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**THE SURPRISING DUALITY OF JUGAAD:
LOW FIRM GROWTH AND HIGH INCLUSIVE GROWTH***

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THE SURPRISING DUALITY OF JUGAAD: LOW FIRM GROWTH AND HIGH INCLUSIVE GROWTH

Western theories on creativity emphasize the importance of access to resources and the generation of innovations as a source of sustainable competitive advantage for firms. However, perhaps the emphasis on slack resources and the firm as the level of analysis may be less appropriate for understanding the benefits of individual creative problem solving in resource-poor environments of the east; focusing solely on the firm is not sufficiently inclusive and may underestimate the benefits of creative problem solving under resource scarcity. Through an inductive interpretive case study of 12 problem solvers in the highly resource-poor environment of rural India, we identified the antecedents, dimensions and duality of outcomes for an Indian cultural source of creative problem solving called jugaad. Jugaad relies on *assertive defiance, trial-and-error experiential learning and the recombination of available resources to improvise a frugal quick-fix solution*. Our inductive framework provides new insights into the dual outcomes of creative problem solving from an eastern perspective; jugaad is unlikely to be a source of competitive advantage for firm growth but represents a source of enhanced wellbeing for inclusive growth.

Creative individuals can help improve the performance of organizations (Amabile, 1988; Elsbach and Flynn, 2013) and communities (Miller, Grimes and McMullen, 2012; Shepherd and Williams, 2015). Western theories of the creativity of individuals within organizations emphasize the importance of access to resources (Bradley, et al., 2011; George, 2005; Paeleman and Vanacker, 2015). The flipside of this effect is that those without sufficient resources are unlikely to facilitate the creativity necessary to generate solutions and are doomed to languish with poor performance. Extending this logic, individuals in resource-poor environments—those who need creative solutions to problems the most (to improve their situations)—are the least able to assemble the resources necessary to generate creative solutions. In contrast to emphasizing resources to generate creative solutions, bricolage represents *actions* individuals take that generate creative solutions in resource-constrained environments (Baker and Nelson, 2005; Garud and Karnoe, 2003). This act of creativity is consistent with the adage that necessity is the mother of invention, but despite evidence that such a process generates creative solutions, researchers question how beneficial these solutions are to firm growth (e.g., Baker and Nelson, 2005; Garud and Karnoe, 2003; Lanzara, 1999).

However, perhaps the firm level of analysis—generally used in the extant literature in the west exploring the benefits of solutions—may be less appropriate for understanding the benefits of individual

creative problem solving in resource-poor environments of the east. Indeed, rather than focus on firm growth as a benefit of creative endeavors, scholars exploring resource-poor regions of the east have begun to call for research on inclusive growth (George, McGahan, and Prabhu, 2012; Halme et al., 2012; Kabeer, 2012). Scholars suggest that focusing solely on firm performance is not sufficiently inclusive and may underestimate the benefits of individual creative problem solving for enhancing the social and economic wellbeing of disenfranchised members of society (George, et al., 2012: 663). Therefore, we ask: how individual creative problem solving in resource-poor regions impacts performance beyond traditional Western theories of a firm's competitive advantage?

We contextualize our exploration of the outcomes of individual creative problem-solving in the highly resource-poor environment of rural India. Specifically, we build a framework on the duality of outcomes of an Indian cultural source of creative problem solving called *jugaad*, which relies on *assertive defiance, trial-and-error experiential learning and the recombination of available resources to improvise a frugal quick-fix solution*. . Through an inductive interpretive case study of 12 *jugaadus* (individuals engaged in *jugaad*) in India, we build a framework of *jugaad*'s impact on firm and inclusive growth. We inductively found that *jugaad* has a behavioral dimension consistent with the notion of bricolage (i.e., "making do by applying combinations of the resources at hand to new problems and opportunities" [Baker and Nelson, 2005. Further, *jugaad* is a broader concept than bricolage because it also involves an attitudinal dimension (an assertive, defiant attitude) and an iterative dimension. In exploring the antecedents, dimensions, and consequences of *jugaad*, we make two primary contributions to the literature on individual creative problem-solving under resource scarcity and the poverty.

First, we found that *jugaad* generates a duality of outcomes—*low firm growth* (i.e., minimal [if any] sustainable competitive advantage to the firm) and *high inclusive growth* (i.e., enhanced wellbeing of disenfranchised members of society), which has theoretical implications for problem solving in resource scarce environments.. Specifically, although scholars have acknowledged that solutions can be and are

generated despite (or because of) resource constraints (Branzei and Abdelnour, 2010; Salunke, et al., 2013; Senyard, et al., 2014), there have been questions about the usefulness of these outcomes for the firm (Baker and Nelson, 2005; Senyard et al., 2013). We find that while *jugaad* generated solutions that were difficult to market, scale, and protect and thus unlikely to lead to a sustainable competitive advantage and firm growth, it did generate solutions that had a positive impact on the individual (i.e., the *jugaadu*) and his or her community; a viable duality for resource constrained regions in the east. This duality of outcomes help explain the “mixed findings” regarding solutions generated in resource-poor environments and highlight the importance of explaining impact at levels of analysis other than the firm. Indeed, this study contrasts the West’s focus on sustainable competitive advantage and its effect on firm growth with an understanding of the East’s focus on solving problems and its effect on the growth of individuals and communities—namely, we offer an inclusive perspective on the impact of solutions.

Second, for studies that have explored inclusive growth, the focus has been on the roles of multinationals (e.g., Ansari, Munir and Gregg, 2012; Halme, Lindeman and Linna, 2012), governments (Hall et al., 2012), and non-government organizations (Fowler, 2000; Khavul and Bruton, 2013) in providing and delivering solutions to the problems faced by people living in resource-poor regions of the world. We extend this stream of research by explicitly examining *local* sources of inclusive growth and implications for growth at the individual and community levels rather than solely (or primarily) at the organizational level. Although this creative problem-solving process often does not generate commercializable solutions—the panacea for *firm* growth—it generally results in creative solutions to problems that help improve community members’ lives—a basis for inclusive growth.

To build toward our findings, in the next section, we review the literature on inclusive growth and on the benefits and costs of both *bricolage* and *jugaad*. Second, we describe our extensive data-collection effort, data coding, and analytical procedures. Third, we describe the nature of *jugaad* and both its drivers

and consequences. Finally, we offer a conceptual framework of *jugaad* and discuss its implications for the duality of firm and inclusive growth and the bricolage literature.

THEORETICAL BACKGROUND

Inclusive Growth

Although still in its infancy, research has begun to focus on the notion of inclusive growth (George, McGahan and Prabhu, 2012). This research makes more salient the question of who benefits from innovations, that is, to what extent does the implementation of an innovation “improve the social and economic well-being of communities that have structurally been denied access to resources, capabilities, and opportunities” (George et al., 2012: 661). These inclusive innovations can be in the form of policy changes by governments (e.g., Indian Planning Commission, 2006) and/or new products, services, processes, and/or business models typically generated by large, established organizations (e.g., Halme, Lindeman and Linna, 2012). Through the implementation of inclusive innovations, the poor can become “enfranchised as customers, employees, owners, and community members” (George et al., 2012: 662) and the innovative organization can grow markets and generate profits (Prahalad, 2006; Prahalad and Hammond, 2002). Although inclusive growth research has increased our understanding of the intra-organizational processes of developing inclusive innovations (Anderson and Markides, 2007; Halme, et al., 2012) and how these organizations can achieve both firm growth and inclusive growth, less is known about the processes by which local individuals can generate solutions that, while not necessarily commercially viable, contribute to inclusive growth nonetheless.

Creative Problem Solving Under Resource Scarcity

Rather than emphasizing the role of abundant resources in facilitating creativity—at least at low to moderate levels of slack resources (Bradley, et al., 2011; George, 2005)—the bricolage research stream has focused on *behaviors* to overcome environmental constraints. Specifically, Baker and Nelson (2005) built on Lévi-Strauss’s (1967) notion of bricolage to explore the process by which managers of resource-

constrained firms render unique services. Bricolage involves “making do by applying combinations of the resources at hand to new problems and opportunities” (Baker and Nelson, 2005: 333). It appears, however, that more of this behavior is not necessarily an unambiguous blessing. For example, Baker and Nelson (2005) found that participants who engaged in bricolage for almost all aspects of their operations (i.e., parallel bricolage) faced considerable obstacles to firm growth (see also Baker, Miner, and Eesley, 2003; Lanzara, 1999). Indeed, because bricolage involves “making do,” researchers believe it results in poor firm performance because the innovations represent “second-best solutions” that are barely (or not quite) good enough to solve the problem (Lanzara, 1999: 347). It appears that bricolage can generate negative firm effects including: (1) wasted effort of enacting a series of temporary solutions to cope with complex problems (Bechky and Okhuysen, 2011; Senyard et al., 2013); (2) a lack of focus on generating permanent or at least durable solutions (Baker, Miner, and Eesley, 2003; Senyard et al., 2013) and; (3) opportunity costs of not developing relationships with users and suppliers that could enhance firm performance (Hall and Andriani, 2000; Senyard et al., 2013).

Jugaad has been offered as a source of creative problem solving under severe resource constraints largely at the individual level of analysis. Given that jugaad is gaining prominence in the academic world (largely in commentaries), it is not surprising that it has various definitions (Prabhu and Jain, 2015). Common among these definitions is that jugaad involves making do with whatever resources that are accessible (Birtchnell, 2011; Prabhu and Jain, 2015) and overcoming constraints (Gulati, 2010; Krishna and Holla, 2009; Rangaswamy and Densmore, 2013) to improvise a frugal quick-fix solution (Prabhu and Jain, 2015; Radjou and Prabhu, 2015; Kumar, Gupta and Mondal, 2012). It has been argued that jugaad generates a broad set of benefits for the jugaadu (e.g., customization of machines and vehicles to fit individual needs) and cost-efficient solutions for urgent needs, such as for problems related to healthcare, electrical power, and infrastructure (Sekhsaria, 2013).

Scholars have explored jugaad to develop a deeper understanding of “the Indian” way of solving things, the achievements of leading Indian organizations, and the leadership approach of elite managers of Indian firms like Infosys and Wipro (Hammonds, 2003; Gulati, 2010; Jana, 2009; Varma, 2004). As such, scholars often describe jugaad as a native cultural asset based on a unique, complex, and genius approach of doing more with less in a society characterized by scarcity (Krishnan, 2010; Kiggundu and Ji, 2008; Nilekani, 2008)—an asset that could potentially be exported to other countries (Lamont, 2010). Although jugaad has also been discussed as a source of disruptive innovation (Bhatti, 2013; Panagriya, 2010; Rai and Simon, 2007), there is little scientific evidence supporting this notion.

Although many celebrate the benefits of jugaad (Mantri, 2010), like bricolage, it too may have negative consequences. For example, jugaad has been associated with systematic risk (Birtchnell, 2011), unsafe solutions that violate international standards (Birtchnell, 2011), pedestrian fatalities (Bhoothalingam, 2010; Husain, Haroon, and Abbas, 2009), bribery and corruption (de la Jara, 2009), digital piracy (Sundaram, 2010; Thomas, 2005), and other illegalities (Rangaswamy and Densmore, 2013). In several reports, jugaad in the areas of transportation and machinery has been shown to cause injuries and death (Dandona, 2006; Husain, Haroon and Mazhar, 2009). For example, in addition to cases of individuals’ tweaking vehicle engines (i.e., “Jugaad gadi”) to achieve higher mileage, individuals have used kerosene in vehicles instead of petrol, leading to higher pollution. Further, in the agriculture sector, farmers have been accused of using cold drinks like Pepsi and Coke as a substitute for pesticides, and some individuals have even used the steering bores of cars to develop make-shift pistols (locally called “katta”) for criminal activities (Kumar, 2011). Against this backdrop, we explore how jugaad’s creative solutions to problems in resource-poor environments affect both firm and inclusive growth.

METHOD

Research Context—Jugaad in Rural India

The present study's focus is the impact of jugaad by individuals in resource-poor environments. We chose rural India because it represents an extremely resource-poor environment. Rural India is "home to roughly one-quarter of the world's poor (those living on less than \$1.25/day)" (Jacoby, 2016:159), and home to approximately 70% of India's population. We chose the regions of Haryana and Gujarat because one of the authors grew up nearby, speaks the local language (Hindi), and still has a network in the region. As a native speaker, this author searched local newspapers to generate examples of jugaad. Because we did not want to project our own expectations on what represents jugaad, we looked for instances when the individual, the reporter, or others involved referred to jugaad. We identified 60 such instances. We used a professional data-collection agency to find and make appointments with these potential jugaadus (i.e., individuals engaged in jugaad) in waves of approximately five at a time. Using a local professional firm was necessary because there are substantial obstacles to accessing information within local villages, communicating with targeted individuals, and traveling to these villages. We continued with data collection (described below) until we reached saturation at 12 (after this point, further data collection failed to introduce new information). These 12 jugaadus represented purposeful sampling (Lincoln and Guba, 1985). More specifically, because the purpose of this study was to explore jugaad, we deliberately selected a sample of individuals engaged in this process (i.e., "those people experiencing the phenomenon of theoretical interest" [Gioia, Corley and Hamilton, 2013: 19]). In addition, our sample size is consistent with other inductive studies (e.g., six firms [Brown and Eisenhardt, 1997], 10 nascent entrepreneurs [Haynie and Shepherd, 2011], and 13 founders [Powell and Baker, 2014]). We asked these focal informants to suggest family members and users of jugaad as additional informants (consistent with a snowballing technique [see Corley and Gioia, 2004]).

Data Collection

We collected data via three primary sources: (1) semi-structured interviews, (2) field notes, and (3) archival reports. Consistent with the inductive approach, we used interviews as the primary source of data.

These interviews were based on a semi-structured interview protocol. The protocol was initially created, reviewed, and refined in English, and then the Indian co-author translated the protocol into Hindi for the initial interviews (interviews with the jugaadu, his or her family, and the end users of the generated solution). Although the semi-structured interview approach provided considerable scope and allowed the interviews to flow in whichever direction participants wanted, we also used the initial interviews to adjust the protocol for subsequent interviews.

The protocol for the jugaadu involved questions about how the solution worked, how he or she determined there was a problem to be solved, what his or her motivation was for developing the solution, and how successful the solution was. The interview protocol for the jugaadus' family members was structured around questions about how the jugaadu family member came up with the creative solution, whether family members used the solution personally, and how the person felt about his or her family member's engaging in jugaad. Finally, the interview protocol for end users of the jugaad solution centered on the problem being solved, the effectiveness of the solution, and the extent to which they (and like others) would pay for the solution (available upon request).

Data collection typically required the interviewer to take a four- to five-hour train ride to the village, ask locals to identify the focal individual's house, conduct the interviews, and return to New Delhi (often the next day). The interviews were conducted in Hindi and were audio recorded. The audio recordings were first transcribed in Hindi and then translated into English, and the co-author fluent in both Hindi and English verified that the translation and transcriptions were accurate. The interviews lasted an average of 67 minutes with the jugaadus, 25 minutes with family members, and 29 minutes with end users. In total, the interview data amounted to 212 pages of single-spaced text. The Indian co-author conducted (with representatives of the professional data firm present [see Christensen, Siemsen, Brnzei and Viswanathan (2016) for the importance of intermediaries in collecting data in environments of extreme adversity]) the first 21 interviews (50% of all interviews) and was in constant contact with those conducting subsequent

interviews. Consistent with the snowballing sampling technique, we interviewed representatives of the National Innovation Foundation of India (NIF) because some of the jugaadus mentioned in their interviews that the NIF was important in promoting their ideas and products. Two of the authors conducted two interviews with the director and operations manager of the NIF. The two interviews were conducted in English and lasted 63 minutes in total.

Observation and field notes were another important data source. Observations included a demonstration of the solution in action and the surrounding resource environment, and the field notes documented non-verbal communications about the jugaad, (e.g., the excitement in the individual's voice). The field notes were taken during the visiting portion of the excursion (before, during, and after the interview), and reflections were also recorded at the end of the day (or the next day depending on the return time to New Delhi). Given that most of the informants were illiterate or semi-literate, they had little documentation about their solution or their jugaad process. However, we did use newspaper articles about the informants and the solutions they generated. As part of the documentation-collection process, we took pictures of the solution, the resources at hand, and the local (resource-poor) environment. In Table 1, we detail each case in terms of the focal solution and its corresponding data sources.

Insert Table 1 About Here

Data Analysis

As we collected the data, we inductively analyzed and used our analysis to modify data collection, inform subsequent analysis, and tentatively identify themes and aggregate dimensions (Corley and Gioia, 2004). Although themes and aggregate dimensions began to emerge, we kept an open mind while initially coding the data. Our first-order analysis was conducted using standard ethnographic analysis to identify and discover themes based on informants' accounts. We used open coding to identify the initial concepts and began to group these concepts into categories. When possible, we used the informants' terms (i.e., the

English translation of these words) to label the concepts and categories (consistent with Corley and Gioia, 2004 and Strauss and Corbin, 1990).

In the second-order analysis, we further developed and connected our first-order findings with the goal of creating theoretical labels. We examined and re-examined the data from a theoretical perspective to ensure discrete patterns and dimensions of understanding. This step is important as it provided the opportunity to expand the analysis of categories and relationships beyond the immediate study by developing meaningful insights for other researchers. The second-order analysis involved: 1) examining each informant's account via qualitative content analysis; 2) evaluating whether the accounts were consistent across informants; 3) extracting theoretical explanatory dimensions from the emerging patterns; 4) engaging and re-engaging the different types of coding until the data structure was stable and; 5) consolidating these patterns into a conceptual framework.

We also took several steps to ensure the trustworthiness of the data (Corley and Gioia, 2004; Lincoln and Guba, 1985). First, we tightly controlled the data collection procedure to maintain data integrity. All interviews were digitally recorded in the informants' mother tongue—Hindi (with the exception of the interviews with the head and operations manager of the NIF)—and all interviews for a particular case occurred within a few days of one another. Furthermore, all field notes were recorded within 24 hours of the observation, and all data were assembled in a single file for each case. Second, for interviews not conducted by the Indian co-author, that co-author listened to the interview's audio file, read the field notes, and had a telephone conversation with the interviewer (usually within one week of the interview). Third, we implemented a systematic process for transcribing the interviews for analysis: (1) after the audio was transcribed (still in Hindi), the Indian co-author reviewed the transcription for accuracy; (2) professionals then translated the Hindi transcript into English; and (3) the translation was reviewed by the Indian co-author for accuracy (from Hindi to English). Fourth, we used the N-Vivo software for data maintenance. Finally, the researcher not engaged in data collection was initially responsible for open coding and then re-

engaged the local member of the research team with deep knowledge of the data. We then involved a researcher who was unfamiliar with the data or the coding to critique our data collection and analysis procedures (Corley and Giola, 2004). This provided an outsider's perspective of the evolving theorizing on jugaad—this unique form of creative problem-solving process under resource scarcity. In Figure I, we illustrate the data structure in terms of first-order concepts, second-order themes, and aggregate dimensions.

 Insert Figure I about Here

FINDINGS

To present our findings, we first overview the jugaad framework that emerged from the data and then provide details of the framework. Our framework consists of antecedents of jugaad, jugaad dimensions, and the dual outcomes of low firm growth and high inclusive growth. As illustrated in Figure II, the individuals faced resource-poor environments that necessitated a creative solution, they were able to problematize their environment, and they had deep knowledge of technologies but lacked knowledge of markets. The dimensions of jugaad involves an *assertive defiance*, *trial-and-error experiential learning* and *the recombination of available resources to improvise a frugal quick-fix solution*. These frugal quick-fix solutions offered a duality of outcomes—outcomes in terms of competitive growth and inclusive growth. For *the firm's growth*, jugaad solutions generated little value to the jugaadu's firm, at least in terms of a sustainable competitive advantage for firm growth. That is, the attributes of jugaad solutions were such that while they could reduce users' costs (a valuable outcome) its value could not be appropriated by the jugaadu's firm. Indeed, these jugaad solutions were difficult to commercialize—difficult to market, difficult to scale in terms of production, and difficult to protect from imitation. For inclusive growth, other businesses benefited by imitating the solution, including creating new organizations. The positive impact on other businesses provided additional value to the community. The community came to respect the jugaadus. As

a result, the jugaadus benefited in the form of enhanced psychological well-being from satisfying the intrinsic need to solve challenging problems, “doing good” for others, and enhanced feelings of self-worth.

 Insert Figure II about here

Antecedents of Jugaad

Stimulating Creativity: The Experiencing of Adversity. Our findings indicate that the jugaadus were embedded in an adverse environment. The extent of the resource constraints in rural India were explained in the research context section above. These resource constraints directly contribute to the jugaad form of creative problem-solving. Many expressed the notion of necessity being the mother of invention. For example, Gaurav, the inventor of an electric-operated compost machine for mushroom cultivation, reflected this common belief about necessity when he concluded the following:

People who have money cannot make new things because they don't feel the need; they have money to satisfy their needs. People who don't have money will keep trying to fulfill their needs. The thinking of a rich man is different from us. I am a common man and not so rich. My thinking is different.

They had also experienced other forms of personal hardship, which appeared to push them toward engaging in jugaad. For example, Vats, who developed a gas-powered three-wheel vehicle, faced health-related hardships that necessitated he do something to rectify the situation, as noted by a family member:

First thing is he has a hearing disability. He used to drive a three-wheel rickshaw. He used to transport nine to ten cylinders at a time, one weighing a minimum 30 kg. It used to pressure his knees tremendously. So, it was absolutely necessary to make something that will work as buying a new vehicle was not affordable.

According to respondents from NIF, the lack of governmental infrastructure and support encourages individuals to take a more active role in solving their own problems and the problems of others. This also means that that the NIF needs to work directly with uneducated and under-privileged individuals to help them generate their own creative solutions and elevate their quality of life. The director of the NIF noted the following:

These individuals are usually not educated and don't receive attention from formal sectors or governmental departments. We have to work directly with them and support them in developing their novel solutions. Many times they are not even aware of what they may have developed.

Despite evidence that adversity triggered jugaad, we did not find any evidence that this adversity obstructed the creative problem-solving process. Indeed, the only individual who complained about his resource-poor environment was Kumar, who created organic fertilizers and adapted vegetable varieties. He lamented, "I did some experiments with cow dung fertilizers. It was successful, but due to space constraints, I could not continue it."

 Insert Table 2 about here

From a Knowing Perspective. The jugaadus had developed deep knowledge in some domains but not others. Specifically, they had deep knowledge of processes and technologies. Take Vats, for example, who had considerable knowledge of machines and gas stoves and was able to creatively solve a problem:

I used to supply gas at Prem Gas Agency. I made a vehicle, a three wheeler. I did not need to go to the petrol pump for 20 years. People use to look curiously at it. Now there are many like it, but at the time of my invention, there were none. I tried to run it on gas, and I succeeded . . . in just two months. I used a domestic regulator. I can show you the photo. I used to repair gas stoves. I was a mechanic looking at the instruments to run an engine, the air and fuel it uses. I made some assumptions and tried to use gas for it. . . . It worked, as in the engine started, but it did not last. I found a solution for it in one to two months. I made a knitted part, so when the engine is raised, the knitted part is adjusted accordingly.

Although knowledgeable about technology, processes, and specific problems, the jugaadus lacked business knowledge, especially as it related to markets and marketing. A family member noted that Bhalla, who created a remote device for operating fire crackers, is "somehow lacking business skills to make a finished product. He had done a series of innovations during his days." Importantly, most jugaadus made the distinction between the person who generates a solution and the person who markets it. The jugaadus' emphasis is on the former rather than the latter under the belief that over time, people will come to know

the value of the solution—“you will use [it] and only then will you know it” (Verma). These jugaadus very much reflected the mindset that if you build a better mouse trap, people will beat a path to your door. For example, Verma explained the following:

If the machine makes life easier, for example, before washing machines came, clothes were hand washed, but when you knew the convenience of using a machine, you do not have to sell it. Same with this machine [Verma's jugaad]; when people saw its efficiency, my business started growing.

Others kept searching for a solution that people would eventually buy. For example, in response to lacking market acceptance for particular solutions, Tewari generated numerous additional solutions: “I made an electrical machine, which was not accepted. Then I prepared a hand-operated model, which is accepted.” However, it was clear that these jugaadus gave little thought to or cared much about the market or marketing.

Problematizing the Situation. Our findings indicate that the jugaadus searched for and identified problems from different spheres. First, they sometimes identified problems from personal experiences. For example, a family member reflected on Biswal's rain-protection system and how it was inspired by a problem that he frequently experienced: “It was seen and noticed many times that our clothes get wet when it rains when we are not home. So he thought something like this should be made so that the clothes don't get wet from the rain.” Second, sometimes the jugaadus identified problems faced by their family members or co-workers. Kotari, the developer of a novel multipurpose farming vehicle, recalled how they previously produced agricultural products: “See, earlier, we used to sow the groundnut, and the laborers had to carry the pump on their shoulders. So, their shoulders used to ache.” This problem for his workers motivated him to find a solution. Third, they sometimes identified problems of complete strangers, such as the case with Pal, who developed numerous solutions, including an electrical rotating drum, a cultivation machine, and a simple tong tool for home cooking. For example, he explains,

I make *Nagada* [a kettle drum and bell], which people use to worship God in the temple. . . . Actually the kettle drum gets fixed in one place and two sticks come from the upper side and beat the drum and create sound. After two to four years, the stick beats the same area of the drum, and it becomes

weak on that side. Then, they said to turn the drum, but who will go to the temple to change the location of the drum? Then, I felt that instead of turning the drum manually, it should turn automatically. . . . It should turn every day, so then I decided to make a drum that rotates every day.

Our findings indicate that the jugaadus enjoyed the process of identifying problems and finding a solution to these problems—intrinsic motivation (Deci and Ryan, 1985; Ryan and Deci, 2000). However, they also appeared to display prosocial motivation (Batson, 1987; Grant, 2008). By prosocial (in terms of motivation), we refer to “the desire to expend effort to benefit other people” regardless of whether the actor personally benefits or not (Grant, 2008: 50). Thus, some jugaadus were motivated to find (and ultimately solve) problems that caused the most difficulty in people’s lives. For example, Verma, who developed a cotton-stripping machine, was motivated to keep children from working in the field and thus keep them in school:

I am proud that I could improve the studies of the kids in this area. The manual process that I explained to you, each kid had to do it, 2 kg, 5 kg, 7 kg, even if he [or she] had an exam, it was compulsory. That is the reason that the education level was very poor in our area. Only one or two kids could become engineers and become successful. Otherwise, most of the kids were working in the field. Now the kids do not have to do the manual labor. . . . Now kids can focus on studies and become doctors, engineers, go abroad for studies. I feel proud.

The jugaadus also had considerable knowledge of problems outside their own direct experiences that they discovered by observing others. For example, Tewari, the developer of a mechanical incense stick maker, actively sought contexts in which he could use his observation skills to learn of new problems requiring a solution:

We get a lot of time to think like this. We wander every day to see new things. It is also about passion, which forces me to do new things. I always travel by road for this. I don’t take the train usually. By road, the journey gives me a chance [to observe]. Just now, I visited Bhubaneswar by car, around 2000 km. We stop anywhere in a small village and meet different people.

Jugaad: Creative Problem-Solving

Our findings about creative problem-solving in this resource-poor environment—jugaad—have a behavioral dimension somewhat consistent with the notion of bricolage (Baker and Nelson, 2005), but they

also revealed a particular attitude, which we call assertive defiance, and an iterative dimension, both of which connect to and complement the behavioral dimension. These findings are illustrated in Table 3 and are explained in detail below.

 Insert Table 3 about here

Jugaad involves a **behavioral dimension** of *combining and recombining the* resources at hand in novel ways to find a solution. Our findings indicate that jugaadus acted by “making do.” Indeed, in defining jugaad, Verma indicated that “you take different ideas and make it work.” As Biswal explained, they also used the resources at hand: “If we need any dimension and it is not available, we have to gather that from the garbage and other places; we adjust that thing to make it work.” They achieved such resource adjustments by combining resources in new ways—“In my opinion it’s a combination of ideas” (Verma). These findings about jugaadus’ behaviors are consistent with the notion of bricolage, which is defined in the literature as “making do by applying combinations of resources at hand to new problems and opportunities” (Baker and Nelson, 2005: 333). Indeed, in aggregate, these behaviors point to a willful tendency for disregarding the limitations of commonly accepted definitions of resources and constraints (Baker and Nelson, 2005: 334). The behavioral dimension of combining and recombining resources at hand capture the actions involved in generating a creative solution but not necessarily the attitude that we found to be closely associated with these actions and tendencies, to which we now turn.

This **attitudinal dimension** of jugaad we labeled as *assertive defiance*. The closest construct we could find in the literature to the nature of this attitudinal dimension of jugaad was chutzpah—a Yiddish term used in the United States to indicate “boldness, assertiveness, to defy tradition, a willingness to demand what is due, to challenge authority, to raise eyebrows” (Dershowitz, 1992). In the Indian context, assertive defiance involved considerable “confidence that, by trying certain things you will receive desired results” (Verma) and the beliefs that “nothing is impossible. . . . Whatever challenges you face, you can find

a way” (Kumar) and that one can “do work [find solutions] that others can’t do” (Pal). Therefore, we define assertive defiance as *an attitude of boldness, self-belief, and a disregard for tradition, conventions, rules, and regulations.*

This assertive aspect is consistent with the notion of proactiveness, which has largely been viewed as a dimension of a firm’s entrepreneurial orientation (along with innovativeness and risk taking) (Covin and Selvin, 1989; Lumpkin and Dess, 2001) but has been applied at the individual level (e.g., Crant, 2000; Seibert, Crant and Kraimer, 1999). Although consistent with the notion of proactiveness, the assertive defiance of jugaad appears to involve more than that. Namely, jugaadus’ willingness to defy tradition, do the impossible, and find a way no matter what challenges are faced all imply a mindset that is contemptuous of constraints, hence, the defiance aspect. Indeed, this mindset of ignoring, circumventing, or disregarding socially constructed constraints provides the basis for a different perspective of the resources “at hand” (consistent with Baker and Nelson, 2005), which can facilitate the combining and recombining of resources at hand into unique configurations. That is, through assertive defiance, individuals are less constrained in their thinking about what represents a resource and what resources are available. As such, assertive defiance changes the amount and/or nature of the resources at hand, which can be combined into a configurational solution. Therefore, assertive defiance is an important aspect of jugaad because it provides the mindset that facilitates a broader perception of the nature of existing resources and diminishes (or eliminates) constraints on how they can be combined and used. Indeed, assertive defiance may not be needed (or at least not to the same extent) in munificent environments where useful resources are “laying around” and few (if any) barriers limit how those resources can be combined and/or used.

In addition to *configuring* the resources at hand and the *attitude* of assertive defiance, we also found an **iteration dimension** toward experiential *learning* was critical to jugaad. Our findings highlight the means by which our participants engaged in an experiential, iterative process from which their solutions

emerged. For example, Lal Rana, the developer of a multipurpose processing machine for small-scale farms, described his creative problem-solving process in the following way:

When we started making products, we came across problems. . . . In the first machine, there was no heater, but we used to light a fire. After that, we felt the need for a heater. I made another machine like this, and when I made a third machine, I realized that the product is still burning in the bottom. When that happens, the entire product gets ruined. After that, we started thinking on that. There was one person in Jaipur heating milk, but he was boiling water in the other. I started thinking on that. His milk was not burning, but our product was getting burnt. I started thinking about indirect heat. We were using direct heat. . . . Yes, and if you use indirect heat, your product will not get burnt. We made the fourth machine along these lines.

During this iterative process, jugaadus engaged trial and error to learn what worked and what did not to inform subsequent attempts. Although trial and error has been acknowledged as a means to probe an uncertain environment (Brown and Eisenhardt, 1997; McGrath, 1999), this trial and error was very much local. This process provided depth to the jugaadus' understanding of the problem but not necessarily information about the scope of the problem (i.e., the extent to which others also experienced the problem). Specifically, the process was complete when a solution was good enough for the specific individual who inspired the problem-solving process, which was typically the jugaadu him- or herself.

We found that the iterative dimension was facilitated by assertive defiance. Assertive defiance motivated the jugaadus to make the necessary time and energy investments to engage in the numerous trials and errors critical for reaching a satisfactory solution. The assertive aspect of the attitude provided participants (over)confidence in their ability to eventually find a solution, and the defiance aspect enabled jugaadus to conduct trials that tested (and went beyond) others' preconceived constraints and to persist in the face of failures (i.e., failures in terms of a trialed combination that did not provide a satisfactory solution). Indeed, it appeared that assertive defiance reduced or shielded the jugaadus from the fear of failure that might have otherwise terminated or reduced the scope of iterative activities (i.e., shielded from the fear of making mistakes from taking action). Therefore, assertive defiance motivated the sorts of activities most critical to experiential learning. In turn, the iterative process provided the feeling of personal

progress (consistent with increasing competence [Ryan and Deci, 2000]), which reinforced the individuals' motivation and persistence (consistent with Bandura [1982]).

We also found that iterations facilitated the combining of resources at hand. That is, the trial-and-error activities led to experiential learning, which informed jugaadus' subsequent attempts to combine available resources as potential solutions to the problems they identified. By trying different combinations of resources, the jugaadus formed a deeper understanding of the potential value of the resources at hand and the advantages/disadvantages of the different possible solutions. This deeper understanding (from iterative activities) helped them generate new ideas for combining the resources at hand in a way that could provide a solution to their focal problem. It appears that individuals who are less able or willing to engage in learning series of iterations will be less effective at combining resources in a way that generates satisfactory solutions.

Duality of Jugaad Outcomes

Firm's Growth. Given that jugaad offers a solution that is inexpensive and one highly focused on a problem currently experienced, it typically benefited the jugaadus' firms through reduced production costs. For example, Verma, who developed a cotton-stripping machine, described how his jugaad solution helped save on labor costs and time: "Today my machine has a production capacity of two tons. This machine replaces 1,000 laborers. Due to this machine, the production is over by [the] end of April, and it does not drag out until monsoon. Each ginning factory has four to five machines." Gaurav and Lal Rana also indicated reductions in labor costs, whereas Kotari described reduced costs associated with keeping bullocks. As illustrated in the top half of Table 4, however, despite these reduced production costs, jugaad does not seem to generate a product (or a service or process) that can be sold in a way that benefits the firm in the long run—that is, it is not a source of a sustainable competitive advantage.

Insert Table 4 about here

First, the outcome of jugaad (the “solution” generated from the creative problem-solving process) is not easily marketable. Because the creative problem process is terminated when a solution satisfactorily solves the focal individual’s problem (consistent with satisficing [Simon, 1955, 1956]), the solution is rudimentary and unfinished; it is perceived as temporary and lacks durability. When asked about the lack of market acceptance of his jugaad, Bhalla explained that “We tried and people also liked it, but we could not improve the product shape.”

Second, the solutions are not easily scalable. Indeed, this issue is so common it appears to be tied to the very notion of jugaad. Biswal noted that “If we want to do jugaad on a larger scale and for the long term, jugaad is not successful in that case.” As an indication of this scalability limitation and his perception of others’ negative opinions of jugaad, he concluded that “Some people are against me. They say I always do jugaad, and I don’t know things. Sometimes I argue with them. I tell them to make something if they have the guts. If I get financial support, I want to bring things to the market on a large scale!” Indeed, given its experiential nature, the creative problem-solving approach focused on solving the immediate problem of the focal individual without consideration of developing a solution for a broader group of individuals, let alone a mass market (i.e., it did not involve design thinking from the start of the process [Dym et al., 2005]). Indeed, while the “good enough” solution was efficient in solving the problem at hand, it was not necessarily efficient for mass production.

Finally, these solutions are often easily imitated and it is difficult for a firm to gain a sustainable advantage from a solution if that solution is easily imitated (Barney, 1991). Verma noted that his “product’s design is not very complicated; they can make it after seeing it.” Others attributed the ease of imitation to a lack of causal ambiguity of the unfinished product (Biswal), the problems associated with filing patents (Vats and Kumar), and the lack of intellectual property protection in India (Bhalla).

Some were not overly concerned about their solution being imitated by users. For example, Kotari stated: “If some farmer makes such a device, I would not mind it because, I am also a farmer. . . . How can

I ask for my share from him?” Others, however, were devastated by imitation. For example, in our field notes, we recorded that Vats had “destroyed most of his work and is not very interested in jugaad anymore because his work was stolen after the NIF had filed for a patent for him. It hurt him a great deal.” In discussing his creative solution, Tewari recalled how as soon as he developed his first product—a battery operated kite reel—the product was copied. He was selling the kite reel for 350 rupees, and the imitators “were selling it for 200 rupees. So at first, we got [a positive market] response, but afterwards, demand decreased. Approximately 10,000 pieces were in the stock that didn’t sell. We had to bear a loss.” With the exception of Verma who told us he had both an American and an Indian patent, all the jugaadus described the ease with which others could imitate their solutions.

Therefore, other than the immediate (yet often temporary) reduction in production costs, the firms did not benefit a great deal from their jugaad solutions because these solutions were not easily marketable nor easily scalable. Furthermore, most were easily copied by others. Despite the lack of clear and sustainable competitive advantages to the firm, we found that jugaad did enhance the social and economic wellbeing of disenfranchised members of society—that is, facilitated inclusive growth.

Inclusive Growth. Although (and largely because) jugaad did not provide a basis for a sustainable competitive advantage for the jugaadu’s firm, the solutions appeared to help other businesses and individuals seeking self-employment (see Table 4). Vats explained how his jugaad solution helped other users in the aftermath of a flood:

There were floods in 1985, so the candles used to cost 25–30 rupees each, and there was no food, no vegetables, no electricity due to the floods. So I opened the last nut bolt of the stove, and attached one metal pipe here, and it worked [providing light], costing only 10 rupees. I can show it to you; it’s still on my stove.

Kumar also helped people by enabling them “to gain maximum yield with minimum water and with limited land” and believed that he had helped “many millions [of people]; farmers, laborers.”

Moreover, some jugaad solutions provided the opportunity for others to become self-employed. Indeed, in our field notes from the site visit with Lal Rana, we noted that “He was very positive toward how his machine was empowering women and enabling them to get employment.” In our interview with Marun Mishrani, a user of Tewari’s solution, he noted that “This machine provides the lower level of people with the daily bread, you know, because this is their earning source.” By helping other users and fostering self-employment, jugaad has an indirect positive impact on the community.

Through their jugaad solutions and the resulting benefits arising from them, jugaadus were able to help others engage in jugaad as well as act as network brokers for further developing solutions, perhaps even solutions that are commercializable. The most direct evidence of helping others engage jugaad was through teaching students. Some of the students were from high school, as illustrated by the help Kotari provided:

See, some boys had come to me; they had made an electronic crane. It would lift goods from one spot and place it at another spot. But it was not working. So, they approached me. I had informed the high school that any child can approach me if they require my support. So, these boys came to me. I helped them make the device operational. And then their project won the award—they also got a recognition letter. They thanked me. I said if your problem is solved, it is a good thing. See, they had made the crane all right, but the balance was missing. Other aspects were all right, but the balance was missing. So, I helped in solving the problem.

Verma also opened his workshops to instruct locals, with university students benefitting from his instruction:

I’m an honorary professor in GTU [Gujarat Technical University]. I’ve been to the technology center of Baroda two times to see the projects or prototypes of engineering students. . . . So I find them perfect in theory . . . [but] in applying that theory into practice, they need to have the eye of an innovator who sees the mechanisms and not the product. So whenever I see any product, I understand its mechanisms, and I don’t forget it. When I get an opportunity to use it, then we think of how to design it. Which mechanism can we use for this? We can combine eight to 10 types of mechanisms that are in my mind and choose the best of them.

This enabler role did not exclusively involve students; sometimes, jugaadus inspired others (e.g., Kumar) through their actions. Our field notes revealed a mentoring role where Lal Rana was “vocal about how his drive for innovation has also been rubbing off on others in the village. He provided many examples

during the talk. When we met his friend, he [Lal Rana] acted more like a superior innovator, and the other person was very much trying to impress him.”

Indeed, the director and the operations manager of NIF acknowledged that jugaadus provided a benefit to the community by encouraging others to engage their creativity to develop solutions and by connecting nascent jugaadus with resource providers, such as those providing expertise, potential funding, and competition awards. NIF maintains regular contact with several more experienced problem solvers and teams them up with novice jugaadus so the novices can reach a higher potential. For example, Tewari described how he tried to help community members:

So I help such people. For their ideas, I sometimes suggest a new design. For example, there was one machine of Batis [cotton that is wrapped for lighting oil lamps for God] that was very big in size. . . . I was asked to give some advice. I suggested a compact design that can be placed on a table. So, if I find an innovative attempt that I like, I help them free of cost. I don't take credit either. It is his machine and his idea. So that person has around 2,000 such machines. So that is my nature.

The experienced jugaadus not only provided expertise to help less experienced members of the community but also helped connect these members of the community to people who could also help them. For example, Kotari used his network to help someone with their jugaad solution: “I helped him by sending his invention to the right place. . . . I introduced him to the right people. . . . I went along with him to meet the people.” In a similar way, Lal Rana used his knowledge and network to help advance another individual's jugaad solution:

There is one girl who had the idea that there should be a bell that rings automatically. I told her that this is a very good idea. I clicked a photo and made video of that [of the prototype]. I started discussing [it] in [the nearby] college. . . . I told them to make that and take expenses from me. They made it. The bell we installed at the school, and we thought of converting it to solar power. . . . I told people that this girl should get a reward for that [her automatic bell]. The Minister of Haryana respected her [by acknowledging the creativity of her invention].”

Although the findings above highlight how the jugaad solutions helped improve the wellbeing of others' lives, the jugaadus were themselves disenfranchised members of society and their solutions

enhanced their own, personal wellbeing. As mentioned above, these individuals were largely motivated to engage in jugaad because they were interested in solving a problem. Consistent with the notion of intrinsic motivation (Deci and Ryan, 1985; Ryan and Deci, 2000), our findings indicate high levels of satisfaction from engaging in the problem-solving process, especially—it appears—because the jugaadus were embedded in a resource-scarce environment. For example, the jugaadus mentioned that the creative decision-making process offers a challenge that they enjoy solving (Pal) and represents a passion (Tewari) that can consume their thoughts and keep them awake at night. Although all demonstrated an obsession with finding a solution to the problem they identified, this obsession is reflected well in the following statement from Singh’s son about his father: “He is always in an analytical mode, reflecting on what he did right or wrong. Even when I was a child, he was not very interested in my activities but focused on his work. . . . He is very loyal toward his work.” That is, the jugaadus seemed to have a general commitment to the creative problem-solving process.

Jugaad helped these individuals develop and maintain high levels of self-worth. This heightened self-worth was reflected in our interview with Pal:

If we want to prove our self-superiority and want to feel proud, we should show something that others can’t do, and we want to show our ability. Everybody has that ability, but they don’t want to use their ability. I have so many ideas in my mind. . . . We need to motivate ourselves. . . . We have an ego.

There were also social benefits that accrued to the jugaadus. For many, their creative solutions put them in the limelight—sometimes by being featured in the media. Our field notes were similar for each of these individuals. An indicative example is the following field note: “[the jugaadu] was a well-known personality in the village, and almost everyone we asked about the location of his house could tell us where it was. Also, they were not surprised to see that people from another place were visiting him. Clearly, he had many people visiting him on a regular basis.”

These jugaadus were not only well known but also popular (e.g., “everyone wants to be his friend” [a member of Gaurav’s village]) and well respected. As Pal noted, with respect comes power:

And now everyone gives me respect as I am doing well. Then we get the feeling of responsibility, and when you think about others, you get power too. . . . You get the power that gets transmitted from others, and it happens when others have less power of responsibility in them. They can't do anything, and that is why they transmit their power to us.

However, there were hints at some social costs. Early on, Kotari faced some doubters, but this doubt was overcome over time:

See, in the beginning, they used to say that I had gone mad, but later on, when they faced a problem and I solved their problems, they came to realize the importance of my work. Today, if you ask anybody, they would say that I can solve any problem. Now, I have made a good name in Babara, in Dhasa.

Bhalla noted that different people have different reactions to those who engage in jugaad, and this “depends on the position of the person in society. They consider them [jugaadus] different than common people. If the person is rich, they consider it [creative problem solving and its outcomes] good. If he is of the same status, they will feel jealous. And if he is poor, they will think he is mad.”

Therefore, our findings indicate a dual impact of jugaad: while the benefits of jugaad to competitive growth may be limited, it does provide a source of inclusive growth.

DISCUSSION

Creative individuals are often considered essential for firms to establish and maintain a competitive advantage over other firms (Amabile et al., 1996; Csikszentmihalyi, 1996; Mumford, 2000). Although slack resources are often associated with employee creativity (Woodman, Sawyer and Goodman, 1993), those who are resource poor likely need to be the most creative in their problem solving. Indeed, conventional wisdom has acknowledged this possibility with sayings like “necessity is the mother of invention.” However, although research has acknowledged that creative behaviors can occur under adversity (Baker and Nelson, 2005; Powell and Baker, 2014), the value of such activities has been called into question (Baker and Nelson, 2005; Baker, Miner, and Eesley, 2003; Lanzara, 1999). The main purpose of the present study was to better understand how jugaad’s creative problem solving in resource poor environments impacts the growth of the jugaadu’s firm and inclusive growth—a duality of outcomes. Research on problem solving in

resource-poor environments and on inclusive growth are rare, yet given the importance of this topic, there is a need for more theoretical work (George, et al., 2012; Hall et al., 2012; Mair, Marti, and Ventresca, 2012). The present study's findings provide a basis for such knowledge extensions by exploring why jugaad solutions generate value beyond that for the focal firm, i.e., contribute to inclusive growth. This jugaad framework of creative problem solving under resource scarcity provides a basis upon which further theorizing can explore the dual impact of creative solutions—their impact on the firm's growth and inclusive growth. The current study makes a number of contributions to the literature.

Theoretical Implications

The effects of jugaad are currently debated, with some claiming it could be the solution to many of the problems poor countries face (Mantri, 2010), whereas others suggest that not only are there few benefits to jugaad but that these creative solutions can be detrimental (Husain, et al., 2009; Bhoothalingam, 2010; de la Jara, 2009; Rangaswamy and Densmore, 2013). In the present study, we uncovered reasons why jugaad provides few benefits to firms in terms of competitive growth but also how its solutions generate benefits for disenfranchised members of society—inclusive growth. That is, we found little contribution toward the firm's growth from jugaad because while the solutions reduce production costs (an important outcome [e.g., Browning and Heath, 2009]), they do not have other features of a solution that are important for a firm to capture and exploit for competitive advantage. Specifically, for a solution to provide a sustainable competitive advantage to the firm, it needs to be rare and inimitable (Barney, 1991), marketable (Gupta, Raj, and Wilemon, 1986), and scalable (Zack, 1999). However, we found that jugaad solutions are usually imitated easily and are difficult to both market and scale; that is, jugaad solutions are difficult for firms to commercialize.

Although some have argued for a more inclusive perspective on growth (George, et al., 2012; Hall et al., 2012), we lack a good understanding of how those living in resource-poor regions (locals) can contribute to inclusive growth themselves. Most management research on alleviating poverty has focused

on large established firms generating innovations that benefit both the firm and disenfranchised others (e.g., Halme et al., 2012)—both firm and inclusive growth. These innovations open up markets for organizations (such as multi-national enterprises) and will likely also benefit local entrepreneurs, local customers, and local suppliers—there is money to be made at the bottom of the pyramid (Prahalad, 2006). Indeed, solutions to eradicate poverty are believed to require both benefits to the innovative organization and benefits to the poor (Prahalad, 2006). However, while jugaad solutions failed to generate firm growth (for the jugaadu) they still had a substantial impact on inclusive growth. That is, firm growth and inclusive growth do not have to go hand-in-hand.

Indeed, the extant research on inclusive growth emphasizes the importance of commercializability of the products and/or services generated including the importance of design and achieving scale and scope (Basu, Banerjee and Sweeny, 2013; George et al., 2012). We found jugaad as less intentional, less “polished”, and less top-down than the described processes of inclusive growth; jugaad was often triggered by the simple desire to solve a problem encountered during everyday living (the jugaadu’s problem or the problem of someone “close by”) without much thought to the broader implications of the jugaad. Indeed jugaadus were not overly concerned about issues of design, scale, or scope (for production, distribution, and so on) critical for successful commercialization. As a result, jugaads contributed little (or nothing) to firm growth but many of the same attributes that diminished the opportunity to grow the firm served to enhance inclusive growth.

Therefore, while jugaad may be discounted by academics and policymakers particularly from a western perspective because it fails to generate a competitive advantage for the firm (and, as a result little to no effect on firm growth), such a scholarly perspective is likely overly narrow. We found that jugaad helped other businesses, helped create new businesses, enabled the jugaadu to play an important role in developing the local community, and thus improved the life of the jugaadu (psychologically and socially, if not financially). In enhancing the wellbeing of disenfranchised members of society (i.e., community

members [including the jugaadu] in resource-poor rural India), the jugaad solutions contributed to inclusive growth. Although our findings require additional theorizing and empirical testing, they highlight the potential contribution that will come from subsequent research that explores the creative problem solving processes used in resource-poor regions of the world and their dual impact, that is, their impact on both competitive and inclusive growth.

Because we suggest that combining and recombining resources at hand is a dimension of the nature of jugaad, it becomes useful to explain the ways in which jugaad is distinct from but related to current descriptions of bricolage; jugaad was more than the behavior of bricolage—it included an attitudinal dimension and an iterative dimension. Indeed, because bricolage in adverse environments requires questioning or disregarding previously established constraints (Baker and Nelson, 2005; Garud and Karnoe, 2003; Senyard et al., 2014), it follows that individuals who challenge the established rules and constraints (i.e., the status quo) are seen by themselves and others as having an attitude of assertive defiance. In jugaad, combining and recombining available resources and being assertively defiant are mutually reinforcing. Future research will need to determine whether this assertive defiance dimension of jugaad is also a characteristic of bricolage at the individual level of analysis. Jugaad also appears to be more social than represented in our current understanding of bricolage. By this, we mean the jugaadus were social in their desire to help others by providing solutions to their problems and social in terms of positively impacting other businesses (i.e., prosocial [Grant, 2008]), enhancing interpersonal learning, and making connections to facilitate others' jugaads. In this context of adversity—resource-scarce rural India—jugaad was driven by and had social (including prosocial) implications. Again, future research can further explore this possible distinction between jugaad and bricolage.

Practical Implications

Developmental support organizations and NGOs such as The National Innovation Foundation of India are interesting in promoting innovation. These organizations have come to find that jugaads have led

to poor results in terms of commercially successful products. However, an implication of the current study is that the evaluation of jugaads should be based more on their contribution to inclusive growth than to firm growth. The government and NGOs need to redirect their efforts towards helping individuals attend to local, social problems and generate jugaad solutions that help the jugaadu, other firms, and community members without the requirement that they also generate a commercially viable product. Indeed, the jugaadus of this study were passionate about helping others through their creative efforts and also in mentoring and teaching others. Although jugaads have little (if any) impact on firm growth, government and non-government organization have an opportunity to promote jugaad by empowering locals to creatively solve local problems in the face of limited resources, which can generate positive, albeit often underappreciated, outcomes.

These government and non-government organizations would do well to expand their notion of what represents a successful creative problem solution to include dimensions of inclusive growth and not diminish (or stigmatize) those who engage in jugaad, because jugaadus make important contributions to their communities. Indeed, these organizations can promote jugaad and give it legitimacy by focusing stories and promotions on how individuals have solved local problems with limited means and doing this within the communities that the jugaad lives and works. By celebrating individuals' jugaads, organizations can create a stronger culture of understanding others' problems, taking actions to create solutions to those problems, and developing a stronger sense of community. More broadly, by focusing on how jugaads contribute to inclusive growth may also raise the expectations that other innovations (including highly commercializable products) also make a contribution to inclusive growth.

Further, research has highlighted attempts by governments to "force" Western organizations to facilitate the development of communities within India by making corporate social responsibility (CSR; McWilliams and Siegel, 2001) activities mandatory for larger companies (under the Company Act 2013). Specifically, Western organizations in India are obligated to invest 2% of their profits in CSR activities that

support the country's development. This means that Western companies are the significant investors of CSR in India. Our results could have an important contribution by enabling a new type of corporate social responsibility program that focuses on individuals who actively engage jugaad to create better local conditions for communities. The financial and business knowledge of these organizations may represent a new set of resources "at hand" that can be used in jugaad and/or provide the basis for creative problem-solving processes that generate commercializable outcomes. To the extent that CSR is able to facilitate "local" creative problem solving, such investments may enable India (and the communities within it) to make more of jugaad to develop disruptive innovations that will directly or indirectly help fight poverty and improve living conditions. On the other side, large western organizations can also learn more about how to be innovative and creative with limited resources through increased interaction with individuals that engage in jugaad. Although not part of current study, it is possible to expect that learning about frugal innovation is on a high agenda for most western companies, faced with increased competition and diminishing R&D budgets.

Limitations and Future Research

A question often posed to authors of inductive studies relates to the generalizability of their findings. As Corley and Gioia (2004: 205) noted, "Although it is always potentially problematic to argue for extensions from case studies, this study has a number of features that suggest that . . . [our findings] are likely to share commonalities with other domains." Clearly, the nature of the resource-poor environment will likely have an effect on jugaad, but the resource-poor environment we investigated is not unusual from other areas of rural India and other rural areas in least developed countries. Indeed, it seems reasonable to note that in resource-poor environments, particularly in the rural areas of least developed countries, there is likely to be some form of jugaad (Prabhu and Jain, 2015). Therefore, although the specific problems and solutions may vary somewhat, the duality of jugaad outcomes likely applies in other resource-poor locales.

We are confident that a jugaad-type lens of inclusive growth is likely to be applicable beyond the regions of rural India explored in the present study.

Obviously, the economies of the West still have regions that are resource poor, and individuals, firms, and communities in these environments are likely to benefit from a form of creative problem solving that fosters inclusive growth without necessarily enhancing firm growth. We realize that this inclusive-growth form of creative problem solving requires a somewhat different perspective of the value or usefulness of outcomes in the dominant “strategic management” paradigm, which focuses largely (or almost exclusively) on the firm as the level of analysis. We propose that creative problem-solving processes under resource scarcity, such as jugaad, is a basis for a deeper understanding of how to achieve inclusive growth, especially from within (i.e., local sources of inclusive growth).

Our findings regarding jugaad’s positive impact on other businesses, the creation of new businesses (via self-employment), and community development are only the first step. We hope future research explores the role of jugaad in changing the community and the ways the community can foster or obstruct jugaad. For example, we found that jugaadus were able to help foster others’ jugaad (and jugaad in others) and also act as a broker connecting community members with each other and with important others outside the community. Our research provides some initial understanding of how jugaad changes the community, but additional research is needed to clarify the community’s role in facilitating jugaad. For example, how does a community’s increased pride in a jugaadu have flow-through effects? Does community pride create the environment where more jugaad is generated, thus leading to more inclusive growth? Perhaps the community itself engages in jugaad—consistent with the notion of the community as an entrepreneurial enterprise (Peredo and Chrisman, 2006). Understanding the relationship between jugaad and the community likely has important implications and requires future research.

Further, we created a framework of jugaad, but future research can begin to explore nuances in the antecedents or implications of this creative problem-solving process. For example, perhaps different means

of problematizing the situation lead to different aspects of jugaad, which in turn generate a solution that provides more benefits at one level (e.g., the individual) and less at another level (e.g., the community). Indeed, we believe future research can make an important contribution by exploring potential tradeoffs in outcomes. For instance, which forms of jugaad have the greatest impact on the community, and which have the least impact on the community and why? Do jugaad solutions that have the greatest impact on the community have the greatest or least impact on the benefits accruing to the individual (vis-à-vis the jugaad solutions that have the least impact on the community)? Do the jugaad solutions that have the least impact on the individual's firm have the greatest positive impact on other firms (i.e., the creation of new ventures and/or established firms)? We hope future research explores these important questions. Central to such future research will be the development of a scale for jugaad; a good place to begin the development of such a scale would be the dimensions of jugaad inductively generated in the current study.

Conclusion

Given the prevalence of and suffering from poverty and the limitations outsiders face in solving this problem (Pogge, 2008; Sen, 1981), it has become critical to understand how locals can operate within their environment to change that environment. As past research has documented, necessity can be the mother of invention. This study suggests that jugaad is a way to creatively solve problems under resource scarcity. Our findings provide insight into the nature, mechanisms, and the duality of outcomes (inclusive vis-à-vis competitive growth) of jugaad as a creative problem solving process under resource scarcity. Therefore, the findings and inducted jugaad framework provide a basis for understanding creative problem solving in resource-scarce environments in general and jugaad in rural India in particular.

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Table 1: Details of Cases

#	Name	Respondent information	# of Jugaad identified	Jugaad Problem	Jugaad solution	Beneficiary	Family	User
1	Dlip Lal Rana	Region: Haryana (North India) Education: Primary school Occupation: Farmer, herbalist, & innovator Recognition: State award winner; recognized by president of India	1. Grass cutter 2. Vegetable cutter 3. Floor clearing machine 4. Water irrigation machine 5. Multi-purpose processing machine	Food processor machine for underprivileged farmers and small-scale entrepreneurs	Lightweight, portable, and cost-effective automated multipurpose food processing devise	1. Farmer 2. Shop keeper 3. Entrepreneur	1. Wife 2. Workers 3. Family friend	1. Entrepreneur
2	Vijay Ramola	Region: Haryana (North India) Education: Uneducated Age: 45 Occupation: Farmer Recognition: Submitted solutions to NIF	1. Hand held drilling tool 2. Hand and Leg bicycle 3. Water purifier 4. Flexible grass wedding tool 5. Seed remover tool	Drilling holes in ground for planting trees and plants	Lightweight and hand-held manual drilling tool	1. Farmer	1. Wife 2. Son 3. Daughter	NA
3	Kumar Gaurav	Region: Haryana (North India) Education: Uneducated Age: 39 Occupation: Farmer Recognition: State award winner. Filled for patent.	1. Compost maker for mushroom cultivation 2. Electric motor- operated hole digger	Labor intensive task of compost marking	Electricity operated machine to turn compost heap; turning and mixing material for mushroom cultivation	1. Farmer	1. Brother 2. Wife	1. Workers 2. Brother
4	Rajesh Kumar	Region: Haryana (North India) Education: Primary school level Age: 51 Occupation: Farmer Recognition: State first award winner and recognized by president of India	1. Organic fertilizer 2. Locally adapted onion variety	Expensive and still low-yield onion variety seeds	High-yield onion variety with distinguished and locally adapted characteristics	1. Farmer	1. Wife	1. Farmer
5	Jai Tewari	Region: Gujarat (West India) Education: Primarily school level Age: 43 Occupation: Self-employed Recognition: Award nominee	1. Battery operated kite reel 2. Mechanical incense stick maker 3. Organic incense sticks 4. Cow dung planting pot machine	Incense stick making in small rural communities is time consuming and can lead to risk of injuries	Easy to use and maintain mechanical machine that makes bamboo strip and incense stick	1. Rural and tribal villagers	1. Workers	1. Entrepreneur
6	Danvir Verma	Region: Gujarat (West India) Education: Uneducated Age: 60 Occupation: Self-employed Recognition: State and national award winner; recognized by president of India. Patent granted on the machine.	1. Cotton stripper machine 2. Cosmetic cotton strip maker	Cotton ginning is time consuming, labor and inefficient when done by hand	Electrically operated and movable ginning machine for cotton framers	1. Farmer	1. Worker	1. Entrepreneur
7	Vinod Pal	Region: Gujarat (West India) Education: University Age: 42 Occupation: Self-employed	1. Electrical musical drum for temple 2. Miniature cultivation machine 3. Vatsal tong	Available tongs in the market are clumsy and poorly designed with limited functionality	Innovatively designed tong, which provides durable and safe use in kitchen	1. Household	1. Wife	NA

		Recognition: State and national award winner and recognized by president of India. Patent granted on the machine.						
8	Karemlash Kotari	Region: Gujarat (West India) Education: Primarily school level Age: 48 Occupation: Farming and self-employed Recognition: State and national award winner and recognized by FORBES for rural innovation. Patent granted on the machine.	1. Multipurpose farming device- Bullet santi 2. Seed-cum-fertilizer dibbler 3. Bicycle sprayer	Unaffordable framing operational machines for small framers	Modified motorcycle that is converted into a farming vehicle that can plough, weed, sow, and spray.	1. Framer	1. Workers	1. Framer
9	Abhi Singh	Region: Gujarat (West India) Education: Primarily school level Age: 60 Occupation: Self-Employed Recognition: Appreciation award from NIF. Patent granted on the cooler.	1. Natural Water cooler 2. Auto air kick pump 3. Suraksha tong	Lack of cost-effective cooling system	Non-electrical cooler, which uses cooper coil and cotton cloth for natural cooling system	1. Public places (e.g., colleges) 2. Village	1. Wife 2. Son	1. Household user
10	Sanjeev Vats	Region: Haryana (North India) Education: Primarily school level Age: 55 Occupation: Retired Recognition: Consolation award from NIF. Patent filled for the gap pump.	1. Gas-based water pump 2. Gas driven motorcycle 3. Warning gas lamp	Portable and cost-effective water pump for use villages	Highly energy efficient LPG- based water pump, which is installed on an LPG-based three-wheel vehicle	1. Framer 2. Household use	1. Son	1. Family friend
11	Sangar Bhalla	Region: Haryana (North India) Education: University Age: N.A Occupation: Student and freelancer Recognition: Recognized by NIF.	1. Pistol for firing crackers 2. Low power clothes iron 3. Remote operated device for fire cracker	Accidents and injuries due to fire crackers	Fire cracker remote, which uses television remote control unit to send infrared signals to electronic receiver.	1. Festival organizers 2. Framer 3. Mining 4. Road construction	1. Brother	1. Brother
12	Manesh Biswal	Region: Haryana (North India) Education: University Age: 24 Occupation: Self-employed Recognition: Student awards and recognized by president of India. Filled for patents.	1. Mobile operated home lighting system 2. Sensor alarm 3. Electrical crane 4. Rain protector system 5. Water overflow controller	Keeping cloths dry from rainy season	Motor driven and moisture sensor-based system that withdraws the clothesline into shade during rain	1. Home 2. Offices 3. Hotels 4. Restaurants	1. Mother 2. Brother	NA

Note: We have changed the jugaadus' names to maintain their anonymity.

Table 2: Illustrative Quotes on the Antecedents of Jugaad

Theoretical Categories	Representative Quotes
Experiencing Adversity	
Embedded in adverse conditions	<ul style="list-style-type: none"> ▪ "...only if the person faces trouble sometimes...then he would learn the necessity of such things" (Kotari). ▪ "His father was a businessman in the plastic industries. After his father's death he ran the same business and suffered losses from this business. Then he started innovating and become an innovator" (Tewari). ▪ "The main objective for all of them was to earn a better livelihood from meager resources" (Field notes). ▪ "For the past twenty years, Arvindhbai has devoted himself to the expression of his creative genius, undeterred by economic hardship and lack of support" (Archival).
Personal hardship	<ul style="list-style-type: none"> ▪ "First thing is he has a hearing disability, he used to drive a three-wheel rickshaw. He used to transport 9-10 cylinders at a time, each weighing minimum 30 kg. It used to put tremendous pressure his knees. So it was absolutely necessary to make something that will work, as buying a new vehicle was not affordable" (Vats). ▪ "In the village people form a co-operative society, about 50-60 villagers are members and run such a factories. The manual process is very complex, the material needed to be in 20kgs bundles, which is labor oriented. The process was tedious and long, transporting from one city to another. The ginning process being long, used to last until end of June, when rainy season started, this was leading to material wastage. Drying use to take lot of time and it was a wasteful process. For all these reasons a speedy process was required. This is how I stated the project. Money making was not the motive behind it. It should make life easy for everyone" (Verma) ▪ "Since childhood, my dad didn't like that I made machines so he used to beat me up & throw me out of the house; hence I came here & did all these. (Ramola) ▪ "Yes. I met with an accident in Delhi and I got to know that herbs are selling in high price in Delhi. I thought of doing cultivation here. I met with an accident so I came back to village. I thought of starting vegetable cultivation. In vegetable, I had to go to market every day. I was thinking to go into processing. I got to know about the strawberry cultivation in one magazine. I thought of doing strawberry cultivation. I went to satara and started doing cultivation. I thought of making jam out of that but I started thinking how to make jam out of it. I was doing cultivation but I couldn't make jam out of that. I went to Ajmer Pushker, I saw ladies farmer were making Ambla, they were doing that all by their hand. I saw in one place that they were making rose water. They were putting flower in one utensil, boiling that and gathering steam in another utensils that is rose water. My condition was not that good that time. The farmer who is having two acre of land, they don't have more income." (Lal Rana)
Knowing (Technology but not markets)	
Deep knowledge of process and technologies	<ul style="list-style-type: none"> ▪ "He has enough knowledge as far as bamboo is concerned, and for that if you ask him to go even at night, he will. [He]...used to go at night to see the quality of bamboo....which bamboo works well for his machine. That is what he is focused on. If the bamboo is hard, then the machine is different than when the bamboo is soft" (Tewari son) ▪ "They tend be quite obsessed or in their own mind with solving the problem and have history of thinking about being bit disconnected from worldly problems" (Field notes). ▪ "After he passed 10th grade, he started a technology course, which he did not complete. But he did gain technical knowledge about automobiles. Then he went to Saudi Arabia and worked with an automobile workshop for 4-5 years and returned back to India. Then he started his own workshop near Ahemdabad. At that point in time he was not interested in business, he was more interested in research and development. He gradually started researching on solar water heaters, then the natural water cooler" (Son of Singh).
Lacks knowledge of markets and marketing	<ul style="list-style-type: none"> ▪ "... he is lacking necessary business skills to make a finished product" (Customer of Bhalla). ▪ "See I never showed it to anyone, people just started approaching me to understand how it is made, some even tried making it; most were not able to make it, but a few were successful. In 1 to 2 months I will make more to sell. [Have you already started selling the product?] No, this is the only machine I have and have not started selling it....I am not interested in selling it, because I am not a carpenter, I am just a normal farmer" (Gaurav). ▪ "I was in Delhi pulling a rickshaw. I used to feel in Delhi that there is guava jam, apple jam and all that, these things were coming in a bottle from Delhi but that sort of system was not available in the village. I saw that these things are getting sold at heavy prices...I had an accident in Delhi and I got to know that herbs are selling at a high price in Delhi....[When] I came back to village I thought of starting vegetable cultivation" (Lal Rama). ▪ "I had nothing with me at that time...I got the Bullet and I decided to make such machine....See, I have not done any publicity. But, when nearby villagers saw it, two more farmers approached me and asked me to make the machines for them. After that, another four people approached me to make the machine for them. Like this, the word was spread around. People saw that it works well... so they started approaching me" (Kotari). ▪ "The individuals also show signs of being not overly interested in the sale of their solutions" (Field notes)

Problematizing	
Desire to solve problems	<ul style="list-style-type: none"> ▪ “I had to cut grass in the field as weeds keep on growing in the field. I saw one kid playing with something like this, I thought of putting this in the power tool [to cut the grass]” (Lal Rana). ▪ I make <i>Nagada</i> [a Kettle drum and bell], which people use to worship God in the temple....The Kettle drum gets fixed in one place and 2 sticks come from above and beat the drum and create a sound. After 2 to 4 years the sticks beat the drum in the same area and the drum becomes weak on that side. Then they said to turn the drum but who will go to the temple to change the location of the drum. Then I felt that instead of turning the drum manually it should turn automatically....I decided to make a drum that rotates every day” (Pal). ▪ “I invented a side stand for a bike. I was riding a bike once and when I was turning, I crashed. At that that time it came to my mind that there should be an automatic stand [to stop people from crashing]...and I did it practically” (Biswal) ▪ “... due to a heavy rainfall the mushroom shades fell....It was partly my mistake and partly the mistake of labor....So I built this machine. It is like a drill. It makes a hole wherever you want and does the work of 4 people. That’s the profit. The laborers are also satisfied because they can stand straight up” (Gaurav). ▪ “They have been self-driven in their approach to constantly work to solve their problem, as they knew they only can solve it” (Field notes). ▪ “His mind is continuously buzzing with new ideas and eyes are always on the lookout for problems, which he can engage his mind with” (Archival records).
Desire to help others	<ul style="list-style-type: none"> ▪ “In Kenya, the region is hilly, and they farm sugarcane and tea. Currently, they are doing this task manually. Instead, they can put it on a cycle and use [my machine] on their farms. So, I feel that it would be useful there. But I have to try the product myself. I have to fit the gears, chakkars yet. I have used it only once on my farm. I have to still improve the machine. I have to consider whether we can fit two tires. I have to make efforts to reduce the price. I have to make such efforts” (Kotari). ▪ “This is how I started the project. Money-making was not the motive behind it. It should make people’s life easier and make them happy” (). ▪ “He thinks about the ways the lower level of people can earn their money and benefit from his inventions. He is a person who doesn’t think about his own benefits you know. He has always had such a nice nature, and that is why he is working toward [the solution to the problem]. He doesn’t want to earn one crore rupees....He wishes other people well, and he thinks that the people should be able to earn money from his machine. Mostly all the people are tribal over here, and are illiterate you know, and they don’t have enough money. So he gives them the machine at a lower price, you know, so that they can afford it” (User Tewari). ▪ “I helped people to gain maximum yield in minimum water and with limited land” (Kumar). ▪ “In addition to him we also met his wife and three more women that were doing the food processing. He was very positive toward how his machine was empowering women and enabling them to get employment” (Field notes). ▪ “Vermais a man driven by passion, who continues to strive relentlessly to deliver something new and innovative for the society. Despite several setbacks, resistance from family and financial constraints, he is always on the look-out for new ideas. An inspiring innovator indeed!!” (Archival records).
Vicarious learning through observation	<ul style="list-style-type: none"> ▪ “When I was small, a tractor came in the village, and I was very curious. I watched how it was repaired. That curiosity was in me since childhood. My grandfather and father use to do everything such as carpentry, blacksmith work at home. That’s how I was brought up” (Verma). ▪ “The person who works on the farm observes everything. A vigilant farmer will always think about it [problems and solutions to those problems] and will experiment a lot” (Kumar). ▪ “I used to read the newspaper every day. [One day I read] that somebody broke the glass [window of a car] and stole a laptop. ...Keeping that thing in mind, I got this idea ...” (Biswal). ▪ “Hearing him talk about capacitors, resistors, and circuits, one often forgets the fact that Harkesh has had absolutely no formal training in engineering and technology. As he said, “Even I don’t know how I know these things. Some I learn by watching others. The rest I just know” (Archival records).

Table 3: Illustrative Quotes of Jugaad

Category Dimensions	Representative Quotes
Assertive defiance (Attitudinal dimension)	<ul style="list-style-type: none"> ▪ “To make things work you need the expertise, experience and confidence that by trying certain things you will receive desired results” (Verma family member). ▪ “Nothing is impossible. If you are committed enough, work very hard, focus on it, whatever challenges you face, you can find a way. You also need to believe in yourself....You have to keep on trying, you will get success. It depends on your thinking” (Kumar). ▪ “I want to do perfect work, which others can’t do but I can do it” (Pal). ▪ “He took a loan of Rs 8000 for making this machine, going against the wishes of his family. Eventually, the machine became so popular that people from many places started visiting him for demonstrations” (Archival records).
Combining resources (Behavioral dimension)	<ul style="list-style-type: none"> ▪ “In my opinion anything that we could not buy or don’t have proper materials for but are still able to make it easily....Like taking things from your surrounding and making it is Jugaad” (Bhalla). ▪ “Yes, they mix all the things. Fix an engine and use steering from something else and fix the wheels to make a tractor” (Family member of Pal). ▪ “I used to take out PCB from them [these sound machines] and I had prepared a circuit....I made an electric crane for lifting a heavy weight. The motor was 12 volts....I took it from there [a cassette deck] and used it in the electric crane” (Biswal). ▪ “If you have waste lying around at home, use it, and try to make some gadget out of it. Something that can be used by someone. That is jugaad” (Biswal family member). ▪ “He was ready with a machine that was made using an old auto engine and scrap materials like chain, sprocket, brushes, and dustbin. He used air pressure for the pump and fitted it with a water sprayer so that dust could settle down and garbage could be collected in one place from where the machine could pump it into attached dustbin” (Archival records). ▪ “His first device was an electric crane that he fashioned out of scrap metal found around the village” (Archival records).
Experiential learning (iterative dimension)	<ul style="list-style-type: none"> ▪ “Well Jugaad for me is any instant alternative to a problem... according to his needs” (Bhalla) ▪ “Because he does not have a technical educational background, he uses the trial and error method and that is “Jugaad” (Patel). ▪ He also demonstrated his old innovations. And it was clear that he had used experience from one innovation to build another similar innovation (Field notes). ▪ “Lots of trial and error. But it is great learning experience” (Tewari). ▪ “The idea of harnessing wind power struck Arvindbhai sometime in 1996 when he was looking at clothes drying in the wind. He used a curtain, a rod, and an air pump to fashion a rough model of a wind tunnel. After several experiments and fabricating different models, he came out with a horizontal “Low Air thrust Multi-curtain System.” The device, Arvindbhai visualises, can be beneficially used for pumping water, heating water, inflating tyres, drip irrigation, and even for running a grinder/juicer” (Archival records).

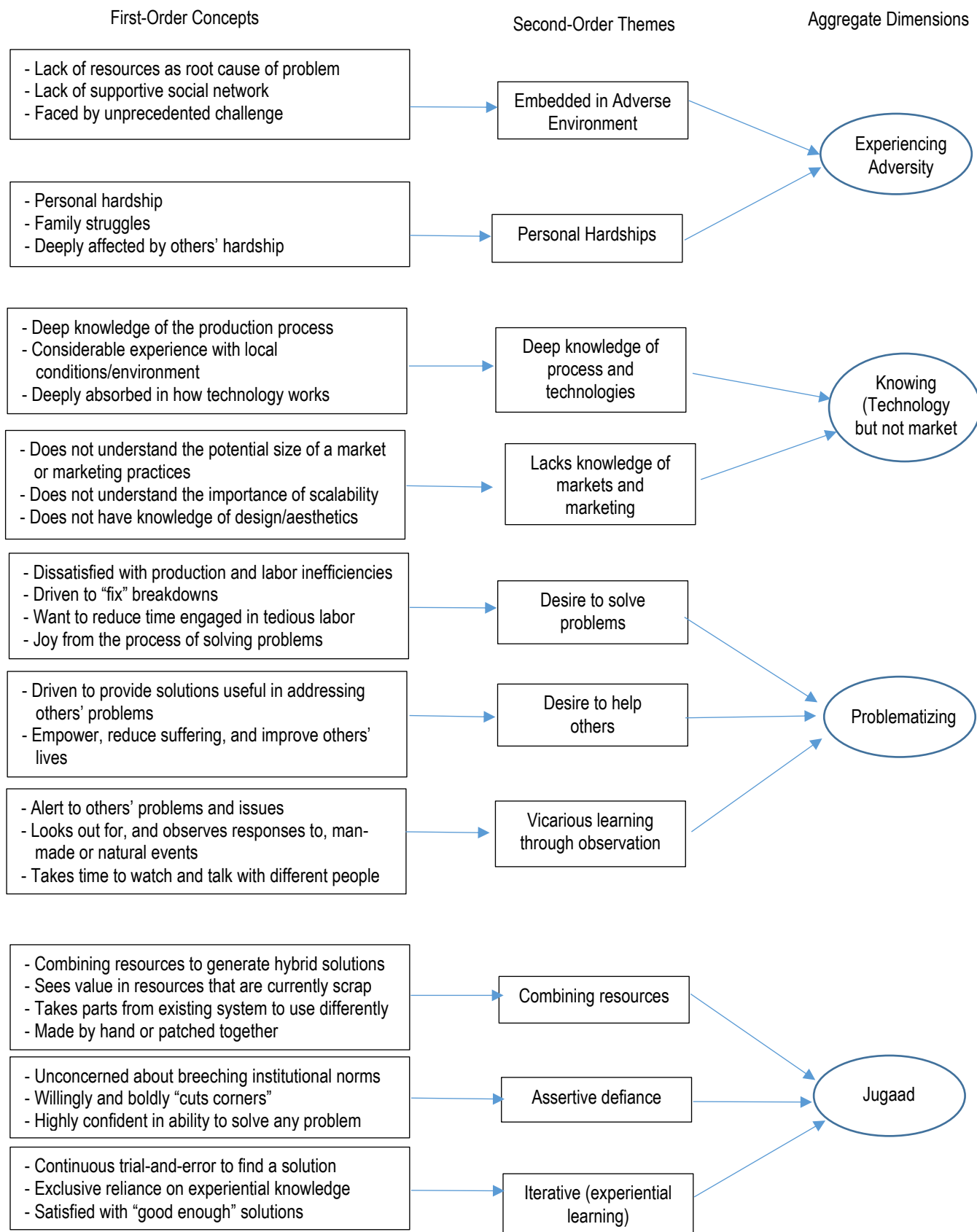
Table 4: Illustrative Quotes on the Impact of Jugaad on Competitive and Inclusive Growth

Category	Representative Quotes
Competitive growth: Impact on Jugaadu's firm	
Reduced operating costs	<ul style="list-style-type: none"> ▪ "The expense of bullocks is reduced and time is saved. Then we had to walk behind the bullocks, this has also now been reduced" (Kotari). ▪ "There is a need for a lot less laborers. Work becomes easy. We can get better work with fewer laborers. We get better compost also....It saves both time and money" (Gaurav). ▪ "There was a cost of 6 thousand rupees for labor so I thought of making a machine for doing that. I made it. (Lal Rana). ▪ "Several cotton mills in the region use the machine now. The machine brought down the cost of cotton stripping from Re.1 per kg to Re. 1 for 20 kg, thereby generating good income for farmers and also improving the milling quality" (Archival records).
Poor marketability	<ul style="list-style-type: none"> ▪ "Well innovation is a proper product and jugaad is temporary alternative" (Bhalla). ▪ "Jugaad because it does not have...durability" (Pal). ▪ "Jugaad is good but it is for temporary basis, if we find our solution with jugaad, then it is good. If we do some temporary work that is called jugaad" (Pal). ▪ "We make [a] simple [product] for our use but the market product has been produced by many experts" (Gaurav). ▪ "Looking at the number of early rusty prototypes it was clear the journey that the initial jugaad had taken to try and become a commercial product. He described that many of the early solutions were made for personal use and these were simpler solutions" (Field notes).
Non-scalable	<ul style="list-style-type: none"> ▪ "I am not able to make it on a large scale; there is a financial problem" (Biswal). ▪ "During the conversation he wanted to know how to build the machine on a large scale" (Field notes Gaurav). ▪ "Also economically, it is not advisable to mass produce a 2- to 3-piece order" (Bhalla). ▪ "See, the market for Saneda, it has good market. Suppose it is popular in Europe, America, so, the parts should be made available everywhere—the gears, the differential. It should be available to the users. So, we thought that we can form an association and build such structure. I talked about this concept to many artisans like me, but nobody was willing for this task" (Kotari). ▪ "As a person, he was quite open and confident person. He was in no way trying to impress us. He had apprehensions on building the machine at a huge scale as he is not sure of the technical and entrepreneurship skills that are a must to build the machine on large scale" (Field notes).
Highly imitable	<ul style="list-style-type: none"> ▪ "It was very difficult to get a patent for this. State government was not doing it, only the central government was doing it [granting patents]. I requested the ministry, met lot of people but couldn't get the patent" (Kumar). ▪ "See I have no problem if someone is making a copy of my machine, I made it for myself and the government is helping me, and I have no tension if someone is making [it]...for themselves" (Gaurav). ▪ "During the last minutes of our conversation. He described the situation where people have duped him of his credit, taken advantage of his name and sold fake seeds. He is quite upset that he gave his life to this but couldn't get the high returns he deserves....He also talked about somebody stealing his ideas" (Kumar field notes).
Inclusive growth: Impact on other's wellbeing	
Helps other users	<ul style="list-style-type: none"> ▪ "There are farmers, they can use this for making products and do the things in less time. Suppose you have to make tomato ketchup. This can crush 200 kg tomato in one hour and that too with the single phase electricity, this is the main thing" (Lal Rana). ▪ "This product is superb. 100% good for the cotton line now. If you have to do the cotton business, without this you will not be able to" (Vermal). ▪ "Not now but when you burn it, after 5 minutes, you will actually realize how different it is. Cow dung usually stinks but I made it pleasant. You can use it in any office. Plus, it is ecofriendly, absolutely natural, no chemicals are used" (Tewari). ▪ "I have to work for the interest of other people" (Gaurav). ▪ "He has distributed the seeds of his variety to about a thousand farmers of Haryana and around" (Archival records). ▪ "If some get benefits by my seeds, why should I complain" (Kumar archival records).
Fosters self-employment	<ul style="list-style-type: none"> ▪ "Subhash Chandra was facing difficulty in opening a business of herbal products. After contacting the experts of industry no one was able to help him or guide him to start it. He then met Dharambeer at a trade fair. Lal Rana provided him support including with setup, operations, raw material sourcing how to use it [the jugaad]" (field notes Lal Rana).

	<ul style="list-style-type: none"> ▪ “He said that he is not able to earn an income with his rickshaw. He asked me to convert it into a tilling machine. So, I made a tilling machine in the rickshaw. Now, he can rent it out and earn money with it...So, in a month he can earn a decent income...It could serve a dual purpose—it could work as a rickshaw and as a tiller. We just have to remove the angles, the balls from the rear side...we have to fix a frame...and we have to fit a reverse gear box there. So, it can be removed easily” (Kotari). ▪ “My name is Marun Mishrani, and I have been in to this line since the year 2010. I have been using this machine since I entered this business. This machine provides the lower level of people with their daily bread you know, because this is their earning source” (Tewari user). ▪ “He has given employment to over two dozen women, who make these products. This machine, thus while improving a farmer’s income by the value addition of his produce, also generates livelihood options for others in the process” (Lal Rana Archival records).
Fosters others’ jugaad	<ul style="list-style-type: none"> ▪ “There was a laborer at my farm and he saw how I worked and was inspired...He learned from my way of working, which changed his thinking and he is successful now. Many farmers have visited me and seen my work” (Kumar). ▪ “Many IIT and IIM students use to visit my father...even from MIT and California” (son of Singh). ▪ He always had a practical approach, he used to teach them in the work shop, and he used to explain until he had removed their doubt. He was a very patient teacher, with a sharp memory. A lot of students from Gujarat and out of Gujarat came to his house and he taught them with demonstrations (son of Verma). ▪ “From his village lots of students come to resolve their problems about engineering, and he feels happy when he helps the students” (Kotari field notes). ▪ “His workshop was open to others as well. He told us how he provides coaching to students from a local engineering school when they want to build something” (Lal Rana field notes).
Network broker	<ul style="list-style-type: none"> ▪ “One person had innovated a stove. Those who have slight ideas, but no funds or guidance of how to do it; I ask them to sit here and clear their funds. Then I give them contacts for making parts of their design and then they can test how successful their ideas are....But due to my goodwill, the charges will be reasonable. Through this something big will happen someday” (Tewari). ▪ “I had organized an idea competition. I told them that I got the Rashtrapati award. I told them that they may win it. There is one girl who came up with the idea that there should be a bell that rings automatically. I told them that this is very good idea. I clicked a photo and made a video of that [jugaad]. I started discussing in college...I told them to make it and charge expenses to me....That bell we installed at the school and we thought of converting that into solar....I bought the solar panel and inverter. When I searched on the Internet, there were no solar bells for schools....I told everyone that this girl should get the award [for her jugaad]. Minister of Haryana respected her” (Lal Rana). ▪ “...due to his pleasing disposition ...[he] enjoys a very respectful place in the village, community, and local administration” (Archival records).
Inclusive growth: Impact on Jugaadu’s wellbeing	
Satisfaction with problem-solving	<ul style="list-style-type: none"> ▪ “Yes if somebody gives me a challenge then I like to make it” (Pal). ▪ “Main thing is that I was interested in these things and I worked hard on these things [jugaads]. Today I am 24 years of age and I worked on these things when I was 8 years of age....When I used to do research, I used to sit in the same position for one week. I used to sleep for one hour only. I was having that sort of dedication to this. I used to skip meals for this because I may feel drowsy if I eat food. I made this side stand system, I worked for seven days continually for this system” (Biswal). “Yes he used to stay awake the whole night” (informant, Biswal). ▪ “And I enjoy inventing products useful for people. Each of my innovations comes through this outlook” (Tewari). ▪ “It is also about passion which forces me to do new things” (Tewari). ▪ “I did take it as a challenge and started working on a bigger prototype” (Verma). ▪ “He showed us several drawing of possible product ideas that he had drawn on napkins. This was usual for him as coming up with new ideas and solutions, this is what keeps him excited about future” (Tewari field notes).
Social benefits	<ul style="list-style-type: none"> ▪ “...now everybody gives me respect as I am doing well. Now I have the feeling of responsibility. Also when you think about others you realize you have power too” (Pal). ▪ “Earlier they thought that he is making some children’s toys. Later on, the media people started coming and then it was considered to be on a higher level. Then they [the public] used to say, yes he is making something” (Biswal informant). ▪ “People were jealous, always” (wife of Kumar). ▪ “His family and the local community also started respecting him as they see that he has provided employment to the women of his village and helped generate revenue for his village. He also wants to provide similar opportunities to others around him” (Archival records).

Feelings of self-worth	<ul style="list-style-type: none"> ▪ If we want to prove our self-superiority and want to feel proud, we should show something that others can't do....We need to motivate our self from our side. We have ego..." (Pal). ▪ "He was very proud of his innovation and was clearly willing to share how he built it" (Gaurav field notes). ▪ "Now kids can focus on studies and become doctors, engineers, go abroad for studies. I feel proud" (Verma). ▪ "I succeeded in that too, in just 2 months" (Vats). "He had many prizes and certificates, which he showed to us" (field notes Kumar). ▪ "He has provided good education to his children. His daughter has a MBA and is married, while his son is a graduate and works with him. His work has also widely been covered by media, print and electronic alike, the latest being a BBC News story in February 2013. For a man who began as a rickshaw puller, Lal Rana's remarkable achievements in spite of innumerable difficulties show what a person can do by the sheer strength of their will power" (Archival records). ▪ "With the success of business came money, and once money comes, a person's lifestyle too changes. But what I value most is education," said Patel, who is extremely happy that children of cotton farmers need not work in fields anymore" (Archival records). ▪ "He described that his factory is always open for students who come for something to learn and he likes to teach them. He has also build a school in his village so villagers don't have to go outside for primary education" (Verma field notes).
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Figure I: Data Structure



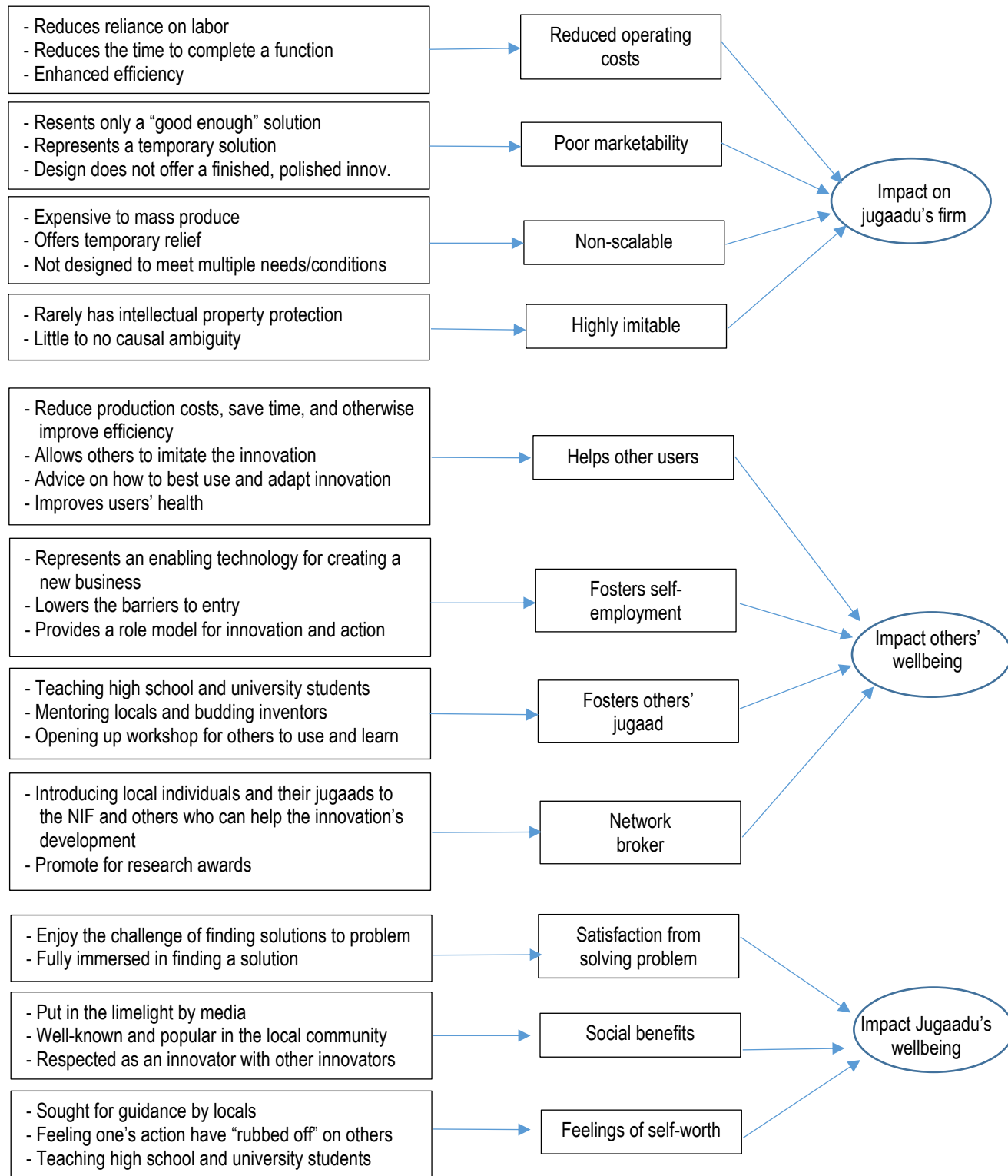


Figure II: Jugaad Framework of Creative Problem Solving Under Resource Constraints

