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Uncovering the scaling of innovations developed by grassroots entrepreneurs in low-income settings

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ABSTRACT

Low-income entrepreneurs operating in resource-scarce settings are typically referred to as subsistence entrepreneurs – informal, operating on a small scale, and selling products developed and produced by others. This study establishes the notion of a unique category of low-income entrepreneurs who have developed, commercialised, and scaled innovations and are self-employed by choice. Further, the paper investigates the scaling process of these innovative grassroots entrepreneurs. The sample consists of four grassroots entrepreneurs from India who founded an enterprise to sell their self-developed innovations. The study follows the grounded theory approach, which is suitable for the exploration of complex questions in unusual settings. The theoretical lens used in this study is entrepreneurial bricolage since the interest of the study lies in understanding action and the usage of existing resources. The contribution of the paper is twofold. First, it contributes to the literature on low-income entrepreneurship by bolstering the theoretical archetype of grassroots entrepreneurs and developing a process model for their scaling process. Second, the study contributes to the literature on bricolage by introducing the notion of grassroots bricolage as a behaviour to utilise and combine both locally available contacts and a broader network as resources in novel ways.

KEYWORDS

Grassroots entrepreneurs; bricolage; scaling; low-income entrepreneurs; resource-scarcity

Introduction

For decades, the world has searched for solutions to eradicate poverty. One of the proposed solutions to overcome this complex grand challenge is entrepreneurship (Bruton, Ketchen, and Ireland 2013; Si et al. 2015; Sutter, Bruton, and Chen 2019). In light of this, considering a broad variety of entrepreneurs, contexts, and activities, entrepreneurship is important as it creates economic and social value (Welter et al. 2017). This study, while shedding light on marginalised entrepreneurs, focuses on how individuals from low-income settings with limited resources engage in entrepreneurship and upscale their businesses.

In the low-income context, entrepreneurship can be understood either as being primarily opportunity-motivated, by choosing to become an entrepreneur, or as being necessity-motivated by the lack of other opportunities and coercion of circumstances (McMullen, Ragby, and Palich 2008). Entrepreneurs in developing countries are predominantly driven by necessity and are often considered micro-entrepreneurs. They are self-employed mostly for subsistence rather than growth (Bruton, Ahlstrom, and Si 2015). Extant literature on entrepreneurship examines entrepreneurs working in a variety of professions such as farmers (Yessoufou, Blok, and Omta 2018; Sutter et al. 2017; Tobias, Mair, and Barbosa-Leiker 2013), selling miscellaneous consumer goods (Webb, Morris,

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and Pillay 2013) and acting as sales agents for foreign-based companies (Scott et al. 2012; Kistruck et al. 2013b). Low-income entrepreneurs typically make sales by approaching strangers on the street (Scott et al. 2012) and in local marketplaces (Kistruck et al. 2013b).

In contradiction with this perspective of low-income entrepreneurs as a homogeneous group, an emerging stream of literature considers them as innovative and creative problem-solvers (Shepherd, Parida, and Wincent 2017; Prabhu and Jain 2015; Sarkar 2018). Thus, there is a scholarly and practical need to understand the phenomenon of low-income entrepreneurs with the potential for growth beyond the level of subsistence (Bruton, Ahlstrom, and Si 2015; Sutter, Bruton, and Chen 2019). Contributing to this stream of entrepreneurship literature, this study investigates the notion of grassroots entrepreneurs. These entrepreneurs are isolated from the formal business market because they have either no or a low level of education. They live distant from urban centres in unstable financial situations and constantly face extreme levels of resource scarcity. They are familiar with the challenges in the low-income context, the needs of people with limited incomes, and the solutions to overcome their everyday challenges (Sarkar 2018). While acknowledging that innovative entrepreneurs are a small portion of the entire body of entrepreneurs in the market (González-Pernía, Jung, and Peña 2015), this study aims to highlight grassroots entrepreneurs and their activities as a unique subset of low-income entrepreneurs.

In this study, particular emphasis is placed on the process of scaling by these entrepreneurs (Ahlstrom 2010). Scaling, in this context, means first expanding their business to customers outside the entrepreneurs' immediate surroundings and then steadily increasing the number of customers to a point where the entrepreneurs can sustain their livelihood, provide for their family from the enterprise, and even create jobs for others in the community (Bruton, Ahlstrom, and Si 2015).

The upscaling of enterprises has caught the attention of scholars in the past; however, this was either from the perspective of resources and resource-allocation tactics of low-income entrepreneurs (Webb, Morris, and Pillay 2013) or in the context of Western-based organisations operating in the low-income markets of developing countries (Chliova and Ringov 2017). Past studies have not considered a process perspective (Webb, Morris, and Pillay 2013). Scaling makes a business owner feel responsible (Kistruck et al. 2013b) and empowered (Mair and Marti 2009), but it is difficult to realise for entrepreneurs from low-income settings (Shepherd, Parida, and Wincent 2017). Therefore, scaling is an important aspect to investigate (Hart, Sharma, and Halme 2016) in order to better understand how entrepreneurship can contribute to poverty alleviation (Bruton, Ketchen, and Ireland 2013). This study aims to understand how the scaling process of grassroots entrepreneurs takes place in a resource-constrained environment. It focuses on the barriers to scaling and the mechanisms to overcome them. Thus the research question guiding the work is *how do grassroots entrepreneurs scale their enterprises in resource-scarce environments?*

The theoretical lens used in this study is bricolage which increases the understanding of entrepreneurial action, the types of resources at hand, and the different ways of utilising those resources. Entrepreneurial bricolage implies the refusal to be limited by scarce resources, improvisation, and making do with the resources at hand (Baker and Nelson 2005). Bricolage as a theoretical frame can also explain how entrepreneurs overcome resource scarcity in conditions of depravity (George, McGahan, and Prabhu 2012). In addition to entrepreneurial bricolage (Baker and Nelson 2005), various other types of bricolage, such as intrapreneurial bricolage (Halme, Lindeman, and Linna 2012) and social bricolage (DiDomenico, Haugh, and Tracey 2010), have been identified. Previous studies have linked bricolage with the firm growth of Western social enterprises (Tasavori, Kwong, and Pruthi 2018), but studies on bricolage and low-income entrepreneurs (Linna 2013; Sarkar 2018) have thus far ignored the questions related to scaling. Therefore, this study adds to the literature of bricolage by offering an in-depth analysis of how grassroots entrepreneurs overcome resource scarcity for scaling and by developing the notion of grassroots bricolage.

The empirical setting includes four grassroots entrepreneurs from India who have developed innovations and established an enterprise to commercialise and scale it. Since the emphasis is on

the lived experiences of the entrepreneur, the analysis is inspired by the grounded theory method proposed by Gioia and his colleagues (2013). The data used in this study are process data (Langley 1999), consisting of interviews and observation data collected from the field. These data are complemented by multiple sources of archival data such as news articles, reports, extensive case studies, and video talks.

This study makes three contributions. Firstly, contributing to the literature on entrepreneurship and poverty alleviation, the study builds a model of scaling up grassroots enterprises. Owing to resource scarcity, the scaling process begins by operating on a small scale in close proximity of the enterprise. Through the utilisation of locally available resources and the expansion of the network, the legitimacy as entrepreneurs grows. Hence, the entrepreneurs gradually begin to operate on a larger scale, eventually becoming entrepreneurs on the state-level. Secondly, the study develops the archetype of grassroots entrepreneurs as a unique category of low-income entrepreneurs who have independently developed, commercialised, and scaled their innovations. In other words, while all grassroots entrepreneurs are low-income entrepreneurs, not all low-income entrepreneurs are grassroots entrepreneurs. This notion contradicts the well-established concept of the low-income entrepreneur as necessity-motivated, operating on a small scale and selling goods developed and produced by third parties (Scott et al. 2012; Webb, Morris, and Pillay 2013), which is typically associated with low-income entrepreneurs. Lastly, the study contributes to the literature on bricolage by establishing the notion of grassroots bricolage. This means the ability to use locally available resources and the expanding network, and to combine these for new purposes in unforeseen ways.

Theoretical background

In the following section, I briefly introduce the literature related to grassroots entrepreneurship. I will then examine bricolage as a way to overcome resource scarcity in various contexts. Bricolage is flexible with regard to what is considered as a resource at hand (Baker, Miner, and Eesley 2003). I also discuss how networks and contacts are used as a resource in the different forms of bricolage. Tables showcasing the prior empirical literature on both low-income entrepreneurship and bricolage can be found in Appendix B.

Grassroots entrepreneurs

Low-income entrepreneurs can be subsumed within the broader definition of entrepreneurship beyond the technology-driven fast growth entrepreneurship (Welter et al. 2017). The low-income entrepreneur is considered as an individual owning an informal and unregistered enterprise, working from home in an informal settlement or working on the street (Webb, Morris, and Pillay 2013). The entrepreneur could be selling cell phone-related accessories or providing services, for instance, such as hairdressing but with no product differentiation and in fierce price competition with other similar low-income entrepreneurs (Webb, Morris, and Pillay 2013).

Innovations that differ from the products already in the market are labelled as differentiation-related innovations, and novelty-related innovations have new sources of demand and supply (Bradley et al. 2012). Low-income entrepreneurs tend to develop differentiation-related innovations (Bradley et al. 2012), sell products developed and produced by third parties (Scott et al. 2012), and execute opportunities created by others (Tobias, Mair, and Barbosa-Leiker 2013). While low-income entrepreneurs typically create imitations of products created by other entrepreneurs and sell them, innovation-driven entrepreneurs create a greater economic impact (González-Pernía, Jung, and Peña 2015).

The group of people living on a low income is diverse, consisting of several sub-groups (Ansari, Munir, and Gregg 2012) similar to the group of low-income entrepreneurs. Innovative low-income entrepreneurs referred to as grassroots entrepreneurs are the primary focus of this study since they

differ from the typical low-income entrepreneur described above. Grassroots entrepreneurs develop solutions for the low-income market (Sarkar 2018) and aim to increase their household income, empower the user, reduce production costs, and enhance their own productivity (Pansera and Sarkar 2016). This study acknowledges the local efforts and self-sufficiency of these entrepreneurs (Si et al. 2015). Bottom-up innovations developed by grassroots entrepreneurs carry the potential of benefitting society (Hossain 2016) and being pioneers for the advancement of sustainable development (Pansera and Sarkar 2016). The motivation of grassroots entrepreneurs is not usually profit-oriented (Pansera and Sarkar 2016) and their success lies in the social aim of providing a solution to alleviate poverty, even on a small scale (Hossain 2016). Hence, the solutions are often easy to imitate and, therefore difficult to scale (Shepherd, Parida, and Wincent 2017).

Grassroots entrepreneurs typically operate in environments mainly characterised by resource scarcity and informality. Like any entrepreneur, grassroots entrepreneurs need financial, human, and social capital to develop successful enterprises (Bradley et al. 2012), but they face a capital accumulation struggle (Yessoufou, Blok, and Omta 2018). Finances provide the entrepreneur time to develop products and position these in the appropriate market (Bradley et al. 2012). Human resources, in this context, relate closely to prior entrepreneurial experience and education (Williams and Shepherd 2016) as well as the ability to access resources (Bradley et al. 2012; Engström and McKelvie 2017). Finally, social resources tend to be limited to family and friends living in the same contextual environment as the entrepreneurs (Sarkar 2018). Intermediaries in low-income settings function to increase the capacity of grassroots entrepreneurs and lower the transaction costs to create a more efficient market (Kistruck et al. 2013a). However, the availability of more resources alone is not enough because the business idea needs to be feasible as well (Bradley et al. 2012).

Grassroots entrepreneurs typically reside in an informal environment (Sutter et al. 2017; Bruton, Ahlstrom, and Si 2015) and operate in poor institutional conditions (Mair and Marti 2009). The informal economy is illegal by law but is considered legitimate in terms of social acceptance yet has boundaries beyond which society does not accept the activities of these informal economic actors (Webb et al. 2009). In an informal economy, formal institutions such as banks are substituted with relationship-based saving and lending arrangements (Webb, Morris, and Pillay 2013).

Entrepreneurs are usually part of the informal economy because they want to enhance their self-interest. They either do not see the value of formal institutions or they do not know how to operate as part of the formal economy (Webb et al. 2009). However, not following formal laws and regulations negatively influences the efficiency of an informal economy. The processes are labour-intensive, competing products are present in the market in large numbers, and the quality of their products is poor (Sutter et al. 2017).

In informal contexts, NGOs act as institutional entrepreneurs to build and improve the institutional arrangements for low-income entrepreneurs (Mair and Marti 2009). These organisations operate altruistically, internalising most of the expense and risk (Kistruck et al. 2013a) to help low-income entrepreneurs scale their businesses. This empowers the entrepreneurs (Mair and Marti 2009) and makes social mobility across generations possible despite cultural and infrastructural restrictions (Scott et al. 2012). However, extant literature until now has not provided a detailed explanation about how grassroots entrepreneurs scale up their enterprises in low-income and resource-scarce environments.

Bricolage and network contacts

Bricolage refers to the behaviour exhibited by entrepreneurs working with resource scarcity, for example, in low-income settings (Linna 2013; Sarkar 2018). The key characteristics of entrepreneurial bricolage include utilising the available resources, combining existing resources for new purposes, and making do with the resources at hand (Baker and Nelson 2005). Resources at hand can be both internal, such as organisational practices, assets, and network, and external, such as those borrowed from the institutional context (Mair and Marti 2009). Furthermore, a bricoleur can use

resources in ways previously unexplored or to combine resources in novel ways (Baker and Nelson 2005). Bricolage is intuitively associated with innovativeness, and studies have revealed that a higher level of bricolage results in a higher level of innovativeness in resource-constrained young firms in the context of developed countries (Senyard et al. 2014).

Skilful bricoleurs are not particularly creative or mindful. Instead, they are analytical and know when to engage in bricolage and when not to (Senyard et al. 2014). Bricoleurs adopt resourcefulness as a mindset (Halme, Lindeman, and Linna 2012) and do not feel constrained by the pressure of being socially acceptable (Sarkar 2018). They feel comfortable handling atypical resources, and they use both material bricolage and intangible ideational bricolage. Ideational bricolage, for instance, can imply the use of a theatrical play in advocacy work or the use of religion to promote hygienic practices (Mair and Marti 2009). According to a study on social impact reporting, social entrepreneurs did not allow themselves to be restricted by rules and conventions and mixed available resources with their own priorities and interpretations of the rules (Molecke and Pinkse 2017). Other atypical resources include working on the innovations in their free time outside working hours, mobilising professional and private contacts, and building a professional field to support the endeavours (Halme, Lindeman, and Linna 2012).

Network bricolage refers to situations where established contacts constitute the resources at hand. Specifically, in network bricolage, existing professional and private contacts are proactively engaged as a resource (Baker, Miner, and Eesley 2003; Halme, Lindeman, and Linna 2012) instead of being utilised passively and occasionally (Baker 2007). Therefore, it is different from the act of merely networking, which implies seeking resources from strangers (Baker, Miner, and Eesley 2003). In network bricolage, entrepreneurs utilise their existing networks as resources at hand, for instance, in the founding process (Baker, Miner, and Eesley 2003), when seeking funding opportunities (Baker 2007) or when expanding the product and the market scope of a social enterprise (Tasavori, Kwong, and Pruthi 2018).

Social entrepreneurs use stakeholder participation to establish new contacts and links with partners who possess valuable resources (DiDomenico, Haugh, and Tracey 2010), share the best practices and facilities with the network actors (Tasavori, Kwong, and Pruthi 2018), and persuade significant actors to obtain additional resources (DiDomenico, Haugh, and Tracey 2010). For instance, social enterprises using both network bricolage and internal assets are more successful in expanding their product and market scope (Tasavori, Kwong, and Pruthi 2018).

Bricolage creates an environment that encourages a trial and error approach and the development of capabilities such as creativity, improvisation, and network skills. Experimentation and on-the-job learning are frequently used to overcome resource scarcity in the low-income context (Linna 2013). Despite having similar characteristics as improvisation, bricolage is a different construct, since entrepreneurs engage with bricolage in both improvised and pre-planned activities (Baker, Miner, and Eesley 2003; Baker 2007). However, bricoleurs generate improvisational competences that might result in being satisfied with and settling for the second-best solution (Senyard et al. 2014). Bricolage also differs from resource-seeking, which refers to actively acquiring new resources that are not readily available at hand (Baker and Nelson 2005; Baker 2007).

In the low-income context, bricoleurs create social value using both physical and non-material resources, leading to accidental expansion of businesses (Linna 2013). The resources at hand may, for instance, comprise of self-taught skills, utilising own time, and recombining existing structures with new applications (Sarkar 2018). Non-material resources may include existing personal networks, strengthening of social capital, and the knowledge of the local people that can be utilised for the enhancement of the business (Linna 2013). However, the phenomenon of scaling has not been examined in these studies. Instead, scholars have predominantly questioned firm growth (Linna 2013) and the level at which bricolage can hinder innovativeness (Senyard et al. 2014). Therefore, in this study, I aim to explore the question of scaling by studying grassroots entrepreneurs and their scaling process.

Research methodology

This research was prompted by the existence of unique cases of low-income entrepreneurs who have developed, commercialised, and scaled their innovations. I had been following the work of Mansukhbhai Prajapati, one of the entrepreneurs examined in this study, since 2015, and I was fairly familiar with his story before commencing this study. Grassroots entrepreneurs with innovative ideas and emerging enterprises had been identified as the phenomenon of interest at the beginning of the study. While examining the literature on entrepreneurship in low-income settings, I arrived at the research question 'How do grassroots entrepreneurs scale up their enterprises in resource-scarce environments?' Through the analytical process, the theoretical lens of the study shifted from the original idea of network theory to co-creation and to legitimacy, landing finally at bricolage, since it holistically captures the dynamic aspect of utilising different kinds of resources – typical and atypical – in resource-scarce settings.

Sampling criteria

The study aimed to understand better the mechanisms for scaling used by entrepreneurs. Searching for relevant entrepreneurs began from the database of grassroots innovations in India that were awarded by the National Innovation Foundation (NIF). In August 2018, this database contained 560 innovations divided into four categories: general agricultural, agricultural equipment, engineering, and utility (National Innovation Foundation 2018). The listed innovations have been awarded by the NIF and are properly reported. However, a vast majority of the innovations are neither commercialised nor scaled. As the primary focus was on entrepreneurs who had built an enterprise around their innovation and scaled beyond their neighbours and fellow villagers, I employed an initial screening to find these type of innovations. In addition, Sristi, an NGO supporting grassroots entrepreneurs in India, helped in identifying the appropriate cases for the study.

Using the theoretical sampling method (Glaser and Strauss 1967) guided by the literature on bricolage, I sought out information-rich cases about the phenomenon of grassroots entrepreneurship (Patton 1990). I screened for entrepreneurs based on three criteria. First, I looked for reportedly sole entrepreneurs who had predominantly worked alone on developing innovations and had been supported only by their family. Second, the outcome of each innovation process had to be a commercial product sold in the market. Third, I searched for entrepreneurs with similar backgrounds in terms of a low level of education and native origins in rural India. I shortlisted eight cases, six of whom I personally met in their factories in India. Finally, I identified four entrepreneurs suitable for the study. They had engaged in similar bricolage behaviour, developing an innovative and complex product or machine. I was confident I could carve out a detailed analysis of the scaling of entrepreneurs in the low-income context based on four cases. In Table 1, I briefly introduce the final selection of entrepreneurs for the study.

When cases are studied over time, in addition to a rich set of data from various sources, relatively small sample sizes can be justified, since they allow the researchers to delve deep into each case. Contrary to a single case study, four cases allow the necessary depth and width of the analysis (Glaser and Strauss 1967) and exploration of various data sources. This also increases the credibility of the overall study. However, adding more cases would not have enhanced the breadth of the study. Being information-rich cases supported by the intense data collection efforts described in the next section, these cases generated insights which are relevant also for other studies on low-income entrepreneurship (Gioia, Corley, and Hamilton 2013).

Data collection

To understand how processes unfold over time, process data typically combines archival data, interviews, and observations (Langley et al. 2013). For this study, data collection occurred in two phases in order to collect data from multiple sources (Table 2). In the initial phase, I collected

Table 1. Introduction of the entrepreneurs covered in the study.

	Mitticool clay fridge	Bullet Santi	Chetak Cotton Stripper	Groundnut digger
Innovator's name	Mansukhbhai Prajapati	Mansukhbhai Jagani	Mansukhbhai Patel	Sanjay Tilwa
Description of the innovation	Food storage without dependence on electricity supply	Three-wheeled tractor with attachments for different work on the field	Extraction of cotton from the shells	Harvest of groundnuts
Novelty	Materials used and application	Diffusion model	Application	Application
Alternative	No preservation of vegetables and fruits	Use of bullocks on land or a tractor	Labour by women and children	Manual labour on the field
Working on the innovation	Since 2001	Since 1994	Since 1991	Since 2006
First customer	In 2005	In 2004	In 1994	In 2011
Sales channel	Retailers, own shop (physical and online)	Personal sales, online retailers	Personal sales, online retailers	Agricultural dealerships
Geographical spread	Pan-India, Middle East, and UAE	Pan-India, Kenya	Pan-India	Pan-India

archival data since it was readily available online. The sources included various types of documentation such as news articles, websites, documentaries, and short videos. This naturally occurring data helped to explain how the scaling process evolves at different points in time. In the second phase, I conducted thorough field research using the interview method.

Since I was focusing on the depth of the study, I interviewed the users of the innovations and the network contacts as well. This provided a broader perspective and further background information on the cases. Other studies on grassroots entrepreneurship in India (Pansera and Sarkar 2016; Gajendra 2015) used similar approaches but neglected the perspective of the network. Conducting the interviews myself and spending as much time with the entrepreneurs as they were able to contribute to the study, I was also able to make field observations and collect visual data in modes of pictures and videos. This data was valuable in not only understanding the context better but also in directly contributing to the research.

Archival data. In the beginning, the purpose of collecting archival data was to build descriptions of each grassroots entrepreneur in preparation for the field visit. However, while collecting archival data, I noticed the richness of the documented sources. The time-stamped multimedia records were published between 2008 and 2017, and they provided a detailed historical account of the evolvement of innovation and scaling processes. It allowed me to construct a detailed process description, which I used in the data analysis and the construction of the interview questions.

The archival data consists of various sources. First, I studied the websites of three of the four entrepreneurs. They had a professional appearance, built either out of their own expense or by external parties. The websites gave an overview to visitors of the way the grassroots entrepreneurs

Table 2. Data used in the study.

Type of data	Use in analysis	Mitticool	Bullet Santi	Chetak Cotton Stripper	Groundnut Digger	Network Contacts
Archival data	Initial and primary analysis	74 pages	56 pages	104 pages	91 pages	
Interviews	Primary analysis	3 h	1.5 h	1.5 h	2 h	6 h
Field notes from observation	Understanding the context and the life of the entrepreneur	5 pages	3 pages	4 pages	4 pages	2 pages
Visual data from observation	Understanding the context	112 pictures	32 pictures	22 pictures	43 pictures	

wanted to present themselves to the outside world. Second, all four innovations have been widely covered by different kinds of Indian newspapers, such as the Hindustan Times, the Economic Times, India Today, and Outlook India. Similarly, these innovations have also drawn the attention of international media, receiving coverage on for instance BBC and Discovery Channel. Third, the organisations working with the entrepreneurs have written reports and case studies with rich descriptions of the entrepreneurs and their innovations. These were either publicly available or provided by the organisations upon request. Finally, I found videos of Mansukhbhai Prajapati speaking about the Mitticool refrigerators in a TED Talent Search event and demonstrations of the use of Bullet Santi, Chetak, and the groundnut digging machine.

Interviews and observations. In order to interview the grassroots entrepreneurs, I visited their factories and offices. During the field visits, a local research assistant and an interpreter translating the responses from Gujarati, the local language, to Hindi accompanied me. The interpreter was necessary as some of the entrepreneurs and users were more comfortable talking in Gujarati than in Hindi. All the interviews were transcribed from either Hindi or Gujarati directly into English. In the field, we spent as much time with the entrepreneurs as they were willing to give us, which ranged between 3 to 6 hours. My objective behind interviewing the entrepreneurs was twofold: first, to verify the narrative as told by archival sources and, second, to get answers to the questions not covered in the archival sources.

Visiting each entrepreneur in their everyday habitat, we gained their trust, and they shared their story with us. Understanding the context where the grassroots entrepreneurs lived and worked in and the environment the products are used in helped to build a background for the research. My research assistant conducted the interviews in Hindi – occasionally with the help of the Gujarati translator – and translated the responses into English for me in between the questions. We used semi-structured interview questions we had prepared together. We asked the entrepreneurs to tell us about the journey that led them to develop the innovation and what followed the initial recognition and success. This method was chosen to focus on the experiences as lived by the individual and obtain greater depth that the archival sources were unable to provide. Towards the end of each interview, we also asked clarifying questions about the issues that continued to be unclear. These included questions, for instance, related to the awards received, the patent registration, and plans for the future.

It was imperative to interview the entrepreneurs to get a broader understanding of the cases. Additionally, I interviewed six users of the innovations – three of the Bullet Santi tractor, one of the Chetak Cotton Stripper, and two of the groundnut digger machine. At the end of each interview, we asked the entrepreneurs for the contact details of users who had purchased a product from them. Following the interviews with the entrepreneurs, we visited the users who lived in close proximity. Even though they were not informed about the visits in advance, calling to announce our arrival was sufficient, and the people welcomed us with open arms. In those interviews, we mainly asked questions related to the product and the relationship between the user being interviewed and the entrepreneur. We interviewed those living at a distance or those who were unavailable over the phone.

In addition, I interviewed the organisational representatives who work with the grassroots entrepreneurs – the NIF, Sristi, and the Gujarat Grassroots Augmentation Network (GIAN). Within these organisations, the interviewees were selected based on their relevance to the research. I interviewed all the employees who had worked and/or continue to work directly with the entrepreneurs, which was, in total, six informants. These interviews took place in the offices of the support organisations during office hours in English. We used semi-structured interviews and focused only the entrepreneurs who are part of the study instead of attempting to obtain a general picture about grassroots entrepreneurs in India. These interviews provided me with a detailed account of the support given to the entrepreneurs and enhanced my understanding of the journey of the entrepreneurs.

In addition to conducting the interviews, I used field visits to observe how and where the entrepreneurs lived and worked. I made a note of all the interactions outside the recorded interview setting in detail. These instances included the factory visit and the informal discussions between the entrepreneur and the employees. These observations resulted in rich and detailed notes about the presence of computers, award trophies, pictures, and other objects in the office. Another noteworthy observation was the distance between the offices/factories and the nearest town as well as the road conditions. For instance, Jagani's factory was located in a remote area, and the roads leading to it were in poor condition. He travelled on a motorbike, while the other people in his area mostly used either auto rickshaws or tractors. This limits the mobility of the people, possibly impacting Jagani's entrepreneurial activities.

Data analysis

I completed multiple rounds of analysis for this study. I started the analysis with the data retrieved from the archives and compiled case narratives for each case. While doing this, I also wrote reflective research memos about the observations drawn from the data. Following this, I conducted fieldwork by interviewing the entrepreneurs and observing their environment. As is typical for grounded theory, the interview phase and analysis phase blurred into one (Gioia, Corley, and Hamilton 2013). Following the steps of the process research, I constructed a timeline for each case to synthesise the data and identify the steps in the scaling process (Langley 1999). Although the experience of the entrepreneur was the primary focus of the study, the perspective of the network also informed the data analysis and the development of the scaling model. For instance, these practices helped to outline the role of the partners in the process and the evolution of the network of the entrepreneurs from local informal partners to national formal partners.

I used both the archival data and the interviews to develop the data structure (Figure 1), and I used the research memos I had written after each interview to develop the codes. I developed the first order codes based on what the entrepreneurs told me about their scaling process, the challenges they faced, and the mechanisms they used to overcome resource scarcity during the process. While consulting the literature on bricolage and going back and forth between the data and the literature, I used the second order codes to link the first order codes with the extant

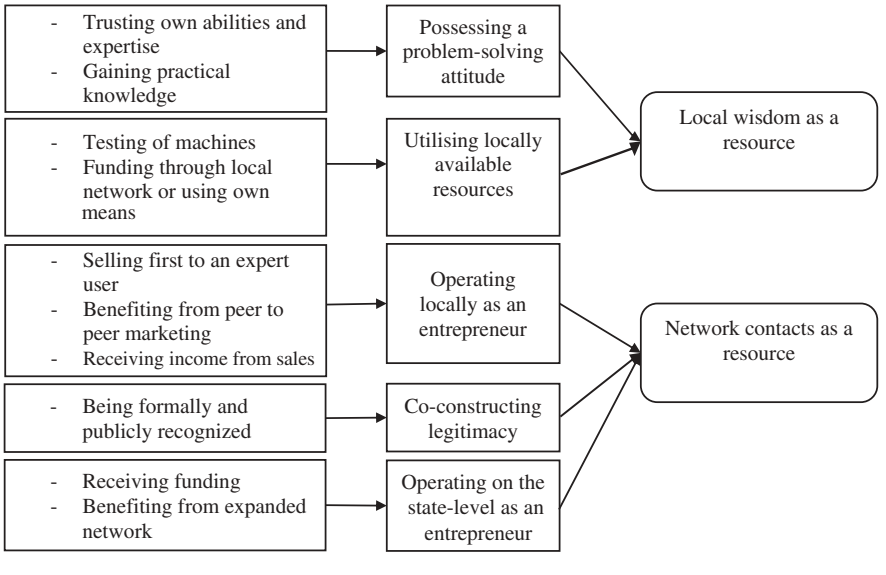

Figure 1. The data structure for scaling of grassroots entrepreneurs.

literature on bricolage and low-income entrepreneurs. Finally, aggregate dimensions emerged from both – the data and the theory – and depicted the answer to the research question.

Scaling process of grassroots entrepreneurs

The data structure (Figure 1) depicts that grassroots entrepreneurs use both their local wisdom and network contacts to overcome constraints of resource scarcity. Local wisdom refers to locally relevant skills, expertise, and the ability to use the same when appropriate. The local network consists of friends, family members, and other individuals in the villages of the entrepreneurs who were perceived as knowledgeable by the entrepreneurs. In a later phase, when their network had grown, the network contacts included representatives from non-governmental and governmental organisations. The findings highlight that the entrepreneurs begin the initiative with solving the problems of people similar to them and with the aspiration to create social value, which confirms the findings in other studies (Linna 2013; Pansera and Sarkar 2016; Sarkar 2018). This study adds to the body of entrepreneurship literature by illuminating the scaling process of grassroots entrepreneurs. It highlights, for instance, the crucial role of the first customer or the benefits of working with formal organisations in the scaling process.

India has a unique ecosystem to support grassroots initiatives. Organisations such as the NIF, Sristi, and GIAN work together with aspiring entrepreneurs to commercialise and scale their innovations, and previous studies have covered the operations of these organisations (Fressoli et al. 2014). Interestingly, the entrepreneurs do not refer to these organisations as organisations but use the names of the individuals working there – Gupta, Professor, Patel – to refer to the organisation. Since the focus of this study is on the perspective of the entrepreneurs, I incorporated these into network contacts. Furthermore, since the organisations work closely together and the boundaries between them are blurred, it is logical to club the organisations together. Other members of the network of the grassroots entrepreneurs are mentioned using their labels, such as family, villagers, and friends.

Local wisdom as a resource

During the product development phase, all the entrepreneurs were ridiculed by their community, feeling ashamed to work on the innovation in the public eye. For this reason, the entrepreneurs worked on the innovation alone and often only after they finished their daily work, which has been observed also by various studies (Sarkar 2018). Jagani worked as a farmer, and Tilwa worked in his brother's tractor dealership, and Patel worked as an electrician in the textile industry. Prajapati owned his own company but stopped working on his entrepreneurial venture to focus on the innovation process. Through these practical activities, they obtained experience and knowledge, which increased their expertise in machines and the conditions they were being developed for.

Problem-solving attitude

> *"I did not have a bike, and the bullet belonged to Mohanbhai [uncle], and he had given it to me and asked me to make this. The first one I made, I gave to him. Initially, it did not have supporters; the tires were not covered, and I put a chain later. In the second one, no one understood that the motorcycle will work in the field. I said that it will work. The villagers were saying that this will not work but I said that it will work. He [my uncle] had made the design, but the reverse gear box was missing. It was made by NIF and the IIM [Indian Institute of Management] people. The design that NID [National Institute of Design] had given was not strong nor did it have the technology – they had just given the design, but it was not useable. – I told Christo sahib; Mahesh Bhai and Gupta sahib [representatives of formal organisations] who said that it has to be designed by the NID people – a designing person doesn't have a technical idea as to what has to be done. The design is good in looks, it does not have the needed strength. I have just left it in the office. There is just one model, and I knew that this [design] will not work." (Mansukhbhai Jagani, personal interview 19.09.2017).*

In the beginning of the scaling process, the grassroots entrepreneurs made do with the resources at hand, which included their experience and the practical knowledge gathered from working on developing the innovation. During the product development process, the entrepreneurs developed the skill of problem-solving (Linna 2013), and this attitude remained throughout the scaling process. Most of the innovations aimed at easing the manual work done by labourers in the agricultural and pottery industry, offering a solution to the problems faced by the entrepreneurs and their community members. Creating social value and spreading it to as many people as possible motivated the entrepreneurs to scale.

Throughout the product development process, the grassroots entrepreneurs developed a habit of experimentation, trusted their own abilities, and became experts on the conditions that the machine was being developed to address. This self-taught expertise, gained through trial and error and improvisation, proved to be a strength in the scaling process. Meanwhile, the members of their community continued making fun of them and their efforts to work on the innovation. At times, it was because the villagers did not understand what the entrepreneurs were working on. In other cases, some sceptical individuals feared that if the machine became popular and used by many people one day, it might push them out of work. For instance, Patel's fellow villagers were worried about their income after the cotton stripper machine would scale in the market.

The grassroots entrepreneurs valued their practical knowledge and experience over external design expertise. The efforts of the network contacts in providing the entrepreneurs with aid to improve the machines they had developed and connecting them with high-quality educational institutions such as NID, IIM, and the Indian Institute of Technology (IIT) were not perceived as helpful by the entrepreneurs. In the experience of the entrepreneurs, the work of these organisations was limited to improving the aesthetics of the design, and they did not help enhance the technical specifications. The entrepreneurs trusted their own practical understanding and knowledge regarding the local conditions more than that of people working or studying in urban institutions away from their villages.

Even though the design support was not perceived as helpful, they valued some of the suggested technological improvements. Following the bricolage logic of using and combining available resources, entrepreneurs used only what they perceived as helpful, while the other parts were left unutilised. For instance, the quality of the Bullet Santi improved when Jagani accepted help to develop a reverse gearbox. The users also confirmed that this led to a significant improvement in the functioning of the machine.

Locally available resources

> *"I had told them in 2009 to test my machine, but they asked me to leave it as it was not giving results. But in 2011, I officially started this business and submitted it for testing. Then they gave me a test performance report. [I wanted to test the machine] to get the subsidy as well as I wanted to know its result of testing. They directly purchased a machine also after getting the result.*
>
> *I have a relative who works in the real estate business. He told me that I should do some good business and he was ready to fund me. He asked how much I need and I asked for around 25 to 30 lakhs [45 000 USD]. [. . .] We have very good relations with him – that is why and he has confidence that we will do something. He supported me at that time. So whenever I needed any money – a lakh or two lakh [1500–3000 USD] – I used to borrow from him." (Sanjay Tilwa, personal interview, 06.10.2017)*

The grassroots entrepreneurs understood that it was important to test the machines before they could be sold in the market. They then used their network to test their product. For instance, Patel's initial sales failed because the machine broke down during everyday use. All the sold machines were returned to Patel, who had to refund the customers and accumulated a huge financial loss. Had the machine been tested, he would have predicted its weak points and improved it before starting the sales process. He realised that the machine was best tested when used in real-life situations to ensure durability and proper functioning. He used his network and rented the

machine to cotton ginners he was familiar with because it allowed him to observe, supervise, and monitor the functioning of the machine. Through this testing and observation, he learned how to further improve the machine.

When an external organization tested and approved the product, the reliability of the innovation and the self-confidence of the entrepreneur increased. For instance, Tilwa approached the Junagadh Agriculture University, a university that he knew of through his work as a tractor salesman and asked them to test his machine. Testing conducted by an outsider was imperative to prove the safety and durability of the product as well. The results of these tests strengthened sales arguments in the market and increased the credibility of the entrepreneur. The testing was also proof for the entrepreneurs themselves that their efforts were coming to fruition.

Throughout the processes of product development and scaling, the grassroots entrepreneurs struggled with funding. When it was time to start large-scale manufacturing of the product and selling it in the market, the entrepreneurs lacked the capital to buy raw materials for manufacturing. Moreover, debt and financial loss during the innovation process added to their financial issues. Therefore, the grassroots entrepreneurs were compelled to make do with the resources at hand. This meant either using their own financial resources earned from their labour – selling clay products or farming – or turning to people in their network for financial support. Since they were not aware of the funding possibilities available within banks, the entrepreneurs did not apply for loans from banks to finance the scaling of their innovation.

Since the grassroots entrepreneurs lacked access to or awareness about organisations that supported entrepreneurs, they relied on their locally available network. The entrepreneurs felt most comfortable approaching people they already knew, and they used private contacts to advance their entrepreneurial endeavours. This worked best when the friend or family member saw private benefits in working with the grassroots entrepreneur. These benefits could include the chance to use the cotton stripper machine for free or fulfilling the duties of being a respectedfamily member, for instance.

The network as a resource

The grassroots entrepreneurs first sold locally and then expanded to the markets beyond their villages. In this process, the entrepreneurs relied mostly on tangible and external resources such as the contacts they created and the networks they built in addition to the awards, patents, and media attention they received. The findings reveal that the entrepreneurs used these resources for purposes other than the ones they were originally intended for. The grassroots entrepreneurs used their creativity to invent new interpretations and modified the existing means at hand for new purposes (Baker and Nelson 2005).

When the grassroots entrepreneurs operated locally, people in their community became aware of them, and they built a reputation of being either creative entrepreneurs or crazy lunatics. Through different mediums, word about them finally reached the representatives of formal organisations. Prajapati met a representative after a journalist wrote an article about him in the local newspaper. A student who participated in the annually organised Summer Scout project approached Patel. In the case of Jagani, the support organisation reached him with the help of the community, since his villagers knew he had developed the Bullet Santi. Tilwa was contacted when a network contact visited the Junagadh Agriculture University and saw the groundnut digging machine that the university had tested. Through these encounters, the network of the entrepreneurs expanded naturally, and they did not engage in an act of active resource-seeking. This is an important detail since it explains how grassroots entrepreneurs encountered formal organisations.

The initial recognition received from the first customer was important to kick start the scaling process. The grassroots entrepreneurs were isolated since they lacked the formal education and skills taught in school besides being located in areas difficult to reach and, in some cases, also hesitant about speaking in Hindi. Living and working in the informal context, the grassroots

entrepreneurs were also not aware of the benefits offered by the formal system. Operating with resource constraints, the networks became an important resource for the entrepreneurs – sometimes the only resource at hand. Since they were resourceful and clever, they capitalized on their interaction with formal organisations in various ways. The awards, recognition, and media attention that followed those milestones were important to strengthen the credibility of an entrepreneur despite coming from an informal setting. The received support helped the entrepreneurs see the potential of the innovations they developed as well as themselves as entrepreneurs. Formally, the innovations were also granted a patent and, despite not understanding the rationale of having a patent, they use it as a means to enhance their legitimacy. In conclusion, through these activities, the grassroots entrepreneurs have expanded their network and gained the skills and expertise needed to scale and operate as entrepreneurs beyond their own village.

Operating locally as an entrepreneur

> *"The trust is built when I give it to someone and that someone recommends it to other people. The fridge is good because it uses electricity and when the apple or tomatoes that are put in it taste different, but when it is put in the Mitticool fridge, the taste is still good, and also it does not consume any electricity. Mitticool has given me such a name and has progressed so much because of it." (Mansukhbhai Prajapati, personal interview, 18.09.2017)*

Their first customer was an expert within the field of the innovation as well as someone from within the network of the entrepreneur and was, therefore, a trusted individual who suggested improvements for the innovation. For Mitticool, the first customer was a civil engineer, and for Jagani, it was a farmer from his village. Tilwa's first customer was an individual working with the Junagadh Agriculture University that conducted the testing. In the beginning, a sales agency of a local ginning cooperative supported Patel. Through this organisation, he sold his first machine. Finding a first paying customer who was satisfied with the product was of the utmost importance. It increased the self-confidence of the entrepreneur, displayed the credibility of the innovation, and provided financial gains to the entrepreneur. Customers were important advocates of the products they had purchased, and the grassroots entrepreneurs used peer-to-peer marketing as a mode to spread the word about their product. Receiving appreciation from one fellow villager created a snowball effect that convinced others within the same and surrounding villages to purchase the machine. In conclusion, satisfied customers were an important resource to boost sales, learn about necessary improvements required in the machines, and improve the self-confidence of the entrepreneur.

Interested people who had learned about the innovation from other users or the media called the entrepreneurs and ordered a product for themselves. Patel paid for an advertisement in a newspaper only once and had started advertising on social media recently, but word-of-mouth continues to be important. The entrepreneurs collectively agree that customers keep coming back if their product is good and, thus, the advertisement is not necessary. Moreover, they did not perceive machines that were similar but cheaper or poor-quality imitations as direct competition. Rather, they perceived it as proof of the demand for their products and machines.

The agricultural machines were developed for farmers at the beginning of the value chain while the clay products were developed for families using traditional cooking tools. The clay fridge was particularly beneficial for households living in rural areas with no or unreliable access to electricity. The entrepreneurs wanted to create a positive impact on their communities. Therefore, the products were sold at a price that the user could afford but one that still provided the entrepreneurs with income. Furthermore, users often bought multiple machines from them. For instance, despite being large machines, each user tended to own two, three, or sometimes even five cotton stripper machines.

Developing, commercialising, and scaling innovations became the livelihood that sustained the family of the grassroots entrepreneurs. The entrepreneurs had grown up in poverty and, as a result, were compelled to discontinue their education to work and support their family. This was one

reason they were not respected during the product development process. Therefore, the income served multiple purposes. First, it functioned as proof of appreciation for their work. Second, it offered a path to escape poverty. Third, it allowed the entrepreneurs to provide better living conditions to their own family. For instance, Prajapati grew up trading pottery items made by his parents for grains. Thus, becoming a factory owner and providing for his family was important to him. In addition, this income also served as a resource to construct their legitimacy as an entrepreneur.

The users confirmed the use of peer-to-peer marketing. They shared information regarding the innovation with other potential users who asked them about new products in the market. For instance, annual meetings of farmers working in a certain industry provided a forum where farmers met each other and shared news about new machines and technology.

> *"He recommended Sanjaybhai to me, saying that he is a good engineer, and he had made a very good digger machine. [. . .] [It] is 15 kilometres from my village, and there the groundnut machine had come, and I had seen it. After seeing it, I felt it was a good machine and need less labour to be engaged in the field. That's why I thought that I should buy the machine." (Groundnut Digger User, 13.10.2017)*

For prospective customers, it was important to hear about the experiences with the machine directly from a user. Furthermore, knowing someone who had used the machine provided them with an opportunity to scrutinise the machine in use and learn about its usage from the user. After witnessing the machine in use, potential customers trusted the machine better, making it easier to make a purchase decision. Hence, the proactive contact between the grassroots entrepreneurs and their customers proved to be an important resource.

Co-constructing legitimacy

> *"The patent for the fridge, the cooker and the tava [clay pan] is all a show. I am not bothered about the patent – I don't feel it is important. I had taken the patent for my happiness. Everyone can copy a patent – the world is very big, and I am a very small person, so there is no point in my teaching anything. I say that I give training and also for all these things – so what is the point of teaching others to make and not allow them to make them? What is a patent? Nokia also has a patent but doesn't it also get copied? You can get a copy of Samsung in Delhi for Rs. 2000 [30 USD] – keep both [original and duplicate] together, and no one will know the difference. This is only for my name and nothing else. I allow whoever wants to do this. Whatever we make is ultimately used by the common people and that is a thing that makes me happy. I am happy that others copy my work, but no one should make it better than me. I am always striving to make quality products. I am interested to make the products in quantity and reach as many people as I can." (Mansukhbhai Prajapati, personal interview, 18.9.2017)*

The grassroots entrepreneurs who are part of the study received the National Grassroots Innovation award from the NIF. The President of India awards it every two years to individuals from the grassroots level who have developed a technological innovation without the support of external agencies (National Innovation Foundation 2018). The award, as well as the encounter with the president of the country, had a huge impact on the entrepreneurs, serving as a resource for scaling in multiple ways. First, it increased their self-confidence and motivation to continue pursuing the occupational choice of being an entrepreneur. They perceived the award as an appreciation of their hard work, and the award encouraged them to continue working with the endeavour to serve their community. Second, the award gave reputational benefit to the entrepreneur. Each innovation developed by grassroots innovators is well documented and verified before the award is bestowed upon them. Therefore, the award carries credibility, which is also perceived by outsiders. Third, the award had a positive impact on their sales. Thus, the grassroots entrepreneurs utilised the award not only as a form of recognition but also as a resource to advance their business.

Receiving the award also generated media attention, and the grassroots entrepreneurs were covered widely by newspapers and television channels at a local, national, and even international level. In addition to the advertisement value, media attention also helped build the legitimacy of the

entrepreneur. There were no questions of authenticity when an international media house aired a story about the innovations. On those occasions, the entrepreneurs were given the opportunity to share their story, the functioning of their innovation, and their vision for the future to a wider audience. Media and publicity functioned, therefore, also as a resource for scaling their enterprises.

The grassroots entrepreneurs accepted various suggestions from their network contacts if they saw value in them, or at least perceived no harm in them. Hence, the entrepreneurs accepted that the network contacts assisted them in applying for the patent. In 2006, the patent was granted to Patel for the Chetak Cotton Stripper machine, and in 2007, it was granted to Jagani for the Bullet Santi. The application for the groundnut digger by Tilwa was submitted in February 2013, and its patent is still pending. Prajapati has applied for design registration on his designs, in 2009 and 2016. Since this is a complicated and costly procedure, the entrepreneurs cannot do it themselves. They provide information about their innovation and sign the application, but all the practicalities are carried out by the network organisations.

Despite appreciating the suggestion to apply for a patent, the entrepreneurs know very little about their network contacts' rational of applying for a patent. Therefore, they attach their own interpretation to it. First, it is a confirmation that their machines and products are really an innovation. Second, having a patent helps grassroots entrepreneurs to be perceived as legitimate in the eyes of third parties and customers. The grassroots entrepreneurs mentioned that the patent was for their own confidence and that it strengthens their products. However, they understood that the patent had limitations. If someone changed the design, it would not be covered by the patent. Therefore, the value of the patent in practice is more instrumental, and it serves the purpose of constructing legitimacy and enhancing self-confidence.

> *"Even these achievements are very much helpful for us. When someone comes to the showroom then seeing the photo, the product quality or standard related questions are answered because 60% of the doubts are getting over there only – if there are so many achievements, then there must be something in these products." (Raja Prajapati, Marketing Manager at Mitticool and son of Mansukhbhai Prajapati, personal interview, 18.09.2017)*

The formal recognition received – whether in terms of awards from the government of India, local banks, or universities – were merits the entrepreneurs shared in the public or private sphere whenever possible years later as well. When visiting the entrepreneurs in their offices, I noticed they all kept pictures hanging in the form of large posters on the wall and displayed the trophies received from different competitions in vitrines for their guests to see. Many of the entrepreneurs also drew my attention to the objects as proof that it really happened and narrated stories related to the events.

In addition to the awards and patents, the publicity also helped in advancing the scaling process of grassroots entrepreneurs. The original function of the award and media attention was to recognise the grassroots actors for their efforts, and the function of the patent was to ensure that the intellectual property rights remained with the inventor of the machines and products. However, the entrepreneurs used these functions as resources at hand for new purposes (Baker and Nelson 2005). These new purposes, for instance, included building the credibility of their innovation, increasing their self-confidence, and spreading the word of the new product available on the market. These also contributed to the scaling process of the enterprises of grassroots entrepreneurs.

Operating at the state-level as an entrepreneur

> *"I have actually 5 to 6 firms – there is Geeta; Uma; Maruti; Chetak; Marshal; Dharti. Around two years back, the turnover was of 30 crores [450 000 USD], and right now also it is around 20 to 25 crore [300 000 – 375 000 USD]. But since demonetization, it has been very slack – everywhere it has slowed down. Slowly we are in the process of consolidating all these companies. We couldn't do business more than Rs. 1 crore [150 000 USD] because of the excise duty, and that is why we had to open so many new companies. Now, because of GST, there is no excise duty, and we can consolidate all the companies under one name." (Mansukhbhai Patel, personal interview, 4.10.2017)*

After receiving the award and gaining immense attention by the media, scaling proceeded faster, and the demand for the innovations increased. However, the entrepreneurs then faced difficulties in trying to respond and meet the increased demand. Even though the grassroots entrepreneurs had developed innovations addressing the needs of the users, they were not aware of aspects such as marketability and usability. They knew they had access to people representing formal organisations whom they could approach anytime with any concern. Working together with these network contacts, grassroots entrepreneurs managed to build partnerships with other organisations. They would not have been able to reach these organisations without help from their network contacts. However, trusting their own expertise and knowledge on the needs of their customers, the grassroots entrepreneurs did not perceive all the suggestions or efforts to help as relevant for them.

The network contacts were valued most for opening doors to formal testing facilities and providing the entrepreneurs access to funding. For instance, the Mitticool fridge was tested in various institutions to verify if its claims of preservation of food held true. With regard to funding, the Micro Venture and Innovation Fund (MVIF) is the funding instrument of the NIF. Being a public institution, it provides risk capital to grassroots entrepreneurs. The MVIF supported Prajapati and Jagani with a capital of INR 500,000 [7,800 USD]. The Technopreneur Promotion Program (TePP) supported Patel with INR 580,000 [9,100 USD]. The trust between the grassroots entrepreneur and the network contacts was an important component in the funding process since reporting of the fund usage was not done formally.

The funding provided by MVIF in the early phases of scaling was a significant financial resource for grassroots entrepreneurs. First, MVIF provided them with the capital to operate as an enterprise and scale their business. Second, for the grassroots entrepreneurs, it was yet another validation and acceptance of their innovative machines and products. Third, since this was collateral-free funding, the entrepreneurs did not have to worry about paying high-interest rates. Additionally, working together with the NIF and GIAN was provided as an in-kind donation, therefore, the entrepreneurs did not have to pay for these services.

Further, also the willingness and motivation of the entrepreneur to scale up the activities affected the scaling process. While others were happy pursuing emerging opportunities, others were more hesitant. For example, Jagani's enterprise has mostly scaled to neighbouring villages but not much beyond. He works on selling the products based on orders, which come in when interested users turn to Jagani after a referral from another user. Jagani continues working on his farming and sees the Bullet Santi as a way to receive additional income. Interestingly, other fabricators are making their own versions of the machine. In contrast, Prajapati, Patel, and Tilwa are selling their machines and products also to customers in other states and actively seeking to find new customers.

Coming from the informal context, the grassroots entrepreneurs were ill-informed about what was feasible and necessary to be done, the sequence of activities in a business, and the skills required, such as marketing. This led to inefficiency in the operation of the grassroots entrepreneurs and frustration when they learned that certain things could have been done better and more efficiently. Tilwa explained that he lacked financial knowledge, did not plan his work in advance, and was unaware about government subsidies. In order to apply for subsidies, he had to write reports and make plans, and for this, he required external help.

Despite trusting their own abilities, being proud of their achievements, and feeling confident about their own work, the entrepreneurs did not feel comfortable working on all issues of the business by themselves. They were aware of their lower status in society, and they often felt like outsiders among formal sector actors. This was especially true when changes in the regulatory system created new situations, making them feel insecure. This predominantly included accounting and taxation-related issues that needed to be completed in accordance with the current legislation. In these situations, the grassroots entrepreneurs utilised their network contacts as a resource and turned to their trusted contacts for formal support.

The close involvement of the network contacts was imperative because it helped the grassroots entrepreneurs on a mental level. Since all the entrepreneurs were seen by their community members as a little bit strange, it was crucial to have a person to turn to – someone both willing and skilled enough to help.

> *"He said that he was trying to manage everything, but it was possible that it was getting stuck at some level because his education was maybe not adequate. Many times he must have felt that because he had a lot of office staff as well as relatives, but he was not getting a good feel about it." (Raja Prajapati, son of Mitticool entrepreneur Mansukhbhai Prajapati, personal interview, 18.9.2017)*

Discussion

This study enriches the discussion around entrepreneurship and poverty alleviation. It makes contributions to the literature on low-income entrepreneurship by (1) building a model of the scaling of grassroots entrepreneurs and (2) defining grassroots entrepreneurs as a unique archetype of low-income entrepreneurs. Furthermore, it contributes to the discussion on bricolage by introducing the concept of grassroots bricolage explaining how grassroots entrepreneurs deal with resource scarcity. Finally, the study involves practical implications, limitations, and avenues for further research.

The scaling process of grassroots entrepreneurs

This study investigated low-income entrepreneurs who have developed, commercialised, and scaled their innovations to different degrees. Previous literature focuses on the lack of resources for scaling (Linna 2013; Webb, Morris, and Pillay 2013) and on subsistence entrepreneurs with little growth potential (Tobias, Mair, and Barbosa-Leiker 2013). Therefore, this study contributes to the discussion by showing that low-income entrepreneurs have the potential and ability to scale their enterprises, and how they do it.

As the scaling model (Figure 2) depicts, the scaling starts from the status quo, where the grassroots entrepreneurs utilise both their own problem-solving skills and locally available contacts. Equipped with these resources, they can operate independently as entrepreneurs in their close locality (Si et al. 2015). At this stage, their network contacts primarily consist of friends, family, and other knowledgeable persons in close proximity with the entrepreneur. Since these people

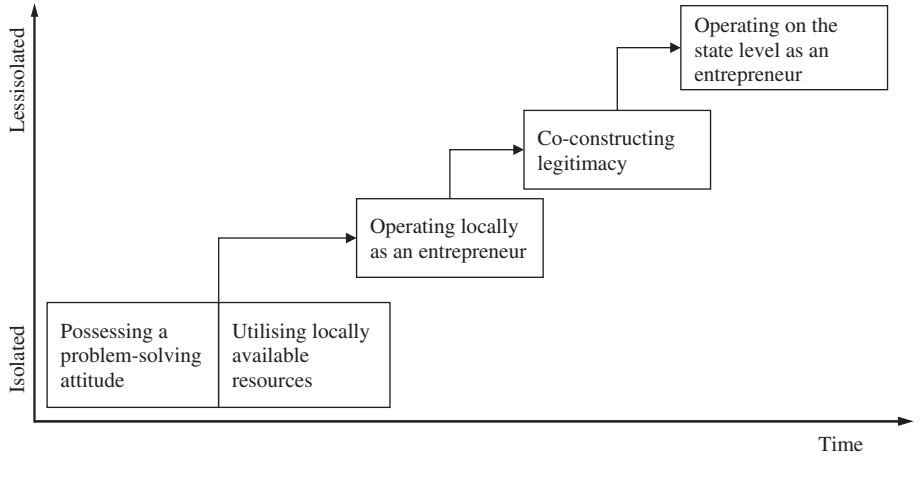

Figure 2. Scaling process of grassroots entrepreneurs.

share a similar knowledge background with the grassroots entrepreneurs, they were unable to provide the entrepreneurs with additional resources necessary for scaling. The local contacts provided the grassroots entrepreneurs with meagre funding and partners for testing and acted as first customers of the machine or product. After the encounter with a formal organisation, the resources available to the entrepreneur increase. Their legitimacy as entrepreneurs, despite coming from a rural setting, gets constructed slowly, together with other actors such as users, the media, and organisations offering formal recognition. Receiving an award, being granted a patent and working with formal organizations contributed to the legitimizing of the grassroots entrepreneurs. Being perceived as legitimate entrepreneurs helps the expansion of the network of the grassroots entrepreneur.

The entrepreneurs face a variety of challenges and difficulties in the scaling process. These relate to a lack of sufficient networks to provide feedback, a lack of funding to advance the entrepreneurial endeavour, and a lack of understanding on how to operate in the system. Though the study reveals the perspective of the entrepreneurs, it does not fully account for the support for product development and business development provided by formal organisations the entrepreneurs worked with. Based on their own interpretation of the situation, the entrepreneurs trust their own experience and gained knowhow, and do not fully acknowledge the support provided by formal organisations in addition to the award, the patent, and the funding. However, it is important to recognise that this was gained by working with the organisations and, hence, requires further investigation.

In addition to the scaling model, this study contributes to literature also by providing further insights related to the scaling process. These relate to (1) the type of innovations, (2) financial resources, (3) the network of the entrepreneur and (4) the degree of informality.

Each entrepreneur has developed an innovative machine or product that cannot be easily imitated since the machines are large, complex, and difficult to produce. Therefore, they differ from the innovations of creative low-income entrepreneurs explored in previous studies (Shepherd, Parida, and Wincent 2017). Moreover, while entrepreneurs from low-income settings typically struggle with scaling due to challenges related to the business idea (Bradley et al. 2012), the entrepreneurs covered in this study had a good sense of business. They responded to the needs of their customers and the market, and their products and machines created a large market demand.

For the scaling process, the grassroots entrepreneurs needed financial resources which came from multiple sources. Initially, the primary source of funding was one's own available means or provided by relatives or a sales agency. Later in the scaling process, publicly funded financial support was accessed through the formal partners of the grassroots entrepreneur. In addition to direct financial support, the formal organisations also offered in-kind support related to product refinement and development, business development, and other trainings. Noteworthy is that the grassroots entrepreneurs found the banking system out of reach for them.

Not restrained by social norms, the grassroots entrepreneurs utilised the networks and resources in ways these were not originally intended for and combined the existing resources to serve new purposes (Baker and Nelson 2005). Through interacting with a broader network, the grassroots entrepreneurs were exposed to operation in the wider society, which included the formal sector. The grassroots entrepreneur stems from an informal environment with informal practices, and available resources are used in an informal way. Instead of contracts and formal agreements, these relationships are based on the foundation of mutual understanding and trust.

At the beginning of the scaling process, the grassroots entrepreneurs were informal and, therefore, illegal actors, yet they worked using legitimate means and activities (Webb et al. 2009). Scaling, they understood, required them to be a formal actor with a legitimate position in the society. The entrepreneurs wanted to sell their innovations and were therefore prepared to formalise their activities. Throughout the scaling process, the grassroots entrepreneurs became less isolated and began to see the benefits of formalising their operations. This observation highlights the uniqueness of these innovative entrepreneurs in resource-scarce settings. It contradicts many

previous studies on low-income entrepreneurs who resisted the formalisation of their activities as it would increase competition and expenditure (Webb et al. 2009).

To conclude, this study demonstrates how grassroots entrepreneurs develop their business opportunities (Si et al. 2015) and scale beyond the level of subsistence (Bruton, Ahlstrom, and Si 2015). Had the formal network contacts not provided support, it can be assumed, that the scaling process would have been less successful. The journey would have taken longer, creating additional financial and mental challenges for the entrepreneurs. Therefore, aspiring entrepreneurs hailing from low-income settings who do not entertain the possibility of expanding their network with formal organisations give up easily when disappointments and failures follow and lead to financial and mental setbacks. The entrepreneurs in the study relied on their network throughout the scaling process. Despite the growth of their experience as a result of working as an entrepreneur, the sense of not belonging and isolation remains.

Grassroots entrepreneurs

The second contribution of this study is illustrating the grassroots entrepreneurs with growth potential as a distinctive category of low-income entrepreneurs. In this capacity, they contribute to the welfare of their community through, for instance, job creation. This is noteworthy since the grassroots entrepreneur has more potential for scaling compared to the typical low-income entrepreneurs as described in literature. Low-income entrepreneurs have been understood typically as local sales agents selling consumer goods, which can potentially be sold with low effort also by other individuals in the same locality, and goods which are produced by third-party organisations (Scott et al. 2012; Webb, Morris, and Pillay 2013; Kistruck et al. 2013b).

To advance the literature on low-income entrepreneurship, this study shows that grassroots entrepreneurs develop, commercialise, and scale their products independently for the most part. They continue innovating until they develop the best option and do not settle for the second-best option (Senyard et al. 2014). They also produce and manufacture the products and machines they developed. If the grassroots entrepreneurs had been unwilling to commercialise and scale their innovation, these products would not have reached the market. Therefore, it is justified to claim that these grassroots entrepreneurs are a unique subset among low-income entrepreneurs. The entrepreneurial endeavour of grassroots entrepreneurs is innovation-driven (Yessoufou, Blok, and Omta 2018), although low-income entrepreneurs are typically necessity-driven (McMullen, Ragby, and Palich 2008) and the innovations developed are differentiation-related (Bradley et al. 2012).

It is important to understand this type of entrepreneurship, even though it does not comply with the traditional Silicon Valley model of entrepreneurship (Welter et al. 2017). Firstly, western-based organisations often do not recognise the appropriate local needs or lack awareness of the level of corruption rampant in local institutions and, therefore, fail to embed a solution suitable to the local context (Khavul and Bruton 2013). The innovation-driven locally-embedded grassroots entrepreneurs are aware of local issues. Secondly, venture creation is a tool to create a new identity (Williams and Shepherd 2016), and in the case of grassroots entrepreneurs, it helped them to transition from ridiculed madmen to legitimate entrepreneurs. Thirdly, scaling also leads to the emancipation of the grassroots entrepreneur from resource constraints and changing the power structures in their surrounding society (Rindova, Barry, and Ketchen 2009).

Grassroots bricolage

To advance our understanding of how low-income entrepreneurs operate and to contribute to previous studies on bricolage in low-income contexts (Linna 2013; Sarkar 2018), I developed the concept of grassroots bricolage. Grassroots bricolage is a type of behaviour necessary when developing, commercialising, and scaling of innovations of grassroots entrepreneurs from low-income settings. It means utilizing the locally available resources and network contacts in

unforeseen ways. Similar to entrepreneurial bricolage (Baker and Nelson 2005), grassroots entrepreneurs work in a penurious environment with new challenges and limited resources. However, grassroots entrepreneurs do not feel limited by their resource-scarce context and overcome challenges imposed by the context.

The entrepreneurs use the means at hand and prioritise what they believe complements their existing expertise and what they perceive as relevant. Grassroots bricolage involves both local wisdom and networks that the entrepreneurs combine and use in novel ways. Locally available resources include indigenous knowledge, the resourcefulness of the entrepreneur, expertise about the self-developed innovation, and awareness of the conditions for which the innovation has been developed. The network consists of both informal actors from the locality as well as formal actors representing organisations that work with low-income entrepreneurs from resource-scarce settings. The network is utilised as a resource, for instance, to gain access to funding, testing, and marketing strategies. The efforts made by the network contacts are appreciated but utilised only when perceived as useful, since the local wisdom of the bricoleur prevails over outsider expertise. The resources available, such as the skills and experiences of the entrepreneur and the network contacts, also accumulate over time. Since the network expands organically and naturally, this cannot be considered as resource-seeking, where the entrepreneur makes an effort to find new network contacts (Baker 2007).

The network also provides awards, patents, and media attention that the entrepreneurs can skilfully utilise to contribute to their legitimacy as entrepreneurs. Utilizing these intangible resources in new ways is the uniqueness in grassroots bricolage and an important contribution to the literature on bricolage. Hence, instead of seeing the patent as protection against counterfeits, it is a seal of proof that the innovation is real and authentic. Similarly, having others copy the innovation is a sign and further proof of demand. These intangible resources are also key ingredients for co-constructing legitimacy.

To summarize, the study provides contributions to different literature streams. Firstly, the study shows how low-income entrepreneurs scale beyond selling to people living in close proximity to the enterprise. The study further advances the literature on low-income entrepreneurs by highlighting innovation-driven grassroots entrepreneurs as a unique archetype of low-income entrepreneurs, contrasting with the necessity-motivated entrepreneur typically referred to when discussing low-income entrepreneurs. Lastly, grassroots bricolage and the unique way of combining intangible resources in unforeseen new ways is an important contribution to the literature on entrepreneurial bricolage. These main contributions are provided in the table above (Table 3).

Practical implications

This study carries a number of practical implications for policymakers and organisations working with low-income entrepreneurs, minority entrepreneurs, and entrepreneurs isolated from access to resources for other reasons such as a disability. It demonstrates valuing what is already available locally – ideas, experiences, knowledge, or awareness of local issues – when planning entrepreneurship programs. The entrepreneurs have a unique knowledge base that gives them agency. This study also indicates that grassroots entrepreneurs are legitimate stakeholders for companies, whether local or international. Not only are they resourceful and creative problem-solvers, but they are also experts on local needs and locally suitable solutions. Therefore, the grassroots entrepreneur can be a prospective local partner for entrepreneurs, under the condition that they are treated as equals, listened to, and given a real voice.

The entrepreneurs benefit from experts in their network who can provide them with access to other important resources as well as feedback. Nevertheless, it is important to listen to aspiring entrepreneurs and their own assessment of their needs when developing support programs and policies. The study further demonstrates that the aspiring entrepreneurs from resource-scarce environments value relationships based on trust since they come from a context where

Table 3. Summarizing the main contributions of the study.

Contemporary understanding	The findings
Low-income entrepreneurs face difficulty scaling their enterprises due to lacking access to sufficient resources.	Innovative low-income entrepreneurs have the potential to scale. Starting from operating locally as an entrepreneur, the network of the entrepreneur little by little grows and hence also the available resources increase. Through working with formal actors, the legitimacy as an entrepreneurs is established which eventually helps with scaling and reaching state-level markets.
Low-income entrepreneurs tend to be necessity-driven entrepreneurs, selling products created by others and being innovative in mundane activities.	Highlighting the heterogeneity of low-income entrepreneurship, grassroots entrepreneurs are a distinct archetype. These innovation-driven entrepreneurs develop complex products and machines, which are difficult to imitate. The entrepreneurs commercialise and scale these innovations to different degrees. Further, grassroots entrepreneurs are low-income entrepreneurs with growth potential beyond subsistence level.
Entrepreneurial bricolage is applied to entrepreneurs operating in resource-scarce settings, and hence it is also used to describe the conditions of low-income entrepreneurs.	Grassroots bricolage refers to the ability to utilise both locally available resources and network contacts. Further, grassroots bricolage means using intangible resources in new and unforeseen ways to advance entrepreneurial activities in resource-scarce settings.

institutional voids are replaced by social relationships. As an organisation working with these settings, it is important not to be faceless but work with entrepreneurs at a human-to-human level. It is important for entrepreneurs to work with individuals they not only trust but also perceive as knowledgeable. Moreover, this study shows that enhanced capabilities increase the self-confidence of the entrepreneurs. Attention should be paid to ensure that the entrepreneurs feel as comfortable among the formal actors as among their peers.

Limitations of the study and directions for further research

The entrepreneurs selected for this study were all based in the same state in India, the western state of Gujarat. This state was selected as it is known for its entrepreneurial spirit, and the support organisations studied were also located in Gujarat. This can be perceived as a bias, but for this particular research, setting the choice was justified, since the aim was to study grassroots entrepreneurs who have already scaled their innovations. Another potential limitation is related to the translation of the interviews, which were an important source of data for the study. Despite being accurate translations, the translated versions may contain discrepancies or changes in meaning.

During the data collection of this research project, I met one entrepreneur who was unable to expand his network and was still struggling to find his first paying customer. The visit was useful to rule out alternative explanations and investigate counterfactuals. It also helped me better understand the factors involved in scaling beyond one's own village and the role of organisations acting as key network contacts. These include, for instance, the lack of recognition, no mental support from someone who understands the innovation, and minimal financial means. Since this case could not help to answer the research question of how grassroots entrepreneurs scale their enterprises in resource-scarce settings, I decided to exclude the case from the sample. However, as a direction for future research, it is important to study entrepreneurs unsuccessful in their scaling as these can reveal more on the factors related to the scaling process of low-income entrepreneurs.

Actors in a network have multiple perspectives on the same events (Baker 2007), and this study focused on the perspective of the entrepreneur. This appears to differ from the perspective of formal organisations working with grassroots entrepreneurs. In future research, giving a voice to other perspectives of the scaling process can enhance our understanding of the difficulty of scaling. Taking another perspective can also give a more nuanced version than the current study

does, for instance, in the degree of support required by grassroots entrepreneurs for product development and scaling. Further, co-constructing legitimacy requires further investigation, particularly on the work done by the network contacts. Furthermore, the low-income context is a potential ground to investigate the negative effects of bricolage and contribute to the ongoing discussion on it (Senyard et al. 2014).

It would also be enlightening to study similar entrepreneurial activities and organisations in geographical locations other than Gujarat, India, including in other Indian states with different institutional environments. Grassroots innovation movements have been identified, for example, in Argentina and Brazil (Smith, Fressoli, and Thomas 2014). Other research could examine entrepreneurial activities in China (Ahlstrom and Ding 2014; Wang et al. 2008) and in much different provinces with respect to entrepreneurial climate (Gong, Chow, and Ahlstrom 2011; Huang 2008). Furthermore, the entrepreneurs covered in the study were Hindu men. It is beyond the scope of this study to assess the role of gender and religion in scaling, but it may be an interesting field for future research (Audretsch, Bönte, and Tamvada 2013).

This study strengthens the case for grassroots entrepreneurs who have developed innovations that scale widely instead of imitations that are diffused locally (González-Pernía, Jung, and Peña 2015). Looking closely at the financial status of grassroots entrepreneurs can help to understand the economic viability of these enterprises in the long run. Further, a closer look at the various financial sources the grassroots entrepreneurs used and the gaps in funding would provide valuable insights, for example, for public policy to support the grassroots entrepreneurs.

It would also be interesting to delve deeper into the challenges faced by the grassroots entrepreneurs on a social and cultural level, following the observations of this study and those of previous studies and examining the influence of social class on occupational choice (Audretsch, Bönte, and Tamvada 2013). This would shed light on prevalent social norms, hierarchies, and the lack of self-confidence limiting the grassroots entrepreneurs. Social acceptability (Webb et al. 2009) or working in the intersection between the formal and the informal, for instance, could also be interesting for further studies.

Conclusion

This study investigated the scaling process of innovative low-income entrepreneurs operating in resource-scarce settings. The entrepreneurs started by establishing a position in the local market, which led to an organic expansion of their network. Through working with the network, the entrepreneurs scaled up to a position wherein they could sustain a livelihood for themselves and their family by selling their self-developed innovation. Further, these grassroots entrepreneurs represent a unique subset of low-income entrepreneurs as they have developed, commercialised, and scaled their innovation. Lastly, the grassroots entrepreneurs manifest the behaviour of grassroots bricolage, which is a combination of the usage of local wisdom and networks as a resource. It refers to utilizing intangible resources provided by the network in new and unforeseen ways. To conclude, if this article could contain only one message, it would be that grassroots entrepreneurs are innovation-driven, resourceful, that they develop, commercialize, scale their innovations, and that they manufacture and sell the products and machines.

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No potential conflict of interest was reported by the author.

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Appendix A. Case descriptions

The four selected cases are the Mitticool clay fridge, the Bullet Santi multi-purpose agricultural machine, the Chetak Cotton Stripper, and the groundnut digger. In the following section, I briefly explain the background of each entrepreneur and the origin of each innovation and Table 4 offers a summary of the cases.

(1) Clay fridge 'Mitticool' and Mansukhbhai Prajapati

Mansukhbhai Prajapati was the only son in a pottery family. He dropped out of school after tenth grade and has been working ever since. He joined a tile manufacturing company, where he learned about machines and automated operations. In 1988, he left the tile manufacturing company to establish his own enterprise that manufactured tava pans made out of clay. He later developed a water cooler made out of clay. During the earthquake in Gujarat in 2001, a local newspaper published a picture of a broken water cooler but wrongly reported that the poor man's fridge was broken. This triggered Prajapati to start developing a fridge made out of clay, because he understood that the need for a fridge to keep food cool may arise in the absence of electricity.

During the product development process, Prajapati faced huge challenges finding the right combination of the clay mixture. He sought the help of his family, who also worked with pottery, and his more educated friends for this

Table 4. Table summarizing data of the cases.

	Possessing a problem-solving attitude	Utilizing locally available resources	Operating locally as an entrepreneur	Co-constructing legitimacy	Operating on the state level as an entrepreneur
Mitticool	(1988)2001–2005			2005–2017	
	Practical experimenting: with clay, soil and design; Chakda for distribution Trusting own abilities	Family: clay expertise Informal money lender: funding Customers: feedback	Operating locally: selling from a chakda Pans break Stopped working with skillet to develop fridge	2007: MVIF 2009: Award 2009: Future group 2011: ISO certificate Trade mark registration	2017: 50 000 fridges sold
Bullet Santi		1994–2000		2001–2017	
	Chakda as example for building Bullet Santi	Uncle: initial idea Customers: feedback Family	1994 – sold 1 1995 – sold 3 1996 – sold 8	Award and cash prize: 2001 MVIF loan: 2001 Exhibition in South Africa: 2002 Gear box developed by IIMA people	Sales to Kenya By 2017 – sold 400 bullets
Chetak		1991–1998		2000–2017	
	Practical knowledge: electrification, machines Trusting own abilities	Ginning cooperative: funds, sales agency Plants for cotton ginning: testing Sons working on the enterprise	Operating locally as entrepreneur Failed sales	2002: Award & cash prize 2004: Patent Word of mouth Funding: TePP Media attention	Diversifying company Exhibitions & fairs Made based on demand
Groundnut digger		2006–2011		2011–2017	
	Develop machines based on perceived problem and own skills	Brother Friend (storage) Relative (funding) Agriculture University (testing)	Machines unsold, or sold but returned Develop ploughing machine to survive	Positive test results Award Patent application First customers	100 machines sold Lacking skills to grow internationally Personal sales

process. He obtained a loan from a moneylender at a high interest rate. When he was unable to repay the loan, he was compelled to sell his parental home, which was the collateral for the loan. After three years of product development, he finished creating the clay fridge, and the first customer he sold it to was a civil engineer in 2004. Prajapati later also developed a non-stick pan and a pressure cooker out of clay.

(2) Multipurpose tractor 'Bullet Santi' and Mansukhbhai Jagani

Mansukhbhai Jagani dropped out of school to help his father with farming activities. He opened his own workshop but continued working on the farm. In the workshop, he carried out reparation and fabrication jobs.

Farmers traditionally use bullocks on their land, as tractors are too expensive. Tractors also require diesel, but only when they are being used. Bullocks require care and fodder all year long, which is difficult to obtain in drought-prone areas. In 1993, Jagani's village faced a drought, and he had to sell the bullocks his family owned. After this, it became impossible to buy new bullocks. Therefore, he started to develop a machine that had the strength of a bullock but at an affordable cost of ownership. Furthermore, farmers lacked the labour force required for their fields, since many labourers moved to the city. Using the engine of an old motorcycle, Jagani built a three-wheeled tractor. The vehicle is smaller than a tractor but stronger than an animal. It turns with ease and applied less pressure on the soil since it is lighter than a tractor. For these reasons, it is very suitable for cotton farming.

His first customer was a farmer from Jagani's own village. Since then, he has not been very eager to structurally expand the business and is happy with the constant flow of customers. There are a total of about 100 fabricators who build machines similar to the Bullet Santi. With the help of Sristi and its local university partner, the Bullet Santi has also been introduced in the Kenyan market.

(3) Cotton Stripper 'Chetak' and Mansukhbhai Patel

As a child, Patel worked as a cotton stripper, extracting cotton fibres out of the shell. He had thought about a machine that would automate the tedious work of cotton stripping. Patel studied until 9th grade, after which he started working as an electrician in the textile industry. While working in the textile industry, he discussed his idea of building a cotton stripper machine with his manager who was also a relative of his. The manager supported Patel, as did the leader of the local ginning mill cooperative, and with this initial capital, he started developing the machine.

Patel had learned about machines while working in textile industry factories. Nevertheless, it took him a lot of time to develop the cotton stripping machine. Since the community made fun of his work, he was forced to work in the evenings. The first prototype was introduced in the market in 1991, and Patel sold 50 machines through an agency owned by the ginners' association. These were soon returned as they broke when being used. Patel had to repay all the initial buyers, and he wanted to improve the machine. In this period, his biggest challenge was the lack of sufficient financial resources. There were days when his family did not have enough to eat. Patel has two sons who dropped out of school to work on the innovation while he worked at his salaried job.

The second prototype reached the market in 1994, and four years later, the third prototype was ready. This version was a success, and even today the machine is still working on the same principle as the third prototype. The customers are ginners, and each customer typically buys 2 to 3 machines from Patel.

(4) Groundnut digging machine and Sanjay Tilwa

Tilwa's father is a teacher, and he himself is educated as well. He moved to Junagadh to complete his B. Com degree while working occasionally to cover the costs. When he graduated in 2003, he moved back to his village and became a farmer. He also worked for his brother's tractor business, taking care of any requirement that came up in the business, but he predominantly worked with sales. A few years later, he wanted to start dealing in agricultural machines, and with the support of a relative, he started his firm Akshar Agro Engineering.

Tilwa was a groundnut farmer. While working on the field, he observed the other workers and realised how difficult it was to dig up groundnuts. Labour costs were high, and due to a lack of labourers, it was difficult to find skilled labour. In 2007, he started developing a machine to aid groundnut harvesting.

The original model was a handheld device. However, this was inefficient and required labour. Next, he developed a tractor-operated plough, but this too did not work properly, as the nut would break or stay in the ground when being dug out. Throughout the developmental process, Tilwa discussed these issues with other farmers. In 2009, Tilwa developed a first working prototype. The support and advice he received from his brother and his friend were very important for the development process.

The groundnut digger was tested at the Junagadh Agricultural University in 2011, and it received positive feedback. The machine digs, cleans, and dries the nuts. It saves time, labour, and money compared to the manual digging of groundnuts. However, the machine was not a commercial success in the beginning. Tilwa also developed a ploughing machine that is currently selling well and using the profit gained from its sales, he was able to develop processes for selling and manufacturing the groundnut-digging machine. He has ambitious targets for the future and is currently looking proactively into the international market.

Appendix B. Tables with prior literature

Below are two tables showing the previous literature, firstly from empirical studies related to low-income entrepreneurship and secondly from studies related to bricolage. (Tables 5 and 6).

Table 5. Prior empirical studies related to low-income entrepreneurship.

Authors	Research context	Key findings related to low-income entrepreneurship
Bradley, McMullen, Artz, and Siiyu 2012	Nairobi, Kenya	Human capital (expertise and family business experience), financial capital (loans) and social capital (networks and weak ties) important for business development. Differentiation-related innovations and novelty-related innovations Indebtedness decreasing likelihood of innovation
González-Pernía, Jung, and Peña 2015	45 developing countries	Focusing on innovative entrepreneurs, the study finds that they contribute to society by developing new technologies, creating jobs, and increasing revitalization in different areas.
Kistruck, Beamish, Qureshi, and Sutter 2013a	11 countries in Africa, Asia and Latin America	Social intermediaries have altruistic intentions, and hence incorporate unprofitable transaction functions and are driven by the motivation of empowering low-income actors.
Mair and Marti 2009	Bangladesh	Departing from institutional voids preventing entrepreneurial activity, the study examines the institutional factors and the work done by an NGO as an institutional entrepreneur to overcome barriers for access to the market.
Pansera and Sarkar 2016	India	Grassroots innovators are driven by improving social conditions in their community and reducing environmental harm. They also have the potential to contribute to achieving sustainable development.
Sarkar 2018	India	For grassroots entrepreneurs, resource-scarce environment is not an impossible limitation as these entrepreneurs reuse tangible and intangible resources through bricolage.
Scott et al. 2012	Townships in South Africa	Exploring women working as sales representatives for Avon showed that entrepreneurship combined with training and other support leads to emancipation, more income, and improved self-confidence.
Shepherd, Parida, and Wincent 2017	India	When bringing the creative poor individuals to the centre of the discussion on inclusive growth, the creative problem-solving leads to both the facilitation of inclusive growth and low firm growth due to the development of imitable products.
Si, Yu, Wu, Chen, Chen, and Su 2015	China	As a case study on entrepreneurial endeavours to alleviate poverty, the findings suggest that peasant entrepreneurs rely on their own efforts to discover business opportunities and they have a deep understanding of the local market.
Sutter, Webb, Kistruck, Ketchen, and Ireland 2017	Nicaragua	Institutional intermediaries helping entrepreneurs to transition from an informal institutional framework to a formal institutional framework use a variety of tactics on individual and network level, but also on a system level. This is called institutional scaffolding.
Tobias, Mair, and Barbosa-Leiker 2013	Rural Rwanda	Rural dwellers exploit entrepreneurial opportunities created by institutional actors for social and economic benefits. More income and better quality of life leads to trust between hostile ethnic groups.
Webb, Morris, and Pillay 2013	Townships in South Africa	Taking a resources-based theory approach, the growth of micro-entrepreneurs depends on the ownership of resources and the formal institutional context, such as access to utilities and efficient access to financial capital.
Williams and Shepherd 2016	Australia	After a natural disaster, venture creation and entrepreneurship functioned as a way to manage a challenging situation and to have naturally occurring social interactions.
Yessoufou, Blok, and Omta 2018	Benin	In a study on vegetable producers, micro-enterprises emerged at the intersection of motivation, uncertainty, and disruptive events.

Table 6. Prior literature related to bricolage.

Authors	Research context	Key findings related to bricolage
Baker and Nelson 2005	United States	Entrepreneurial bricolage means "making do by applying combinations of the resources at hand to new problems and opportunities."
Baker, Miner, and Eesley 2003	United States	Investigating strategic improvisation and introducing the concept of network bricolage referring to contacts as a means at hand.
DiDomenico, Haugh, and Tracey 2010	United Kingdom	Introducing social bricolage as a way social enterprises acquire resources in a resource-scarce environment. Social bricolage includes the processes of entrepreneurial bricolage but also social value creation, stakeholder participation, and persuasion.
Halme, Lindeman, and Linna 2012	Ethiopia and India	Individuals working on projects related to innovations for inclusive business within large organisations facing resource scarcity engage in various practices labeled as intrapreneurial bricolage.
Linna 2013	Kenya	The bricolage activities low-income entrepreneurs engage with are possessing a social mindset, being resourceful, making do with resources at hand and improvising. Further, entrepreneurs need to have the capabilities to use perform these activities.
Mair and Marti 2009	Bangladesh	The process of institutional entrepreneurs working to fill institutional voids can be understood as a form of bricolage. Aspects of bricolage the study highlights are the sense-making of the bricoleur, its political nature and unintended consequences.
Molecke and Pinkse 2017	10 developing countries in Latin America, Asia and Africa	The study on impact measurements conducted by social enterprises shows that material bricolage, referring to the tangible means, and ideational bricolage, meaning the logic, interpretation and intuition of the entrepreneurs, relate to each other and entrepreneurs use these simultaneously.
Sarkar 2018	India	Bricolage behaviour of grassroots entrepreneurs: breaking social norms; utilising old and acquiring new skills; own time
Senyard et al. 2014	Australia	The study shows that the more a new and resource-constrained firm engaged in bricolage, the more innovative it is.
Tasavori, Kwong, and Pruthi 2018	United Kingdom	Social entrepreneurs utilise both internal bricolage with incremental improvisation, and network bricolage when growing their product and market scope.