurship is evident in studies that recount subsistence social entrepreneurs' capacity to engage in bricolage in (re)producing social innovations. For example, Holt and Littlewood (2017) detail how informal economy entrepreneurs worked with a social enterprise to creatively redeploy and sell artisan products made from waste materials. They engaged in "artistic bricolage"

by salvaging, improvising, tinkering, and innovating with existing materials. Sarkar and Pansera (2017, p. 332) note that all of their "grassroot ecopreneurs" adopted a "bricolage attitude … making do with what is at hand [and] integrating easily available resources in novel ways." Yet while scholars evidence the ability of some subsistence users to engage in bricolage to (re)produce social innovations, how this matches to varying levels of knowledge capacities (especially lower levels) and cognitive predilections remains to be clearly delineated.

This article thus seeks to bolster these under-researched areas. It starts to bridge the divide between the knowledge on subsistence consumer-entrepreneurs and the social innovation literatures. In so doing, it extends theoretical understandings of the diffusion of social innovations via reproduction, emphasizing the role of subsistence user-producers.

Method

To answer the overarching research question, the authors employed methods to explore two aspects: (1) What *attributes of social innovations* affect who can reproduce the innovation and augment the need for bridging agents, and (2) How do these attributes interact with the *capacity of subsistence* users to effectively adopt and potentially reproduce the social innovations? A comparative, inductive case study analysis facilitated the authors' examination of these queries across a range of social innovations. Per Glaser and Strauss (2006), this method is useful when generating theory. Comparing the "internal logic" of the different cases of social innovations enabled the elements that contributed to or prevented successful reproductions to be demarcated (Glaser and Strauss, 2006, p. 139). Per Eisenhardt and Graebner (2007), the case comparison is also appropriate for investigations into the unexplored "how" and "why" (p. 26). The authors thus used it to illuminate *how* social innovations could be successfully reproduced by subsistence users and *why* some social innovations are or are not within their capacity to reproduce successfully. Table 3 contains descriptions of the cases.

Data, Sampling, and Data Collection

This article builds from research the authors have undertaken across multiple research studies set in sub-Saharan Africa, including Kenya, South Africa, Mozambique, and Zambia from 2011 to 2018 (see online Appendix 1). Aspects of this prior fieldwork are detailed from the perspective of social and informal economy entrepreneurship in Holt and Littlewood (2014, 2015, 2017).

In adopting the comparative, inductive case-based approach, the authors iteratively explored data collected from these prior case studies alongside data from secondary sources on other cases (e.g., Avon in Africa) and more recent fieldwork in Kenya between 2016 and 2018. This latter fieldwork involved observations of three different types of social innovations. The first was the diffusion of water storage ponds into subsistence communities, which, pending their reproduction, were sometimes ineffectual. The second was the reproduction of a simple solar cooker by a women's group. The third was a business model of chicken farming. These three field observations initiated the authors' focus on the reproduction aspects of social innovations.

Ten cases, selected through an instrumental use purposeful sampling, form the basis of the analysis (see Table 3 for details). As Patton (2014) suggests, this sampling is appropriate when scholars are trying to "understand the phenomenon" and "generate generalizable findings that can be used to inform changes in practice, programs, and policies" (p. 295). The cases, which the authors either saw in the field or found in the literature, are not rare; they are seen across subsistence markets in multiple countries. They reflect the definition of social innovations given earlier: they include products, business models, or markets that seek to create social value. Notably, the examples reflect varying levels of design complexity: simple, moderate, and complex. Thus, similar to the approach taken by Langner and Seidel (2015), these varied cases facilitate the exploration of boundary conditions needed for theory building. They make apparent what types of social innovations subsistence users could produce, what types they could likely never produce, and what types demand the involvement of bridging agents to varying levels.

These cases contain a mix of primary data (interviews, focus groups, observations, and field notes) and secondary data sources (case vignettes by other scholars and publications by actors, such as NGOs) as detailed further in the online Appendix 1. For the primary research the authors used a key informant/knowledgeable strategy (Patton, 2014). Informants included people involved with reproducing social

Table 3. Case Synopses

Case Studies	Field Context
Water ponds • *Design:* Hole (typically 8 × 10 × 1.5 m deep) dug by farmer and then covered with waterproof liner. Different soil conditions vary the required slope of the sides of the pond design. Located to take advantage of shade and run-off from roofs or the ground (the mechanism by which they are filled with water). Often linked with drip kit; also requires protective fence and covers to prevent animals and children falling in. • *Use:* Small water storage ponds can address agricultural productivity (UNCTAD, 2011) and water shortages. Can be used to grow kitchen gardens, water cattle, provide water for main farming crops, or to wash dishes/do laundry. They reduce amount of time women/children spend collecting water.	• Found in smallholder farms during fieldwork. • 6 ponds reproduced with involvement of intermediaries, 5 reproduced by subsistence users without assistance and a range of nonfunctional attempts. • A Catholic development organization funded the installation of 600+ household water storage ponds coupled with kitchen gardens with support of local Ministry of Agriculture.
Solar cookers • *Design:* Relatively simple composed of a curved backplate of cardboard covered in foil and a similar baseplate, with a pot placed to focus sunlight on it. • *Use*: NGOs promote these cookers due to their low costs, and environmental benefits in subsistence contexts where electricity is unavailable and firewood and charcoal use is discouraged (Sesan, 2014). They free up time for women by reducing need for collecting firewood/getting charcoal, allow them to multi-task while preparing food for family, and reduce household income spent on firewood/charcoal. • *Additional Background*: Simple solar cookers originated in 1994 (designed by French scientist Roger Bernard), developed in association with volunteers at nonprofit Solar Cookers International.	• Introduced to the community through the daughter of a prominent woman in a self-help group. • Researchers bought foil and PVA glue leaving them with the agricultural extension officer who then facilitated two training sessions, allowing group members to practice making the cooker with the supplies provided. Members with cookers used them when at home and pending weather conditions.
Cookstoves + bakery business model • *Design:* A social enterprise making a range of energy efficient cookstoves and ovens. Employs a business model that encourages women to start bakery businesses using the cookstoves. • *Use:* Stoves and ovens are sold through distributors in subsistence communities and facilitated by an informal training package to promote small-scale bakeries mostly run by women in subsistence communities. • *Additional background:* Products sold are combined with an advocacy program promoting self-sufficiency in charcoal by selling seeds alongside the ovens and working with partners to promote sustainable charcoal.	• An example of a social enterprise (and its founder entrepreneur) acting as a bridging agent facilitating the diffusion of a bakery business model (with purchased oven) that generates income for women in subsistence contexts. • Focus is on the bakery business model enabled by cookstoves. • See also Holt and Littlewood (2015).
EcoSan toilets • *Design:* Double-pit latrine where solid waste and urine are separated and collected. Reproduction requires following a relatively complex design. Involves disseminating knowledge amongst a larger number of actors: intensive training is advised for builders and masons, supervisory agents, and end-users. • *Use:* Socially innovative product for collection of human waste in a dignified, sustainable, and safer way in a subsistence context (Ramani et al., 2017). Waste is then used or sold as a fertilizer.	• Kenyan CBO was encouraging the reproduction and diffusion of EcoSan toilets. • Local CBO acted as a knowledge and resource broker: training local artisans (masons) in constructing the toilets and provided inputs for demonstration models.

Table 3. Continued

Case Studies	Field Context
Solar lights + social franchisee business model • *Design:* (1) miniaturized, off-grid small-scale, nonpolluting solar-LED lights (2) can be combined with a rental or sales model for subsidence entrepreneurs. Lights attach to small solar panel allowing charging during day for subsequent use in evening. • *Use:* Improve access to light for educational purposes and general personal security and used to charge mobile phones. Reach consumers through purchasing (via agents, supermarkets), donation (charities, NGOs), or rental (subsistence entrepreneurs). • *Additional background:* Brought originally into subsistence markets by NGOs, now reaching 35 million + people in 7 million households in Africa improving energy access because of lights (Mills, 2015). Lights reduce use of kerosene, reduce air pollution, and lower emissions.	• SolarCo actively promoted and trained NGOs and nonprofits in a "business-in-a-box" model where sell lights or rent to fellow community members at 20ksh $0.20 per light per day. • Local nonprofits selected and trained a group of participants and provided the funding for the initial purchase (from SolarCo) of ten solar lights per entrepreneur paid back to nonprofit via subsequent profits.
Chicken business • *Design*: Initial purchase of laying hens or eggs, incubation of eggs for new chicks. Needs secure storage area and way to keep chicks warm (e.g., charcoal stove) and fed. Eggs sold in community and chicks raised to sell on or to increase egg production. • *Use:* Often promoted by NGOs (e.g., CARE Kenya) as an income generation model for subsistence farmers, with added advantage of improving nutrition and food security.	• Seen during in one of the farms during a field visit to explore the water ponds. • Eggs and chicks as a business introduced to the community and self-help groups) via seminars held by a development charity working in the area as well as an entrepreneur who committed to buying chicks once they reached a certain size.
Avon in Africa • *Design:* Micro franchisee model selling Avon cosmetics and other toiletries directly to consumers through a travelling sales model. Representatives traverse the "last mile" of the distribution chain to promote and sell products to consumers; leverages their social networks to access new markets. • *Use:* Income generation opportunities for women entrepreneurs who live in subsistence contexts; "empowers" women by increasing their confidence, business skills (Dolan and Scott, 2009).	• Avon model seen in operation in the field in South Africa (more urban areas). • Similar business models seen in the field, such as those promoted by NGOs for items such as sanitary pads, diapers, fortified foods, and other products which struggle to reach the consumers in subsistence markets.
Reverse osmotic water filter • *Design:* Design reduces costs and simplified knowledge required to reproduce. After receiving initial training offered by bridging agents subsistence users-entrepreneurs reproduce the design of the water filters to sell in communities and/or consumers. • *Use:* Removes pathogens and contaminants from water, increasing water safety for personal consumption (CITE, 2015). • *Additional background*. This is often seen as a "frugal" social innovation (Annala, Sarin, and Green, 2018) to reduce water pollution in places such as India; water pollution disproportionally impacts those in poverty. There are some concerns being raised about this an unregulated industry. Other emerging examples include a Biochar filter and sand filtration techniques (CITE, 2015).	• Based on desk-based studies. • Case included as example of a frugal innovation. This is a product redesigned: knowledge required for its reproduction is simplified so that it is within the capacity of subsistence users to copy once trained, and the overall product costs reduced to make it cheaper.

Table 3. Continued

Case Studies	Field Context
$100 laptop • *Design:* Strategic redesign that reduces the products' resource components and makes the products more affordable for poorer consumers to purchase. Moving parts were eliminated as much as possible to reduce the possibility of dust, damage, and breakdowns. Parts simplified to be lower cost (Robertson, 2018). • *Use:* Targeted as a "frugal" social innovations (Cristia, Ibarrarán, Santiago, and Severin, 2012) for use in poverty contexts. Laptops are bought or donated and typically used in schools, to improve access to the learning environment and the internet, most often targeting children.	• Explored as an example of a social innovation seen in "use" in our fieldwork. • Many schools in Kenya lack access to computers. • Seen in a solar IT lab set up by a solar enterprise funded by a national telecommunications company. • Labs were located at a school in each of the 47 provinces.
Mobile money (e.g., MPesa/Equitel) • *Design:* Originally an electronic mobile money transfer system geared toward helping the traditionally unbanked customer. Registration designed to be easy with basic requirements mobile 2G phone. Individuals can credit their phone with just a few shillings, and use this money held in a personal "account." • *Use:* Individuals use to safely send remittances upcountry or make payments. Now crucial component of many business supply chains for sending and receiving cash in Kenya. • *Additional background:* Reaching the unbanked and under-banked is a key focus for many social innovations in financial products (Berger and Nakata, 2013; Onsongo, 2019). Originally financed by the UK's Department for International Development as part of a joint venture between Vodophone and Safaricom to help facilitate repayment of microloans.	• Launched in Kenya in 2007 by 2013, two thirds of the adult population of Kenya (over 17 million) used MPesa, transferring monies that equated to approximately 25% of Kenya's GNP (The Economist, 2015). • Examples of use seen across multiple case studies and in everyday life in Kenya with increased functionality and services offered (such as paying for electricity, travel tickets, wages, and small loans).

innovations or who had experience working with, or in, social ventures. In entering the subsistence contexts, the authors leveraged key gatekeepers to gain access to subsistence users/entrepreneurs or social ventures. Given the nature of these hard-to-reach, often hidden and marginalized groups, as well as safety concerns of working in less politically and economically stable countries where urban crime rate is quite high, gatekeepers are critical. Gatekeepers are key to signaling trustworthiness of researchers to respondents, and securing the safety of researchers. Imperatively, using a key knowledgeable strategy allowed the authors to capture a bottom-up perspective of the end-users and key local actors. In addition to interviewing groups made possible through gatekeepers, the authors also pursued opportunity sampling (Patton, 2014). This included interviewing people who were acting entrepreneurially when the authors passed by them. The informal entrepreneurs operating on roads in and out of Nairobi are exemplary of this strategy. The authors likewise pursued data opportunistically, exploring additional social innovations respondents reproduced even though the innovations were not originally a part of the study.

The resultant primary data contain interviews and focus groups with, and observations of, subsistence producers, informal economy entrepreneurs, local government representatives, community representatives, NGOs (nongovernmental organizations) or CBOs (community-based organizations), social entrepreneurs, and members of various social enterprises. The recorded interviews took place in English with local language translations used as necessary. For interviews with those with lower levels of literacy, the researchers used more simplistic terms and, where possible, pointed to actual objects when discussing the social innovation (e.g., water ponds). In some instances only field notes were possible, in part due to difficulties in recording interviews in noisy field conditions or where interviewees might be uncomfortable with the formality of recording. The interviews all

took place in situ, that is, in fields, moving vehicles, in farmers' homes, outbuildings, in open-air community meeting areas, or community rooms. The authors undertook multiple visits to some communities to build trust; to confirm interpretations and postulations; and to deepen the level of rich, emic-based data. The emic data (from the perspective of those under study) helped to prevent potential biases introduced from an etic (Western/outsider) view.

Data Analysis

Informing the data analysis are recommendations for generating theory with cases and qualitative data, particularly that offered by Glaser and Strauss (2006); Spiggle (1994); and Gioia, Corley, and Hamilton (2013). Open coding, which allows codes to inductively emerge from the data, produced a first-order analysis (per Gioia et al., 2013). The authors then categorized and reduced these codes to a more manageable number (i.e., axial coding per Strauss and Corbin, 1998), as seen in Figure 1. For each emergent category, the authors compared examples in the same category across the cases (Glaser and Strauss, 2006). Given that data stem from a range of cases, the authors opted to capture the first-order elements in more abstractive terms, which reflect informants' descriptions. As exemplified in the quotes contained in Table 4, these "emic redundancies" sought to stay close to the "meanings of informants" (Spiggle, 1994, p. 499).

Following the initial coding, the authors conducted a second-order analysis. In this phase, rather than capturing what the data described (per the first-order categories), the authors reconsidered the data from a theoretical perspective with the goal of figuring out "what's going on here?" (Gioia et al., 2013, p. 20). Accordingly, the second-order analysis focused on what was causing the successful or unsuccessful reproduction of social innovations and affecting this process. The

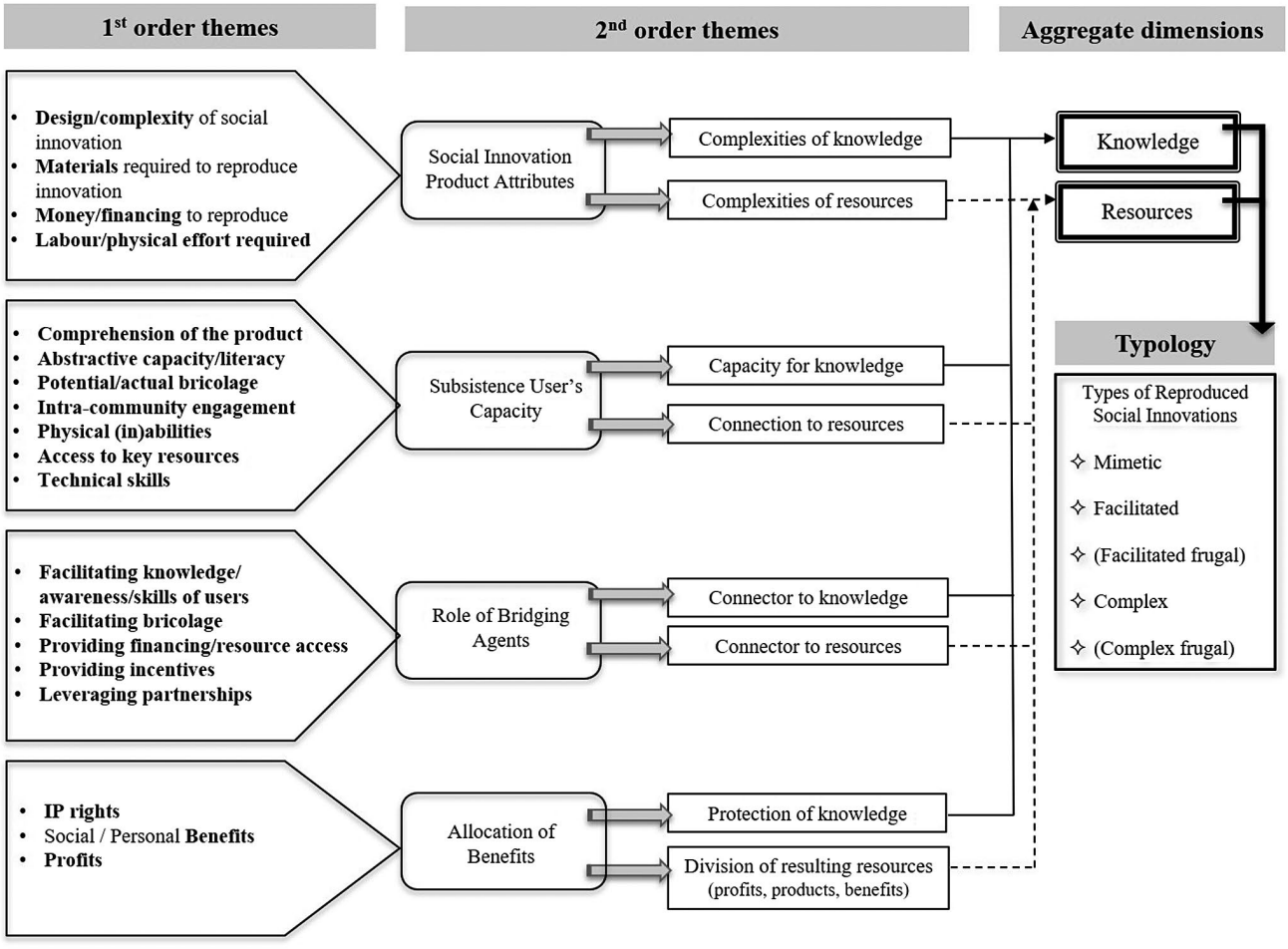

Figure 1. Major Findings Emerging from Data Analysis

Table 4. Representative Quotes for 1st Order Categories

Social Innovation Product Attributes

DESIGN COMPLEXITY

Water Ponds

Field Notes: Black cotton soils require steep sided ponds; red-volcanic soils require sloped sides. Black cotton retains water naturally; red-volcanic does not and requires a liner to function. Ponds need to be located to take advantage of shade and run-off from roofs or roads, and surrounded by fencing. This information is communicated in the training but is not always followed by those copying.

Subsistence User [literate fluent]: They taught us how we can do the pond, because it cannot go vertically but has to be sloping. Because when it's sloping water near the pond will not break, the sides will not break. But some of the liners they're providing they're so weak the rats break them and eat them.

Solar Cooker

Field notes: Template for solar cooker taken from a group member who had a store bought one. Those reproducing it described the design as simple: with an adequate template to follow they required little additional knowledge. Their trial and error process determined the optimal amount of glue and the need for thicker cardboard.

EcoSan Toilets

Excerpt from WaterAid's (2013) *technical brief:* Latrine designs have three main components: pit, slab, superstructure. Variations of each component exist and are interchanged to optimize solutions for a particular area. Pits can be built (partially or wholly) above ground level; depth should be around 1.5 m but could be as deep as 3m. Specifics depend on context: "urban areas or composting latrines might require shallow pits with frequent emptying; in unstable ground the pit walls should be supported with timber, cement rings, stones or trapezoidal blocks. [For slabs] concrete…should be used in combination with steel reinforcement. Well-trained local craftsmen must supervise the mixing and placing of the concrete in the slab" (pp.1-2).

Artisan who builds toilets [literate and well-versed in English]: It is 10 days [to build the toilet] depending on the size. [Initially] we didn't understand this toilet properly, so [the local NGO] decided to take us to the training… They were saying this toilet has two holes and we were doubting, 'How, how come it will be having two holes?'.

Excerpt from WaterAid (2008): EcoSan latrine technology [has] 3 step structures: containment, sanitization and recycling (p. 4).

Community member demonstrating toilet [low literate]: Here [we] store the ash [from cooking]. Every time you deposit waste you add ash, for drying and sanitizing…Then the urine comes out of that place…after they use [the urine] for top dressing.

Chicken Farming

Researcher: [Viewing book the subsistence producer shows] This is the type of bird and it tells you about the chicken and what to do. From one to four days you give warm water. So, it tells you exactly what to do…[feeding chicks] mash one to 60 days.

Subsistence producer [literate and well-versed in English]: When they come to 60 days they are introduced to growers [protein-enriched feed]. I would give [the chickens] growers for [another] 60 days and then they will be ready to market.

Reverse Osmosis Water Filters

Summary of Annala et al (2018): Frugal water filters use reverse osmosis technology where solid and other dissolved particulates are separated out by forcing water through a micro-sieve. Entrepreneurs assemble, sell and service filters. Costs are reduced as entrepreneurs operate informally, with cheaper labor, assemble in informal premises or homes, and use unbranded components bought from wholesalers.

$100 Laptop

Excerpt from One Laptop per Child's (2009) *blog:* To maintain a low price point [we're] refreshing the hardware to take advantage of the latest component technologies. … The memory will be increased to 1 GB of DDR2 SDRAM, and the built-in storage will be 4 GB of NAND Flash. … The processor will be a VIA C7-M. …The enabling chipset is hot off the fab line, the VX855. This single chip provides the memory interface, a 3D graphics engine, an HD video decoder, USB, [and] SDIO. … [One change] is a move from AC'97 to HD Audio [allowing] an upgrade to a stereo external microphone (and DC sensor) input (n.p.).

Mobile Money Platform

Field notes: MPesa [mobile money platform] is now being used to pay energy bills, e.g., MKopa Solar [Kenyan energy provider]. The update involved re-iterative redesign processes with other IT partners. Involvement of end users was limited to commenting on the design or functionality of the platform.

MATERIALS

Water Ponds:

Field notes: Material inputs varied: some required just digging holes (black cotton soil); others also needed liners to retain water (red volcanic soil). The government or NGOs provided liners. Some ponds had simple irrigation systems using hosepipes or drip-kits; others were more complex with metal or wooden sheds built around them. Covered ponds, highly subsidized by the government or NGOs, prevented liners from getting stolen or ruined by the sun, bugs, birds/other animals.

Solar Cooker:

Field notes: The majority of resources came from the researcher. The foil from the supermarket, the glue from the bookbinder. The groups were to find the cardboard.

EcoSan Toilets*:*

Expert from WaterAid (2008)*:* The [Nepal government-sponsored EcoSan promotion program] contributes only to the pan level, which includes two vaults for feces storage, a urine storage tank, and two pans in case of dry Ecosan otherwise one for wet Ecosan toilet. The [other] materials, which would include bricks, grass, bamboo and labor (unskilled) works, etc., [are] provided by latrine users (p. 11).

Table 4. Continued

Social Innovation Product Attributes

Social enterprise who funded demonstration: [The villagers who would use toilet] contributed the sand and food for the people who were building [the EcoSan toilets] and water [used for concrete].

Avon Franchise:

Excerpt from Scott (2012) *Avon in Africa case study:* Reps…preferred selling Avon products to more traditional objects such as produce or handicrafts. The advantages [were] the quality and affordability of products, the generous margin and the lower level of risk [produce is perishable]. … [S]elling Avon did not require a craft skill or a lot of dedicated space and did not have to be done from the side of the road as was the case with the stalls and blankets used as shops by many women (p. 14).

MONEY/FINANCING

Water Ponds:

Subsistence user/project assistant [literate and fluent in English]: Farmers were supposed to…dig and cover the costs to dig. The cost… depends on where that pond is. For some it is more because [the soil] is stony, others it is less because [the soil] is soft. After being given the liner [by the NGO, worth approx. 50,000KHS for a large pond] they now go and install the liner. The piping and how they will fetch the water will also be farmers' expenses.

Subsistence user [low literate]: Up to where my water pond is now, it cost 10,000KHS (100USD) because I was paying 1000KSH (10USD) per day for labor since [my land] was too rocky…. I got that money from digging in other people's field…. I got a hole in my liner in because the liner was too light. I want to fix it but I need glue. There is someone who lives around here that can fix it. It will cost around 2000KHS.

Researcher: Why haven't you fixed it yet?

Respondent: Because I have no money. I have to look for money to do this…I'll have to do casual labor [digging].

Field note: 10 months had passed since she had first gotten the hole in her liner.

Solar Cooker:

Field notes: Cost of glue, foil and cardboard estimated to be $16 for 20 solar cookers.

Subsistence user [low literate]: [The community group] has to come together so that they can…buy material for solar cookers.

Researcher: Why don't you do this by yourself?

Respondent: I will try… when I get the money

Researcher: Do you know how much [the materials] cost?

Respondent: No… I don't know.

EcoSan Toilets*:*

Expert from WaterAid (2008)*:* EcoSan is more than a toilet; it is a toilet and treatment of recycling system. In this context, the cost of Ecosan is significantly less than other toilets and treatment systems. … Every household should always make a financial contribution towards the cost of their Ecosan toilet, even though in some cases this may be relatively small (p. 11).

Solar Light Franchise:

Local NGO facilitating income project: You know, we give [the members] the [solar lights], we buy them stuff, and then they go and sell. So they're not losing anything since this is like capital.

Field note: Solar lights bought in bulk by the social enterprise for 2,210KHS (22USD). Only after the social franchisee has sold the lamp (at a profit) do franchisees pay back the social enterprise.

Chicken Farming

Field note: Subsistence producers took out a loan for 52000KHS (520USD) to fund entire operation (including chicks, feed, and coop with a heater inside to keep chicks warm).

Avon Franchise:

Excerpt from Scott (2012) *Avon in Africa case study:* Avon requires only a minimum startup fee (about US$12). … Some women couldn't even afford that but often the [Avon recruiter] would loan out the start-up fee. If a candidate could not qualify for credit, Avon let her start on a cash basis and build up credit; many reps earned their way into the system by this method (p. 12).

LABOR/PHYSICAL EFFORT REQUIRED

Water Ponds:

Subsistence user [literate and fluent in English]: The pond I built in 1996, I dug it with my family. My husband, my children. We all dug. [Respondent was about 35 years old at the time] Later, in 2015-16, the government encouraged farmers to get a pond. I spent 45,000KHS…to have a machine dig it. It was a double pond, 15x26x2 meters.

Solar Cooker:

Field notes: The women copied the initial design, sourced cardboard, and built their own in a group meeting (led by a literate member).

EcoSan Toilets*:*

Summary of WaterAid reports (2008, 2013, 2014): Ecosan toilets require holes be dug, cement laid, and substructures (e.g., wooden or brick sheds) built. People are to dig/build substructure themselves or hire people. Well-trained craftsmen are required only for mixing and pouring cement.

Solar Light Franchise

Solar light franchisee [low-literate with functional English]: I charge the solar then I distribute to my customer.

Table 4. Continued

Social Innovation Product Attributes

Chicken farming

Subsistence producer [literate and well-versed in English]: It now takes one hour a day [to take care of the chickens]. In the first two weeks, that is when we spend a lot of time to manage them. I remained here for two weeks going nowhere. These are small babies. If you don't take care of them they will die**.**

Subsistence Users' Capabilities

COMPREHENDING THE PRODUCT

Water Ponds

Subsistence user/project assistant [literate and fluent in English]: I construct ponds on some farms [belonging to farmers who help implement the project] and use these as sites for demonstration. I ran two demonstrations. The first one, although the pond was already dug, I showed people how you do the slopes. There were 30-40 people that attended. In the second demonstrate I showed how you install the liner and finish off the pond, putting the grass around the top of the liner to hold it tight. I did this second demonstrate twice and in the same month of the first demonstrate, but not as many people came.

Researcher: Why didn't more people attend?

Subsistence user/project assistant: There are those people who don't attend because they lack interest and they are ignorant. …Others attend the meeting and hear something is free but they have not internalized that something has happened.

Interview with subsistence user of failed water pond [low literate]:

Researcher: What did you know about the pond before you dug it?

Respondent: It can preserve water and do irrigation with it.

Researcher: Where did they hear about this?

Respondent: From neighbors that went to a seminar held by [an NGO].

Researcher: What did they tell you?

Respondent: These ponds are very good for irrigation.

Researcher: Anything about digging a pond like dimensions or slopes?

Respondent: No.

Researcher: Do you know where to get a liner?

Respondent: I don't know.

Researcher: Do you know how much it costs?

Respondent: No.

Researcher: Did you know about needing a liner when you started to dig?

Respondent: No.

Subsistence user [literate and fluent in English]: For instance, me when I'm building the pond I know why I'm building it, and I'll gather materials or the knowledge to make sure that it has been done the way it can help me.

EcoSan Toilets

Excerpt from WaterAid (2008)*:* Most of the Ecosan users are agriculturalists by occupation and so…[are] familiar with the methods of making compost and co-compost through mixing the humus formed in toilets with infertile and worked-out soil (p. 9).

Field note: Discussions with the local CBO and the masons they had trained showed an understanding of how the product worked and could be adapted. The masons selected had experience in building walls and houses using concrete and tin sheets at their farm plots

Reverse Osmosis (RO) Water Filters

Excerpt from Annala et al (2018)*:* The owners of low cost RO filters are less educated, have lower incomes and are less likely to have used water filters while growing up. … The RO entrepreneurs find their own advice unheeded by customers. …The customer states that their doctor has asked them to drink RO water only. So on customer's insistence, we install the machine. Then we put a different TDS control valve, so that the TDS can be improved from 50 to 150. The customer does not know that TDS can be set up (p. S110).

Mobile Money Platform

Representative from local NGO providing training to community group on savings: Initially, when they heard about [branded mobile money platform] they thought these people wanted to take their money. … They feared that [the company] wanted to take their savings from them and keep it. But after they had been taken through the awareness [by a local non-profit] the [saver] understood it… that that money was actually theirs. They decided to embrace it because they thought it would change their situation.

Field notes from savings group meeting: Demonstrates that even large corporations often require the involvement of bridging agents in creating awareness, comprehension, acceptability of SI product.

ABSTRACTIVE CAPACITY/LITERACY

Water Ponds

Subsistence user/project assistant [literate and fluent in English]: When I did the first pond [back in 1996] that is what encouraged other people to do it. I decided to have that risk. That encouraged them to have their own. They had seen the results coming for vegetables in my home and now there are many ponds.

Researcher: So what enabled you to take that risk?

Table 4. Continued

Subsistence Users' Capabilities

Subsistence user/project assistant: For me I had gone to a seminar [as a government extension officer] in Turkana [a very dry area]. We [saw] a farmer who had a bigger pond. She was growing cabbage and cowpeas with that pond. So I said why can't I also do that? And that's what encouraged me to take that risk. And since we had a problem with rains [droughts], I had to… take the risk. When you have a problem you have an opportunity. And you need interest.

Subsistence user/community member [literate and fluent in English]: The biggest problem is some people are not enlightened and they don't know where they're heading to. They drive us backwards because they don't have the interest; not necessarily because they don't have the interest, it is because they don't know. That's why we get some drawbacks.

Social entrepreneur from StoveCo: So the southern Maasai guys will be copying the southern Kisi guys who are copying the northern Kisi guys who were trained by actual agricultural extension officers, and so now this guy is learning farming that has been bastardised five times and is doing some of the most obnoxious farming practices you would ever [see]. … [The average subsistence farmers] don't know how to farm, and they actually just try to copy it.

Solar Light Franchise

Subsistence franchisee [literate with functional English]: The [solar light] was a new idea…I am more creative [than others who did not get involved] …a number of [community members] have been coming to me [to be involved too].

Representative of NGO facilitating solar light sales model: Most people in Mozambique... above 30 years, did not go to school and they need to have some means of livelihood, and they can't have that if they don't have basic literacy skills.

Chicken Farming

Researcher: Most people worried about the loan. But you didn't. Why not?

Subsistence producer [literate and well-versed in English]: Why worry for nothing. That's not making me to be worried. Why?

POTENTIAL OR ACTUAL BRICOLAGE

Solar Cooker

Field notes: Ten solar cookers were made and distributed but only by one of the groups. This group costed out all the necessary resources (tin foil, glue) and were proposing to make more to sell for a profit to the local community but were looking for stronger cardboard. Second group also had ten members attend the demonstration, but none had made the cooker. The group had let the glue dry up; they did not improvise or find an alternative solution. They waited until the intermediary bought additional glue.

EcoSan Toilet

Field notes: The subsistence masons and the intermediary tinker and engage co-creatively in bricolage. Masons varied the design to reduce costs by adapting locally available materials to build the toilet chamber and by substituting in materials such as sheet tin.

Solar Light Franchise

Social enterprise working with social franchisees: In terms of helping the customer… some youth have [adjust the business model]. [They] give the product on credit… at the outset the customer gives some money, like 50%, and then [the customer] commits to pay their 50% at the end of the month.

INTRA-COMMUNITY RELATIONSHIPS

Water Ponds

Subsistence user/project assistant [literate and fluent in English]: I work with farmers who help me distribute information to other farmers and who keep track of farms that are actually farming and are thus appropriate recipients of liners [from the NGO].

Field notes: Some subsistence users got money to build the ponds or to do repairs through local saving groups [merry-go-rounds] or through digging on other people's farms. Informally employing each other seems to be a common practice. Some women also reported not wanting to get a pond due to perceived safety risks: they *heard from other women* about children and cattle drowning.

Solar Cooker

Field notes: Groups met and decided to purchase the cardboard required at 30 KSH (approximately $0.30c) per carton. The majority of group members had not reproduced the solar cookers because the group had yet to reach a consensus on if they should make them, how to pay for the materials, and how they would sell them.

EcoSan Toilet

Excerpt from WaterAid (2008)*:* Farmers of the community accepted the technology and created an environment to persuade others to replicate it considering its potential to 'add value' to their agricultural production, to the water, and to environment conservation (p. 11).

Solar Light Franchise

Solar franchisee [literate with functional English]: I worked for [a local government agency] collecting taxes from the fishers. …I was told by [a community member who knew the NGO] and became interested. …I went to the training and learnt how to [sell the lights].

Faith-based NGO sponsoring program: The first step was really mobilizing the youth. … We needed 400. And then shortlisting them to find out who are really entrepreneurs. … We grouped them into about 20 groups of ten youths each, where they could guarantee each other. So they took the products, and we had lighting kits complete for them, so they guaranteed each other.

PHYSICAL (IN)ABILITIES

Water Ponds

Field notes: Some subsistence users who could afford to use oxen to reduce physical labor of digging holes; older women/those physically frail had to pay local laborers to dig the holes for the water ponds even though this could increase their financial strain. Digging was viewed as a man's job; women who did report digging did so in partnership with their husband. Some women reported not having a water pond because it required too much energy.

Table 4. Continued

Subsistence Users' Capabilities

ACCESS TO KEY RESOURCES

Water Ponds

Subsistence user of a failed pond [low literate]: We didn't get the liner [for the pond] so we don't use it. We used to put in water but the water disappears. Once I have a liner it will be better.

Interviewer: Why don't you get the liner?

Subsistence user: I don't know where to get the liner. … and I don't even have money. We asked the [people from the NGO giving out liners], but they said it was just a project and that we must find one by ourselves.

Interviewer: How did that make you feel?

Subsistence user: Not good. We spent a whole week digging the pond and never used it. …We did a lot of work and its useless.

Chicken Farms

Researcher: What allowed you to get qualified to do this and others to not?

Subsistence producer [literate and well-versed in English]: We were told we would be given a loan. Some people worry about it. They don't know what they will pay with.

Field notes: The sizeable loan ($520USD), while a critical resource, seems to be a deterrent for those unwilling to undertake or unable to comprehend the scheme.

Solar Light Franchise

Solar franchisee [literate with functional English]: Every day I can save 100KSH. By end of the month I can pay my house rent…the rest I [use to] expand my business. I am clearing [the debt to the NGO that provided the initial 10 lights] faster. [NGO translator confirms originally repayment terms were 8 months at 25% of income earned]. I still want to add more solar. The solar are not enough for my customers.

Role of Bridging Agents

FACILITATING KNOWLEDGE, AWARENESS & TRANSFER OF TECHNICAL KNOW-HOW

Water Ponds

Subsistence user [low literate]: The person who [showed] me how to do the slopes was also the man who came and did the slopes.

Field notes: Local Ministry of Agriculture and NGO organized for subsistence users demonstrations on how to properly make water ponds. They sent trained farmers to show subsistence users where they should dig the pond, and to help with figuring out correct slopes for the pond.

Solar Cooker

Local NGO project assistant: The women are really interested in the training on solar [initiated by the researchers]. … They have really been yearning for this kind of training, cooking with solar. And any other kind of training, they welcome.

Cookstoves + Bakery Business Model

Social entrepreneur: With a kiln more than half the secret is how you use it. … Those are a bit tricky to teach [first time users]. So I've saved all the pictures in a file and tell then "oh you get free. What's up training. I'll walk you through it. [First] open the top." I send a picture. "Now the smoke should look like this," I send a picture." Put the lid down." Send a picture.

Another NGO bought 20 big ovens and took [them] to Kenya and …Tanzania. They're doing [the training] with small ladies groups now. [They are] training [who they hope will be future] trainers.

EconSan Toilets

Excerpt from WaterAid (2014) *blog:* Because construction and use of EcoSan toilets are very different from conventional toilets, intensive training must be given to the mason, users and supervisor staff for a successful outcome.

Solar Light Franchise

Supplier of solar lights: [We tell the youth] this is the product. This is the cost price. Then this is the selling price. This is the Business-in-a-Box [model].

Chicken Farming

Researcher: Where did you get this information from?

Subsistence producer [literate and well-versed in English]: From the one who gave us the contract. … He came and taught us. He had a seminar.

Field note: The subsistence producer had a book detailing key information for the successful raising of chickens.

FACILITATING SKILLS DEVELOPMENT

Solar Light Franchise

Social enterprise: [The youth] go sell and then every month we gathered together to see how sales are going, what challenges they are facing, and then [the social enterprise's] technical team comes in to advise youth on how to sell and how to deal with customer care and customer complaints.

Local NGO member: [I did] extra training on record keeping… the [social enterprise] was just to explain the technical part of [the solar light use]. Now we are assisting them on bookkeeping [shows record book made by the local community support group]. Apart from that there was some training on money [management skills necessary for a franchisee's success].

Table 4. Continued

Role of Bridging Agents

Avon Franchise

Excerpt from Scott (2012) *Avon in Africa case study:* The Avon experience, which stresses forward planning for both business and personal goals, seems to have affected new attitudes about money in which the prevailing hope was to move from using Avon income to meet daily consumption needs toward using it to build capital (p.14).

Microfinance

Informal economy/subsistence entrepreneur [literate with functional English]: The people [from a microfinance bank] organized four seminars for us on how to save, run business and avoid many loans or borrowing [too much] money.

FACILITATING BRICOLAGE

EcoSan Toilets

Excerpt from WaterAid (2014) *blog:* We initially used poly-fibre squatting pans for the EcoSan toilets, but because these were not available … the cost per toilet increased. This cost was not viable. … Thus. … [local] masons were trained to construct the floor of the toilets as EcoSan pans. This. … reduced costs substantially. …We worked with [masons] to further decrease [costs using] locally available material such as bamboo (n.p.).

Solar Light Franchise

Social enterprise: We do some [business] skills training [and] we also *train* [solar entrepreneurs] on *idea development.*

PROVIDING FINANCING AND/OR RESOURCE ACCESS

Water Ponds

Subsistence user [literate and functional-level of English]: A donor came in 2009 and said if you raise 27,000KHS we will do a whole pond for you with a metal roof with a gutter and a stone structure inside to hold the lining. The donor provided all the materials and even the laborers. I worked as one of the laborers and got paid to dig my own pond. Four people, including myself, dug the pond. The donor also paid for people [welders] to do the metal roof and masons to put in the stone wall, and they provided the liner. My wife got some of the [27,000KHS] through using different merry-go-rounds [saving groups] and I had money from working at [a big] farm.

Field note: This is a highly subsidized pond as this pond is big - 24x30x10 feet deep. Most farmers who received the liner from the [Catholic charity] dug ponds that averaged 6mx6m; while the farmers had to pay to dig the hole, the charity provided the water liner est. to cost 20,000KHS and a drip kit.

Solar Light Franchise

Supplier of solar lights: [The social enterprise] bought 1,000 lamps, 1,000 kits each. They give them to the youth. The youth sells them at 2,740KHS. The moment [the lights] sell, [the youth] return the 2,210KHS to [the social enterprise]. You see, this is like a moving fund. So, [the] profit which [the youth] get, that is the margin. [The social enterprise] don't want any profit, they just want to recover the [cost].

Social enterprise: Each youth got one complete kit - one household kit and one lighting kit - at the start. Once they sell, they sell at a margin of about 20%. They keep the profit, and then the rest is used to buy extra kit so they can go on with the business. The plan is that, in the future, they will be able to earn enough to be able to buy their own products.

Cookstoves + Business Bakery Model

Social enterprise: [This] Italian NGO… sponsored the small ovens for the [women] centers. They teach cooking as part of the curriculum. [The NGO] gave out 20 [stoves] to people who know how to bake. The best students get to take one home to their slum.

EcoSan Toilets

Excerpt from WaterAid (2008): Out of a total cost of an Ecosan toilet: £120; £45 will be contributed by the toilet user and £75 by the project to ensure financial contribution up to the pan level, again excluding unskilled labor works (p. 12).

Chicken Farm

Subsistence user [literate and well-versed in English]: [The subcontractor told us] where we could get the financing… from a [savings and credit co-operative]. He was the one that went to them and got the loan. He gave us the chicken and even the food.

PROVIDING INCENTIVES

Water Ponds

Local NGO project assistant: [The NGO] was here for two years. They only gave resources in the beginning and after that they used farmers to follow each other. These farmer coordinators were within each group and would visit farmers. The coordinators were not paid. They were volunteers. They could be paid to go to meetings and seminars. But when these incentives finished the coordinators stopped visiting and farmers stop doing the kitchen gardens and caring for their ponds.

Local NGO project assistant: If you do everything for an individual they will relax and they will not see the value of the project. When you cost share the farmer will value it. They will own that project. [An organization should] empower individuals but select a few to be experts so they can be followed [by others] or entice or encourage others to continue.

EcoSan Toilets

Excerpt from WaterAid (2008): [The financial] contribution from this project, which amounts to around 60% of the total costs, is considered a subsidy and has been instrumental in generating demand even when the technology is relatively new (p. 12).

Table 4. Continued

Role of Bridging Agents

LEVERAGING PARTNERSHIPS

Water Ponds

Field notes: A Catholic charity partnered with the local Ministry of Agriculture. They funneled their support through the government representatives to reach the subsistence users who were the target of their social innovation reproduction

Solar Light Franchise

Social enterprise: The organization which we are partnering with ... [named company] foots all those bills for their staff, for transport and for the SVEs [Solar Village Entrepreneurs project]. We just go [to the community] to train.

Social enterprise supplier: NGOs [are] buying our product and using them in [the camps]. We sell to them at the wholesale price. There are volume discounts, especially for people who are buying big… a full container [around 6,000 solar lights]. You see, they'll buy at factory price… and the unit price will drop a little.

Chicken Farming

Researcher: How did you meet [the chicken farming subcontractor]?

Subsistence producer [literate and well-versed in English]: He came through the [NGO that did the water ponds]. He had a seminar. He met with 17 groups and said if you want, you register yourself. So our group registered.

Rights, Benefits & Profits

IP RIGHTS

Solar Cooker

Field notes: Involvement in making the good gave them a sense of pride and an 'ownership claim,' increasing their willingness to optimize their personal usage and an unwillingness to share design.

Cookstoves + Business Bakery model

Social entrepreneur: I've done a YouTube clip] a little bit but that's really giving the game up. I don't mind people replicating but [I'm not going to let] the cat out of the bag.

Field notes: He uses 'What's app' instead, sending pictures and explaining the process to cookstove purchases. It is his way of controlling IP/ knowledge dissemination process.

BENEFITS

Water Pond:

Subsistence user [literate well versed in English]: I use it for feed the sheep and for washing, but not for home use

Subsistence user [low-literate]: He was told it is good he can do the kitchen garden with it. He'll never ask for food from anyone.

Solar Cooker:

Field notes: Users noted: savings in time, money, and effort, e.g., the daily 3-hour task of collecting firewood or 1-2 hours of going to buy charcoal; improved efficiency, allowing them to boil water and cook rice unattended while working in their fields; reduced cost spent on fuel (kerosene, charcoal, wood cutting) by at least 150KSH ($1.50 USD) per week; increased use of hot water for washing, improving family sanitation.

$100 Laptop:

Expert from Robertson (2018): In early 2014 [after years of product failures], the Boston-based OLPC Foundation quietly disbanded… OLPC *is* dead….In 2015, the OLPC Association was bought by the Zamora Terán Foundation, a nonprofit created by Nicaraguan banking tycoon Roberto Zamora…. "We're not in the business of selling laptops," says Zamora. "If we don't grow 10, 15, 20 percent a year, that doesn't matter for us. With a little money, we can have a lot of impact on poor communities throughout the world. [Other laptops] need to get replaced after weeks of being in the field, with the dust, the water, the heat." And though some phones and tablets are cheaper in the short term, one rugged OLPC might outlast generations of them (n.p.).

MPesa:

Subsistence user [low-literate]: I save with MPesa. I don't have a bank account

Subsistence user [literate well-versed in English]: I opened a business account called boresha biashara* account…after 6 months you can even go for a loan because they will consider you as a business person *[*a micro banking loan for micro entrepreneurs without normal credit from KCB bank]*.

PROFITS

Solar Cookers

Researcher: Did you tell anyone about the solar cooker?

Subsistence user [literate]: Yes. I have told three people [about the solar cookers] because of its benefits… it keeps them from having to use firewood. I tell them to look for cardboard, tin foil and glue. And then I show them how to build them…. I charged them 200KHS each.

Field notes: The one group making solar cookers has talked about selling them but they haven't started yet. They are looking for money. Group members are supposed to give 50KHS ($5) each for the group to buy the materials. They also need to look for buyers, as this is a new product. Any profits they make they plan to use to buy fertilizers and seeds.

Chicken Farming

Subsistence producer [literate and well-versed in English]: Because we are on contract, we get 800KHS to 700KHS per chicken. After four months we're supposed to send the chickens [to the subcontractor]. According to the amount we'll get from those chickens, we'll deduct the loan from that amount and that will leave us with profit.

Researcher: You got all the feed, chickens and everything for [a loan of] 52,000KHS. How many chickens do you have?

Table 4. Continued

Rights, Benefits & Profits
Subsistence producer: 100.
Researcher: So you're hoping to make about 70,000KHS ($700USD) let's say, and you minus the 52,000KSH ($520) loan, so then you have a nice profit… [of] 28,000KHS ($280USD). What are you going to do with that profit?
Subsistence producer: I will build a nicer house.
Researcher: But is this [money] yours or the group? Won't the group split it up?
Subsistence producer: The money is mine. It is not for the group. It is mine.
Field notes: Although the group has originally registered to be involved in the training seminar, she was one of only three out of 30 seminar attendees that risked taking on the loan.
Solar Light Franchise
Social enterprise: The youth sells [the solar lights] at 2,740. The moment they sell, they return the 2,210 [sells them at 2,740 KSH] to [Charity partner in Nairobi]. …So, through that profit which they get, that is the margin.
Social enterprise: What [social enterprise partner in Kisumu] has done is they have bought 100 lights and they have given to ten people and then the people they have given to pay them back from the rental income.
Avon Franchise
Excerpt from Scott et al. (2012)*:* [She] was selling tomatoes at the roadside when she learned about Avon; she had no money for registration and did not qualify for start-up credit. The more established agent who recruited her provided a small loan. She soon repaid the debt and now earns an income that would be quite comfortable, even by Western standards (p. 553).
Excerpt from interview in Scott et al. (2012): We are having people that are sitting on a street corner selling something that is not that profitable, selling just to have something to eat in the evening but with Avon we are really changing people's lives (p.561).

authors searched for patterns across the cases, noting key variables. These variables are summarized in Figure 1 as a first set of second-order themes. In moving between the findings and the wider literature on social innovations and subsistence markets (Glaser and Strauss, 2006), and through ongoing discussions between researchers regarding emergent theoretical notions, the authors delineated these categories into a second set of second-order themes. These became distilled down into two key aggregate dimensions: (1) knowledge, and (2) resources. The authors then re-assessed the cases through comparing the interaction of these two dimensions, and grouped the cases into different "types" of social innovations. Figure 2 captures the result of this work in the typology of reproduced social innovations. Significantly, given that during this process the fieldwork in Kenya was still ongoing, the authors tested the emergent theoretical interpretation. They probed for the dimensions of knowledge and resources in interviews with subsistence user-producers of social innovations and with local community members. Through this iterative, inductive-based process (Spiggle, 1994) the authors developed and verified their proposed typology and extension of social innovation theory.

Findings: Exploring the Reproduction of Social Innovations

The findings that emerged from the data analysis demonstrate that the interaction of eight elements affects the reproduction of a social innovation (i.e., second-order themes per Figure 1). Table 4 contains representative quotes of these elements, which are summarized below.

Social Innovation Product Attributes: Complexities of Knowledge

"Complexities of knowledge" capture the mix of knowledge required to reproduce the product. The nature of the social innovation design influences how complex this is. For example, in the case of the solar cooker the design was simple: glued tinfoil on a sturdy piece of cardboard. Subsistence users could reproduce a copy by creating a template from a store-bought version owned by a group member. Through a trial and error process they could learn how much glue to put on the cardboard and how thick the cardboard needed to be. The case of mobile money, however, stood at the opposite end of the spectrum: upgrading or extending the platform required high levels of professional-based, expert knowledge and skills related to technology and information systems.

The remaining social innovations fall between these two product design complexities. As the quotes in Table 4 relate, water ponds are more complex in their design than solar cookers. For water ponds, subsistence users needed to know how to maximize runoff of water from roofs or roads and how to put in place gradients to reduce silt. It was vital that subsistence users could understand how their soil type dictated the slope they should use and whether

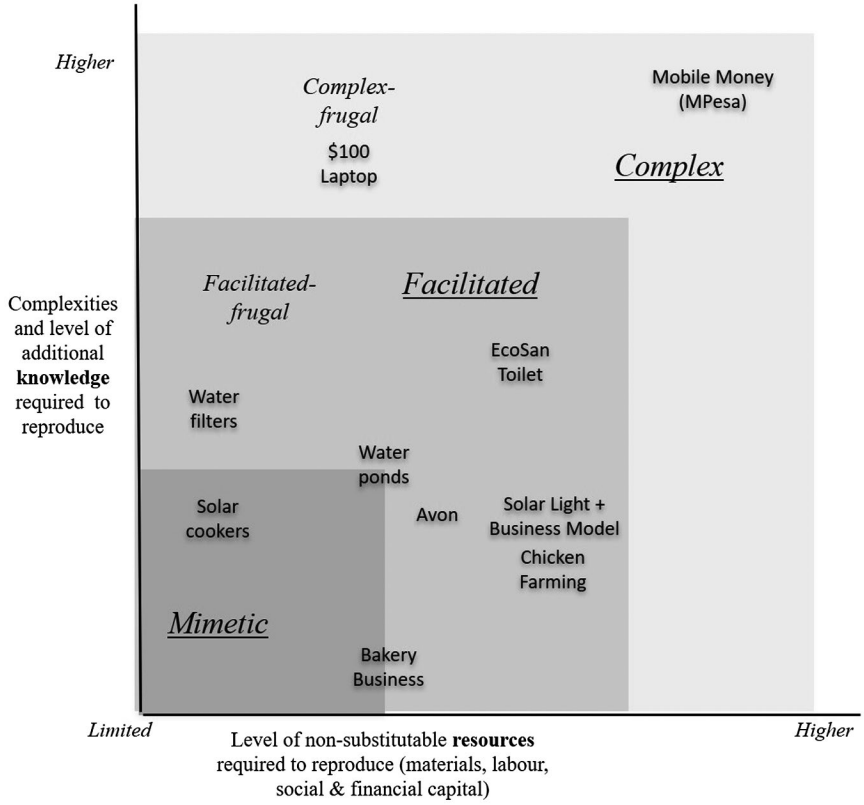

Figure 2. Typology of Reproduced Social Innovations

they needed a liner. Failure to grasp this knowledge is one reason why abandoned, nonfunctioning water pond holes exist. EcoSan toilets are a step above this, demanding knowledge skill sets such as masonry to build and a comprehension of how the various components, ground type, and depth affect its reproduction.

Social franchises or other business models, like the subcontracting of chicken farming, can require quite specific knowledge that could be codified and explicitly translated. For example, raising chickens involved following specific steps related to food, warmth, timing, and weight. Franchises demanded franchisees know what price points to use in product sales or how to manage money.

The cases of frugal innovations (innovations that attempt to simplify designs to reduce costs) had varying levels of design complexities. While the initial de-complexification process involved high levels of knowledge (often done in tandem with university professors or professionals) (Robertson, 2018), the resulting product design could be simplified to a point where knowledge on how to reassemble component parts could be translated to subsistence producers (e.g., the reverse water osmosis). Others, such as the $100 laptop, still had high levels of professional/expert knowledge (e.g., computing, engineering, manufacturing) required for its reproduction.

As detailed later, although most subsistence users did not have the knowledge needed to reproduce some of these more elaborate social innovations, there were some innovations they could viably learn to do through training programs offered by bridging agents (e.g., water ponds, EcoSan toilets, social franchises). Failure by both subsistence users and bridging agents to adequately anticipate potential problems or recognize complexities of knowledge involved in reproducing products contributed to their unsuccessful reproductions.

Social Innovation Product Attributes: Complexities of Resources

The complexity of resources considers what resources might be needed to reproduce a social innovation. These may include materials, financing, physical

labor, or social networks. Wide variances in technical specificity, cost, and/or accessibility span the cases. At one extreme are the numerous, costly, and complex resource configurations demanded by MPesa. At the other end are products that require simple material items that may readily be purchased, like the solar cooker's tinfoil, glue, and cardboard. Resources may also include leveraging one's physical abilities, such as the strength to dig ponds, or the monetary resources to rent a machine, hire oxen, or employ casual laborers to do the digging. Last, intangible resources, such as social networks are important, particularly to the success of franchises or other consumer-facing business models.

When the mix of resources had relatively low levels of complexity and high levels of availability or substitutability, subsistence user-producers could more readily reproduce them. The solar cooker, for example, did not require much physical effort and had relatively affordable inputs that were available in local markets. In the case of the reverse water osmosis filters, the informal entrepreneurs could obtain the parts needed to assemble the filters, and through maintaining good customer relations, they could achieve sustainable sources of funding to purchase these parts. As detailed later, at other times the resource mix demanded the involvement of a bridging agent (e.g., NGO, government, businesses) to help cover the costs of the innovation (as in the case of the highly subsidized EcoSan toilets), or to provide access to key materials (per the solar lights in the case of the solar franchisee model).

Reproductions failed when the mix of needed resources was not duly considered. For instance water ponds, which look deceptively easy to copy, required resources beyond the means of some subsistence users. One of the major barriers for subsistence users to reproduce the water ponds effectively was the liner (estimated to cost $200 USD) but also the cost of the substructures that could protect the liner. Reproducers who did not have roofed ponds (which was the majority) risked having their liner ripped by stones, rats, bugs, birds, or having livestock (and in one case a child) fall in and potentially drown. Thus, while an NGO provided the expensive liner, it did not supply the other required resources (such as labor to dig the pond or money to hire people, and money/materials to build a substructure). In conditions where the soil required liners, the absence or destruction of a liner led to poorly performing ponds where water evaporated quickly. This caused farmers to view the resources invested in digging (either paid or self-labored) as wasted.

Subsistence Users' Capacity: Capacity for Knowledge

Subsistence users' capacity for knowledge or ability to think abstractly profoundly affects reproductions. As evident in the cases, subsistence user-producers exhibited a range of capacities for grasping the knowledge required to reproduce the social innovation. For some the required knowledge aligned with what they already possessed or learned, or knowledge that was tacit and that they intuitively knew. For example, Avon ladies, solar light franchisees, and reverse osmosis filter entrepreneurs knew how to navigate or leverage social relationships. Subsistence farmers could discern where to dig a hole based on their knowledge of their land. They likewise exhibited practical levels of know-how, such as how to dig a hole. When subsistence users did not possess the knowledge, they could potentially learn it either from bridging agents or through their intra-community networks. However, as the data demonstrate, a divide is evident between those capable of learning and properly applying the information to reproduce a social innovation, and those who struggled to do so. This could be related to levels of literacy.

In line with Viswanathan, Torelli, et al. (2009) and Viswanathan et al. (2018), the findings illustrate how those with low levels of literacy tend to think in concrete versus abstractive terms. Low-literate subsistence user-producers often reproduced social innovations based on *what* neighbors had told them, *what* they saw others doing, or *how* they had been taught, without understanding the deeper *why*. Their cognitive predilections meant they focused on the concrete elements—"the how-tos"—to reproduction. This is part of the reason why so many water ponds failed to be successfully reproduced and why other social innovation practices became "bastardized." Moreover, the inability to understand the "why" of reproducing a social innovation limited the ability of subsistence user-producers to engage in bricolage. By failing to grasp the deeper level of what the product was doing, they could not adapt innovations to suit their physical context (e.g., different soil properties) nor adjust design elements to suit the materials they had at hand. They could only repeat the "how." The solar cooker is

exemplar of this: the groups could not find thicker cardboard but rather than change the design they put on hold the reproduction of solar cookers. Additionally, by not comprehending more abstractive concepts, like "markets" and "consumer needs," subsistence franchisees struggled to innovate "business-in-a-box" models beyond the initial designs. As problematized later, this may threaten the sustainability of the model as market saturation is inevitable with their preferred approach (which is to sell rather than rent lights).

Lower levels of knowledge capabilities also affected willingness to reproduce social innovations. As related in Table 4, low-literate subsistence users "feared" the unknown. For example, low-literate individuals often followed the crowd. Subsistence users reproduced the social innovation only after others had demonstrated or told them about the positive benefits. But, if their friends, family, or neighbors told them of risks, such as water ponds being a safety hazard for children, they would not attempt reproduction. Similar to what Viswanathan et al. (2012) note, this research finds that social relationships are very decisive to these subsistence users' lives and thus often determine involvement.

Additionally, even though many subsistence users heard of the social innovation's benefits, and sometimes temporarily experienced these benefits, they grappled to comprehend short-term versus long-term trade-offs. For example, a woman could work in another person's farm, digging to raise money to fix her liner for the water pond or to get sufficient funds to buy the materials needed to make a solar cooker. While this might put added pressure on her in the short term, this would be greatly offset in the long term by significant reductions in the time required to do her daily tasks. Yet, many women with lower levels of literacy did not do this. Rather, they let their water ponds remain as empty, dry holes for months on end and did not attempt to make a solar cooker.

In contrast, more literate individuals tended to *not* follow the crowd. They acted like the "transformative entrepreneurs" detailed by Sridharan et al. (2014). They took risks in hopes of longer-term benefits. They trialed new social innovations (as one of the respondents with the water ponds and a solar social franchisee did) or took loans to enable involvement in the reproduction of a social innovation (per the chicken farming entrepreneur). They seemed more capable of engaging in bricolage and had the capacity to initiate activities that went beyond eking out a livelihood to doing things that made sense from a social or environmental perspective, such as the EcoSan toilet masons or the reverse osmosis water filter entrepreneurs. Although not given as a detailed case analysis, the authors witnessed this pursuit of social–environmental benefits with some subsistence farmers who adopted innovative conservation agricultural practices, such as using a home-made mix of grounded chilies with ash to ward off pests instead of buying toxic and expensive pesticides. When locals were asked what they thought allowed people to pursue such opportunities, they explained how literate people, particularly those also versed in English, had "enlightenment," meaning they could engage more with the world and in so doing gain exposure to new ideas.

The myriad quotes in Table 4 evidence how the capacity for knowledge of subsistence users is closely related to literacy and effects their comprehension of the product, abstractive capacity, potential for bricolage and ingenuity, and the level to which they allow intra-community relationships to determine their actions. The variability in knowledge capacities helps to explain why some community members successfully reproduced social innovations while others failed or did not even try.

Subsistence User's Capacity: Connection to Resources

Key to the ability of subsistence user-producers to reproduce social innovations is gaining access to the resources required. Often these resources act in an interactive way. For example, the reproduction of the solar light and Avon franchise models and EcoSan toilets thrived on intra-community networks, enabling individuals to find out about the opportunities; gain access to training and materials; and, in turn, sell the products for their own benefit. Many subsistence user-producers heard about the social innovations through their community connections, particularly their groups. Community groups also operated with a collective agency, pooling financial resources to purchase materials. The case of the solar cooker, however, in which members were waiting for the group to coordinate the reproduction effort, illustrates that group dynamics can also delay or limit reproductions of social innovations.

Subsistence producers likewise "traded" resources. Women worked in other farmers' lands "digging" (plowing or weeding by hand) in order to raise money

to pay men to dig their water pond holes, make alterations to their water ponds, or fix their liners. This concept of a subsistence producer "trading" something in exchange for other resources is a common thread that runs through many of the highly subsidized programs sponsored by a variety of organizations. Normally, this takes the form of physical effort, as this is assumed to be something subsistence users have available. By putting in effort, it is assumed that subsistence users will gain a sense of ownership and take care of the materials given. However, as the countless empty water ponds signify, this assumption rarely holds. Once incentives are taken away, subsistence users (particularly those with lower literacy) allow other needs to take precedence. Likewise, the ability of subsistence users to contribute labor is not something that can be assumed. The ability of subsistence farmers to maintain or even start to reproduce a social innovation, such as digging a water hole, can be undermined by sickness or physical limitations.

The findings also evidence how deficiencies in social resources can result in a domino effect and lead to failure and/or dissuasion. For example, one woman who dug a hole for a water pond with her husband did not receive a liner. She joined the project too late. Her social relations did not connect her to the project in time and gave her inadequate information. Consequently, her water pond remained empty and her perception, which she shared with others, was that water ponds were a waste of effort.

The quotes in Table 4 also demonstrate that subsistence user-producers who exhibited a higher capacity for accessing resources were not only those who were well connected but also those who were literate. This finding is evidenced in comparisons of those who understood how to obtain financing to make social reproductions happen—whether it was making arrangements to borrow from multiple informal saving groups or getting a loan—and those who did not. In the latter case, the low-literate subsistence users either relied on traditional means for obtaining income (e.g., digging), which did little to make more transformative changes in their lives, or they continued to hope for a bridging agent to help them through a sponsored/subsidized program.

Role of Bridging Agent: Connector to Knowledge

Bridging agents, such as NGOs or CBOs, play key roles in a number of ways. The findings detail how they raised awareness of the social innovation, which in turn motivated subsistence user-producers to consider reproducing it. Reproducing a solar cooker was an idea initiated by an intermediary, which some group members decided to pursue. Second, bridging agents facilitated knowledge and skill transfer. Popular strategies employed to build this knowledge awareness and comprehension, as described in Table 4, included: running demonstration events (e.g., water ponds), seminars (e.g., chicken business), training sessions (e.g., all social franchises), or leveraging social media to walk subsistence user-producers through the "how-to" (e.g., baking business models using cook stoves [as detailed later]). Third, bridging agents encouraged and helped subsistence user-producers to engage in bricolage, as the NGO did with local masons when trying to adapt the EcoSan toilet to the local conditions.

In transmitting knowledge, bridging agents often formed partnerships and worked together. For example, in the case of the water ponds, the Catholic charity worked through the local Ministry of Agriculture to access interested subsistence farmers and to run demonstrations that explained to farmers how to self-build. To supplement the training sessions (assuming that a single exposure to key information may not be sufficiently absorbed), these bridging agents supported the visit of a technical officer to each farm registered in the program to offer additional advice and to check on the pond's design.

For the social light franchises, a sponsoring faith-based organization tasked the local social enterprise to find the youth and train them in business skills necessary to run a successful rental or sales business. In the EcoSan toilets case, the CBO and subsistence artisans engaged in joint reproduction of the toilets. The CBO established a microbusiness model that the artisans could employ to build the toilets and diffuse the innovation while potentially earning income. The CBO provided the initial training on both the product design and the business model.

In the case of microfinancing, a training program run by a local CBO in partnership with a bank (Equity) and NGO (CARE Kenya) introduced a secure banking product to the group that could be used to save small amounts of money. Later, the CBO held a series of events to introduce subsistence users to potential business models (such as a chicken business) that could be started with the savings users had built up. Working with local bridging agents not only ensured information was communicated in the local language

but also added a layer of trust and acceptability to the knowledge being shared.

Comparing across the cases reveals that bridging agents become increasingly significant as complexities of knowledge increase. They de-complexified information and transmitted it, or provided access to those who had the knowledge and could apply it (e.g., trained farmers, masons). Without this occurring, the potential for the subsistence users to think about reproducing the social innovation, let alone doing so correctly, would be significantly reduced, particularly for lower literate individuals.

Role of Bridging Agent: Connector to Resources

In addition to the product awareness and specific knowledge about the reproduction and use of a social innovation, Table 4 details how bridging agents are also key providers of critical material and financial resources. In poverty contexts, the major barrier to the diffusion of many social innovations is their cost and/or resources required. Bridging agents can thus enable reproduction by offsetting or subsidizing the costs for key materials (per the water ponds, solar cooker, cook stove, and EcoSan toilets) or by providing upfront capital (per the social light and Avon franchises and the chicken business cases). For example, in the case of the water ponds, the Catholic charity paid for the training events and gave each participant a waterproof liner and drip kit. Estimates suggest these material inputs were worth around $250, a significant expense for farmers in extreme poverty (earning less than $2 a day). In the case of the solar cooker, the intermediary purchased the initial glue and tin foil, reducing the risk that group members might incur a financial loss if the proposed idea did not work out.

The solar lamp franchise model exemplifies a specific form of social innovations facilitated and resourced by intermediaries. This business model (similar to Avon in Africa [Scott, Dolan, Johnstone-Louis, Sugden, and Wu, 2012]) required intermediaries to transfer knowledge and skills (as outlined above). Yet it also required them to provide subsistence user-entrepreneurs access to: (1) key nonsubstitutable resources (e.g., the discounted solar lights that the bridging agents obtained through leveraging their own networks and bulk buying purchase power), and (2) seed financing to cover upfront costs (e.g., an initial set of solar lights). Without these initial injections, the individual subsistence user-entrepreneurs would be unlikely to access the resources needed to start the business and could struggle to keep it running. To feasibly run this model, however, required partnerships be formed between organizations, which eventually could trickle down to benefit the subsistence user-entrepreneur. The model started with SolarCo, the supplier of lights, which funded its business through a dual channel business model: 30% of its business relied on a "traditional" commercial arm supplying supermarkets; the remaining 70% was through what they described as their "alternative trade channel" focused on nonprofit clients. In the latter channel, SolarCo sold lights in bulk to NGOs or nonprofits at a reduced price to either promote a sales-based model in which individual entrepreneurs would sell lights in their "patch," or to encourage a rental-based model in which entrepreneurs would rent the lights out on a daily basis for a smaller but more sustained income. Interestingly, of these routes, SolarCo estimated 90% of entrepreneurs used the sales-based model even though the rental-based model would have provided longer term benefits. A sales-based model, while providing larger boosts to income when lights are sold, resulted in unpredictable streams of income and could eventually result in competitive market saturation. As detailed in the next section, this suboptimal option chosen by the majority of solar light franchisees emphasizes a need to go beyond a simplistic understanding of benefits achieved through social innovations. There is a need to consider potential trade-offs, particularly since the economic and social benefits of reproducing social innovations for subsistence user-producers is often tied to their ability to achieve profits.

Allocation of Benefits: Protection of Knowledge

One way producers gain benefits from the (re)production of social innovations is through maintaining ownership over knowledge. In traditional business models, this takes the form of IP rights. By enforcing IP rights, organizations can accrue profits, which can allow them to recoup the costs invested in designing, piloting, and market testing the product. IP rights occurred in cases when the innovations demanded high levels of investments into knowledge, such as MPesa and the $100 laptop. In cases like these, the reproduction of the social innovation tends to stay with the originating organization, which then commercializes upon it. Profits (if any) are to accrue to the organization while social benefits accrue to the subsistence users.

As complexities of knowledge become lower and start to match the knowledge capabilities of subsistence users, the potential increases for the social innovation to be reproduced by the subsistence users. If IP rights become unenforced or remain open, these subsistence user-entrepreneurs may adopt a business model that can allow them to effectively and freely reproduce the innovation and capture social benefits and profits from the social innovation. The examples here include the basic solar cookers, water ponds, cook stoves of the bakery business, EcoSan toilets, and reverse osmosis water filters. Yet in order for these entrepreneurs to protect their profits, some enforce a similar protection mechanism over their valued knowledge. The case of the solar cooker is exemplifying: one woman, who encouraged her neighbors to reproduce solar cookers, also charged them $2 USD each to train them on how to make the cookers. (Her neighbors were still expected to provide their own tin foil, glue, and cardboard.) Likewise, in slightly more complicated social innovations, like a cook stove used in a bakery business, the entrepreneur may try to control access to the knowledge. As noted in Table 4, the cook stove entrepreneur did not want to let the "cat out of the bag" and so he used messages and photos sent via WhatsApp to guide users through the process of how to use the cook stove.

A final way knowledge becomes protected is through a hybrid model. In these instances, such as the solar light franchisee model, parts of the social innovation are protected through IP rights, while other elements are left as open access. The actual solar light is the component that is IP protected with patented technology built into its design. The business model that equips subsistence entrepreneurs with the resources and knowledge to run a solar light rental business is modeled on a "common" open-access design used by other social enterprises and NGOs.

Allocation of Benefits: Division of Resulting Resources

Alongside the idea of who "owns" the innovation design, the data point to considerations related to the accrual of benefits: social and economic. While social benefits, such as increased access to lighting, energy, finance, health, education, food, security, and personal well-being or confidence, often accrue to the end-user, economic benefits achieved through profits or cost savings can become a fuzzy area. This was apparent in instances where subsistence user-producers attempted to figure out how to split money between them. For example, in the case of the solar cooker where the one woman gained a $6 profit for training others, some of her group members thought this type of income belonged to the group. It was, after all, in the group that they first learned about and practiced making the cookers. The plan was for the group to pool their resources together and make a number of cookers, sell them, and use the proceeds to buy fertilizer and seeds that would be divided between involved members. This split between group versus individual benefits may not be of immediate concern in an untapped market, however, as the social light franchisee model hints at, if subsistence entrepreneurs pursue strategies that bring them short-term benefits (e.g., selling a solar light), they could do so at the risk of compromising longer term, more sustainable flows of income (e.g., renting a solar light) for the community of their fellow workers.

The data in Table 4 also demonstrate problems with a sense of ownership over some reproduced innovations and an unwillingness, at times, of people to share their social innovation with others. For instance, in the case of the solar cookers, subsistence user-producers would proudly relate that they had a solar cooker. Owning one gave them a sense of pride. However, this ownership mentality also resulted in subsistence user-producers refusing to let others use their solar cooker (even on days when they would not be using it) out of fear that their neighbors might break it.

Finally, the cases make apparent that attempts to obtain social benefits and profits do not always occur together. While the basic solar cooker, Avon, and MPesa achieved both, in other instances, one or neither benefit accrued. The story of the $100 laptop exemplifies the way this is commonly understood in the social innovation literature: this frugal innovation did not generate sufficient economic benefits (Robertson, 2018). However, this article's findings also reveal how subsistence user-producers experience this problem. In situations where key components (resource and knowledge) required to reproduce the social innovations escape user-producers' capacities, the accrual of anticipated benefits can be stymied. The water ponds are illustrative. Costs in terms of money, time, and effort were incurred, yet at times the reproducer failed to achieve a working pond. Those living in poverty lead precarious lives where such failures may have serious consequences on the well-being of themselves and their

families. This is perhaps why there is a reluctance to invest in some social innovations; rather, subsistence user-producers rely on bridging agents to mitigate that risk. Just as the balance between benefits and costs differed across social innovations, so too does the risk and rewards. This trade-off was one factor that contributed to subsistence users' (lack of) willingness to attempt a reproduction. As this example makes evident, it is not sufficient to solely assess social innovations based on their postulated benefits. Rather, if practitioners/scholars are to understand the story of their diffusion, they must also consider the potential social benefits, the division of economic benefits, and the costs and losses that can occur in attempts of any actor to reproduce them.

Discussion

Insights into Reproductions of Social Innovations and Implications for Research

The case comparisons reveal a number of insights that can help extend theoretical understandings on the reproduction of social innovations in subsistence marketplaces. One is a clearer understanding of how attributes of social innovations mix together and matter to subsistence user-producers' capacity for reproduction. Notably, juxtaposing these elements generates an insightful typology of reproduced social innovations.

A typology of the reproduction of social innovations. By corroborating the findings with existing literature, two key elements become apparent. These aggregate categories, per the data analysis in Figure 1, are: *complexities of resources* and *complexities of knowledge.* Juxtaposing these elements helps explain the types of social innovations subsistence users might be capable of reproducing. Per the cases, resources include material, labor, financial, and social capital or networks that are required to reproduce innovations. This perspective resonates with the wider innovation literature, which emphasizes that it is the resources in use (Penrose, 1959) and the bundling of resources (Sirmon, Hitt, and Ireland, 2007) that matter. If actors cannot access or are dissuaded from accessing required bundles of resources (as in the case of the water ponds), their abilities to reproduce social innovations may be constrained or lead to devastating results.

Knowledge, or what this article terms *complexities of knowledge,* considers how complex, sophisticated, or involved the information is to reproduce a product, with this knowledge being either tacit or explicit, possessed or something that must be learnt, conventional or expert-based. In the cases, subsistence user-producers' prior related knowledge—whether that was based on intuition, their own experiences, information they gleaned from others, or their level of literacy—shaped their ability to act on new knowledge, how they responded to reproduction opportunities, and whether they could successfully engage in bricolage. These findings resonate with higher level theories of organizational capacity for innovation. As scholars note, an organization's prior knowledge ("absorptive capacity") can affect its ability to identify, evaluate, assimilate, and exploit new knowledge or engage in bricolage (Cohen and Levinthal, 1990; Mair and Marti, 2009).

Crossing these two proposed dimensions raises to the fore how the resource requirements of the social innovation and the resource capabilities of the reproducer *interact* with the knowledge requirements of the social innovation and the knowledge capabilities of the reproducer. The resulting typology can be seen in Figure 2.

As the typology illustrates, when the levels of complexity in knowledge and resource decrease, the possibility for subsistence user-producers to copy and reproduce the social innovation, potentially without any intermediary, increases. This mode, termed a *mimetic* social innovation, is most closely exemplified by the solar cooker: it had low resource and knowledge requirements. Conversely, when complexities of knowledge and resources increase significantly, the plausibility for subsistence users to reproduce the innovation becomes highly unlikely. The example of MPesa captures this extreme mode. Classified as a *complex* social innovation, these innovations are the type that organizations often attempt to commercialize to bring both profit and social impact. In these instances, the subsistence individual remains as an end-user who may be capable of doing many things with the social innovation but who will never be able to reproduce the underlying platform. In between these two modes is *facilitated*. This type of social innovation demands that bridging agents become involved to transfer either knowledge and/or resources to subsistence users to enable their reproduction. The water ponds, franchise/business models, and EcoSan toilets are exemplar of this type of social innovation.

In addition to these three archetypes are two sub-archetypes: *complex-frugal* and *facilitated-frugal*. Frugal innovations, by their nature, attempt to reduce resources involved. The process of doing this often initially involves complex knowledge and a sophisticated understanding of how the social innovation works. When the knowledge stays high in subsequent reproduction, *complex-frugal* innovations occur. Innovations such as the $100 laptop are exemplary. Proprietary knowledge still exists but the resources needed to reproduce the product are lessened. When the knowledge, along with resources, is de-complexified to a point where parts of the reproduction are within the knowledge capabilities of subsistence user-entrepreneurs, *facilitated-frugal* innovations can transpire. The reassembly of component parts by subsistence entrepreneurs to create reverse water osmosis filters represents this type of reproduced social innovation.

In both the case of mimetic and facilitated social innovations, because of resource constraints and because the required knowledge set is within the capabilities of some subsistence user-producers, the potential for a level of bricolage exists. In instances where subsistence users engage in the reproduction of a social innovation with adequate resource substitutes and sufficient knowledge capacity, bricolage can result in an acceptable reproduction. When resources, knowledge, or individual capacities are insufficient, bricolage can result in inadequate reproductions often with detrimental consequences. Although it could be postulated that these consequences of bricolage could occur for any marketplace actor, it is the fragile position of subsistence users that marks their experience as particularly prone to detrimental failures. It is in these cases where bridging agents (discussed below) may be needed to facilitate productive bricolage behavior (per Holt and Littlewood, 2017).

The role of bridging agents. Delving further into *facilitated* reproductions of social innovations draws to the fore this article's second contribution, that is, extending understandings of the involvement and roles of various marketplace actors in the diffusion and reproduction of a social innovation. As the literature review relates, scholars emphasize that social alliances and partnerships are key to the implementation, adoption, and potential diffusion of social innovations. Yet the dominant perspective is a top-down analysis of this diffusion process. Less research exists that examines the critical role alliances play in the *reproduction* of the social innovation or the variety of actors involved from a bottom-up perspective. Figure 3 offers this perspective. It maps out a simple distribution chain, clarifying the role that actors play in helping subsistence user-producers to reproduce social innovations versus allowing subsistence users to merely acquire or adopt social innovations. This chain demonstrates how many of the bridging agents work in partnerships, forming links with various actors in order to feasibly and appropriately facilitate reproduction by subsistence user-producers.

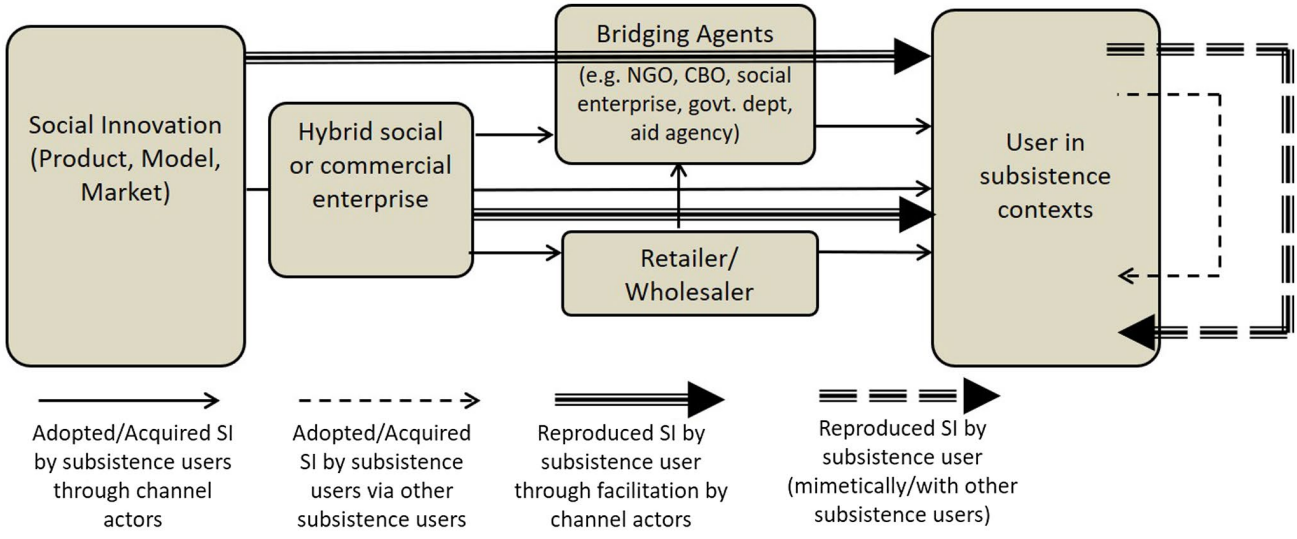

Figure 3. Distribution Channel of a Social Innovation for Reproduction vs Adoption by Subsistence User-Producers [Color figure can be viewed at wileyonlinelibrary.com]

Many of the cases evidenced how these intermediaries—or bridging agents—were key to enabling the subsistence users to engage in reproduction: they lowered the risks of experimenting with ideas, and provided financing, training, and access to key resources. The case of the EcoSan toilets exemplified how the role of bridging agents can go beyond provisioning to include facilitating bricolage behaviors. This included the agents' willingness and ability to work with the local masons to co-create (jointly design) and co-produce (jointly produce) the social innovation. These insights are quite nascent. Future research could thus help clarify what is required to facilitate these opportunities, and how marketplace actors navigate the simultaneous demands of bringing products to market and sharing knowledge and profits (and the limits to this) with users. Additionally, while this article highlights the need for subsistence user-producers to be connected to bridging agents to escape the limitations of closed-loop systems, how they amass the necessary resource of social capital is a perspective future research could address. Insights into network formations in subsistence contexts could broaden understandings of how reproduction is enabled.

Accrual of profits and social benefits. This article's third contribution emphasizes the importance and transience of IP rights, profits, and social benefits in the diffusion and reproduction of social innovations *across a spectrum* of actors. Although many definitions use profit as a defining characteristic to distinguish between "social" versus "commercial" innovations, profits often do, and at times should, accrue from social innovations. As the example of MPesa and the $100 laptop entail, in cases where social innovations require continual adaptions to keep up with the market and competition, the social innovator's capacity to improve the social benefits (either in quality or quantity) is premised, in part, on its ability to own the IP rights so that it can accrue profits, and then reinvest these profits in the continual development of the social innovation and/or sustainability of the company. In a similar fashion, the capacity of subsistence user-entrepreneurs to reproduce a social innovation, and thus diffuse the innovation and its potential social benefits, rests in part on their ability to gain profits from reselling or renting the product.

The majority of the literature on social innovations, however, treats the profits accrued to subsistence users as a social benefit. Yet, this is a naïve perspective that glosses over what subsistence users do with profits and what happens when the desire for profits causes a mimetic or facilitated social innovation to saturate a market. This is a risk that is particularly pertinent when bridging agents train franchisees in "bulk" and in a restricted geographical area, as in the case of the solar lights. Moreover, pursuit of economic benefits, which may improve the social benefits to an individual, may come at the cost of wider benefits shared among a group.

The role of profits related to social innovations is a murky area that calls for more research. Rather than viewing profits as a defining difference between commercial versus social innovations, scholars need to understand the role profits play, how they accrue to various stakeholders along a continuum, and how they may subsequently affect the social relations of "socially rich" subsistence markets. This research is urgently needed given that additional pressure is mounting for more "open access" and "shared value" social innovations.

Implications for Practice

The findings raise four key lessons for intermediaries and social innovators that relate to the design of social innovations and intermediations.

Knowledge heterogeneity and capacity. In exploring the complexities of knowledge, this research underscores how knowledge is not homogeneous in nature but is fundamentally heterogeneous and temporal—it has the potential to be enhanced over time. In reproducing social innovations, it is thus important to identify what types of knowledge preexist that can be leveraged versus what types of knowledge need to be built and shared (e.g., tacit, explicit, possessed, or knowledge learned through practice).

For example, as the EcoSan toilet indicates, the tacit knowledge possessed by masons enabled them to be a part of the reproduction process and to profit from their knowledge. In order to optimize these conditions it was necessary for the local nonprofits (the intermediaries) to recognize these knowledge capabilities and repositories. The water ponds, however, exhibit an inadequate anticipation of subsistence users' tacit knowledge and cognitive predilections. The farmers' existing tacit knowledge may

have contributed to perceptions that they could build the ponds with no training. The restricted diffusion of technical knowledge related to the complexities of ponds caused limited access to information that could have countered perceptions of reproduction ease. Additionally, demonstrations seemed to reinforce low-literate individuals' focus on the "how-to," doing little to prepare them to think more abstractly to adapt information to their own context. While the program did try to offset this by providing expert farmers, these farmers only came at the beginning. When repairs needed to be done, the subsistence users could not rely on their knowledge and had to pay for help.

These examples emphasize the importance of considering tacit knowledge, not just explicit knowledge, in the reproduction of a social innovation. It also stresses the role of knowledge capacity and cognitive predilections of subsistence users. As this article finds, levels of literacy can significantly affect ability and willingness to reproduce social innovations. The findings support Viswanathan, Sridharan, et al.'s (2009) and Viswanathan et al.'s (2012) contention that marketplace literacy is a key factor influencing subsistence users' participation in the market. As exemplified in the cases, if subsistence user-producers are to reproduce facilitated social innovations, practitioners need to address not only key "know-hows" (e.g., how to reproduce a product) but also "know-whys" (e.g., why I should reproduce this product in a certain way). Viewing marketplace literacy as a factor on par with addressing financial and resource constraints may be one way for practitioners to preempt unsuccessful reproductions of innovations and to ward off states of dependency. It is likely a more beneficial approach in the long-term than the current perspective—a perspective that leads subsistence users to toil in physical labor so that they potentially gain a sense of accomplishment and buy-in.

Additionally, practitioners need to recognize how knowledge and relationships interact. While leveraging the closed-loop system of social relationships is critical for subsistence user-producers to become aware of opportunities to reproduce, there are times when they must be able to break out of the closed-loop system to gain access to other sources of important and accurate information. In many rural communities, such as those featured in the majority of the cases, access to information remains quite restricted. These users tend to be overly dependent on key individuals within their networked system who may or may not be able to provide appropriate knowledge for reproducing goods, or feasible substitutions that could be used in the reproduction of goods.

As per network theory, these trusted networks can act to support interventions but can likewise restrict their diffusion beyond the trusted group. Tightly bound networks can encourage group think, limit introduction of new and viable information, restrict creativity, and be disadvantageous to complex tasks (Granovetter, 1983; Katz, Lazer, Arrow, and Contractor, 2004). In instances where social innovations go wrong (e.g., the water ponds), the proximity of networks can result in negative word of mouth, increasing resistance to future reproduction or diffusion efforts. For social innovators and intermediaries, subsistence market conditions of constrained knowledge capabilities, transmission pathways, and the closed-loop and one-to-one nature of social relations should be carefully considered when thinking about how to disseminate knowledge. This is particularly important as intermediaries represent one way to offset the negative aspects of closed-loop systems (e.g., offering new knowledge and avenues to access resources).

Adequate, appropriate, accessible knowledge, and resources in facilitated reproductions. As stressed throughout this article, resources and resource constraints matter. Yet these relate not just to material and financial resources but also physical (human body) capabilities. The example of the water ponds is exemplary. By not taking into account the resources of physical capabilities (or labor), the intermediaries did not consider all the costs. The result was a heightened demand on already-limited financial resources for certain groups keen to reproduce the social innovation.

On top of this need to consider resources more fully, this article raises awareness that the interaction of appropriate resources (and their potential for substitution) and required knowledge (and the potential for inadequate comprehensions) needs to be more carefully considered when designing interventions. This is particularly significant when actors intend to reproduce social innovations through facilitation. As the water ponds demonstrate, it is in these instances where actors or bridging agents need to take a bottom-up perspective: they need to

recognize the constraints faced by their target markets, specifically the most vulnerable in their target market group. Failure to do so may inadvertently perpetuate the divide between the haves and the have nots, that is, those who are more readily capable of reproducing social innovations and securing social/economic benefits versus those who might struggle and potential be left absorbing costs and detrimental consequences.

Incentives and temporal effects. Although this article's proposed typology focuses primarily on the resources required for the reproduction of social innovations, the initial resource constraints faced by subsistence user-producers in their daily lives and the resulting temporal effects cannot be ignored. These temporal effects and cognitive predilections can lead to suboptimal decisions: livelihood demands often cause subsistence entrepreneurs to veer toward opportunities to achieve more immediate financial outcomes versus more sustainable models of income (Viswanathan, Sridharan, et al., 2009). The popularity of the SolarCo "quick" profit sale model over a more sustainable and longer-profitable rental model exemplifies this. Expecting subsistence entrepreneurs to wait for long-term benefits, even if those are higher in the end than short-term gains, is impractical and inappropriate. It fails to recognize the immediacy of demands placed on their financial resources. It does not take into account the way varying levels of literacy may prevent some from being able to engage in the more abstractive thought processes required by a long-term orientation. These temporal effects mean that intermediaries need to act as bridging agents, increasing awareness and accessibility, and shifting resources, such as additional financial support, to incentivize more sustainable business growth models. This, however, also raises questions regarding temporal restrictions placed on intermediaries through the metrics imposed by donors.

Limits to the reproducing subsistence user. There is a tendency in the informal economy across Africa to imitate successful microbusinesses once knowledge on how they "work" becomes widespread. However, as the solar lamp business model alludes, only a certain number of solar entrepreneurs can operate in a given location before the market becomes saturated. Thus, a successful social innovation that is being diffused to generate profit may perversely limit diffusion of these socially innovative technologies. Although supporting more rental models may be a solution, as noted above, cognitive predilection of co-producers may inadvertently limit this.

In addition, the diffusion of social innovations through reproduction may be affected by proprietary effects. As some of the cases indicate, at times there exists an unwillingness and resistance by subsistence user-producers to pass on information, or to lend *their* resources to others outside of trusted networks or social groups. The self-help groups, for example, desired to retain knowledge related to the reproducibility of the elements of the solar cooker (and access to their templates) to exploit it for profitability purposes. This desire to control knowledge or to own a product and market can limit diffusion.

Conclusion and Limitations

This article enriches social innovation theory by employing a bottom-up approach to draw attention to the reproduction of social innovations in subsistence contexts. It moves beyond a focus on normative and social factors that affect the willingness and ability of actors to adopt and diffuse innovations to consider how the availability and complexities of resources and knowledge matter to subsistence user-producers' reproduction efforts. The findings stress that different cognitive predilections and physicalities of subsistence user-producers are critical to the successful reproductions of social innovations. Intermediaries thus need to consider and plan for these.

While the primary data covered many countries in sub-Saharan Africa, other subsistence markets exist that have different sociocultural dynamics and beliefs. In consideration of the limitations of this article's data, the authors encourage scholars to test the theoretical boundaries, proposed typology, and models in these and other contexts, and with additional social innovations. Even with these limitations, this article's theoretical and practical insights add immense value. The article emphasizes the agency of subsistence user-producers and considers factors that interact with this agency. It reveals how social innovations can be reproduced effectively, with and without the substantive involvement of third-party actors. Reproduction is one of the key ways that social innovations can reach a critical tipping point in acceptance and

use. For social innovators and intermediaries, understanding the technical dimension and impact potential of social innovations is fundamental. The missing part, however, to many theories and designs is what this article illuminates: the subsistence user-producer as an active participant within the diffusion of an innovation.

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