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The use and appropriation of the mobile telephony technologies by the rural Bangladeshi farmers

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“The use and appropriation of the mobile telephony technologies by the rural Bangladeshi farmers”

This paper is based on the initial understandings gained from the first half of my doctoral research, that investigates how the mobile telephony technologies can be used and appropriated by the rural Bangladeshi farmers and what could be the potential impacts of such interaction. The research tries to find a relation between the issues raised by the ICT for development literatures and the theoretical underpinnings gained from information systems and marketing. This paper has been developed after the completion of the four month long doctoral fieldwork. An action research approach was undertaken through an intervention by providing the farmers’ groups with mobile telephones. The fieldwork project also provides a model for community based use of the mobile ICTs which can connect the rural farmers among themselves and with the local community based technology centres that have internet connectivity. The farmers’ perceptions about the mobile telephony technology before and after the intervention were collected through interviews and focus group discussions. Ethnographic tool in the form of diary notes describing researcher’s personal observations about the culture and social structure was used to complement the interviews and discussions. The paper provides a snapshot of the theoretical underpinning for the research and a description of the fieldwork. The paper also discusses how the data will be interpreted and analyzed.

1.0 Introduction:

This research investigates the use and appropriation of the mobile telephony as the means for achieving agricultural development in Bangladesh. It examines how the farmers make use of the mobile telephony technology, how the technology is integrated with their lifestyles and what impact results from such interaction.

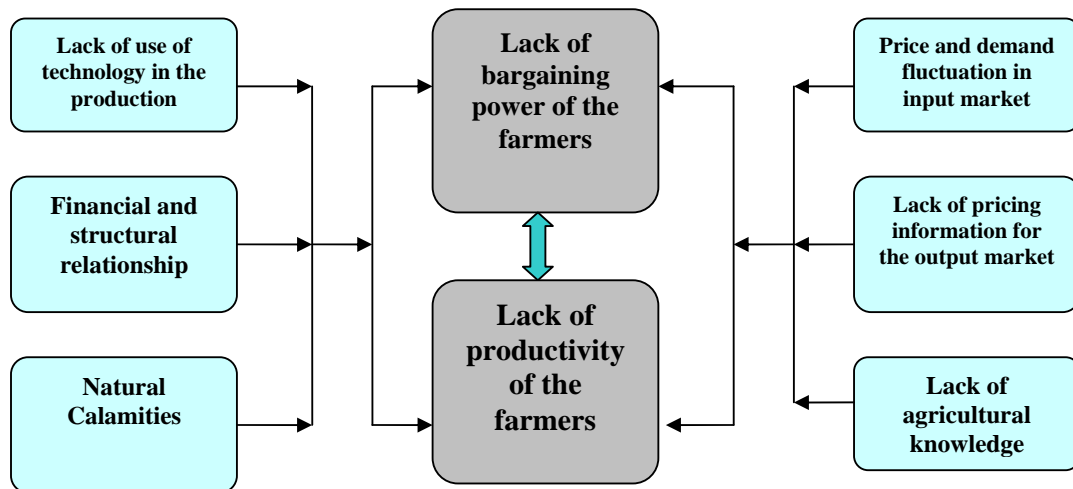
It has been claimed that through social networks, farmers can obtain information (e.g. on prices or the weather) that they can use to improve their farm income, and their lives, leading to rural development. It has been suggested that farmers in rural villages can use voice and data services over mobile telephones to benefit from such information. However, it is also necessary to comprehend how the farmers make use of this technology/application. The appropriation of the mobile telephony technologies by the rural Bangladeshi farmers along with the potential benefits, resulting from such initiatives are investigated in this research.

1.1 Background of the research

Agricultural system in Bangladesh: In a country like Bangladesh farms are extremely small, cultivation is dependent on the uncertainties of variable rainfall and

average output is generally low. Value addition in agriculture requires technological, institutional and price incentive changes designed to raise the productivity of the small farms (Todaro, 2000). In rural Bangladesh opportunities outside agriculture sector are extremely limited. In 1991 the top ten percent of landowners owned sixty percent of the land, while the bottom sixty percent of landowners had only one percent of the land (Ullah and Routray, 2007). The structure of the agrarian system in Bangladesh is considered as a major impediment for balanced rural development (Rogaly, Harris-White and Bose, 1999). Small farmers are entangled within a vicious cycle because of sharecropping, tenancy, money lending and other structural and financial relationship with owners and traders (Crow, 1999). The situation of the vulnerable farmers is exacerbated by the land erosion, drought, flood, deforestation and other natural calamities. This together with lack of financial muscle power reduces farmers' propensity to take risks. Their bargaining power in the input market is not very strong either. Lack of bargaining power reduces farmers' earnings against their produce. Reduced earning also makes a negative impact on farmers' productivity. The overall situation can be summarized by the figure-1.

Figure 1 Reasons behind lack of bargaining power and lack of productivity of the farmers of Bangladesh



Can ICT be a panacea? : As ICT diffusion started to grow in many developing countries, the application of ICT to agricultural and rural development began to draw

the attention of both researchers and policy makers. Various studies have suggested that ICT could play an important role in the agricultural development. A microwave-radio telephone system installed in the remote region of Tumaca, Columbia, along with community access points resulted in better trade and market opportunities (Lio and Liu, 2006). Rural telephone and community radio services initiated in India and Sri Lanka received remarkable response from the farmer communities (James, 2004). International Institute of Communication Development (IICD) and Manobi, an African telecom company have initiated a collaborative program to help the farmers of Burkina Faso, Ghana, Mali, Uganda and Zambia to have access to market price information via text messages, Wireless Application Protocol (WAP), or the mobile internet as well as personal computer and personal digital assistant (PDA)¹. Bayes (2001) has identified that the Village Phone Program (VPP) of Grameen Bank of Bangladesh can convert the telephones into production goods by lowering transaction costs. However, cautious scepticism is conveyed in many research works regarding the effectiveness of the use and appropriation of ICTs in the developing countries. There can be a number of ways to analyze how and to what extent ICTs can be used in different spheres of development activities and what could be the resulting impact of such intervention. This research has taken mainly an ethnographic approach.

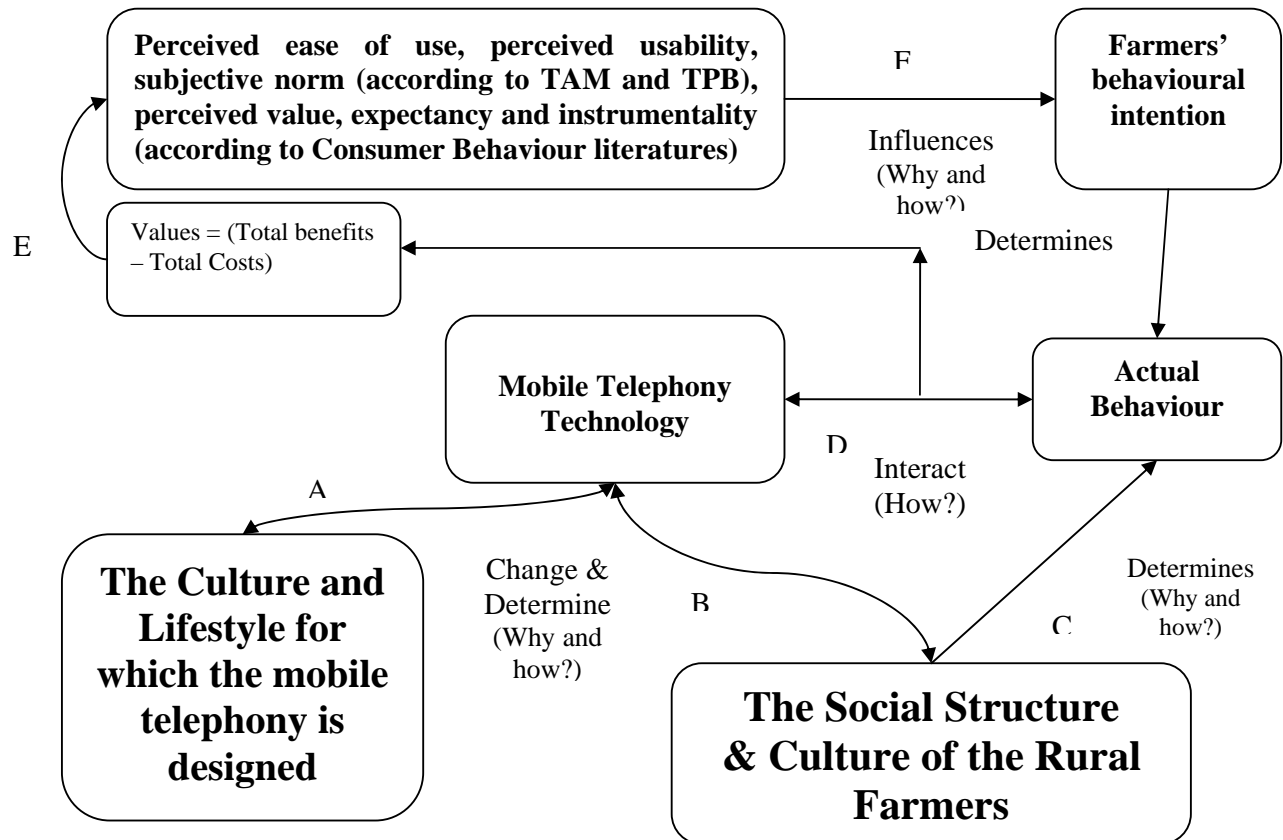
1.2 Objective of the research:

1. What are the ways ICTs can be used and appropriated in rural Bangladesh?
 - What are the needs of the farmers in regards to the use of ICTs?
 - In what ways do farmers make use of mobile telephony technologies to meet their agricultural information needs?
 - How the use and appropriation of the mobile telephony enable the farmers to confront the challenges they face in agricultural processes?
 - What are the attitudes of the farmers toward the use of mobile ICTs (i.e. mobile telephony technology)?
2. What are the farmers' perceived benefits from the use of mobile telephony technologies with regard to resolving their agricultural problems?

¹ (<http://www.uneca.org/aisi/picta/pictabulletin/pb55.htm>)

2.0 Literature Review

The following diagram shows the conceptual framework for the research



The whole diagram has got mainly three parts. Analysis of each of the parts along with the relevant theories is presented below:

1. The relationship between technology and society (A)

This is the social shaping of technology. Technologies have social effects, at the same time social forces give rise to particular technologies (Mackay, 1995). This research is going to analyze the way mobile telephony technology makes an impact on the societies of the developing countries. At the same time the research is going to develop an understanding about how the needs of a particular society are catered by the development of mobile telephony. It is important to note that the mobile telephony technology is not developed or designed for the use of the rural Bangladeshi farmers. Like many other ICTs the mobile telephony is also designed to cater the needs of a

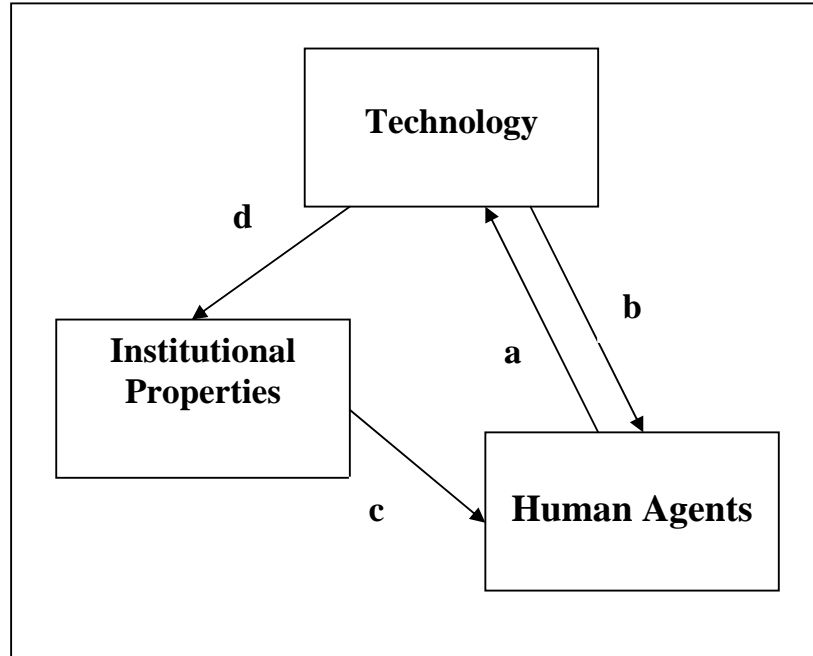
broader community. In most cases the technology, developed in the western countries may only reflect the lifestyle and culture of those countries. People still make use of the technology that is not developed in the context of their countries. While society and technology shape each other, the individuals also make use of the technology according to their lifestyle. It is also important to understand the appropriation of technology – how individuals are likely to use the technologies and with what (intended or unintended) consequences in different conditions (Wiredu, 2007). People are not just malleable subjects who submit to the technology. They may reject, redefine or give meaning to the technology (Mackay and Gillespie, 1992). A western born mobile telephony technology application can have a different consequence in the developing countries. For example, a miscall is meant to provide an indication that someone has tried to call a person. In many developing countries including Bangladesh the price sensitive low end users use miscall to let the other person know that s/he does not have the credit (or does not intend to spend the credit) to make the call, hence a return call is requested.

2. The relationship between technology, society and individuals (B, C and D)

It is also important to analyze how individuals interact with the technology and how this interaction can enable them to change their position within a social structure. To investigate this issue structuration theory and its use in analyzing the interaction between human agents and technology are used. Anthony Giddens' structuration theory purports that social structure is the result of recursive interaction among the human agents, institutionalized rules and material resources. This theory has been used in this research to develop an understanding about how human agency (the rural farmers) through interaction with material resource (mobile telephony) and institutionalized rules (the rural lifestyle in Bangladesh) can confront or overcome the problems pertaining to the existing agricultural system. The research also attempts to identify how social structure facilitates or restricts the human agents in making use of the mobile telephony. Orlikowski (1992) and DeSanctis and Poole (1994) have used the structuration theory in the context of organization. Orlikowski (1992) proposes the structural model of technology. The model shows the interaction among three

entities: the human agent, technology and institutional property. These three entities interact within themselves and develop four states of interactions.

Figure 3 Structuration model of technology



Source: Orlikowski, 1992, p 412

Arrow	Type of Influence	Nature of Influence
a	Technology as a product of human action	Technology is an outcome of human action like design, development, appropriation and modification
b	Technology as a medium of human action	Technology facilitates and constraints human action through provision of schemes facilities and norms
c	Institutional conditions of interaction with technology	Institutional properties influence (for example intentions, professional norms, state of the art in the material and knowledge, design standards and available resources) human in interaction with technology

d	Institutional consequence of interaction with technology	Interaction with technology influences the properties of an organization through reinforcing or transforming structures of domination, signification and legitimation.
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This particular model provides key understanding to develop the conceptual framework for this research. The technology is the outcome of human action – for this research the use and appropriation of the mobile telephony are the result of the farmers’ ability and intention. Again, the use of the mobile telephony may facilitate or restrict farmers’ action. Nevertheless, the rural lifestyle, agricultural marketing process, social relation and communication make impact on how and why farmers are going to use the mobile telephony. There is also scope to analyze how (if at all) the interaction between farmers and mobile telephony can make any impact on the overall social system.

Structure and culture are very closely related with each other. Hence, it is also important to take the cultural issues into consideration for the use and appropriation of technologies. Through a large-scale, international focus group study Jarvenpaa and Lang (2005) have found that purposes of technology use vary due to differences in cultural orientation. The purpose of the use of technology in individualistic societies (i.e. Western countries) may not be the same as the purpose of the use of technology in collective societies (i.e. Asian countries). Kirlidog and Aydemir (2005) relate the use of ICTs with social science theories of Hofstede and Hall. The rural societies of the developing countries, predominantly having high context culture, rely more on the oral communication. ICTs with more oral communication like telephone, mobile phone, radio can be more effective for the developing countries.

3. Individual’s behavioural intention and use of technology (E and F)

Despite the studies of structuration and culture analyze how technologies can be used and appropriated within a social and cultural context, the determinants for individual behavioural intention still remains unexplained. Davis (1989) develops and validates scales for two specific variables, perceived usefulness and perceived ease of use, hypothesized to be fundamental determinants of user acceptance toward technology

applications. The Theory of Planned Behaviour (TPB) proposes that in addition to attitudes toward use, subjective norms, and perceived behaviour control (PVC) such as skills, opportunities, and resources needed to use the system also influence behaviour. The original TAM model was developed to examine IT/IS adoption in the organizations. The suitability of the model for predicting general individual acceptance needs to be explored. The study of technology acceptance has its genesis rooted in the analysis of attitude, considered as the cause of intention. In consumer research attitude receives much attention. Attitude determines consumers' likelihood to adopt a particular product. In this particular research consumers' (here the rural farmers) attitude toward adopting the mobile telephony technology is analyzed. Bauer *et al.* (2005) have brought a new dimension to the study of consumer acceptance toward technological application, mobile marketing in particular. They have presented the importance of the perceived risk as a factor that negatively influences the consumer acceptance. A consumer is normally uncertain about the outcome of any action. This uncertainty causes perceived risks. There can be different types of perceived risks - physical, functional, financial, social and psychological. For someone belonging to the affluent urban middle class or higher middle class the purchase of the mobile phone may involve more of social and psychological risks, as he or she would try to find a mobile phone set or application consistent to his or her social status and life style. A poor village farmer of a developing country on contrary may consider the physical and financial risks more than anything else. The TAM model, originally developed to find the acceptance of a technology in the organizational context does not consider the individual's perceived risks. This is because in the organizational context an individual may not be directly exposed to many of the risks. However, the acceptance of any technology or application by an individual does require the perceived risks to be considered.

The concept of perceived value also needs to be discussed in this regard. Perceived value is the trade off a customer makes between the perceived utility and the price. Lee and Jun (2007) provide a broader definition of the perceived value – the difference between total utility and total costs. It is important to mention that a customer does not only consider the financial cost while making a decision for the purchase of a good or service. There are some other costs involved (i.e. time, effort, risks and convenience). The perceived benefits not only comprise of the economic

benefits, but also involve social and relational benefits (Roig, *et al.* 2006). For example, the social and relational benefits obtained from mobile telephony may be more important to the consumers than the economic benefits.

The review also resorts to consumer behaviour theories including expectancy model by Victor Vroom and theories of needs based on Maslow's hierarchy and subsequent works. Both of the theories help to analyze the behavioural intention of the farmers to use the technology.

Interrelationship among three parts

In the figure-2 A, B, C and D define the social shaping and appropriation of the mobile telephony technology. The use of the technology from technology acceptance and consumer behaviour perspective is defined through F. The experience of using the mobile telephony and its appropriation in the day to day life (or failure to do so) also change or reinforce the existing perception and attitude. This is represented through E. The entire process is like a continuous cycle. However, it requires an intervention (which enables the farmers to make use of the technology) to start with.

3.0 Methodology

3.1 Fieldwork

3.2 Designing the fieldwork project

Four major ongoing projects and programmes have been followed and studied to develop the fieldwork project. These are:

- 1) e-Choupal, implemented in India
- 2) Village Phone Programme of Grameen Bank, successfully implemented in Bangladesh and replicated in Uganda and Rwanda
- 3) GPCIC (Grameenphone Community Information Centre), implemented in Bangladesh
- 4) Pallytathya implemented in Bangladesh

All these projects have used trained individuals or telecentres/kiosks or both to provide the rural farmers with the access to the use of ICTs. E-Choupal deals with the computer and internet connectivity. VPP renders telephone services through mobile

phones. GPCIC uses both mobile phones and computers for telephone and internet connectivity. In the VPP project of Grameen Bank and Grameen Telecom, the rural women purchase mobile telephones using microfinance facilities. GPCICs are initiated by the rural young entrepreneurs. Pallytathya offers help and information to support the livelihoods of the rural people. However, these three projects do not directly target the rural farmers. E-Choupal is a project developed particularly for the farmer. However, the set up and operational cost of e-Choupal is quite high.

The penetration of mobile telephone is also faster and higher in Bangladesh compared to internet connectivity. The mechanisms and objectives of these projects are combined to design a suitable model for the fieldwork project. Some other projects like B2Bprice.com in the Philippines and KACE in Kenya (both of the projects use ICTs to access market price for the agricultural produce) also provide understanding for developing the project idea. The following table can be used to summarize the use of the ICT tools and objectives of the proposed project in relation to the projects discussed in the literature review:

Table 1 the use of the ICT tools and objectives of the proposed project in relation to some ongoing projects.

		ICT Tools used for the projects		
		Internet	Mobile Telephony	Accessing internet through mobile telephones
Target user groups	Rural people (in general)	Pallytathya	VPP	GPCIC
	Rural Farmers	e-Choupal, KACE, B2Bprice.com	Proposed Project	

From the literature review, it is assumed that mobile ICTs hold the potential to be used in the development activities. In the rural environment of a developing country, community based use of the ICTs can be more effective. Mobile telephony services, with a faster growth and better penetration rate can provide better access for the rural people of a developing country like Bangladesh.

3.2 Description of the project

In this research a planned intervention by the researcher himself has been monitored and evaluated with the aim of discerning whether or not that action can produce the expected consequences. From the intervention and subsequent evaluation the researcher intends to develop an understanding that can resolve some of the present concerns and confusions regarding the usability and effectiveness of the ICT tools in the agricultural development. Gronhaug and Olson (1999) argue that action research can enlighten clients' problems. Through actions and reflections, clients' reality construction and knowledge base can be changed. In this research the clients are the rural farmers. They have their experience based knowledge from the actual context. The researcher's theory based knowledge can be used to more precisely identify the actual problems and clarify the implicit assumptions.

In Bangladesh a number of NGOs have initiated community based information centres. By and large all these centres are operated to take the ICT facilities to the remote rural community. We decided to work with one of the outlets run by D-Net and its partner organization under the Microsoft Unlimited Potential project. However, Grameenphone, the leading mobile telephony service provider in Bangladesh operates more than 400 similar outlets in association with Katalyst, a DFID and Swisscontact funded concern. Unlike the project run by D-Net, which is an NGO-driven model, Grameenphone and Katalyst's GPCICs (Grameenphone Community Information Centre) are set up by the rural entrepreneurs. We decided to work with both of the projects to develop a better understanding about the nature and operation of such information centres. Again, the two centres, operating in different locations were selected to analyze the socio-cultural and geographic issues pertaining to the farmers' behavioural and usage patterns. One of the locations is around Shaturia sub-district of Manikganj District, situated 50 Kilometre away from the city of Dhaka. The other one is around the Joyag Union of Shonaimuri sub-district of Noakhali district. This area is about 130 Kilometre away from the capital city.

Step-1 Planning stage: The bottom-up approach for introducing ICT enabled projects and the appropriation of different ICT tools in accordance with the needs and cultures of the rural populace have been stressed in a number of literatures reviewed for this article. The project carefully takes this issue into consideration. In order to

delineate this issue, the farmers' views and opinions need to be examined. The initial planning and preparation started from 1st week of January, 2008. The first one month was engaged to mingle with the farmers and learn about their problems. The in-depth interviews and FGDs were complemented by researcher's own observation to comprehend farmers' life style, their means for communication, their problems with regard to different economic and social issues. Farmers' opinions regarding the use and availability of fertilizers, use of technology in farming and non farming activities were gathered. Their perception about mobile telephony technology was also investigated during this period. The very first task in this regard was to find out farmers who never owned and used mobile telephone. However, some of the farmers selected have family members who possess mobile phones. This happens particularly with the senior citizens among these farmers' communities. Their sons, daughters, sons-in-law and daughters-in-law own and use the mobile phones. All these people have the financial solvency to have their own sets though. The planning stage also involved forming groups among the farmers. Five groups of farmers each comprising of five members have been formed in each of the areas. Initial plan was to make each group of ten members. However, the number was changed to five. This is due to the fact that smaller groups is easily manageable. Again, a more focused understanding becomes possible with smaller intervention groups.

Step-2 Intervention stage: After the FGDs were conducted five groups were formed each comprising five farmers. The groups were formed on the basis of geographic, religious and family connectivity so that the farmers in a particular group could comfortably get along with one another. Each of the groups was given a mobile telephone with connection. Each of the members of the group had the opportunity to keep the phone for two weeks. As a result all the group members used the mobile telephony technology at least for two weeks. The intervention continued for 10 weeks till end of April. The groups were met once in two weeks.

Step-3 Reflection: Weekly meetings within the groups and among the group leaders were regularly monitored to find out different aspects of the use of mobile phones by the farmers. The following issues were examined through the meetings:

- What are the problems they face while using mobile phones?

- What are the purposes they use the mobile phones for?
- What is the daily/weekly frequency of use?
- How helpful the local information centres are?
- Is there any impact of seasonality on the use of mobile phones?
- Is there any change of their initial attitude toward the use of the mobile telephony technology?
- How comfortable they are feeling while sharing knowledge and information?
- How comfortable when they interact within the group and across the group?
- What are the benefits they have been receiving?
- Finally whether the mobile telephony technology has been helping them to overcome the obstacles to get information (mentioned during the initial FGD) or not? If so, then how? If no, why?

The researcher conducted FGD and in-depth interviews with the group members and the person who possessed the mobile telephone separately. The researcher also took note of the informal discussions took place among the group members. Based on the discussion with the farmers the researcher checked back the theories so that more relevant theoretical explanation could be explored. Also the outcome from the discussion with one group was checked with another group in order to develop a better understanding.

Step-4 Further planning and action: It was interesting to see whether they find this process helpful for developing a network through resource and knowledge sharing. Monitoring and evaluation also generated need for some special value added mobile telephony service for the farmers' community (i.e. Bangla SMS and voice messaging). The processes and methods of operation were fine tuned based on the feedback generated from the meeting and interviews. For example, the farmers remain busy during the day time. After the first week the meeting time was set during the evening.

Step-5 Final evaluation: The intervention has just been completed. It is going to take few months to transcribe the interviews and FGDs. All these transcribed data along with the researcher's diary notes will be analyzed by using computer aided software package (i.e. Nvivo). This particular paper is prepared on the basis of the

initial understanding gained from the diary notes and initial transcription of the interviews and FGDs. The paper would expect some theoretical guideline offered by the conference attendees.

3.2 Research philosophy

The objective and methodology of the research requires qualitative tools to be used. The interaction between human agents and technology requires the social and cultural context to be taken into consideration. My personal observation and diary notes are used to complement the findings gained from interviews and focus group discussions. I have decided to take up an ethnographic approach in analyzing the context. However, the basic philosophy of the research, according to my opinion needs to be guided by phenomenological approach. I believe the farmers' experience regarding the use of the mobile telephony and both complex and subtle issues pertaining to other spheres of their life need to be investigated to develop an understanding about how this technology is being appropriated. Again, the actual use of the mobile telephony by the farmers is the result of their conscious experiences. I am still learning the subtle differences among different paradigms of qualitative research approaches. I hope the reviewers and the colloquium attendees will offer me advice in this regard.

4.0 Conclusion

5.0 Findings

5.1 Before the Intervention:

D-Net partnered with Gandhi Ashram, a local NGO to set up the Pallytathya Kendra (rural information centre) at Joyag, Noakhali, as a part of the Microsoft Unlimited Potential Project. The location is situated at the South East corner of Bangladesh, around 120 miles from the capital city of Dhaka. While the salary of the employee is paid by D-Net, Gandhi Ashram provides the infrastructure and logistic support. According to the Gandhi Ashram authority 90% of the project cost is covered by them, and D-Net pays for the rest.

GPCIC is a joint project initiated by Grameenphone, Katalyst (funded by a donor consortium comprising of SDC, DFID and SIDA) and Grameen Telecom. GPCICs are set up in different corners of the country with an aim to providing internet connectivity and other ICT facilities to rural areas. Unlike, the Pallytathya Kendra, GPCIC is an entrepreneurial project. It is expected that the young entrepreneurs of rural Bangladesh can develop profitable ventures by selling ICT services. Grameenphone provides the GSM/GPRS/EDGE infrastructure and other partnering organizations provide training and content support for the entrepreneurs. A typical GPCIC hosts a number of ICT tools including computers with internet connectivity through EDGE technology, telephone, photocopier and printer. There are more than 400 GPCICs across the country. We chose the one based in Shaturia Upazila (sub-district) of Manikganj district 40 miles from the capital city of Dhaka. The following table presents features of GPCIC at Shaturia and Pallytathya Kendra at Joyag:

	GPCIC at Shaturia	Pallytathya Kendra at Joyag
Nature of the location	At a semi-urban area	Remote rural area
Source of finance	Entrepreneur's own investment	Gandhi Ashram Trust and Microsoft
Technical expertise and support	Grameenphone	The trained staff of Pallytathya Kendra takes care of trouble shooting.
Service Offerings	E-mail, web based fax, online chatting, photocopying, electronic top up facilities for mobile phones and computer training.	Computer training and Pallytathya Help Line services (phone based solutions for public health related issues and non farming businesses for rural women).
Duration of operations (till January 2008)	One year	Less than one year (seven months)

Farmers' information needs:

Our research set out to investigate the information needs of the farmer community of Joyag and Shaturia. The following issues have been identified:

Prices and sources of the fertilizers: In Bangladesh fertilizers are subsidized and the government fixes the price range to prevent any iniquitous price manipulation by dealers. The local government and administrators are responsible to monitor the distribution of fertilizers. Still, we found that the price and availability of fertilizers are major concerns for farmers. As one of the farmers tries to explain the situation:

“I need to put up to twelve kg fertilizers in my land. We used to use the organic fertilizers in the past days and 5 kg chemical fertilizers were enough.”²

One farmer told us about the prices and availability of fertilizers:

“No, we do not get it (fertilizer). Even if we get, the price is too high. There is a particular variant of fertilizer, known as red fertilizer, happened to cost us TK12 last year. Now the price of the same fertilizer is TK28-TK30. Now you can imagine how difficult it is for us.”

Farmers believe the local government members and dealers also create artificial crisis. Nepotism and corruption make fertilizers even more difficult to hard.

Information about the pests, crop diseases and cultivation methods:

In recent times the farmers of Joyag and Shaturia are facing perennial problems with the pests and plant diseases. They are not very familiar with many of the pests and the plant diseases they come across these days. They believe the following reasons are causing these problems:

The change in the climate: In Bangladesh the nature has been behaving in an uncharacteristic manner for the last few years. The agricultural system in Bangladesh is very much dependent on the weather and the climatic pattern. Any change in the climatic condition results to plant diseases and pest attacks. This year when the fieldwork was conducted, the winter approached much later than the usual case. Normally the winter starts from middle of December. This year the winter did not arrive till middle of January. Through out the month of February it was overcast and quite cold. February is the beginning of the Bengali spring though. The farmers believe that this uncharacteristic behaviour of the climate caused strange plant diseases which they are not familiar with. There were also some strange pests in the field.

“This year we are unable to understand the nature's characters. We are not having any spring this year.”

² All quotations have been recorded and translated from Bengali by Mr. Dey

“We come across new pests. The pests have destroyed the potato field. Even in the corn field there are some strange pests”

- a. Cultivation of the hybrid crops and the use of the chemical fertilizers: The elderly farmers believe that the pest attack and plant diseases have increased since they started cultivating the hybrid crops and using the chemical fertilizers.

Most of the farmers are semi-literate or illiterate. They do not have any academic knowledge about farming and cultivation. There are employees of the Ministry of Agriculture of the Government of Bangladesh to help farmers in resolving these problems. These people are known as block supervisors. The entire Joyag union has got only two block supervisors and in Shaturia the number is five. In both cases the number is very inadequate compared with the total number of farmers. Hence, contacting these block supervisors is a major concern for the farmers.

Output price information:

The structural and financial relationship in the agricultural production system (between farmers and landlords, between farmers and brokers and farmers and money lenders) is a major impediment for farmers’ empowerment and welfare. Farmers often take loans from the solvent people in their area. These people are often their landlords and brokers (who work for the bigger wholesalers) for the yields. These people are also their customers. Farmers need to borrow money from these individuals for different reasons. At different stages of the cultivation they require hard cash to buy fertilizers, pesticides, to pay off diesel and electricity bills. Particularly by the end of the season they need financial support to pay off all the debts, incurred during the cultivation period. They also need to pay the daily labours that help them during the harvest season. When they are in dire need of the hard cash they borrow money from the landlords or the brokers.

“They pay (the brokers) us less; often they cheat on us while measuring the crops. Basically at the end of the cultivation season we need hard cash. We need to pay debts; we need to pay the labour. This is why we do not wait for anything. Say even if the normal price of one maund³ of rice is TK500, we often end up getting TK400 per maund due to such pressure”.

³ a local unit of rice, equals to 37 kg approximately

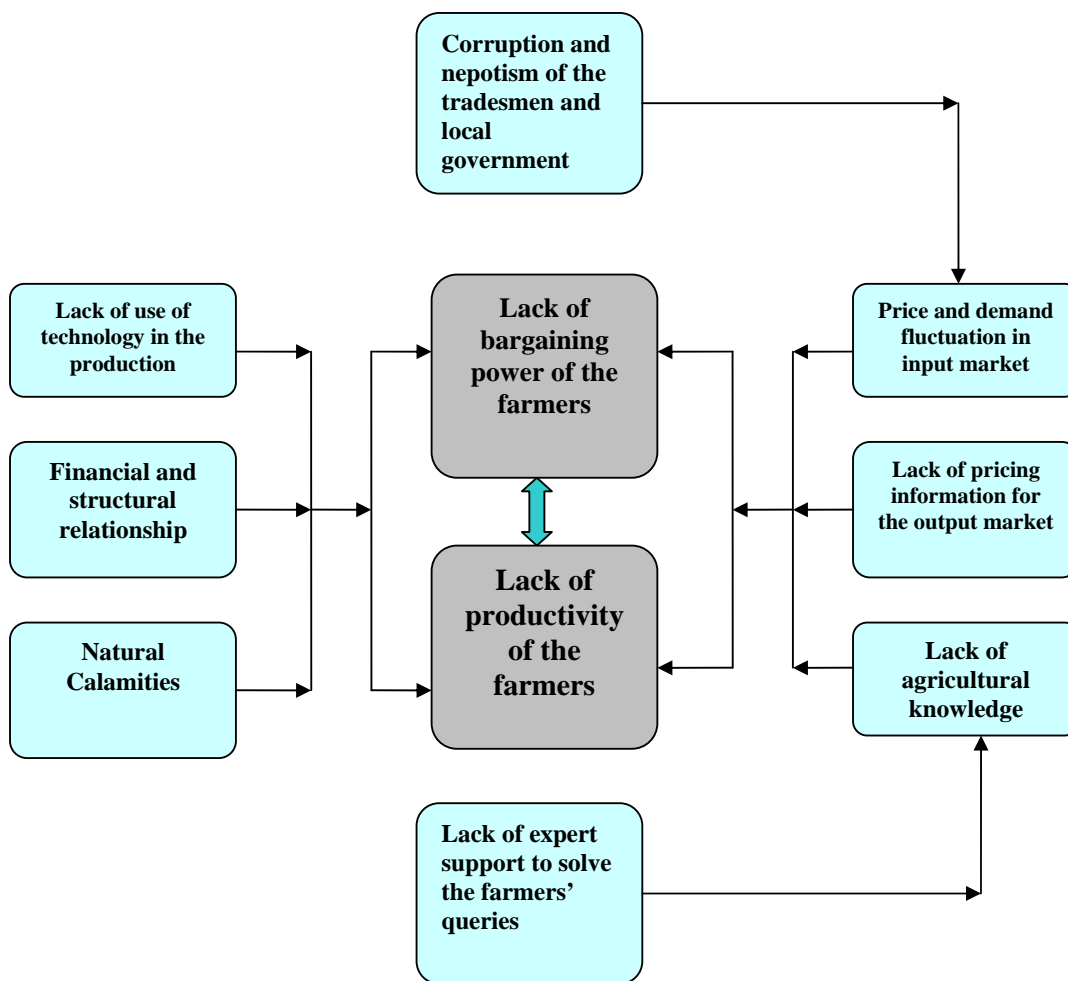
If the farmers had not taken any loan from any of their customers, they could have been in a position to sell their produce at the market price. It is often argued that through the use of the ICTs farmers can learn about the wholesale price and thereby can achieve superior position in terms of bargaining power. This may be true for the fishermen and for the vegetable producers, may not be the case for the Bangladeshi rice producers, particularly the sharecroppers. They are least concerned about the wholesale price. Because:

- The traditional trading system: Traditionally the brokers of the big wholesalers or millers (who convert the paddy to rice) visit the village farmers. They move around from door to door to buy the produce. As a result often farmers do not have any chance to verify the price at the local market. They normally discuss within themselves to find right price of the produce though.
- Risk of keeping the paddy/rice for longer time: Farmers are often concerned about keeping the paddy/rice for longer period at their disposal. Rain water, rats and insects may damage their hard earned harvest. Hence they prefer to sell off the produce as soon as they can.
- Risk of taking the produce to the bazaar: Farmers often cannot afford the cost of taking the produce to the nearest bazaar. The financial risk is quite high as well. This is why they prefer to sell it from their door steps.

After the research our initial understanding about the problems pertaining to the agricultural system of Bangladesh can be recapitulated.

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Figure 2 Problems of the agricultural structure of Bangladesh (an extension of the figure 1)



The diagram reflects an understanding developed through the needs assessment. The findings have made an extension of the conceptual framework developed through in the literature review section (Fig-1). The lack of expert support to solve farmers' queries does not help them improve their knowledge and expertise. The number of government employed block supervisors is too insufficient to support the large farmer community. As a result farmers are unable to tackle vital problems like pest attacks and plant diseases.

Our theoretical understanding has identified the crisis of inputs including fertilizers as a major problem for Bangladeshi farmers. The fieldwork has found that the nepotism and corruption by the members of the local government and dealers have worsened the fertilizer crisis.

The findings of the research also reveal why farmers do not have much of bargaining power in the output market. The existing structure of the agricultural trading system does not offer too much of space for the farmers to exercise their bargaining power. They are tied and trapped within the system where they have little to do. Our intervention made an attempt to find how and to what extent these problems encountered by rural Bangladesh farmers can be addressed through telecentres' services.

After the intervention:

GPCIC and Pallytathya Kendra's operations yet to go past the adaptation level of the stages of the diffusion of technological innovation (Fig-3 of Appendices). Both of the centres were within the first year of their operations when the project was initiated. The duration of their operations was not long enough to make any significant impact on the life of local residents. Farmers, being the target users, were yet to get these operations embodied in their daily life and practices. The structuration model theory can be used to investigate whether or not farmers' practices can be facilitated by the current or potential services of these telecentres' services. In this regard we need to register their current service offerings and their scopes within the socio-economic practices.

Current service offerings:

The current service offerings (till February 2008, before the start of the intervention) do not have any mechanism to meet the aforementioned information needs of farmer community. Disseminating market price information for agricultural commodities remains as top priority for both of the projects though. Neither of these centres took any initiative to inform farmers about the prices of fertilizers or solution of plant diseases till the intervention for this project was initiated.

Intervention:

The intervention initiated two undertakings:

1. Empowerment of the farmers through networking and sharing of information
2. Different applications of mobile telephony and other ICT tools were used to address farmers' needs.

Empowerment of the farmers: Our project has identified that the following measures can facilitate the farmers in resolving this problem through the support of telecentres (GPCIC and Pallytathay Kendra):

1. Create a network among the farmers: Farmers can network themselves and get connected with the telecentres. The centres have to be equipped with the local information (i.e. sources and prices of the fertilizers) so that they can act as a hub for input and output prices. This is not just going to be a one way communication. Farmers can also inform the centres about the sources and availability. Hence, if one farmer comes to know about any cheap source of a type of fertilizer the other farmers will also come to know about it. If farmers know about the cheaper price of the fertilizer they will not be easily charged higher price by dealers.
2. Good governance: If there is any violation of the government regulation (e.g.: nepotism by the member of the local government or an artificial price hike) farmers can let the centres know about it. Farmers feel themselves quite helpless in front of the powerful nexus formed by the local government bodies and dealers. Farmers' opinions in this regard:

"We know the government provides subsidy. But I think the subsidy does not reach us. The dealers and the distributors take it away. It is also clear to us that the members and Chairman of the local government create a nexus with the businessmen. This is why we face the fertilizer problem. The local government needs to be honest and strong enough to tackle this situation"

"In our area Union member does not treat everyone equally. He prioritizes the people who are close to him. Often many of the ordinary farmers' names are not registered for fertilizers. Hence they do not get fertilizers."

The telecentres can be a place where farmers can resort to with their complaints. The Pallytathya Kendra GPCIC can report these issues to the concerned Government officials, Katalyst, D-Net and other NGOs and lobbyist groups (i.e. press and electronic media). GPCIC at Shaturia does have a very good contact with the press. The local press reporters get their news report composed at the centre and send it to Dhaka through e-mail.

Information about the output price:

Farmers' network can be proven useful to get the output price information as well. The Pallytathya Kendra and GPCIC can collect price information from the nearest

wholesale markets. Farmers can collect this information from other farmers as well as from the centres. This service is currently not available with any of these centres. However, they can play a more useful role for the farmers who deal with vegetables, poultry and fisheries. They normally do not sell their crops in advance against loans. The prices of these agricultural commodities at wholesale markets can enable the producers to decide where they can go with their produce.

The Pallytathya Kendra and GPCIC can encourage and facilitate farmers' networks. Farmers can get connected within themselves at the same time they can get connected with the centre through mobile telephony. The intervention enabled the farmers to network in this way. Through this interconnection farmers can exchange information. The following two diagrams show that small groups of farmers (G1, G2, G3, G4 and G5), each comprising of individual farmers (F1, F2, F3, F4 and F5, led by Group Leader GL) can develop network.

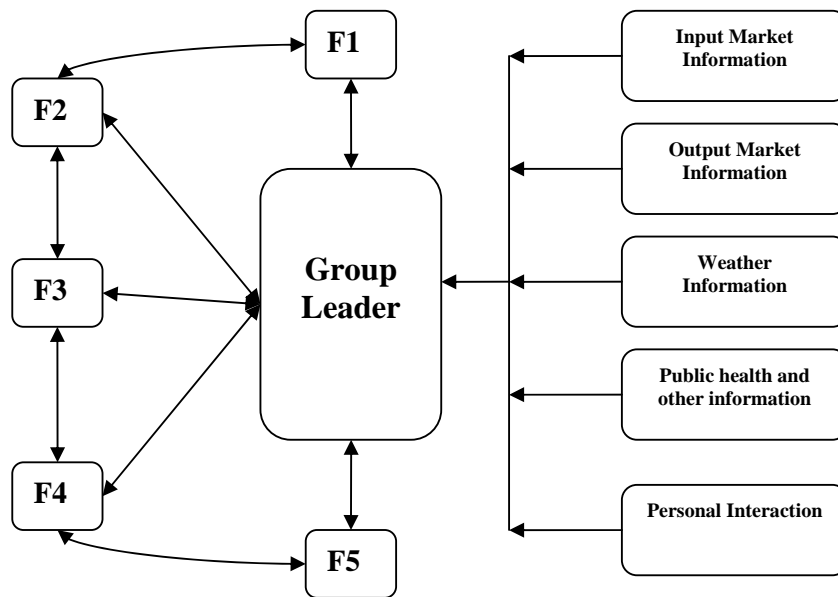


Figure 3 Farmers' interaction within the group
 F1, F2, F3, F4, F5- Individual farmers led by the group leader.

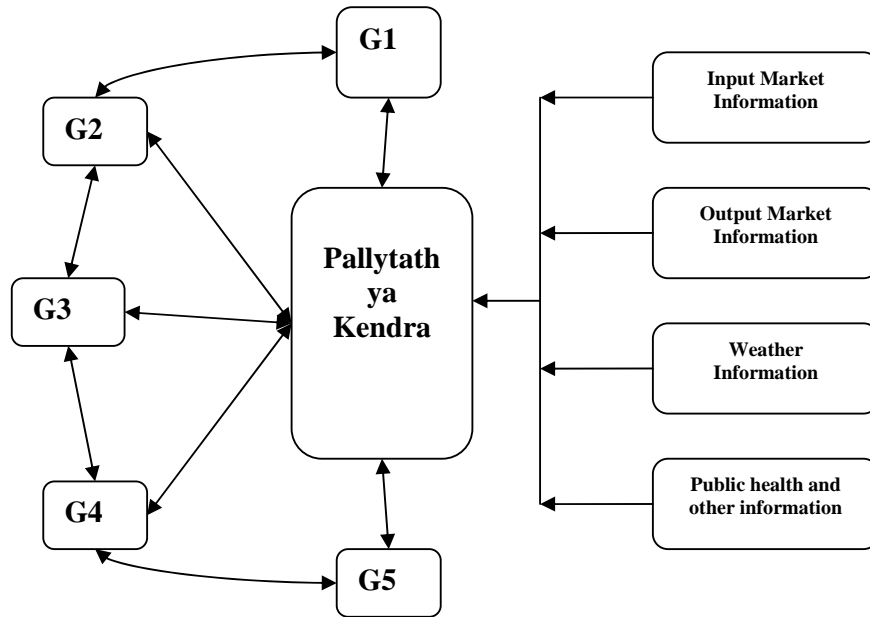


Figure 4 Groups' interaction with the Pallytathya Kendra

Exploring the utility of different ICT applications

- Communicating with experts through voice services, text and picture messaging and e-mail: They could receive the queries of farmers and send them to expert personnel for solutions. For the pest and plant diseases they can take photographs and send them to the concerned authority. The centres can also connect farmers with block supervisors for quick solutions. The photograph of the strange pest in the potato field of Shaturia was sent to Dhaka through internet to find a solution.
- Pallytathya Kendra already has a service named Pallytathya Kendra help line. However, helpline currently offers services about the public health and capacity building of the rural women, not on plant health. Perhaps an SMS/MMS service would have been helpful in this regard. Farmers could send text messages with a problem (sometimes with an accompanying photograph), and receive a text message in reply. But the institutions would need to be set up to do this fairly quickly, in say a day or two.
- Advisory Software: Pallytathya Kendra has a particular software package named "Jion". The package answers frequently asked questions for farmers. Farmers are more or less aware about the cultivation methods described in the software. The pests and diseases described in the package are also the

common ones. Hence, this particular package needs to be extended before it becomes very useful for local farmers. In particular Pallytathya Kendra would need to develop solutions for the local agricultural problems. Agriculture across Bangladesh does not involve standard or common problems. The climate, land composition and demography vary from place to place. Any software package to cater the needs of the farmers has to be developed with a bottom up approach. It is expected that GPCIC can disseminate agricultural information from the website www.ruralinfobd.com. During the fieldwork project the website was still under construction. However, when this paper is being prepared (16th September, 2008) remarkable development has been noticed in the FAQ section that answers farmers' queries. The website offers solution in Bengali in response to farmers' questions. In the website it is not clear though how quickly the answers were delivered.

Farmers' interaction with the telecentres' services and social structure:

Farmers have their own way to accomplish their tasks. They have been following certain traditions and practices for years. Farmers have their own way to collect information about fertilizers, pesticides and appropriate prices of their produces. They have been following certain processes to get fertilizers and buyers for their produces. Farmers tend to move from one bazaar to another to learn about the prices and sources of fertilizers. We observed that farmers easily accepted the use of the mobile telephony to enquire the prices of fertilizers. This was possible, because the traditional practice could easily be facilitated with the use of the technology. Farmers were still contacting the same people (other farmers or the dealers) about the same issue (prices and sources of fertilizers). Without changing the human agents (farmers and the people they contacted for information) and the nature of communication, a cheaper and easier mechanism could be developed with the help of the technology. As one of the farmers happily accepts the usability of the mobile phone:

"Yes now I understand. If I go to three different shops it costs me the whole day and can cost me 50 TK for the rickshaw fair. Now I can save this time and 50 TK by making three phone calls costing me maximum 9 TK."

Here we can see that social structure and the use of technology are facilitating each other. The use of the technology gets embedded within the social practice and generates an important and new dimension of its use. This can be attributed as a

typical example of the appropriation of the mobile telephony within the social structure of the rural Bangladeshi life.

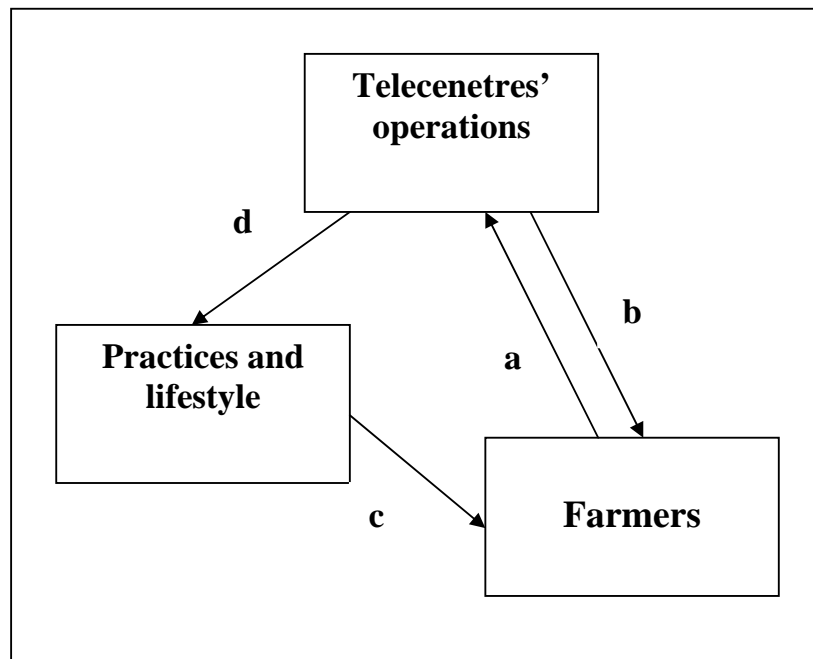
However, not all the traditions and practices support simple technological intervention. We noticed that normally at first farmers try to solve a problem of their crop (pest attack or disease) with the help of their own experience and knowledge. If they fail to get any solution they get in touch with their neighbours and other farmers. Getting help from the block supervisors or government officials is not very easy. As some of the farmers argue:

“We do not think so. Getting access to the block supervisors is not a concern; it is the people that matter. These people will keep us dodging. We do not think the mobile phone (as a means to communicate with the block supervisors) can make any difference in this regard. You even will not get the block supervisors in the office. The agricultural officers and block supervisors take ages to test the soil and give the report. You cannot expect anything from these people.”

“My main problem is the plant disease that has attacked the eggplant field. The leaves are getting dry. Gradually the leaves are withering. I have been to the block supervisor who could not offer me any solution.”

“It is not easy to get hold of them (the block supervisors) first point. We actually try to find the solution by consulting the fellow farmers first before we resort to block supervisor or any other expert persons. We share our experience and thereby try to get the solution.”

As a result even today farmers try different measures to overcome crop diseases or pest attacks until they get the success. In most cases these measures are either learnt from their experiences or suggested by their fellow friends/neighbours. Now, the use of the software package like “Jion” or getting photograph of the plant/pest and sending it to the nearest telecentre may require a total change of the traditional process. This is why the intervention was not very successful in this regard. A technology is embodied in a set of social institutions to make it work. So, e.g., the use of chipboard requires training courses for carpenters and demonstration factories, otherwise carpenters will use nails or screws, and split the panels. According to the ICT value chain (Figure-2, Appendices) a technology adaptation enables users to get new information through new communication patterns. If the new communication pattern is not preferred by the end users they will not be interested to adapt to the technology.



- a – Farmers’ intention to adoption to telecentre services.
- b – Technology facilitating farmers
- c – Lifestyle and practices influencing farmers to get benefits from the technology
- d – Telecentre changing the practices and lifestyle

The traditional practices and lifestyle influence the interaction between farmers and telecentres’(c) and its impact. Because farmers are tied in the vicious cycle of money lending and sharecropping, there is less chance that the operations of the telecentres can help them to have much of bargaining power to set the farmgate price for their produces. Farmers who live adjacent to the village bazaars are always in touch with the market prices. Hence, their lifestyle and practices do not get much of value addition through the use of telecentres, as far as getting market price information (for output) is concerned. During the intervention farmers started to collect fertilizer price information or solution for pest attack by using mobile phone and/or asking the telecentre contact persons. Thereby the operations of the telecentres made a change in the overall practices and lifestyles (d). In order to understand a and b we need to investigate factors determining farmers’ behavioural intention:

6.4 Farmers' perception about the telecentres:

If we use the technology acceptance model and relevant theories to evaluate why farmers do and why they do not intend to adapt to the telecentres' services, the following major issues can be identified.

1. Farmers' perceived value: Here there are two factors involved:
 - a. Perceived usefulness: Farmers need to have the belief (organized pattern of knowledge) that the centres can satisfy their information needs. In other words, farmers need to believe that the centre is going to be useful for them. It has been observed that the training programmes of the centre are preferred by local young population. They consider these training courses will be extremely helpful for them to secure overseas employment opportunities. As a result local teenagers and young adults (many of their fathers are into farming activities) assemble at the centre. One of the trainees told the researchers:

"I came to the centre to learn computer. I believe this learning would be helpful for me in future. I pay BDT1200 for the entire course, which is reasonably expensive. But this is worth it."

- b. Perceived ease of use: The services farmers receive from the centres need to be easily available. The "Jion" package or ruralinfobd.com, answers many of the basic agriculture related questions. However, farmers do not know how to operate the laptop or access to internet and they may not have enough time to visit the centre quite often. As, accessing the computer based learning mechanism is difficult and inconvenient for them, farmers are less interested to avail of this opportunity. Farmers even do not know what computers can do for them. As they register during the interviews:

"What can I do with the computer?"

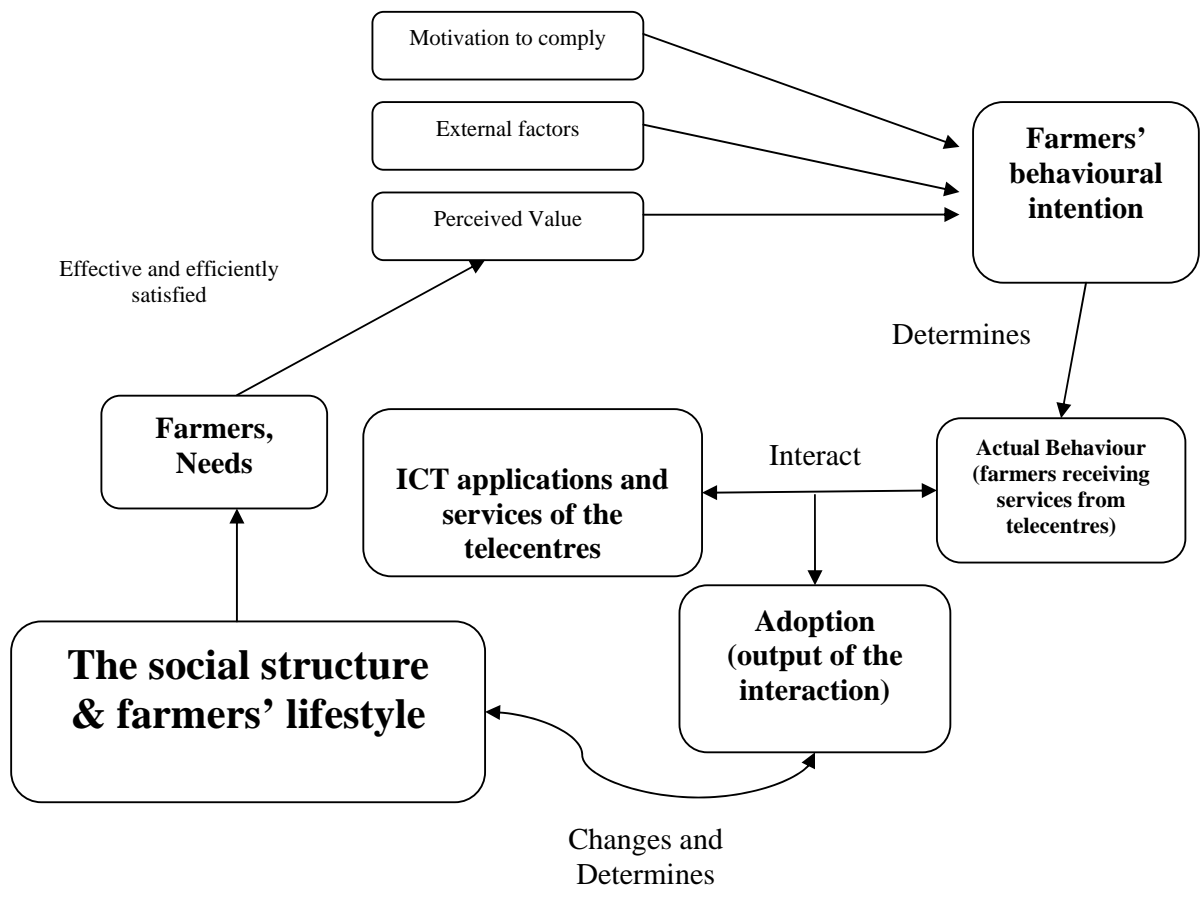
"No I have not used the computer at the Gandhi Ashram, because when we are free the office is closed. And we do not have time to go to the Gandhi Ashram and explore the computer."

"No I do not have any clue about what they (computers at Gandhi Ashram) are for".

In Shaturia photographs were taken and it took two weeks to get a reply from the concerned persons of Katalyst, based in Dhaka. By that time the entire

potato field was destroyed. The delay in getting response made the farmers sceptic about the effectiveness and efficiency of the process.

2. External factors: The following issues can be mentioned in this regard:
 - a. Opinion leaders and reference groups: Mr. Raja of Gandhi Ashram has successfully created farmers' groups in the region over the last couple of years. It was observed that the farmers respect the suggestions given by Mr. Raja. Mr. Shiplu, an educated young person of Shaturia also has similar level of command over his neighbouring farmers. An opinion leader like Mr. Raja or Mr. Shiplu can make an impact on farmers' behavioural intention. Again farmers are also influenced by the members of their reference groups (i.e. families, friends and relatives).
 - b. Culture: Bangladesh predominantly holds a collectivist society. We noticed that farmers feel comfortable to share information and other resources. Traditionally they consider it to be a moral and social responsibility to extend cooperation to their friends and neighbours. They share tractors, they share spray machines and they share their knowledge and experiences. Community based use of technology is very much welcomed by them. Telecentres can facilitate their social needs and can also use this sense of collectivism in making their services popular. Our model of developing farmers' network will certainly fit into this particular cultural attribute.
3. Motivation to comply: From the interviews and FGDs it was evident that the farmers tend to cooperate with each other and they conform to their groups' norms. Initially few of them had some doubt about the nature of this project and the usability of the mobile phones. Later on they complied with the other member of their groups and took part in the project.



This diagram is an overall understanding about the entire evaluation project. We can segregate the entire evaluation project into a number of sequential stages:

Stage-1: Understanding about the social structure and lifestyle and needs assessment (Analyzing the readiness): The operations of telecentres and their interaction with farmers are just part of their social structure and lifestyle. Social structure and lifestyle can determine how successful an adoption to a technological application can be. Again the social structure and lifestyle constitute needs. For example, the use of tractor has increased the demand of chemical fertilizers and thereby has created farmers' needs for fertilizer prices and availability information. However, needs may be created because of other reasons like climatic conditions.

Stage-2 Understanding the factors determining farmers' behavioural intention (Analyzing the intermediate and adoption): In this regard Farmers' perceived value, external factors (i.e. opinion leaders, family members) and their motivation to comply are assessed with regard to their behavioural intention to use the services of the telecentres. Perceived value depends on how effectively and efficiently their needs are satisfied.

Stage-3 How the interaction can facilitate the social change (analyzing the impact): This phase tries to find out how the interaction between farmers and telecentres make and/or initiate change (if they can at all) in the social practices.

It is important to mention it may require quite a long time to experience any change in social structure, precipitated by ICT enabled intervention. Again, if there is any change in the lifestyle, there can be further problem resulting to some additional needs. For example if farmers get used to enquiring about market price information through mobile telephony, quick and remote top up of the mobile credit will become a crucial need for the agricultural marketing. Hence this evaluation model accepts the dynamic nature of social change and its relation with ICTs.

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