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Advancement of Women in Rural India

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Introduction

You can tell the condition of a nation by looking at the status of its women.
- Jawaharlal Nehru, First Prime Minister of India

Gender equality is more than a goal in itself. It is a precondition for meeting the challenge of reducing poverty, promoting sustainable development and building good governance.
- Former U.N. Secretary-General Kofi Annan

India is a growing economy that has seen enormous growth in recent years. The trade press is rich with stories about India's booming IT industry that has resulted in a burgeoning middle class mostly in urban India. Despite these impressive strides, the urban-rural divide in India has widened.¹ A recent study found that using a multidimensional poverty index,^{2,3} a vast majority of people in eight Indian states were worse off than people in sub-Saharan Africa, perhaps most worryingly in terms of infant, child and maternal mortality, metrics related to Millennium Development Goals (MDGs) 4 and 5—India has an infant mortality rate of approximately 55 per

* The views expressed in this paper are those of the author and do not necessarily represent those of the United Nations.

¹ <http://www.scribd.com/doc/7849672/The-RuralUrban-Divide-in-India>

² <http://www.ophi.org.uk/wp-content/uploads/OPHI-MPI-Brief.pdf>

³ <http://www.hindu.com/2010/07/15/stories/2010071564372200.htm>

1,000 live births and 78 under-five mortality per 1,000 live births. This rate is much lower in urban centers and consequently, much higher in rural areas.^{4,5} Based on this, we can only conclude that macro-level statistics about India as a whole grossly inflate its progress. The reality is that against many of the MDGs, as of year 2010, much of rural India is seriously lagging.

If this disturbing situation has to change, it is important to educate and empower women. The issue of gender equity and advancement of women has been seen as key to the progress of developing countries in general. In no small measure, this has been the driving force behind the formation of *UN Women* that structurally brings under one umbrella the various entities within the UN that focused on women's issues.

Sadly, with the infusion of technology in agriculture, it is women's jobs that have been most displaced and the newly created jobs, e.g., operating the new technologies, have gone to men.⁶ However, technology can also be a solution. A variety of technology-based solutions, such as Internet kiosks and cell phones, are in use across India to provide information to people in rural India. Women, in particular, stand to benefit from such Internet kiosks as they [kiosks] provide valuable information about prenatal and antenatal care for the mother and the baby. Within the past few years, it was noted that there were about 150 such Internet kiosk projects throughout India.⁷ Despite the vast number of Internet kiosk projects, there are many important unanswered questions that merit attention:

- a. Do such kiosks lead to systematic benefits related to reducing infant, child and maternal mortality?
- b. If so, who is most likely to benefit?
- c. Are there any specific ways to foster success?

I attempt to answer these questions based on a five-year study of women in 10 villages in India that deployed Internet kiosks that were compared with 10 adjacent villages with no such intervention (i.e., a control group). Data were gathered using surveys and government archives.

Background: Women and Technology Adoption in Developed Countries

Before delving into the expected pattern related to women's reactions to technology in rural India, I first present a summary of what is known about women (gender differences), further segmented by age, with regard to technology adoption and use. Much of this work has been conducted in organizational settings and the interested reader is referred to many earlier published works.^{8,9,10,11,12,13} Table 1 presents a summary of the findings from one of my recent papers.

⁴ <http://unstats.un.org/unsd/mdg/Resources/Attach/Indicators/OfficialList2008.pdf>

⁵ http://www.un.org/esa/population/publications/wpp2006/WPP2006_Highlights_rev.pdf

⁶ <http://www.fao.org/sd/WPdirect/WPre0108.htm>

⁷ <http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTARD/EXTAGISOU/0,,contentMDK:20932073~pagePK:64168445~piPK:64168309~theSitePK:2502781,00.html>

⁸ Morris, M.G. and Venkatesh, V. "Age Differences in Technology Adoption Decisions: Implications for a Changing Workforce," *Personnel Psychology* (53:2), 2000, 375-403.

⁹ Morris, M.G., Venkatesh, V., and Ackerman, P.L. "Gender and Age in Technology Adoption and Usage Decisions: Toward the Emergence of a Unisex Work Force," *IEEE Transactions on Engineering Management* (52:1), 2005, 69-84.

¹⁰ Venkatesh, V. and Morris, M.G. "Why Don't Men Ever Stop to Ask For Directions? Gender, Social Influence, and Their Role in Technology Acceptance and Usage Behavior," *MIS Quarterly* (24:1), 2000, 115-139.

Table 1. Technology Adoption among Women in Developed Countries¹⁴

	Low on Demog. Var.		Significance of Difference	High on Demog. Var.		Significance of Difference
	Women	Men		Women	Men	
<i>Age</i>						
R ²	.59	.57		.55	.43	
A	.43***	.42***	ns	.22*	.65***	***
SN	.18*	.20*	ns	.37***	.04	**
PBC	.24*	.22*	ns	.29**	.07	*
<i>Income</i>						
R ²	.59	.40		.52	.39	
A	.36***	.59***	**	.30***	.56***	**
SN	.27***	.10	**	.28***	.11	**
PBC	.26***	.06	**	.25***	.09	**
<i>Education</i>						
R ²	.62	.39		.56	.41	
A	.31***	.56***	**	.38***	.61***	**
SN	.31***	.10	*	.27**	.14	*
PBC	.30***	.10	*	.25**	.09	*
<i>Occupation</i>						
R ²	.57	.39		.55	.41	
A	.30***	.55***	**	.27**	.58***	***
SN	.28***	.10	**	.29***	.14	*
PBC	.25**	.12	*	.33***	.08	**

Notes:

1. A: attitude (extent of liking to use the technology); SN: subjective norm (social influences); PBC: perceived behavioral control (extent to which internal and external factors are in place to facilitate technology use)

2. Significance of Difference represents the significance of the interaction term (e.g., A X GENDER), and was also confirmed by test of beta differences across independent samples using Chow's test.

3. * $p < .05$; ** $p < .01$; *** $p < .001$.

Social Networks as a Theoretical Lens

I use social networks as the guiding theoretical lens for the reasons outlined in my earlier work.¹⁵ Here, I explain the basic concept of social networks and why it is an appropriate and useful lens to study women's issues in developing countries. A social network is a map of the interrelationships among individuals. Social network theory examines how individuals' ties with others in a given network context influence outcomes of interest. Social networks are conceptualized based on the type and context of the relationships being mapped—e.g., advice,

¹¹ Venkatesh, V., Morris, M.G., and Ackerman, P.L. "A Longitudinal Field Investigation of Gender Differences in Individual Technology Adoption Decision Making Processes," *Organizational Behavior and Human Decision Processes* (83:1), 2000, 33-60.

¹² Venkatesh, V., Morris, M.G., Davis, F.D., and Davis, G.B. "User Acceptance of Information Technology: Toward a Unified View," *MIS Quarterly* (27:3), 2003, 425-478.

¹³ Venkatesh, V., Morris, M.G., Sykes, T.A., and Ackerman, P.L. "Individual Reactions to New Technologies in the Workplace: The Role of Gender as a Psychological Construct," *Journal of Applied Social Psychology* (34:3), 2004, 445-467.

¹⁴ Modified version that was originally reported in Morris et al. (2005).

¹⁵ Venkatesh, V. and Sykes, T.A. "Digital Divide Initiative Success in Developing Countries: A Longitudinal Field Study," *Information Systems Research*, conditional accept.

friendship and hindrance. For example, advice networks are the interrelationships amongst individuals based on giving and getting advice from one another, and friendship networks are maps of the affective social relationships among individuals. I focus on friendship networks as it relates specifically to the bonds people develop and when it comes to sensitive women's issues, such as prenatal and antenatal care, friendship ties are likely to be most relevant in disseminating information. Such ties are particularly important in our context due to the low literacy, high poverty, high collectivism and an oral tradition of information dissemination, especially among women in rural India. The role of social networks is further underscored given the higher levels of illiteracy among women, especially in rural India, associated lack of computer knowledge, and the biases against seeking such information. Thus, the key vehicle for the diffusion of relevant information and consequent behavior will not be achieved by the use of the kiosks by many women but by the use by few women and the transfer of information via their ties, ties of their ties and so on. In sum, a social networks lens is well suited for this context. The approach of choosing one type of network is consistent with a vast body of prior research on social networks.

Classical Social Network Constructs and Hypotheses¹⁶

There are many social network constructs that are typically used in a vast body of research to predict behavior and outcomes. Among the different constructs, I chose eigenvector centrality because it best represented the web of connections an individual has. Eigenvector centrality incorporates ties of a focal individual, the ties of their ties, and so on. For instance, while two individuals could have the same number of ties, one of them could have ties who are in turn connected to others and the other could have ties that are essentially isolated from the rest of the network. In such a case, the former's ties are likely to be more valuable in helping the focal individual have access to information. In a network of women in the context of a village, it can be argued that a woman with high eigenvector centrality, given her direct and indirect ties, is more likely to learn about prenatal, antenatal and child care. Consequently, she is more likely to act on the information and seek medical care.

Strength of Weak Ties

One of the most cited works in social psychology is Granovetter's strength of weak ties hypothesis.¹⁷ One competing explanation to centrality that emphasize strong ties and transmittal of information via interactions among family and friends is that non-redundant information will traverse more effectively.¹⁸ In his work, Granovetter found that the weak ties hypothesis has received support in a variety of contexts, such as job search. The reason that this is a legitimate competing hypothesis in the context of women in rural India is that strong ties that are characterized by homophily can often suppress new information and even create pressure to ignore new information. In contrast, a woman with many weak ties is likely to acquire information related to prenatal, antenatal and child care that is disseminated through kiosks, hear about possible benefits and behave in ways that could result in such benefits, i.e., seek appropriate medical care.

¹⁶ <http://www.analytictech.com/borgatti/papers/centflow.pdf>

¹⁷ Granovetter, M. "The Strength of Weak Ties," *American Journal of Sociology* (78:6), 1973, 1360-1380,

¹⁸ Crowell, L. F. "Weak Ties: A Mechanism for Helping Women Expand Their Social Networks and Increase Their Capital," *The Social Science Journal* (41:1), 2004, 15-28.

Theoretical Framework and Model

It is widely recognized in social networks research that network position confers a variety of benefits.¹⁹ Most important among those are benefits of having access to knowledge of others to whom one is connected. Such knowledge can lead to performance of specific behaviors that would otherwise not be possible or about which a person may be completely unaware. Further, network position itself can bring about behaviors through social pressures to act. Depending on the nature and type of behavior in a particular context, it stands to reason that particular outcomes will occur. I draw on these basic ideas and findings from social networks research to propose the following causal chain: Network position → Behavior → Outcomes

In this particular context, our focus is on understanding women's network position and the type of ties they have and its causal chain related to the acquisition of new knowledge related to prenatal, antenatal care and child care. Consequently, the more knowledge a woman has, the more likely she is to seek medical care for her infant/child and herself. It is also possible that network position results in a woman seeking medical care without fully understanding the reasons because she is advised or even pressured to seek such care. As an ultimate outcome, the more such care a woman seeks and obtains for herself and her infant/child, the greater the chance of avoiding maternal, infant and child mortality.

Who Will Benefit?

Table 2 summarizes the interactions of strong and weak ties that I propose. In the context of women in rural India seeking and obtaining appropriate medical care during pregnancy and after childbirth for both the mother and child, I contend that strong ties and weak ties will interact to influence seeking medical care. I go a step further and suggest that the interaction will be such that strong ties will be harmful and weak ties will be beneficial. Specifically, if someone has high centrality in terms of strong ties—i.e., many strong ties—and low centrality in terms of weak ties—i.e., few weak ties, this, in our view, represents the worst case scenario. Homophily and status quo biases, especially the strong pressure to not change years of practice, are likely to be most harmful in gaining and acting on new information. This problem will be further exacerbated by the fact that superstition and religious beliefs are dominant in rural India, which in turn again promotes the status quo. Consequently, women who are central with strong ties but few weak ties will not find the push, pressure or desire to seek medical care. The situation will be quite the opposite for women who have few strong ties but many weak ties. Such women will be exposed to a lot of diverse and new information about the importance of such care, and this could also include stories about those who have benefited from such care. Perhaps between these two scenarios is the scenario of being high both in terms of strong and weak ties. This will create a tension between the old and new practices of care. In some cases, it may push the woman toward exploring the new care, which is an obvious benefit. The obvious worst case scenario is those who neither have strong ties or weak ties because they would have no information and little or no support.

¹⁹ Borgatti, S.P. and Foster, P. "The Network Paradigm in Organizational Research: A Review and Typology," *Journal of Management* (29:6), 2003, 991-1013.

Table 2. Impact of Interactions of Strong and Weak Ties on Outcomes Related to Natal Care

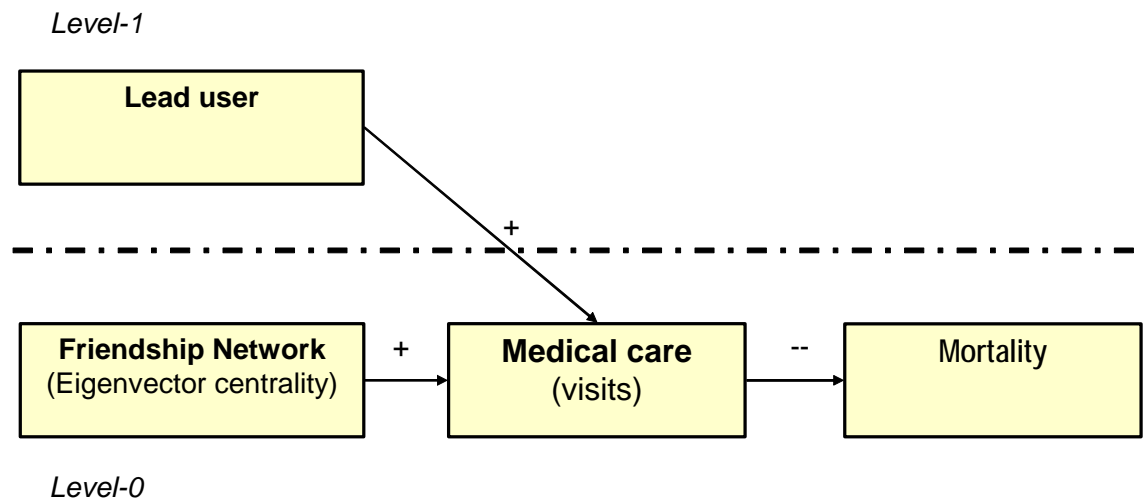
		Strong ties	
		Few (low)	Many (high)
Weak ties	Few (low)	Worst	Bad
	Many (high)	Best	Moderate

Role of the Lead User

In much prior research, the lead user has been theorized to have an impact on the diffusion of a technology. Lead users tend to be opinion leaders who can influence others. Intuition would suggest that if the lead user is a highly central woman with many strong ties, she can not only positively influence other women to use the kiosk to acquire the relevant knowledge about medical care but also share the knowledge she has acquired with her many ties. However, I argue that an alternative mechanism will be at play: one where strong ties will again be detrimental to the diffusion of the knowledge and enactment of relevant positive behaviors among women—i.e., seeking care. I believe a woman with many strong ties in a friendship network will also be subject to the influence of others, who may not have used the kiosk and may be skeptical of the acquired knowledge. In turn, this will result in the lead user being far more tempered in their positive views. Further, strong ties are expensive and time-consuming to maintain and if the lead user is strongly embedded in the network, she may not necessarily have enough time to educate her vast network, which, of course, I acknowledge will be educated and influenced by the diffusion of information (rather than everyone having to acquire the information first-hand from a lead user). In contrast, a lead user with weak ties can help in presenting the information in a more balanced way without it being tempered in the negative. It should, of course, be acknowledged here that I am assuming that a lead user will acquire knowledge about medical care and view the same positively.

The research model is shown in Figure 1.

Figure 1. Research Model



Project Overview

We present various details related to the project in a series of tables. Table 3 presents the basic details of the study context. Table 4 presents the various constructs and associated measurement.

Table 3. Basic Details

Location	Villages in India
Number of villages	10 in technology intervention, 10 control group
Target population	Women
Intervention	One staffed (16 hours per day) Internet kiosk for every 100 families
Data collection	Survey at the start of the deployment of the kiosk Annual knowledge survey (highest pre-pregnancy score used) Use data were tracked at the kiosk and archives were mined Health records—government archives, self-report Other information, including death records
Duration of study	5 years in each village
Sample	Approximately 300 women in each village participated
Measurement	Survey using traditional individual-level scales Roster-based social network survey Mortality and medical rates based on information from healthcare providers (tracked using biometrics)

Table 4. Constructs

Control variables	
Age	In completed years
Marital status	0: Single
Family size	Number of adults, children and infants living in the same house as the woman
# of children	Number of infants and children alive at the start of the study
Education level	0: Illiterate; 1: Attended primary school; 2: Attended middle school; 3: Attended high school; 4: Attended college; 5: Attended college
Mortalities in family	Prior to the study: number of infants, children under-five and mothers who died
Knowledge	Four questions each about pre-natal care, ante-natal care and care for the mother
Need (pregnancy)	0: No during study period
Village population (level 1)	Government archival data of village population
Year (level 1)	Point of measurement during the study
Social network	
Friendship network	Question about friendship ties with a roster of all women in the village (5-point scale of frequency of contact)
Eigenvector centrality	Formula capturing ties and ties of ties, etc.
Interaction	Calculated after mean-centering variables included in the interactions
Lead user (level 1)	Index of number and % of lead weak-tie lead users
Outcomes	
Medical care	Number of visits to the doctor during the period of study
Mortality	Equally weighted index of infant, child and maternal mortality during the period of study

Data Analysis and Findings

The primary purpose of our analysis was to understand the contributors to knowledge acquisition, seeking medical care and various metrics of mortality among children and women. I used UCINET and hierarchical linear modeling (HLM) to analyze the data. I conducted extensive analyses but in the interest of space and a desire to focus on the core message, I report only the key results here.

First, I present a summary of mortality rates in the intervention and control groups. As seen in Table 5, there is a declining trend in both groups, with a more rapid decline in the intervention group. Second, I present a summary of the percentage of women who visited the kiosk at least once during a year. As can be seen in Table 6, even after 5 years, the percentage of women using a kiosk is under 10% of all women. This confirms that using a social network lens is valuable because clearly the transmittal of information hinges not on using the kiosk but on women's ties to those who may have used the kiosk or ties of ties.

Table 5. Mortality Rates

Year	Control group (10 villages)	Intervention group (10 villages)
2002	73.1	73.5
2003	70.3	70.8
2004 (intervention)	68.4	68.5
2005	66.2	65.1
2006	64.1	61.8
2007	61.8	56.4
2008	59.4	52.2
2009	57.3	49.1

Note: Rate is an equally weighted index of infant, child and maternal mortalities.

Table 6. Percentage of Women Using the Kiosks

Year	% of women using kiosks
2004 (intervention)	4.8
2005	5.5
2006	6.9
2007	7.5
2008	8.2
2009	8.8

Armed with this knowledge, I proceeded to test the classical social network hypothesis. The results are shown in Table 7, model 2. Contrary to the classical social network hypothesis, strong ties had a strong negative effect on seeking medical care. The proposed model of positive effects for weak ties was supported as shown in Table 7, models 3 and 4. Further, the interaction effect proposed earlier in Table 2 was borne out as shown in Table 7, model 5. It is worth noting the variance explained by various models 2 through 5 compared to model 1. Progressively, there was more variance explained, with model 5 that included the key interaction being the most at 43%. Table 8 shows the multilevel model and the effect of lead users with weak ties was found. Like in the case of Table 7, here also including the key predictors from social networks at the individual level and the village level contributed significant additional variance in explaining medical care sought, with a total variance explained of 48%. Finally, as shown in Table 9, medical care did reduce mortality rates. Specifically, medical care contributed an additional 16% variance beyond control variables, resulting in a total of 39% variance explained in mortality rates. Overall, this suggests that the theorized predictors can contribute to increasing the medical care sought and reducing mortality rates.

Table 7. Predicting Medical Care Sought

	1	2	3	4	5
R ²	.24	.29	.34	.35	.43
ΔR ²		.05***	.10***	.10***	.08***
<i>Control variables:</i>					
Age	.17***	.15**	.13**	.13**	.13**
Marital status	-.12**	-.11**	-.08	-.08	-.08
Family size	-.03	-.02	-.02	-.02	-.02
# of children	.07	.05	.03	.03	.03
Education level	.15***	.13**	.11**	.07	.07
Mortalities in family	.15***	.15***	.13**	.11**	.11**
Knowledge	.17***	.12**	.13**	.13**	.13**
Need (pregnancy)	.25***	.20***	.20***	.16***	.15***
<i>Social network construct (strong ties):</i>					
Eigenvector centrality		-.17***		-.12**	.07
<i>Social network construct (weak ties):</i>					
Eigenvector centrality			.26***	.20***	.04
<i>Social network construct (strong ties X weak ties):</i>					
Eigenvector centrality					.33***

Note: * p<.05; ** p<.01; *** p<.001.

Table 8. Multilevel Model of Medical Care Sought

	1	2
R ²	.28	.48
ΔR ² (see note 2)		.20***
<i>Level-1</i>		
<i>Control variables:</i>		
Village population	-.05	-.03
Year	-.15***	-.12**
<i>Lead users:</i>		
% of lead weak-tie lead users		-.21***
<i>Level-0</i>		
<i>Control variables:</i>		
Age	.17***	.12**
Marital status	-.12**	-.07
Family size	-.03	-.02
# of children	.07	.03
Education level	.15***	.06
Mortalities in family	.15***	.11**
Knowledge	.17***	.13**
Need (pregnancy)	.25***	.14**
<i>Social network construct (strong ties):</i>		
Eigenvector centrality		.06
<i>Social network construct (weak ties):</i>		
Eigenvector centrality		.03
<i>Social network construct (strong ties X weak ties):</i>		
Eigenvector centrality		.32***

Note: * p<.05; ** p<.01; *** p<.001.

Table 9. Predicting Mortality

	1	2
R ²	.23	.39
ΔR ² (see note 2)		.16***
<i>Control variables:</i>		
Age	.14**	.12**
Marital status	-.12**	-.11**
Family size	-.07	-.02
# of children	.05	.02
Education level	-.16***	.12**
Mortalities in family	.13**	.12**
Knowledge	-.16***	.14**
Need (pregnancy)	.28***	.23***
<i>Medical care</i>		
Medical care (visits)		-.40***

Note: * p<.05; ** p<.01; *** p<.001.

Conclusions

Summary of key findings

- Mortality rates in rural India have shown a steady decline
- Empirical evidence backing the positive effects of technology kiosks
- Evidence counter to traditional social networks hypotheses

What reduces mortality rates?

- As has been known for a while, medical care is crucial
- Strong ties are detrimental
- Weak ties are valuable
- Technology kiosks are helpful
- Lead users being more embedded via weak ties is helpful

Actionable guidance

- Deploying technology kiosks and finding ways to support them is crucial
- Mechanisms to overcome negative effects of strong ties have always been and are crucial
- Fostering more weak ties is important and may be a solution for the “strong tie problem”
- Finding ways to have lead user with several weak ties could be vital