Finding your feet in constrained markets: How BoP social enterprises adjust to scale-up technology enabled health care delivery

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Abstract:

Scaling social impact is a challenge innovative social firms operating in resource-constrained BoP markets must address while also ensuring profitability. However, how scaling occurs is scarcely understood. By building on case studies of two India-based health care social enterprises, we make four important contributions to improve understanding of the process of scaling up. First, we demonstrate that entrepreneurial adjustments are guided by whether social firms prioritize alleviating constraints internal to the firm or those that customers face. Second, such dynamic prioritization of constraints influence how firms mobilize resources and use operating routines from inception to market establishment. Third, by pursuing the above resource mobilization strategies and operating routines, firms generate 'depth' impact i.e. by expanding the number and type of activities or 'breadth' impact by increasing the membership base, geographic area. Finally, our findings show that relative prioritization of internal and customer constraints lead firms to establish elements of institutional legitimacy i.e normative, regulative and cognitive in different sequences. We conclude by developing a process model for scaling-up social firms, by developing propositions and by discussing implications.

Keywords: Bottom of Pyramid; Scaling-up; Social impact; Health care; Entrepreneurial adjustment.

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1. Introduction

Bottom of the Pyramid (BoP) market consists of billions of people in the lowest income group (Schaefers et al., 2019), predominantly in emerging markets with more than 70% of the BoP consumers located in Asia (Pitta, et al., 2008). A systematic review of articles on the BoP have found that a market belongs to BoP when the per capita income is at or below US$1,500 or US$2,000 per annum (expressed on an internationally comparable "purchasing power parity" basis), or if poverty threshold is US$1 or US$2 per day (Kolk et al., 2014). Due to these resource constraints, BoP markets have significant unmet needs including lacking access to livelihood improving products such as power generators and air coolers (Schaefers et al., 2019), or livelihood improving services such as financial services and health care (Kuriyan et al., 2008).

Due to the presence of these unmet needs, BoP markets (Prahalad & Hart, 2002) are considered ideal for cultivating technological innovations that provide new or different value propositions over incumbent livelihood services or products (Anderson & Billou, 2007; Wiprachtiger et al., 2019). To successfully offer the value propositions, these markets require bringing together three core entrepreneurial principles: a service solution, a technology, and sustainability by effective use of limited resources (Reynoso et al., 2015). Scaling the level of social impact, however, is a key challenge an innovative social firm operating in resource-constrained BoP contexts faces (Bloom & Smith, 2010). Social ventures providing services in BoP markets are particularly interesting to study for the following reasons (Schaefers et al., 2018).

Compared to other startups and established service providers in urban markets, social ventures face relatively low levels of customer bargaining power, competitive rivalry, and lower threats of new entrants, but in contrast, they have limited resources and need to provide social

impact and ensure operating profitability. Charitable organizations or NGOs differ from social ventures by usually having only social objectives. Social ventures also face absent, weak, or failed physical infrastructure, financial and legal systems, and human resources that do not accomplish their expected role (Mair & Marti, 2009; Desa, 2012).

Limited research exists, however, about the processes by which social ventures in BoP markets achieve scale. Desa & Koch (2014) represent a notable exception in the nascent social innovation literature as they identify minimum critical specifications, demonstrate the importance of resource mobilization (e.g., recruitment of human resources) and operating routines (e.g., setting up of guidelines and processes), and highlight some entrepreneurial adjustments made by the firms to overcome scaling barriers.

Desa & Koch (2014), however, do not explicitly factor in the role of constraints faced by firms (e.g., access to financial and human capital) and customers (e.g., low purchasing power) in scaling-up and how these constraints guide the ways firms mobilize resources and use operating routines to generate the desired social impact. Similarly, Gollakota et al.'s (2010) proposal of a two-phase strategy (cost management, then benefits management) to create a sustainable advantage for BoP firms also does not consider the role of constraints faced by firms and customers as well as the challenge of scaling up while creating social impact. Ansted & Dent's (2015) framework of BoP best practices and business models also do not factor in consumer constraint.

Leaving out these constraints is an important omission (Hockerts & Wüstenhagen, 2010) as constraints such as access to resources (abundant vs. limited) are found to influence, among other things, organizational creativity in established firms (Sonenshein, 2014). Interestingly, indications are emerging that constraints drive firms to make entrepreneurial adjustments, which in turn help them to innovate in ways that translate those constraints into long-term firm success (Singh & Chaudhuri, 2009; Ray & Ray, 2010).

Bringing together literature about social innovations, firm and customer constraints, long-term scaling of social impact, and BoP firm strategy and entrepreneurial adjustments reveals an unresolved research question regarding scaling up social innovations. To investigate this, we study two questions. How does a social venture scale-up social impact in BoP markets, and how do firm and customer constraints influence the entrepreneurial adjustments it makes over time?

We investigate this by studying health care delivery in BoP markets and focus on India for the following reasons. First, social ventures providing technology-enabled health care in rural areas need to overcome resource constraints and infrastructural constraints while serving large, poor, and dispersed populations living in remote areas. For example, in India, more than 450 million rural residents are without access to quality health care (Meher & Patro, 2014) and women are considered especially vulnerable (Fletcher-Brown et al., 2017). Second, potential customers face inadequate health care facilities and services and limited ability to pay for services (Gollakota et al., 2010). Finally, the health care domain is suitable for studying social innovations in BoP markets, especially those which are enabled by technology (Mechael, 2009), because entrepreneurs increasingly enter this market aiming to provide different value propositions (e.g., cheaper, shorter waiting times, or more convenient) over incumbent health care services or products.

By analyzing two illustrative India-based social enterprises, iKure Techsoft and Neurosynaptic Communications, we make three important contributions regarding how firms generate social impact in BoP markets. First, we demonstrate that entrepreneurial adjustments are guided by whether firms are trying to alleviate constraints internal to the firm or those faced by the customers. Second, internal and external constraints guide how firms use multiple types of resource mobilization strategies and operating routines from inception to establishing themselves in the market. Third, by using resource mobilization strategies and the operating routines, firms generate different forms of social impact- depth and breadth. Depth impact can

be generated by expanding the number and type of activities using economies of learning and connectedness (see Dieleman & Sachs., 2008) while breadth impact can be created by increasing the membership base, geographic area, or working budgets by pursuing economies of scale (see Hitt et al., 1997; Prahalad, 2006). Finally, our findings show that relative prioritization of internal and customer constraints lead firms to establish elements of institutional legitimacy i.e. normative, regulative and cognitive in different sequences. Building on our findings, we propose a process model of scaling-up social impact in BoP markets and develop propositions before we discuss the managerial implications of our findings.

2. Literature Review

2.1. Social entrepreneurship at the bottom of the pyramid

The impact and scalability limitations of traditional institutional setups at the BoP have led to emergence of social entrepreneurship as an alternative towards creating a scalable socio-economic impact at the BoP. Social entrepreneurship involves social entrepreneur as a change agent and social enterprise as an organizational entity that considers the BoP segment as a customer and delivers both social and economic value (Seelos and Mair, 2005; Mair and Marti, 2006, Luke and Chu, 2013; Goyal et al., 2015). Social entrepreneurship emphasizes innovation and risk orientation along with the market efficiencies of the commercial enterprises and last-mile capabilities of the NGOs at the BoP (Luke and Chu, 2013). However, social entrepreneurs face multiple challenges during the entire life cycle of the organisation (Bhatt et al., 2019; Goyal et al., 2016). Some prominent challenges are related to scarcity of financial resources, leadership challenges, institutional and regulatory environment, scalability dilemma, difficulty in impact assessment etc. Rosca et al. (2020) analyzed how women entrepreneurs engage in social entrepreneurship processes in BoP environments and used the effectuation lens to investigate the entrepreneurial journey and decision-making logics employed at various stages of the venture development.

There is limited research on healthcare social entrepreneurship in BoP settings with a few exceptions. Esposito et al. (2012), in their study of hospitals, providing services in India, emphasized the need to focus on product/service offerings, which are affordable, accessible, available and lead to awareness among the masses, the need to engage the BoP across the value-chain and on local capacity building. In their study of social enterprises in Indian healthcare sector, Agarwal et al. (2018) found that social enterprises build both normative and regulative legitimacies prior to cognitive legitimacy. Normative legitimacy is established through imparting skills and education to local BoP populations and regulatory legitimacy by collaborating with multiple stakeholders. Once normative and regulative legitimacy are built, social enterprises are able to draw upon cognitive legitimacy to grow organically using hub and spoke model, public-private partnerships, or by sharing best practices (Agarwal et al., 2018).

As a follow-up study, Agarwal et al. (2020) used event structure analysis to analyse three social enterprises in the Indian healthcare sector to identify when social entrepreneurs encounter organizational dilemmas during the evolution process. The authors identified four key practices—asset multiplication, leveraging human capital, building social embeddedness, and affordable quality using which social entrepreneurs engage to manage dilemmas that occur in an emerging market setting.

2.2 Constraint-driven technology-enabled service innovation for the bottom of the pyramid

Service innovation in a social, communal context plays a different role in emerging economies because the end goal more explicitly concerns benefits to society rather than pure economic goals (Reynoso et al., 2015; Ramani et al., 2017). Service innovations in BoP contexts mirror social innovations (Phills et al., 2008) as they engage communities rather than relying solely on firms, thereby having the potential to lead to lasting social change by providing novel solutions with long-lasting value created for society as a whole. Importantly, social ventures in emerging

economies help to address market failures (Zahra et al., 2008; Prahalad, 2005). BoP markets are characterized by chronic shortage of resources, which affects production, exchange and consumption (Linna, 2013). Hence, social enterprises engaging in such innovations in BoP contexts are likely to face resource constraints while customers also face constraints in terms of accessibility and affordability. Hence, such service innovations can be considered as resource-constrained innovation , which is defined as innovation developed in emerging economies in a context characterized by lower power of purchase, lower understanding of technology, and lower investment resources"

Service innovations that create new markets differ along two primary dimensions: type of benefit offered and degree of service separability. The type of benefit offered by the innovative service provider may be a new core benefit such as providing high-quality and affordable cataract surgeries as done by Aravind Eye Care in India (Rangan & Thulasiraj, 2007) or a new delivery benefit that revolutionizes customers' access to the core benefit, for example, providing medical consultations over a video link using telemedicine. Separability indicates whether the service needs to be produced and consumed simultaneously (Berry et al., 2006).

Particularly in the early stages of social innovations and to create consumer demand, alliances may be required with other intermediaries such as NGOs that have established relations with the local community (Ramani & Mukherjee, 2014). The emphasis of social innovations is on generating mutual benefits for both the recipient community and the commodity provider, rather than profit maximization of the innovating firm. Bessant & Maher (2009) , relatedly, emphasize co-creation in the context of service innovation (involving users or suppliers, etc.). There is growing evidence for co-creation in health care, for example, by learning from radically different contexts via "probe and learn" approaches like the Aravind eye clinics in India (Prahalad, 2006) and in experiments toward workable technological solutions such as telecare.

A technology-enabled service innovation must overcome four general uncertainties before it is a successful innovation: technological feasibility, commercial viability, organizational appropriability, and social acceptability (Hall & Martin, 2005). In the past, technological advances had limited impact on people at the BoP, but currently, much of this population have adopted technology into various aspects of their daily life, providing them with new opportunities (Friedman, 2006). For example, mobile technology not only provide access to new knowledge but also provide products and services for rural communities, which previously relied on virtually impossible physical distribution channels (Reynoso et al., 2015).

An appropriate BoP technology focuses on the optimal use of local resources to develop technologies for the benefit of the poor (Schumacher, 1973) and should fit the constraints of the context (Pansera & Owen, 2015), the resource base of the final user, and user and task characteristics (Goodhue & Thompson, 1995). The new technology must also be compatible with income levels, resource availability, existing modes of production, existing technologies, and costs corresponding to the community for which it is designed (Stewart, 1977).

Moreover, technology-based service innovation processes encompass many informal and iterative elements, which extra-organizational factors influence, such as prevailing policies and cultural values (Barlow et al., 2006). Essen (2009) notes that existing studies on service innovation neglect the informal and unpredictable dimensions of the technology-based service innovation process, as well as its sensitivity to informal and unpredictable factors, many of which can be beyond the organization's control such as cultural norms and its social acceptance (Hall et al., 2011). Analyzing these kinds of constraints faced by firms focused on technology-enabled service innovation along with the BoP population they seek to serve are particularly promising in the context of health care services as users, technology, policies, and cultural values are integral to the delivery of health care.

2.3 Technology-enabled service innovation in health care delivery

Nowadays, IT helps deliver many traditional services including health care (Lanseng & Andreassen, 2007; Varshney, 2007; Junglas et al., 2009; Akter et al., 2013). Technology-enabled social innovations are becoming increasingly relevant in BoP markets as they help deliver low-cost, quality health care to large populations who often live in rural and remote areas (Srivastava & Shainesh, 2015). Rapid advances in information and communication technology (ICT) make it possible for service innovation to inform the design of business models (Yang & Hsiao, 2009). For IT-enabled services, the use of ICT is not simply a service tool (Chao et al., 2007); it is the core of provided service.

The rapid development of mobile ICT also fuels innovations in the health care industry—often in the context of developed countries—and has the potential to improve patient care (Siau, 2003). Tele-health services (Lanseng & Andreassen, 2007; Essen, 2009; Lockamy III & Smith, 2009), remote health care monitoring (Blount et al., 2007), and integrated or pervasive health care service delivery (Varshney, 2007; Yang & Hsiao, 2009) are illustrative examples.

Using mobile technology, health care professionals can also seamlessly access patient and medical information and enter it into centralized databases, independent of location or context of the health care worker (Haux, 2006; Chatterjee, S. Chakraborty et al., 2009). Chatterjee et al. (2009) identify portability as a necessary and sufficient condition for use and satisfaction with mobile technology usage in health care. Other important factors are device reliability and the quality of service of the technology.

A key factor in implementing an e-Health solution is an appropriate design, which implies that the technical features must fit the local context. Moreover, the technology needs to be reliable, flexible, mobile, ergonomic, user-friendly, and, if relevant, have a high image quality. Problems among individuals and between organizations can occur when implementing e-Health due to technical support problems and logistical problems (Hage et al., 2013).

For patients in BoP markets, accessing health care services is a not always easy or an option because they lack resources or fear losing livelihood while undergoing treatment. Thus, firms providing health care services in BoP markets must ensure that the value propositions are strong enough to motivate people to use those services. Akter et al. (2013) confirm that both perceived service quality and perceived trust predict continuance intentions of BoP consumers for e-Health services. Similarly, motivating health care workers to use technologies requires training and demonstration of benefits (Wu et al., 2007). These considerations also extend into the challenge of scaling-up social ventures in BoP markets facing resource constraints.

2.4 The challenge of scaling social impact and the need for entrepreneurial adjustments

A key challenge social ventures face in addressing market or government failures in resource-constrained contexts is their ability to scale-up social impact (Bloom & Smith, 2010). Scaling social impact concerns the process of expanding or adapting an organization's output to match the social needs (Desa & Koch, 2014). Scaling can be achieved by two ways (Uvin, 1995). Breadth impact builds upon economies of scale (Prahalad, 2005) where the cost of production is reduced as the social product or service is replicated to multiple geographic locations. Depth impact means adding new activities to the operational range (adding products or social-service activities) and are similar to horizontal diversification and builds upon economies of learning and connectedness (Dieleman & Sachs., 2008).

Dees et al.'s (2004) framework determine the adequate "scaling path" for a given social innovation as readiness, receptivity, resources, risk, and returns. Bradach (2010) suggest generic approaches such as using the Internet to scale impact through disseminating campaigns or facilitating networks and collaboration by using intermediaries to broker information between supply- and demand-side actors. (Bucher et al., 2016), relatedly, provide a narrative description of scaling options in a private health care set up in rural Argentina.

To achieve depth or breadth impact, firms make entrepreneurial adjustments, which concern how entrepreneurs incorporate new information over time when making decisions about business ventures (Parker, 2006). Entrepreneurial adjustments are important for organizational growth (Shepherd et al., 2011) and particularly important for social ventures aiming to scale social impact as they continuously need to balance economic and social goals (Desa & Koch, 2014). Thus, social ventures will expend a certain level of effort in their venture, wait and obtain signals from the users and the environment regarding the needs, and then adjust to achieve more impact (Parker, 2006).

Though the above literature provides some practical guidance, limited knowledge exists about how ventures achieve scale when confronted by social or economic institutional voids (Mair & Marti, 2009; Desa, 2012). Desa and Koch (2014) suggest that social ventures require capabilities in social innovation, design for affordability, and market penetration or a set of minimum critical specifications for scaling impact. Different forms of resource mobilization approaches (e.g., optimization or bricolage) and organizational routines (e.g., ostensive or performative) mediate the effect of minimum critical specification capabilities in social innovation, affordability, and market penetration on breadth and depth scaling (Desa & Koch, 2014). Hence, the need for entrepreneurial adjustments prompt social ventures to develop suitable resource mobilization strategies and operating routines to overcome barriers for scaling social impact. In this context, social ventures may use an optimization-based approach or bricolage to mobilize resources. The former approach involves acquiring standard resources with proven capabilities for the specific application for which the job is intended (Garud & Karnoe, 2003), while the latter applies combinations of undervalued, slack resources that are often available for free or cheaply (Baker & Nelson, 2005).

3. Methods

3.1. Case selection and overview

To find suitable social enterprises providing technology-enabled health care services in BoP settings in India, we collected news articles. Agarwal et al. (2018) noted that many entrepreneurs in India are pursuing social businesses by reaching greater number of beneficiaries to deliver positive impact. Hence, India can be considered an appropriate setting for our research. Out of 16 social enterprises which were identified, using Factiva we used purposive sampling to select iKure and Neurosynaptic as they differed along two service innovation dimensions: (a) the type of benefit offered and degree of service separability (Berry et al., 2006) and (b) dimensions of service process matrix (e.g., resource intensity and degree of customization) (Schmenner, 1986).

We conducted an in-depth, multiple-case study (Yin, 2009) of the two cases, iKure and Neurosynaptic. Both the social enterprises started out with similar motivations but made different entrepreneurial adjustments along the way extending into resource mobilization strategies and operating routines that eventually led to distinct forms of social impact in BoP markets. The case-study approach was appropriate as little was known empirically about the scaling-up of technology-enabled health care delivery in BoP markets (Mair & Marti, 2009; Desa, 2012; Desa & Koch, 2014).

Table 1 summarizes iKure and Neurosynaptic according to the minimum critical specifications needed to create social impact (Desa & Koch, 2014). In short, iKure provided core services, which were largely inseparable and required much involvement of health care professionals. Neurosynaptic, in contrast, offered more delivery benefits, which were separable due to videoconferencing facility, but also involved a degree of inseparability because they relied on some involvement of health care professionals. iKure's services had a higher level of resource intensity and a higher degree of customization than those provided by Neurosynaptic.

Table 1: Social innovation, affordability, and market penetration: minimal critical specifications for iKure and Neurosynaptic

	iKure	**Neurosynaptic**
Social innovation	• Uses a self-developed, low-bandwidth dependent and user-friendly tablet PC (WHIMS technology) to capture and record patient details. • Provides health care services in rural areas to minimize patient traveling. • Provides doctor consultation, medicines, and diagnostics at low cost in one place. • Provides other services such as early child development screening.	• Uses a self-developed portable Remote Health Delivery technology (ReMeDi®), which draws just 2 watts from a USB port and with low-bandwidth requirements. • ReMeDi enables real-time measurement of vital parameters at rural care centers. • ReMeDi ensures availability of patient information during teleconsultation with city hospital doctors.
Affordability	• Low patient cost USD 1.5 per visit. • Made possible through support from NGOs, private organizations, and sponsored research and by locating care centers based on population density, existing facilities, and family income of at least USD 2.5 per day.	• Charges partners (e.g., NGOs) a fee for service (using cloud-based service), which helps reduce capital expenditure. • Relies on NGOs to deliver care, which keeps the overall service costs low. • Low cost per consultation (USD 0.63-2.50) depending on type.
Market penetration	• Health care workers help to spread awareness, achieve access, and overcome local resistance. • Partners (NGOs) know the local population and livelihood and can engage with the local village head.	• Scaling-up to a larger number of rural care centers possible by focusing on technology development and letting partners deliver the health care services. • New cloud-based model implies implementation capability of partners (NGOs) is no longer a prerequisite.

3.2. Data collection and analysis

We collected qualitative data from iKure and Neurosynaptic and used them in a triangulating manner. We conducted semi-structured interviews (Brinkmann & Kvale, 2015) using an interview guide informed by insights about fitting technology to contextual constraints (Goodhue & Thompson, 1995), scaling-up of social ventures involving entrepreneurial adjustments (Shepherd et al., 2011), and depth versus breadth impact (Uvin, 1995). The interview guide was flexible as needed if, for example, relevant topics arose freely. Adopting a strategic choice approach (Child, 1972), our interviews and data analysis relied mainly on senior managers' perspectives.

At iKure we conducted semi-structured interviews with the CEO, three times (lasting 45, 90, and 120 minutes). During one of these, we also interviewed two employees involved in software development at iKure to learn how the firm had developed its technological solution. To acquire first-hand insight into the services iKure provided and how those were delivered , we visited a rural center where iKure provided its services and where we interviewed rural health care workers, a doctor, and other employees and patients to acquire employee and patient perspectives. Documents collected included iKure presentations, published interviews, press articles, and iKure blog posts and website. Similarly, at Neurosynaptic, we interviewed Mr. Rajeev Kumar, the COO, twice (lasting 60 and 80 min). We also interviewed a senior manager of Neurosynaptic's largest NGO partner (45 min.) to understand how Neurosynaptic worked. To learn about their operating routines, we visited a rural health care center where the NGO partner provided its services to interview staff and patients. We obtained and analyzed documents available on Neurosynaptic's website including case studies and reports by academics and students. At least two researchers were involved in every interview and field visit.

Interviews were recorded and transcribed and notes were taken for the field visits. A consolidated case document was created consisting of the interview transcript, the field visit notes and the secondary material such as published interviews, press articles, blog posts and relevant text from the website. The case documents were shared with the key informants for validation. Data analysis was conducted in parallel to interview phase to be receptive to new results, thereby ensuring construct validity (Eisenhardt, 1989. The first step of the analysis involved an in-depth analysis of raw data (e.g., case documents).We coded the case document using a theory-guided coding strategy in NVivo software. By coding common words, phrases, and terms, it was possible to identify first-order categories of codes, which expressed the views of respondents in their own words. In the second step, the links and patterns within the first-order categories were identified. This iterative approach led to the formation of second-order themes that represented theoretically distinct concepts such as constraints faced, entrepreneurial adjustment, resource mobilization, operating routines and type of impact. (Crabtree & Miller, 1999; Lofland et al., 2006; Gibbs, 2007).

Based on this, we derived a theory-informed description of how constraints influenced the entrepreneurial adjustments made and how they guided the ways firms mobilized resources and engaged in operating routines to generate the desired scaling impact. Two researchers independently coded the case documents and inter-rater reliability was 90.6 percent. Wherever there were differences in coding between the two researchers, the other three researchers were consulted and a consensus was reached.

Use of triangulated data, highly knowledgeable informants, use of an interview protocol, review of the case reports by the informants ensured construct validity. Use of contrasting cases, use of knowledgeable key informants, and pattern matching among cases ensured internal validity (Yin, 2014; Eisenhardt, 1989). Gathering data on the context of the cases ensured external validity. Using an established a chain of evidence including case study

protocol, use of the semi-structured interview guide and analysis of interview transcripts ensured reliability (Yin, 2014).

4. Results - Similar motivations, different outcomes

Even though iKure and Neurosynaptic faced similar internal and external constraints (e.g., difficulty in providing care in rural areas, recruiting and training human resources, raising capital, as well as cultural differences), they made different entrepreneurial adjustments to scale the social impact of their IT-based health care solutions:

- iKure decided on operating a hub-and-spoke healthcare delivery model where the latter (rural health care centers) connects to the former (an advanced health care clinic) using iKure's patient data transfer software (WHIMS). A depth-scaling strategy characterized the outcome of iKure's entrepreneurial adjustments.
- Neurosynaptic decided to sell and service a portable medical device (ReMeDi), which allowed rural health care providers (e.g., NGOs) to measure vital signs in real time and make it available during teleconsultations with city-based doctors who then diagnose and make a treatment decision. A breadth-scaling strategy characterized the outcome of Neurosynaptic's entrepreneurial adjustments.

To understand the two distinct developments, we analyzed: (1) how constraints influenced entrepreneurial adjustments, (2) how entrepreneurial adjustments guided resource mobilization strategies and operating routines, and (3) how resource mobilization and operating routines facilitated how constraint-driven entrepreneurial adjustments could generate different forms of impact.

4.1. iKure Techsoft: entrepreneurial adjustments leading to "depth" social impact

iKure started in 2010 with incubation support from the Indian Institute of Technology (IIT) Kharagpur and Webel Venture Fund, an early-stage incubator, established by the government

of West Bengal. The proprietors of iKure ventured into health care service delivery motivated by health tragedies in the family, understanding of health-related problems in rural India, and prior experience in IT. iKure started out by developing the software called Wireless Health Incident Monitoring System (WHIMS), which is a cloud-based and award-winning application[1].

4.1.1. Recognizing constraints and developing the iKure business model

As the rural India population faced severe constraints (limited offerings, long travel distances, strained household economy, etc.) in accessing quality health care, iKure considered WHIMS as a key means to address those constraints. However, iKure soon realized that patients face bigger sets of constraints that technology alone can solve. This encouraged iKure to get involved in hands-on health care delivery and they decided on a hub-and-spoke care delivery model but faced financial and human resources constraints to make the model work. iKure decided to operate hub clinics in district towns with a railway station to improve access and reach. Moreover, iKure decided to partner with NGOs to deliver care services in neighbouring villages in rural health centers (RHCs) (of which 28 are in operation), thereby providing logistics support on the ground in rural areas.

iKure initially designed its hub clinics with glass doors and good aesthetic appeal but realized that it would increase costs and create a perception that services would be costly. Many villagers were initially unwilling to visit the hub clinics, but providing affordable and accessible doctor consultations, medicines, and diagnostic tests helped overcome this. For example, a general doctor consultation, including basic medicines, costs Rs. 90, and other charges range

[1] WHIMS digitally links to various biomedical equipment and stores image-based data from scopic procedures and radiology made available at the point of care. WHIMS also has plug-and-play capabilities to work alongside existing health care management information system (HMIS). During the design phase, iKure considered the fasts that rural areas had a low skill set among users and limited infrastructure (low Internet bandwidths). The software-as-a-service (SaaS) has defined flows, processes, and highest level of data encryption.

from Rs. l0-100. Some diagnostic services were outsourced, but discounts meant iKure patients get services cheaper.

iKure also faced human resources constraints. For example, recruiting doctors and health care workers in rural India was difficult. Sujay, the entrepreneur behind iKure, then used his network to identify talented, young, and eager youth interested in training as health care workers. Sujay also identified qualified doctors from rural areas interested in practicing near their hometown but lacked resources to set up clinics themselves and faced competition from medical charlatans. Human resources were critical as each hub clinic employed up to six medical teams consisting of nine people. From each team, five (doctor, nurse, paramedic, and two health workers) were stationed at the hub clinic, while four (doctor, paramedic, and two health workers) traveled to the RHCs to assist the iKure employed and trained, local health workers.

iKure soon realized the importance of investing time and effort to communicate the value and affordability of their care services. Connecting with and wining villagers' trust was especially important as health care in India was tied to local customs, and village headmen also must be convinced of the usefulness of iKure services. To meet this, iKure decided to organize free temporary health care spot camps, have vans stocked with medicines travel across villages, as well as support the local and government-run public health clinic. Employing local people helped building relationships and overcame resistance as villagers tended to feel negatively about private firms. Establishing collaboration with hospitals so iKure patients could get discounts also strengthened goodwill toward iKure.

4.1.2. Entrepreneurial adjustments through dynamic evaluation of constraints

Figure 1 summarizes the dynamic process of entrepreneurial adjustments at iKure guided by their need to balance internal and customer constraints, which in turn determined resource mobilization and operating routines.

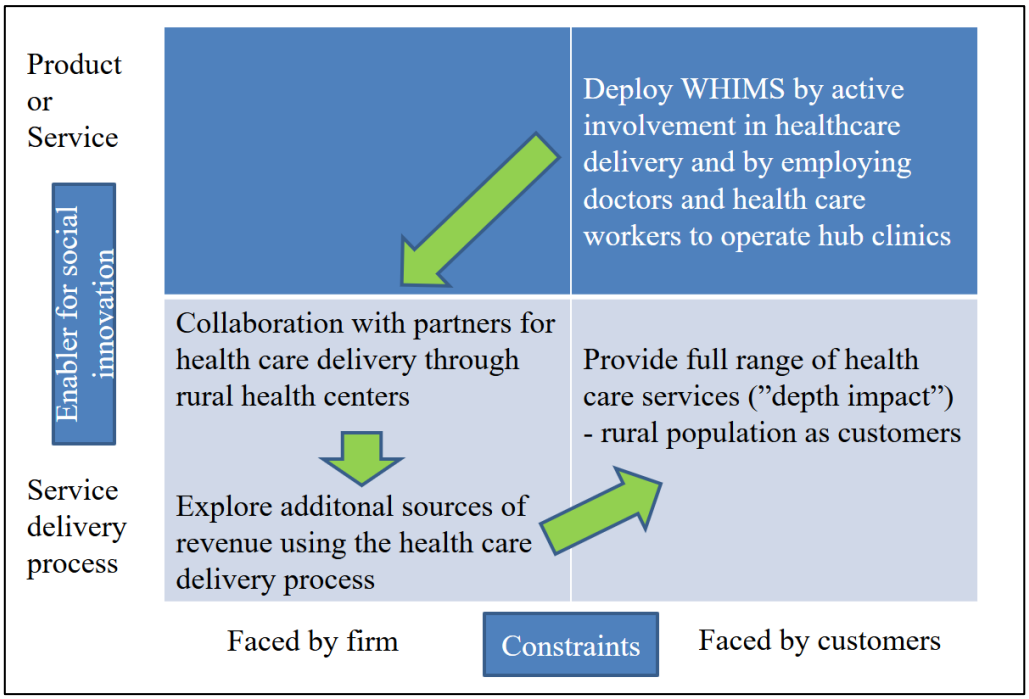

Figure 1: Constraint-driven entrepreneurial adjustments at iKure

In the initial phase, iKure prioritized customer (patient) constraints over its own constraints and considered the WHIMS technology to play a key role in alleviating constraints. Thus, iKure became involved in health care delivery by recruiting doctors and health care workers and by deciding to run hub clinics. However, iKure soon faced severe constraints in delivering care services in the villages. Unless iKure alleviated firm constraints and recognized how important health care delivery was, iKure would also not succeed in alleviating customer constraints and, as a result, it decided to work with partner NGOs to run the rural health centers.

As iKure treated the patients as the firm’s end customers and realized a need for a broader portfolio of services to cater to patient needs, it kept prices low and within its patients’ paying capacity. iKure therefore started looking for alternate revenue sources by utilizing the strength of its hub-and-spoke health care delivery process. Solutions included collaboration with leading universities to conduct commissioned research on health care outcomes, partnered with an eye care organization to provide low-cost eyeglasses, and collaborated with firms interested in investing their corporate social responsibility (CSR) funds in iKure’s health care service

activities, for example, by supplying health care products for free or providing regular health screening to rural people.

As partnerships grew and iKure generated internal funds, the firm decided to focus on providing as many health care services as possible to its end customers. iKure considered providing one-stop health care services key as patients could not afford to visit multiple venues for doctors, medicines, and diagnostics, thereby avoiding diagnostic tests or doctor visits. Though diagnostic services were initially outsourced, iKure realized a need to develop in-house capabilities to provide diagnostic services to build more credibility and to ensure faster turn-around time.

Providing diagnostic services, however, required additional capabilities and financial resources. Thus, iKure collaborated with a leading medical device firm to train rural youth as medical equipment technicians who afterward could potentially join iKure. This arrangement was mutually beneficial as the medical device firm acquired technicians trained to operate their equipment in rural areas and iKure acquired trained labor. iKure also realized a need to motivate the doctors to continue working with them. A solution involved arranging professional continuing education through a leading hospital chain. Together with the same hospital chain, iKure ensured that certain patients could be referred, depending on their needs, at discounted rates.

Once iKure started working with multiple partners for CSR projects and universities for commissioned research and improved its financial position, it focused on delivering a full range of services to the rural customers. A key reason was that availability of multiple health care services at a single nearby location was a primary requirement to alleviate the constraints faced by the rural population in terms of accessing health care services, which minimized wage loss and decline in health conditions for the patients.

4.1.3. Influence of entrepreneurial adjustments on resource mobilization and operating routines

While making the entrepreneurial adjustments to achieve the desired level of impact and dynamic prioritization of constraints, iKure emphasized different types of resource mobilization (Table 2) and operating routines (Table 3) and constantly adjusted between alleviating firm constraints and customer constraints.

In the early phases, iKure relied on bricolage to identify talented employees and local NGO partners. It recruited motivated, local men and women, Masters graduates in computer applications passionate about working in a health care environment instead of as software engineers, and appointed acquaintances who shared the same vision. iKure also determined the optimal composition of the team of doctors, nurses, paramedics, and health care workers who can cost-effectively staff the rural health centers. The above resource mobilization strategies ensured that the services provided were affordable.

Later, as iKure worked on generating additional revenue sources through commissioned research and CSR funds, it followed an optimization approach to resource mobilization by recruiting a senior employee from the United States. This person brought background knowledge of the research needs of universities in North America and was engaged to build contacts with universities there and pursue commissioned health care research projects relying on data collected by iKure. Realizing that keeping doctors motivated was key, Ikure demonstrated another optimization approach by developing collaborations with US and Canadian universities in which iKure doctors worked on research projects. iKure, relatedly, cooperated with Narayana Health, a leading hospital chain in India, for continuous upgrading of iKure doctors' skills. These initiatives sought to ensure sustainability of the social innovation. Similarly, identifying the right NGOs to work with in different regions and involving local communities helped iKure in market penetration.

iKure developed processes for engaging with local village headmen, for arranging temporary health care spot camps to build awareness and sent vans with medicines to build strong local bonding. They also created guidelines for how medical teams should work, to health care workers for identifying ailments and for how to report that information using WHIMS. The above decisions ensured sustainability of the social innovation.

iKure relatedly developed processes to engage with companies for CSR funds and for providing additional services such as mother- and childcare, basic diagnostics, subsidized eyeglasses, and so forth, thus demonstrating ostensive operating routines. Such decisions were guided by the primary motive of, on the one hand, alleviating the constraints that the rural population faced regarding access to quality health care services at one location while, on the other hand, ensured that the firm overcame its human-resources and financial constraints.

Regarding the influence of entrepreneurial adjustments on operating routines, iKure practiced performative routines by identifying patient needs by organizing temporary health care spot camps, by engaging with local village headmen, and by interacting with staff at local PHCs to learn about their challenges and supporting them. However, iKure also developed standard processes for health care worker and patient interaction and engagement with leading medical device firms to train potential diagnostic technicians, thus demonstrating ostensive routines.

4.2. Neurosynaptic communication: Entrepreneurial adjustments leading to "breadth" social impact

Incorporated in 2002, Neurosynaptic started working with the Indian Institute of Technology, Madras, to address the health care challenges people living in rural India face, including poor-quality care services, long travel distances, and loss of wages. Such challenges motivated the

entrepreneurs behind Neurosynaptic to invent a remote health delivery solution called ReMeDi®[2].

4.2.1. Recognizing constraints and developing the Neurosynaptic business model

Finding a partner interested in delivering health care services using ReMeDi® was difficult. As a result, Neurosynaptic decided to demonstrate its proof of concept by delivering the service itself with some support from a kiosk operator. While the developed technology was scientifically feasible and had superior attributes, it faced social uncertainties not previously envisaged. Providing health care using a common kiosk appeared advantageous as local villagers came for many public services such as land registration and health care. However, having other people around resulted in lack of privacy, so Neurosynaptic decided to have separate centers run the health clinics.

Lack of locally available of medicines also threatened the use of the technology. This forced Neurosynaptic to partner-up with a pharmaceutical company, thereby bypassing the distributor and ensuring direct delivery to the health clinics. Neurosynaptic later built in a pharmacy stock management module into *ReMeDi*®. Similarly, they added a glucometer to the diagnostics capabilities. Because nurses performed too many tests and prescribed medicines themselves to earn extra money, Neurosynaptic developed a safety feature so authorized people could operate the device. The company later filed for a patent of this safety device.

Even with a separate clinic and availability of medicines, when deploying *ReMeDi*® in 2006, patients were few and later dropped to zero. Such experiences helped the firm realize that

[2] *ReMeDi*® includes a portable medical device that draws just 2W of power from a USB port and enables real-time measurement and storage of six vital parameters: electrocardiogram, blood pressure, temperature, oxygen saturation, pulse rate, and captures auscultation sounds using an electronic stethoscope. *ReMeDi*® supports multiple simultaneous video consultations that work even on bandwidth as low as 32 Kbps. It also works as an Electronic Medical Record (EMR) to store patient data. Finally, *ReMeDi*® can print the complete medical record, prescriptions, lab reports, and measurements with a standard PC printer. Importantly, all information is available during the tele-consultation between rural health care centers and city based doctors, who can then make a clinical diagnosis and prescribe the appropriate treatment. The initial technology solution was developed based on doctors' recommendations so blood pressure, temperature and electrocardiogram attributes were recorded.

their core capability was technology development and not health care delivery. Around 2007, Neurosynaptic started discussions with possible NGO partners possessing the necessary resources and experience to deliver health care services using *ReMeDi*®. Ultimately, Neurosynaptic collaborated with World Health Partner (WHP), an NGO running telemedicine centers in villages through franchisees and with extensive expertise in delivering health care in rural India. At this point, Neurosynaptic realized it needed funds to improve its product further and obtained soft loans from the Technology Development Board in India.

4.2.2. Entrepreneurial adjustments through dynamic evaluation of constraints

Figure 2 summarizes the entrepreneurial adjustments Neurosynaptic made. Initially, Neurosynaptic faced internal constraints in demonstrating the value of *ReMeDi*® as they lacked a service provider, so they soon became involved in health care delivery. During this service delivery process, Neurosynaptic faced additional constraints as service delivery in rural areas required a deep understanding of local challenges and customs. *ReMeDi*® also required improvements. Neurosynaptic then simultaneously sought funding as well as experienced external partners capable of service delivery. When it succeeded in obtaining both, Neurosynaptic focused on improving the product, leaving health care delivery across geographies to its partners. After deploying *ReMeDi*® in many rural telemedicine centers in India , Neurosynaptic began exploring opportunities to alleviate customer constraints (its service providers) and developed the services on a cloud platform.

By the end of 2015, 60 percent of the centers using Neurosynaptic technologies were telemedicine centers whose franchisee invested in setting up infrastructure, computers, and software with help from Neurosynaptic and connected to Delhi-based doctors. Neurosynaptic also collaborated with private hospitals running telemedicine centers, for example, Meenakshi Medical Hospital, Madurai. Partnerships were successful as Neurosynaptic has sold and

deployed *ReMeDi*® in many regions in India, which in turn generates social benefits by reaching a large population.

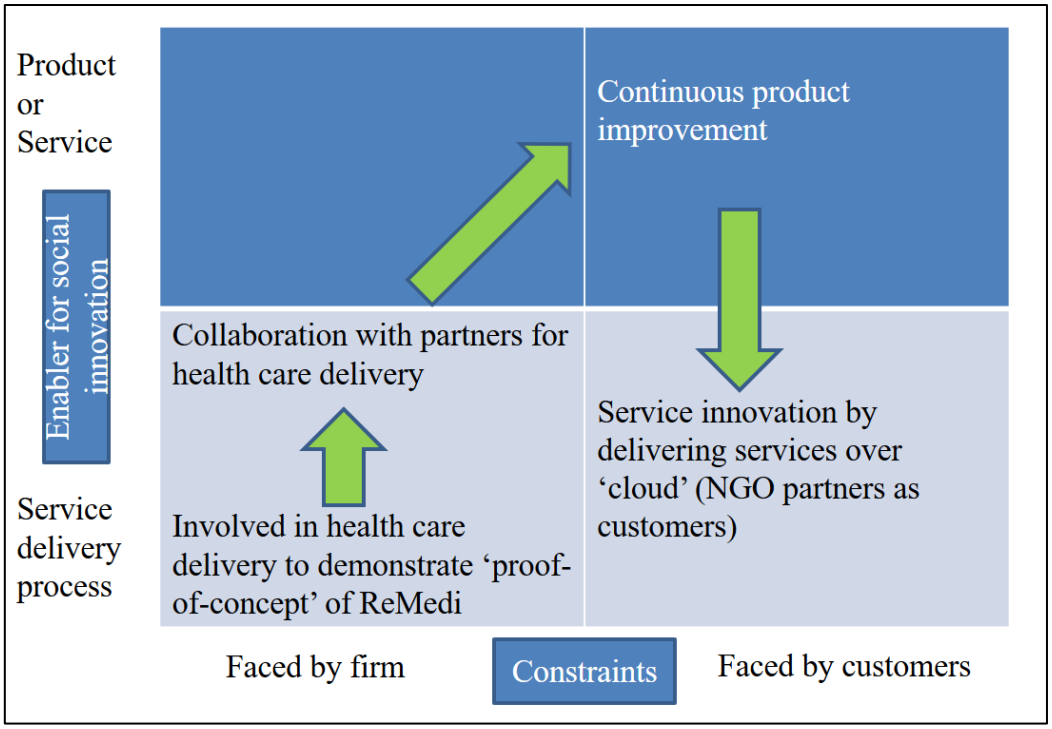

Figure 2: Constraint-driven entrepreneurial adjustments at Neurosynaptic

Neurosynaptic's revenue model until 2015 was sales, support, and customization of the software. After successfully deploying remote health services using large implementation partners, Neurosynaptic started focusing on making the product more affordable for the implementation partners and, hence, the patients. A cloud-based solution brought down costs as the service providers pay only monthly rental for cloud usage. This converted capital expenses into operating expenses, thereby also allowing smaller organizations to deliver health care using *ReMeDi*® and through this increase the social impact.

4.2.3. Influence of entrepreneurial adjustments on resource mobilization and operating routines at Neurosynaptic

Neurosynaptic's resource mobilization (Table 2) concerns redeploying a service engineer to lead its production team because this person brought in customer insights related to usability and affordability. Having the service engineer lead production helped fine-tune the design and plan the production and sourcing considering the needs and social context of the users. It also showed bricolage patterns of resource mobilization in engaging with an experienced NGO partner with health care delivery experience in rural areas but not with telemedicine. At the same time, Neurosynaptic looked for resident doctors or female doctors on maternity leave as an opportunistic bricolage type of resource mobilization that addressed the shortage of qualified doctors who were crucial for delivery of telemedicine services.

As Neurosynaptic focused on the product and faced more constraints regarding funds than end customers, who competent NGOs and franchisees served, it used an optimization approach to resource mobilization by hiring a senior executive for international business development. Later, Neurosynaptic started focusing on the constraints of its immediate customers, that is, the NGOs. Neurosynaptic's end objective remained "breadth impact," that is, ensuring that as many telemedicine centers as possible inside and outside India used its products. To make that happen, it needed more NGOs to participate. However, smaller NGOs as well the existing large ones face constraints because of high capital costs. Thus, Neurosynaptic focused its efforts on service delivery innovation by delivering its product over the cloud to its partners so that they can avoid the capital costs and pay based on the usage.

While deciding on operating routines based on entrepreneurial adjustments, Neurosynaptic (Table 3) engaged in performative routines to make improvements to its product by continuously encouraging employees to interact with end-users and make improvements to the product. The early experience of misuse of the glucometer feature in its product led it to develop a safe device with proper authentication leading to a patent. Neurosynaptic also demonstrated

ostensive operating routines by strictly adhering to quality standards and by developing joint action plans and standard operating procedures (SOPs) to help new partners in health care delivery.

We compare the resource mobilization and operating routines followed by iKure and Neurosynaptic in tables 2 and 3 respectively.

Table 2: Resource mobilization at iKure and Neurosynaptic

	Resource mobilization at iKure	**Resource mobilization at Neurosynaptic**
Social innovation	• Hiring a US-based employee to build connections with top US and Canadian universities to conduct commissioned health care research using iKure collected data. • Motivating iKure doctors by providing opportunities to learn by working on projects with US and Canadian universities and receive continuing education through collaboration with Narayana Health.	• Employing a field service engineer with deep understanding of user needs and constraints to lead production.
Affordability	• Identifying, recruiting, and training local men and women as health care workers who also serve as local service ambassadors. • Determining optimal resource deployment at hub clinic to efficiently serve rural health care centers	• Developing a portable medical device, which people can operate with little training. • Simplifying the design and manufacturing by understanding usability requirements in rural areas. • Focusing future development efforts to launch cloud-based services
Market penetration	• Identifying NGOs to expand presence regions, where iKure does not have local knowledge. • Engaging with local communities and employees of government PHCs to build trust.	• Roping in experienced NGOs to deliver health care services. • Employing a senior executive to focus on international business development. • Helping NGOs by identifying resident doctors in medical

		colleges who can spare time to overcome resource shortages

Table 3: Operating routines at iKure and Neurosynaptic

	Operating routines at iKure	**Operating routines at Neurosynaptic**
Social Innovation	• Engaging with the local village headmen, arranging temporary health care spot camps to build awareness, sending vans with medicines to areas to build strong local bonding. • Creating guidelines for the interaction of medical teams with patients and for health care workers to identify ailments when they interact with patients, and to capture and report such information using WHIMS.	• Encouraging employees to interact with end users to develop an understanding of the ground realities that can be translated into continuous improvement of the design from user friendliness and cost effectiveness perspectives.
Affordability	• Investing only in hub clinics and using existing facilities in villages as rural health centers	• Product designers following the philosophy of continuously trying to improve the design using cost-effective but high-quality components.
Market penetration	• Adding services such as mother- and childcare, referral to bigger well-known hospitals for treatment, if needed, providing subsidized eyeglasses beyond doctor consultation, basic diagnostics, and provision of medicines. • Gaining experience in different geographies by engaging in CSR projects funded by corporations.	• Jointly developing an action plan and standard operating procedures for service delivery with partners.

5. Discussion

Despite having similar objectives of providing affordable, rural health care using technological innovations, iKure Techsoft and Neurosynaptic Communication made different entrepreneurial adjustments influenced by whether they prioritized alleviating constraints faced by the firm or the customers at a particular point in time and level of impact. Such entrepreneurial adjustments, in turn, guided their resource mobilization and operating routines (Desa and Koch, 2014). While Neurosynaptic decided to remain a technology service provider after having tried also to deliver the care itself, iKure successfully operates as a health care service provider. Both the firms used bricolage (Linna et al., 2013; Esse´n, 2009) followed by optimization approach in resource mobilization and used both performative followed by ostensive routines. The difference in relative prioritization of internal constraints led the firms down different paths in establishing constituents of institutional legitimacy i.e. normative, regulative and cognitive in different form and sequence, thereby creating different forms of social impact. Institutional legitimacy can be conceptualized using three elements (Scott, 1995). Regulative legitimacy is the means of attaining authorization or endorsement from actors such as regulatory agencies, governments or other established partners. Second, normative legitimacy is related to what is morally desirable and socially acceptable. Third, cognitive legitimacy flows from rapid replication by developing templates for organizational structures and actions (Agarwal et al., 2018).

Our results differ from those of Agarwal et al. (2018) who found that healthcare firms operating in BoP markets establish normative and regulative legitimacy before cognitive legitimacy. Our findings show that iKure prioritized customer constraints first before internal constraints, decided to provide healthcare services on its own and hence established normative legitimacy first (employing local youth and training them, building local relationships and regional focus) followed by regulative (collaboration with other partners) and finally cognitive legitimacy by providing a full range of services. Further expansion to regions where they do

not have local knowledge require building partnerships with NGOs first followed by expansion of the service portfolio. On the contrary, Neurosynaptic moved away from providing healthcare service itself as they prioritized internal constraints over customers in initial stages. Hence it established regulative legitimacy first followed by collaboration with partners followed by service improvement using resources who understand the field conditions (normative legitimacy) and providing cloud based services and by developing standard operating procedures as a form of cognitive legitimacy in the end. This was guided by the respective motivations of the firms to generate depth and breadth impact respectively.

5.1. Towards a model of scaling-up social ventures

As iKure and Neurosynaptic followed different patterns of entrepreneurial adjustments guided by their own analyses and prioritization of firm constraints and the constraints faced by customers, the two social ventures engaged in different forms of resource mobilization and operating routines. The different forms of entrepreneurial adjustments and relative prioritization of the constraints faced by the firms and the customers eventually created environments for creating depth impact for iKure and breadth impact for Neurosynaptic.

Based on our findings, we propose a conceptual model as shown in Figure 3. Social enterprises, engaged in technology-enabled social innovation for BoP markets, must develop some minimal critical specifications regarding social innovation, affordability, and market penetration (Desa and Koch, 2014). In order to scale-up services, these firms continuously analyze and dynamically prioritize the need to alleviate firm constraints or the constraints faced by the users and customers, guiding the firms to make the necessary entrepreneurial adjustments (Shepherd et al., 2011). Such entrepreneurial adjustments, in turn, guide resource mobilization strategies and operating routines and generate the desired forms of social impact, that is, depth or breadth. This leads us to propositions 1 and 2.

Proposition 1: Social enterprises initially prioritizing internal constraints over customer constraints will establish regulative followed by normative and cognitive legitimacies to achieve breadth impact.

Proposition 2: Social enterprises initially prioritizing customer constraints over internal constraints will establish normative followed by regulative and cognitive legitimacies to achieve breadth impact.

In developing this conceptual process model, we extend the findings from Ansted & Dent (2015), Desa & Koch (2014), and Gollakota et al. (2010) and contribute to the BoP innovation literature by highlighting the role of constraint-driven entrepreneurial adjustments on resource mobilization and operating routines to generate and scale-up the desired form of social impact (deep vs. broad). Thus, this research contributes to the body of literature on technology-enabled social innovation (Gupta et al., 2020) and literature on service design in social entrepreneurship (Reynoso et al., 2015) by explicitly recognizing the role of dynamic prioritization of constraints by social enterprises as drivers for entrepreneurial adjustments. We further extend the literature on institutional legitimacy (Scott, 1995; Agarwal et al., 2018) by demonstrating different sequence in establishment of different elements of institutional legitimacy based on how firms prioritized the constraints and the form of social impact they sought to create.

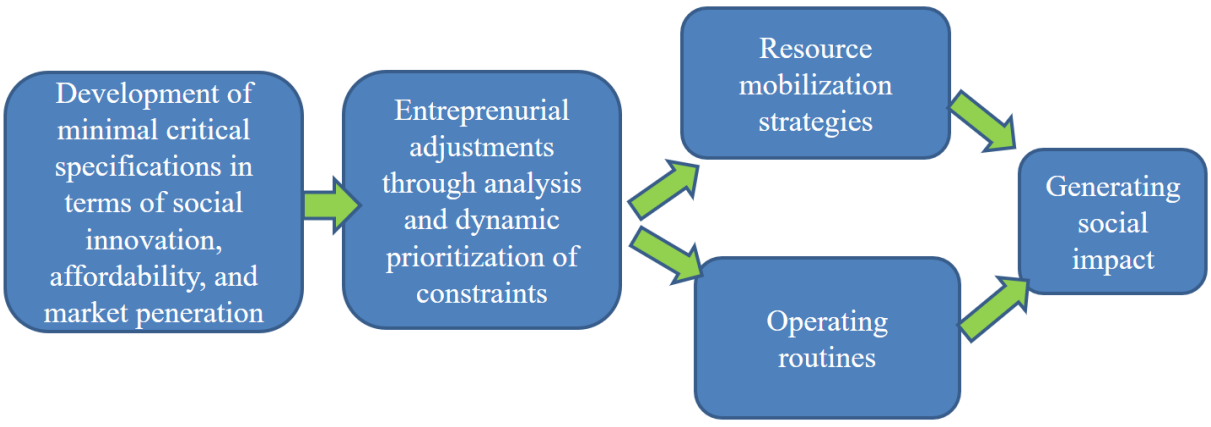

Figure 3: A conceptual model for scaling-up of social ventures in BoP markets

6. Conclusions

Although the approach of enhancing the access to livelihood improving products and services at the BoP through the intervention of enterprises has gained enthusiasm, it is important to understand the overlooked nuances of its working in practice. Especially, this well-intended approach to tackle the bottleneck can neither end up creating opportunities for the BoP nor be financially self-sustaining for the social enterprises if implemented inappropriately. To avoid this inappropriate implementation, we set out this research with an objective to answer two important research questions - how does a social venture scale-up social impact in BoP markets, and how do firm and customer constraints influence the entrepreneurial adjustments it makes over time. Our findings demonstrate that social venture's entrepreneurial adjustments to scale-up social impact at the BoP are guided by whether firms are trying to alleviate constraints internal to the firm or those faced by the customers. The constraints prioritized lead firms to establish elements of institutional legitimacy in different sequences. The prioritization determines how firms use multiple types of resource mobilization strategies and operating routines from inception to establishing themselves in the market to generate different forms of social impact - depth and breadth. To explicitly achieve the objective of this research, we propose a process model of scaling-up social impact in BoP markets and develop propositions before we discuss the managerial implications of our findings.

Proprietors of social enterprises face multiple internal constraints regarding resources and the aim to create desired levels of social impact, more so at the BoP. Thus, such firms need to continuously balance between social and financial objectives. This research demonstrates to managers that dynamic prioritization of constraints faced by the firm and the users or customers can indeed guide social ventures to make necessary entrepreneurial adjustments through appropriate resource mobilization and operating routines and thus establishing institutional legitimacy elements in different sequence to achieve the desired social impact at the BoP.

Managers of social ventures may also take note that it may be prudent to focus on achieving one form of social impact—depth or breadth—in the initial phase to guide their actions and to avoid complexities in decision making. After achieving some level of depth or breadth impact, it may be possible to pursue both. However, we need more research to understand the mechanisms by which firms simultaneously can pursue both forms of social impact.

As the research focuses on only two technology-enabled social ventures delivering health care services, the generalizability of the findings cannot be guaranteed unless further research is conducted across a variety of social ventures working in different sectors such as sanitation, education, agriculture, and so forth. Future research should also validate the conceptual model and the propositions proposed in this research. Moreover, under certain conditions, social ventures may be able to achieve both depth and breadth impact. Operations management literature emphasizes that firms face trade-offs only when operating at the performance frontier and possibly can improve on multiple dimensions (Schmenner & Swink, 1998). Theory of competitive progression also states that firms can cumulatively build capabilities to improve quality, delivery, flexibility, and cost and, once they have improved on multiple dimensions, firms will face trade-offs (Rosenzweig & Roth, 2004). Innovation can potentially overcome such trade-offs. These theoretical concepts will hence benefit from further additional research in the context of social ventures.

Further research opportunities also exist to develop constructs relevant for scaling social innovation and validating them, which can lead to theory building and testing in this nascent field of study. Future research should also focus on developing hierarchical planning models considering strategic, tactical and operational decisions in technology enabled rural healthcare delivery networks. A strategic planning model for rural telemedicine network by Ishfaq & Raja (2015) is a step in that direction. Developing decision support systems incorporating insights from our proposed model and data about patient profiles and needs can help technology enabled

healthcare service providers in BoP markets take more informed decisions about location, capacity and resource planning and help them achieve the desired impact.

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