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# Mobile ICT and Knowledge Sharing in Underserved Communities

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## ABSTRACT

Organizing principles, exchange relationships, and technology affordance of underserved communities in emerging markets are different from privileged communities, which have been the focus in traditional information systems literature. This paper investigates mobile ICT and knowledge sharing in a rural farming community in India. Our qualitative field study reveals that value creating and value claiming norms are key enablers of knowledge sharing in underserved communities. The findings also identify the communication mechanisms and challenges of mobile ICT innovations that foster knowledge sharing among dispersed underserved communities. We discuss the implications for theory and suggest a practical guide to enhance knowledge sharing in underserved communities.

## Keywords

Developing economies, knowledge sharing, mobile ICTs, relational exchange norms, underserved communities

## INTRODUCTION

Knowledge has been effectively used in privileged communities that are empowered by advanced knowledge management strategies. Previous studies identified two essential enablers of effective knowledge sharing: (1) technology infrastructure to support knowledge transfer and use, and (2) behavioral norms that motivate people to create and distribute knowledge (De Long 1997). However, the organizing principles, exchange relationships, and technology affordance of unregulated communities in emerging markets exhibit distinctive characteristics different from privileged communities. People in these unregulated communities are ready to use affordable information and communication technologies (ICTs) but have not been fully served (Jain et al. 2010). Given the lack of research on knowledge sharing behaviors among these underserved people, our study aims to disclose the gap by exploring enablers of effective knowledge sharing in underserved communities.

Fostering knowledge sharing through ICT innovations in underserved communities is far more challenging than in privileged communities as advanced technology infrastructures are not readily available. However, ongoing innovations in mobile computing technologies have made it possible to empower underserved communities with cost-effective mobile ICT. For instance, recent studies have found significant impacts of mobile ICTs on the use of knowledge in underserved communities, specifically in farming communities (e.g., Puri 2007).

Despite the significance of cost-effective mobile ICTs in underserved communities, little is known about the exchange relationships among the underserved people. Some studies identified relational exchanges as antecedents to knowledge sharing (e.g., Ivens 2006; Kaufmann 1987; Macneil 1999), but the importance of relational exchange norms (e.g., Heide and John 1992; Lambe et al. 2001; Zajac and Olsen 1993) was usually determined in privileged rather than underserved communities. To fill the gap, this study examines key concepts in knowledge sharing, mobile ICTs and relational exchange norms to address the following questions: Do mobile ICTs and relational exchange norms contribute to effective knowledge sharing in underserved communities? If so, in what communication mechanisms are such enablers embedded?

This research makes several theoretical contributions. First, our central tenet proposes that mobile ICTs and relational exchange norms are fundamental to understanding knowledge sharing in underserved communities. We develop and test a

conceptual model that uniquely integrates mobile ICTs, relational exchange norms and knowledge sharing theories. Second, our study synthesizes various theoretical foundations to conceptualize relational exchange norms that are associated with knowledge sharing. Third, our study is unique in identifying the role of mobile ICTs as communication mechanisms that underlie knowledge sharing.

This study also makes several practical contributions. First, understanding the relationships among information technologies, norms and knowledge sharing in the real-world phenomenon of underserved communities can help to provide empirical guidelines for practitioners, especially system designers of mobile ICTs. Second, mapping knowledge sharing in traditional communities to mobile ICT innovations provides a clear path to intervention for system development teams when they conduct participatory system development and deployment. The next section builds up the theoretical foundations for our research.

## THEORETICAL INSIGHTS

### Underserved Communities

The underserved communities constitute about 3 billion people in the world population who have mobile phones but are not part of communities with modern Internet (Jain et al. 2010). In Table 1, we provide an overview of the organizing principles of the underserved communities compared to privileged communities. Recent stream of studies has focused on challenges pertaining to underserved communities, and suggest that mobile ICT innovations can potentially address these issues. This raises the question whether underserved communities can benefit from cost-effective mobile ICT and relational exchange norms to overcome knowledge sharing challenges, since these communities are often closely-knit and embedded in strong social networks.

	Underserved Communities	Privileged Communities
Definition	Community is composed of decentralized small-scale groups, who are targeting at subsistence goals and collaborating for collective-survival.	Community is composed of centralized large-scale groups, who are targeting at profit-oriented goals and collaborating for high self-interest.
ICT Resource	Simple mobile phone is the dominant electronic mode supporting communication.	Sophisticated ICT is the dominant electronic mode supporting communication.
Knowledge Resource	Indigenous knowledge is more easily accessible than exogenous knowledge.	Exogenous knowledge is more easily accessible than indigenous knowledge.
Education	Not literate or semi-literate, use diversified local language.	Literate or highly literate, use a common language.
Public Facility	Facilities are in poor condition, lack of efficient transportation, electricity and network support.	Facilities are in good condition, with efficient transportation, electricity, and network support.

Table 1 The background of underserved communities compared with privileged communities

### Knowledge Sharing

In a community, knowledge sharing is an activity through which knowledge (i.e., information, skills, or expertise) is exchanged among people (Bock and Kim 2002). The effectiveness of knowledge sharing is likely to be influenced by both personal motivations and contextual forces (Yoo and Torrey 2002). As such, we define knowledge sharing as (1) the willingness and intention of individuals to share with others the knowledge they have acquired or created (Bock et al. 2005), and (2) the actual knowledge shared with others (Kankanhalli et al. 2005).

Knowledge sharing cannot be forced but can only be encouraged and facilitated (Gibbert and Krause 2002). Hence, the willingness of individuals, i.e., the intention to share, is an essential indicator of the effectiveness of knowledge sharing. In addition, the intention itself cannot fully reflect the effectiveness of knowledge sharing, unless it leads to actual exchange. However, achieving a high level of knowledge sharing is challenging in underserved communities where the people are faced with resource-scarce problems (for example, the lack of ICT support and restricted knowledge resources). Therefore, we propose that the accessibility of affordable ICTs and relational exchange norms are important enablers of effective knowledge sharing.

## Mobile ICTs

Mobile ICT of knowledge sharing enabler mainly refers to the fundamental building block of mobile computing technology that supports and coordinates knowledge sharing, for example, mobile message, mobile web-based knowledge platform, and mobile database, etc. Hence, mobile ICT can enable rapid search, access and retrieval of information, and can support communication and collaboration between community members (Yeh et al. 2006).

According to Zack (1999), the information technology plays four roles in knowledge management: (1) obtaining knowledge; (2) store and index knowledge-related digital items; (3) seek and identify related content; and (4) flexibly express the content based on the various utilization backgrounds. Previous literatures have discovered that ICT has a direct and indirect influence on the motivation of sharing knowledge because it provides channels to obtain information and find the knowledge carriers or seekers. Based on the previous review, we know mobile ICT is the most accessible and affordable ICT in underserved communities. Therefore, in the building of knowledge sharing model, we propose mobile ICT as one of the key factors of influence.

## Relational Exchange Norms

Relational exchange norms refer to the behavioural norms that govern the exchange relationships. Prior research in knowledge sharing has investigate the impact of collaborative norms (e.g., Bock et al. 2006), norms of reciprocity (e.g., Bock et al. 2005; Chiu et al. 2006), and organizational norms (e.g., Hsu et al. 2007). Norms “provide the participants in an exchange with a degree of confidence that they know what they are doing, and are thus a major factor in creating the context within which an exchange occurs” (Ivens and Blois 2004). They are salient in underserved communities, as they reflect the relational aspects that are not part of the resource-related constraints faced by the underserved communities.

Whereas some norms affect the communities’ ability to increase value, others govern the process of value distribution (Kaufmann 1987). In an empirical analysis, Ivens (2006) identified two dimensions of relational exchange norms: value creating and value claiming norms. Value creating refers to norms that create and increase values (e.g., Kaufmann 1987; Lax and Sebenius 1986) for both parties involved in knowledge sharing. Examples of value creating norms include solidarity, flexibility, and role integrity (Kaufmann 1987). First, the norm of solidarity encourages individuals to hold the belief that most others are dependable (Ivens and Blois 2004). Second, the norm of flexibility sets an adjustable environment, envisions a constantly changing relationship, thus encouraging a constant exploration for better knowledge sharing (Kaufmann 1987). Third, the norm of role integrity increases the interdependence among individuals and allows each party to care about each other’s interest, which leads to high common interests and essentially, increased common value.

Value claiming refers to norms that control the distribution of values in communities (e.g., Kaufmann 1987; Lax and Sebenius 1986). Examples of value claiming norms include creation and limitation of power, and harmonization of conflict. Macneil (1999) argues that one party is granted with power to distribute the value created by an exchange. However, the norm of limitation sets the extent of the use of power. The norm of balanced creation and limitation of power resembles the fiduciary duty to ensure the fairness of knowledge sharing. On the other hand, conflicts or overt disputes that include either sentiment or economic interest, can be expected to arise sooner or later in most exchange relationships (Kaufmann 1987). The strategy of harmonization of conflict may act as a dispute resolution process that might well uncover the underlying deception and facilitate a jointly beneficial solution.

The norms altogether build up an atmosphere of relationships, which influence the executing of knowledge sharing behaviour. Meanwhile, mobile ICT is the fundamental tool for knowledge sharing because it enables the transference of information among community members much faster. As such, the relationship is shown in Figure 1.

## RESEARCH METHOD

This study adopts a qualitative methodology within the interpretive tradition (Walsham 1995). Evidence was gathered from a variety of sources such as documentation, archival records, and interview. Data were also triangulated through interviews with counterparts in different locations and in the case where the interpretation of subjective evidence was questionable. In addition, the data analyses involved both the presentation of qualitative data in the form of statements made by interviewees as well as quantification of data in the form of statement frequencies.

## Participants

The participants include famers in the Indian farming communities. We randomly selected sugarcane farmers around two villages in Maharashtra (see Figure 2), which is one of India’s highest sugar-producing states. 14 interviews were conducted in the two villages. Specifically, 7 interviews were conducted around Nasik, a village located in the northwest of Maharashtra, 180km from Mumbai and 202km from Pune. Another 7 interviews were conducted around Pabal, a village in Shirur taluka in the Pune district. The interviews were conducted in Marathi. Gifts were given to encourage active

participation in the interview. Contextual photographs on the field (for example, Figures 3) were taken to understand the original settings in the context of our research.

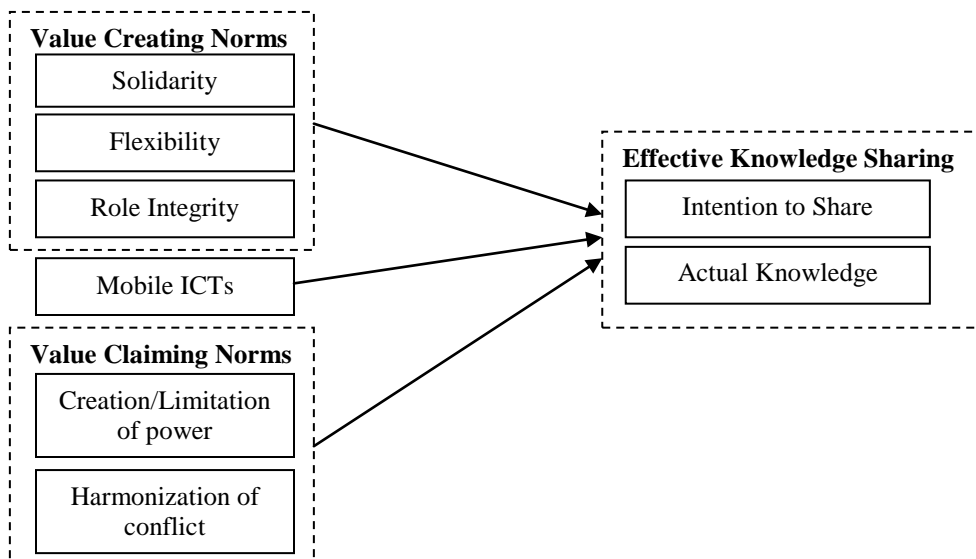


Figure 1 The main concepts and their categories



Figure 2 Research site: Maharashtra state, India



Figure 3 Farming Community

### Data Collection

Most of the initial fieldwork was completed during the period of June to August 2011. Each interview lasted for 80 to 90 minutes. The participants were able to answer most questions. Some needed clues and examples from real life contexts to express their opinions. Some examples of the interview protocols include: “are you willing to tell others about your farming experience?” “Who do you often discuss with? And how do you discuss with them?” “Do you often get help from other farmers?” The interviews were tape-recorded for accuracy and then transcribed to English before our data analyses.

### Data Analysis

The data were analyzed by independent researchers following several steps: (1) iterative coding of the data using the open-coding technique (Strauss and Corbin 1990), (2) sorting and refining themes emerging from the data based on the definitions of the categories with some levels of diversity (Strauss and Corbin 1990), and (3) linking the data to categories and concepts.

## RESULTS

The results of the two case studies carried out at Nasik and Pune are interesting. Specifically, we argue that mobile ICT, relational exchange norms contribute to effective knowledge sharing in underserved communities. To support this claim, we provide three levels of evidence. The first level is an outline of statements made by interviewees associated with the concepts under investigation (i.e., mobile ICT, value creating norms, value claiming norms, and knowledge sharing). The second level is the frequency of these statements. The third level presents the number of instances in which the key concepts are linked to effective knowledge sharing.

### Knowledge Sharing in Underserved Communities

Effective knowledge sharing can be defined by various indicators. Statements were analyzed regards the (1) intention to share and (2) actual knowledge shared. Based on the content analysis, we found most of the participants are willing to share information or experience with others. But due to the transportation or telecommunication constraints, they always share knowledge with nearby people face to face, or via mobile phones sometimes. We list some statements as examples in below:

#### *Intention to share*

Nasik “I am willing to share the information and experiences with others. If I share and somebody is benefited by using the information or experiences, other people will also share knowledge which can be beneficial for me.” (Farmer No. 1)

Pune “I am always willing to share information with others. Other people also like to share information with me. If they find out something new, they come and tell me.” (Farmer No. 12)

#### *Actual knowledge shared*

Nasik “I always ask for advices from neighboring farmers. I also advise and suggest to my neighboring farmers about disease, medicine, fertilizers and others. I do talk to the farmers belong to other villages, usually during marriage ceremony or festival. I talk to the agricultural officer in the village once in a year.” (Farmer No. 2)

Pune “We discuss with each other face to face or even through mobile phone. In the evening, our friends usually sit together to discuss like how you are doing, what’s going on, and you will be in profit. This sharing is important.” (Farmer No. 8)

### Relational Exchange Norms: Value Creating

Statements made by interviewees were analyzed and associated with (i) solidarity, (ii) flexibility, and (iii) role integrity. Based on the content analysis, we identified that the farming communities are very united and pursue for collective survival. They (1) are willing to help each other and trust each other (solidarity); (2) are also open to alternative suggestions or changing situations (flexibility); and (3) believe that each people can accomplish their role and finish their work when they collaborate together (role integrity). Taken together, these farmers are willing and able to create value together for the sake of their community's benefits, which can be good enablers of effective knowledge sharing. Example statements are listed in below:

#### *Solidarity*

Nasik "I talk to farmers who have more experience than me in farming, also to shop keeper who sells fertilizers, seeds and pesticides in the village. These people provide me reliable and authentic information" (Farmer No. 4)

Pune "Other neighboring farmers ask me to come and check the quality of their crop, and they also glad to help me check the quality of my crop. When problem arises, I visit 'Vigyan Asram' (a non-government organization) or the agricultural department. If I need something specific, they help me to get the answer and provide me useful suggestion. They tell me everything" (Farmer No. 12)

#### *Flexibility*

Nasik "We always have choices. They (middlemen) come to use and provide their rates and offers. I compare them and then take my decision." (Farmer No. 7)

Pune "When there is problem with our crop, we take sample and show it to medicine shopkeeper. If they do not understand, then we take that crop itself to the shop." (Farmer No. 11)

#### *Role Integrity*

Nasik "All the people (around 3 to 4) who plant the same bread are in touch with each other. When we meet in the market, we exchange information over there. They sometime invite me to check their crop and others." (Farmer No. 3)

Pune "I expect the neighboring farmers to achieve similar good quality yield as I am able to achieve and get the same benefit. I think if I share information with them, they can make a good profit by following the process I suggest." (Farmer No. 14)

### Relational Exchange Norms: Value Claiming

Statements made by interviewees were analyzed and associated with (i) creation and limitation of power, and (ii) harmonization of conflict based on the definition provided above. In general, the farmers have a certain amount of power to determine how to sale their crops (creation of power), but due to the market conditions and bargain power, they sometimes only have a few choices (limitation of power). In case of any conflict during the production or marketing of the crops, the farmers are usually able to find alternative ways to prevent from it (harmonization of conflict). The organized process of distributing value set a good atmosphere and governance structure that may motivate people to actively share knowledge. Therefore, the value claiming norms can also contribute to effective knowledge sharing. Some statements are shown below as examples:

#### *Creation and limitation of power*

Nasik "They (middlemen) buy from us directly, and then they sell it to vendors. We can also sell directly to the vendors that will be beneficial for us, but problems of receiving money may arise as they are in big cities. So, it is more beneficial to go through local agents sometimes." (Farmer No. 6)

Pune "If there are more people, more crop, then bargaining power can increase. We also compare the rate in our market with nearby markets. If other market has different rate, we will tell the broker over here." (Farmer No. 10)

#### *Harmonization of conflict*

Nasik "I always sell my crops separately. I am afraid of losing money if I try to sell it together. Sometimes theses agents don't make the payment on time. So I always try to find out good agent and try to sell my crop to him directly." (Farmer No. 5)

Pune “Of course that problem (language diversity) happens. If it’s Marathi language, I can understand. If others, it’s problematic. The message should come in more language. If I got a message in other language but it contains the phone number of the sender, then I can give him a call.” (Farmer No. 9)

### Communication Mechanisms Supported by Mobile ICTs

The analysis of the evidence collected at Nasik and Pune suggested that there were several social interaction relationships that mobile ICTs and relational exchange norms are embedded in: (1) the interaction between farmer and government officers (e.g., expert in government department); (2) the interaction between farmer and merchants (e.g., middleman, village shop owner, agent); and (3) the interaction between farmer and other farmers. In addition, the analysis of the empirical evidence suggested that there were some particular mobile ICT tools that the social interactions had applied. Table 2 outlines the activities associated with the three social interactions in building up relational exchange norms and outlines the set of mobile ICT tools applied by underserved communities studied.

In summary, the farmers communicate with multiple people and mostly through face-to-face or mobile phone. By exploring the current status of communication mechanisms and use of ICT in underserved communities, we find that further ICT innovations should focus on mobile ICT innovations that are affordable by underserved people and be designed to strengthen the value creating and claiming norms among them.

Communication Mechanisms	Mechanism frequencies	
	Nasik	Pune
Farmer-Government Officers – Exchange knowledge with experts in local government or experts from various places during seminar or workshop. – Ensure the quality of knowledge.	20	30
Farmer-Merchants – Exchange knowledge from local village shoppers, middlemen, or other agents. – Keep updated to the timely knowledge.	66	28
Farmer-Farmer – Exchange knowledge with other farmers, e.g., family members, neighbor, reputable farmers in the village or nearby village, etc. – Learn best practices and experience from peers, either indigenous knowledge or exogenous knowledge.	43	30
ICT Tools – Mobile phone, but mostly are simple mobile phones without Internet connection – Computer, mostly are located at village centers, where farmers can exchange knowledge with both government and non-government officers, merchant and other farmers.	79	98

Table 2 Communication mechanisms underlying knowledge sharing in underserved communities

### Frequencies of Main Concepts

This section presents a calculation of all statements made by interviewees at Nasik and Pune. We refer to this calculation as concept frequencies. For example, 174 statements were made by interviewees in total from Nasik with regard to knowledge sharing in farming communities.

Our calculations show that 258 statements were made with regard to value creating norms, 162 statements concerning value claiming norms, 177 statements about mobile ICTs, and 297 statements about knowledge sharing. Within the concepts, a large number of statements were associated with solidarity (150) and power (103). These findings suggest that interviewees consider developing solidarity in social networks to be an important element in knowledge sharing. The number of statements



concerning mobile phone (146) is much more than computer (31), which suggests that the mobile phone is the main tool for collaboration in underserved communities.

#### *The Relationships between Mobile ICTs, Relational Exchange Norms, and Knowledge Sharing*

To assess the importance of the key concepts, a calculation was made of statements that represent explicit relationships between mobile ICTs, value creating norms, value claiming norms, and knowledge sharing. Two conclusions can be drawn from the calculations. Firstly, it suggests that value creating and claiming norms were positively associated with effective knowledge sharing in 60% and 21% of the statements made, respectively. Mobile ICTs were positively associated with effective knowledge sharing in 67% of statements made about this concept. Secondly, value creating norms (60%) and value claiming norms (21%) were associated with effective knowledge sharing, almost to the same extent with mobile ICTs (67%). The significance of these findings is underscored by the observation that interviewees were asked a similar number of questions about norm-related issues and about communication mechanisms.

### **DISCUSSION**

Mobile ICTs and relational exchange norms involved in knowledge sharing among underserved communities are the focus of this study. The cases of Indian farming communities demonstrate the importance of value creating norms such as solidarity, flexibility, and role integrity, and value claiming norms such as creation and limitation of power, and harmonization of conflict, and technical supports such as the use of mobile ICT tools in underserved communities. The implications for relational exchange norms and knowledge sharing are both theoretical and practical.

#### **Theoretical Implications**

This study holds several implications for theoretical developments. First, our research model suggests that the conceptualization of mobile ICTs and relational exchange norms in underserved communities warrant more attention. Previous studies in the IS literature seldom integrate these two factors to understand knowledge sharing. There are strong theoretical reasons to expect mobile ICTs and relational exchange norms to influence fundamentals underlying knowledge sharing outcomes in underserved communities.

Second, this study provides implications to both the relational exchange norms and knowledge sharing literatures by confirming norms as the mechanism through which mobile ICT innovations influence knowledge sharing. We explore different conceptualization of relational exchange norms and found that solidarity, as well as creation and limitation of power are two of the most important relational exchange norms in predicting knowledge sharing in underserved communities.

Third, this study is unique in explicating the connection of mobile ICTs with not only knowledge sharing, but also relational exchange norms. We identify the role of mobile ICTs in supporting communication mechanisms that underlie knowledge sharing and discuss three interaction relationships. Based on the case analysis, we found that knowledge sharing occurs under each interaction relationship and mobile phone is the dominant mobile ICT tool for communication in underserved communities.

#### **Practical Implications**

From a practical viewpoint, our study has implications both for technology design, system development and managerial investment. First, our study offers empirical guidelines for designers of mobile collaborative tools by addressing issues in the real-world phenomenon of underserved communities (Hughes et al. 1994). Since the mobile phone is the dominant tool in underserved communities, robust designs of mobile ICT innovations are strongly suggested.

Second, the experience from this field study can benefit the IS development teams when they conduct participatory system development, deployment and field testing. During the process of IS development, deployment and testing, local users should be involved to understand the relational exchange norms in their communities. This participatory design will enhance the usability of the mobile information systems.

Third, this research provides empirical insights for managers who are considering mobile ICT investment for the developing regions. Our research presents an empirical account of the underserved communities, including the norms of exchange relationships, the communication mechanisms, and the knowledge sharing practices.

#### **Limitations and Future Work**

The study is not without limitations. Firstly, the sample size is not big enough to explain knowledge sharing situations in all underserved communities. But this is a good start for researchers and practitioners to understand the needs in underserved communities. Secondly, in identifying the enablers of knowledge sharing, we only consider the human relations and technical factors while neglecting other possible factors, such as government policies and community management strategies. Future

research can extend the current study and offer further insights for researchers and practitioners. Third, the results are based on the interview data. Future studies could include quantitative measurements across the underserved communities in which the causal relationships between the concepts will be further investigated.

## CONCLUSION

In this paper, the contribution of relational exchange norms (i.e., value creating and value claiming) to effective knowledge sharing in underserved communities and the role of mobile ICTs are explored. In addition to technical solutions, human-related issues in the form of norms are the key to effective knowledge sharing in these communities. Communication mechanisms that support the creation and distribution of value among underserved community members are reported in detail. The study is based on an in-depth study of two farming sites through an interpretative methodological lens. In conclusion, our study helps to identify significant opportunities and challenges of mobile ICT innovations for fostering knowledge sharing in underserved communities.

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