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# Analysing appropriation and usability in social and occupational lives: An investigation of Bangladeshi farmers' use of mobile telephony


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# **Analysing appropriation and usability in social and occupational lives: An investigation of Bangladeshi farmers' use of mobile telephony**

## **Abstract:**

**Purpose:** The purpose of this paper is to understand how Bangladeshi farmers interact with mobile telephony and how they negotiate the resulting difficulties. In doing so the paper identifies how farmers integrate mobile telephony into their daily lives and what factors facilitate and limit their use of mobile telephony.

**Methodology:** Ethnographic observation, interviews and focus group discussions collected through four months long fieldwork conducted in two remote areas of Bangladesh.

**Findings:** It was found that Bangladeshi farmers' use of mobile telephony is inhibited due to language barriers, a lack of literacy, unfamiliar English terminologies, inappropriate translation to local language (Bengali) and financial constraints. However the social, occupational and psychological benefits from mobile telephony motivate them to use and appropriate it through inventive use and adaptation

**Research implications:** The findings suggest that current understanding of usability needs to be interwoven with that about the appropriation of technology in order to develop a better understanding of the use and consequent integration of a technology in daily lives.

**Practical implications:** This article adds to the argument for a bottom up approach for ICT enabled intervention in development activities and for the mobile telephony manufacturers and network providers it contributes to understanding of the rural consumer market of a developing country.

**Originality/value:** The article presents an original conceptual diagram that combines the concept of usability and appropriation.

**Keyword:** Mobile telephony, usability, appropriation, farmers in Bangladesh, and ethnography.

**Paper type:** Research paper.

## **INTRODUCTION:**

The rural population of less-developed countries which is estimated to be approximately 3 billion constitute a huge potential market for different consumer durables including mobile telephony. However, these rural populations also contain the highest concentrations of poor people with rural poverty accounting for over 60% of poverty worldwide. There is evidence to suggest that information and communication technologies (ICT) have the potential to contribute to poverty alleviation and wider socio-economic development. Mechanisms identified include: enabling disadvantaged communities to meet their agricultural information needs (Dey *et al.*, 2008); facilitating money transfers and enabling entrepreneurs to expand their businesses (Donner & Escobari 2010). There is also evidence that the take-up of mobile telephony in the developing world has grown rapidly in recent years (Rashid and Elder, 2009).

In order to improve the contribution of mobile telephony and other forms of ICT to rural development, it is necessary that both large mobile telephone operators and development workers understand how groups such as rural farmers might make effective use of mobile telephony and dynamically integrate it into their lives. Existing research based on the technology acceptance model, usability studies and the appropriation literature does this to some extent, but it is suggested here that a better understanding of the appropriation of technology is required. Using an ethnographic approach the present paper seeks to identify factors contributing to the usability of mobile technology within the social and occupational spheres of rural Bangladesh and to explore its appropriation in farmers' daily lives by studying the dynamic processes through which a group of Bangladeshi farmers learnt to use mobile 'phones in farming and family practices. Groups of farmers in two regions in Bangladesh were supplied with mobile 'phones. Their use was studied over ten weeks to identify what problems they encountered, what factors constrained or facilitated their interaction, how they overcame those problems and shortcomings and how this interaction with mobile telephony initiated changes in their social and occupational lives.

## LITERATURE REVIEW

By engaging with a technology, users develop cognitive and affective perceptions about it and come to terms with its functions, utilities and difficulties. Usability studies investigate this overall user experience and explain the adoption process. However, people's use of technology may go beyond adoption as they often integrate it into their lives and, in doing so, associate meanings and perceptions with its use.

In order to understand how a technology is adapted to users' needs and embedded in their lives, it is necessary to look beyond adoption to technology appropriation. This allows account to be taken of new unintended uses and the invention of new practices as well as the contribution of technology to the modification of existing practices and structures.

### *Usability: beyond laboratory studies*

The term usability was coined in the early 1980s to replace the term 'user friendly' which came to be regarded as too product centred and which failed to reflect the diversity of user needs and characteristics. In an early paper, Gould and Clayton (1985) sought to identify design characteristics which if followed would lead to systems which were easy to use. These they identified as an early focus on users, empirical measurement of performance and iterative design whereby the system is modified, tested and modified again.

Nielson (1993) narrowed the concept of usability and identified it with ease of use. In his schema, the overall acceptability of a product depended on its social and practical acceptability. Practical acceptability was a function of characteristics such as cost, usefulness, reliability, and compatibility with existing systems. Usefulness in turn was regarded as a function of utility and ease of use. Bevan (1995) argued for a broader concept of usability synonymous with "quality of use". This he defined as the extent to which a product satisfies stated or implied needs when used under stated conditions.

The subjective aspects of usability in the form of behavioural and emotional factors were emphasised by Gorlenko and Merrick (2003). They argued that, from users' perspectives, it is not only the quality of an application which matters but also the quality of their interaction with the application. Hence, it is difficult to identify the universal usability of a product, as usability varies with the skills, knowledge and experiences of different users (Han *et al.*, 2001). Usability problems for an educated urban user are likely to be different from those for rural less educated individuals.

Dillon (2001) was also concerned with the behavioural and emotional aspects of usability. He acknowledged that the definition of usability as the effectiveness, efficiency, and satisfaction with which specified users can achieve specified goals in particular environments as incorporated in ISO 9241 provided the basis for a highly grounded operational approach. However, he argued that existing measures were not capturing all that was of interest. User experience was made up of actions, results and emotions. There were weaknesses in the measurement of all these elements with emotion being totally ignored. Dillon proposed an extension of usability through three different levels of user experience: process, outcome and affect. These require usability to be elicited through user experience which consists of what a user does, what s/he achieves and how s/he feels. Dillon claims that this approach extends the scope of usability. In particular, by exploring the terrain of user emotions, it moves beyond ability to use and into willingness or desire to use.

Throughout the usability literature, there is a tension between a narrow focus on user performance when interacting with an object, and wider considerations of the context, including user goals, skills and emotions, and the physical and social environment. The limitations of the narrow focus become clear once one starts to study the introduction of technologies into underdeveloped areas, most recently in connection with the application of mobile telecommunications for development.

### *Mobile telephone & usability*

In recent years, usability issues for mobile devices (including laptops and palmtops) have received some research attention. While some studies have focused narrowly on usability issues (Hagen *et al.*, 2005; Gorlenko and Merrick, 2003; Zhang *et al.*, 2009), others have been concerned with the search for appropriate methodology (Nielsen *et al.*, 2006; Berg *et al.*, 2003; Duh *et al.*, 2006 and Kjeldskov and Graham, 2003). Attempts have also been made to identify the dimensions of usability related problems and their remedies in order to develop an understanding of how and why public perception of mobile telephony is shaped (Palen *et al.*, 2000).

Kjeldskov and Graham (2003) found that mobile human computer interaction (HCI) research still relies heavily on the laboratory based experiments. Salzman *et al.* (2001) argue that, in HCI research, there is limited analysis of the social, cultural and environmental influences that affect adoption, design and usability. Research on the use of mobile 'phones also needs to

step out of laboratory as it is important to observe how they are actually used in different locations and in different states (Duh *et al.*, 2006).

All of this suggests the need for a widely defined conception of usability entailing field measurements, contextual understanding and learning processes. This is why we focus on the observation of how people interact with mobile telephony in a given social setting. However, although field-based usability studies explain some of the barriers to technology adoption, they do not tell us anything about the dynamic processes of user appropriation, in which people adapt their working and living practices to make effective use of the technology.

### *The role of appropriation*

The concept of appropriation is an active process involving the development of individuals' capacities which occurs during the use of the tool or artefact to support a person's activities and subsequent development (DeSanctis and Poole, 1994). The technology modifies or shapes human activity by offering new opportunities and constraints but the technology may also be modified during the process of appropriation, and used in ways and for purposes not envisaged by the original designers. For example, in many African and Asian countries the 'miscall' has both social and economic implications which were not thought about during the original design of the mobile telephony (Donner, 2008)<sup>1</sup>.

In spite of the growing research interest in the appropriation of technology, there is a paucity of integrated theoretical approaches. Isaac *et al.* (2006) have argued that the adoption and appropriation of ICTs are intertwined and cannot be theoretically separated. The model by Bar *et al.* (2007) effectively combines adaptive structuration theory (AST) (DeSanctis and Poole, 1994) and cultural appropriation (Jamison and Hard, 2003) to address the issue of how users tackle the conflict between their socio-economic conditions and the producers' original design. However, it assumed that users can only adopt and appropriate technology and account is not taken of the possibility that users may stop using technology after initial adoption. Carroll *et al.* (2002) developed an integrated model of mobile telephony appropriation in which this deficiency is rectified. Their model identifies three levels that gradually lead to the appropriation of a technology.

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<sup>1</sup> Miscall is the deliberate flashing or beeping when the caller wants to send a message or requests a call back without spending the call charge.

The first level is the stage when users first come across a technology and develop perceptions about its attractiveness. If they find it attractive enough they will buy (accept) it; otherwise they will remain uninterested and eventually ignore it (non-appropriation). The second level involves deeper evaluation through use. Users adopt and adapt the technology and generally explore its features. This is the stage where users experience the usefulness and usability of a technological application. There are two possible outcomes: appropriation and disappropriation (when users choose not to continue with the use). The third level captures longer term use of a technology. Finally, a technology is appropriated and integrated into users' everyday practices.

In their later work Carroll *et al.* (2003) identified usefulness as an appropriation criterion and ease of use as a factor influencing disappropriation. The usefulness of a technology provides impetus for adaptation, while lack of ease of use discourages appropriation.

Appropriation enables users to overcome or avoid the difficulties of a technology. It can often be inventive and can lead to uses which deviate from the designers' original intentions. For example, to get better network coverage villagers in Burkina Faso often climb hills (Hahn and Kibora, 2008). SMS (Short Messaging Services) is used as a cheap and convenient means to adapt and appropriate mobile telephony (Hormantshof and Power, 2005). This is a serendipitous phenomenon as the original design intention of SMS was to make the most of a spare channel in the mobile phone broadcast system in order to notify users that they had received voicemails or to provide account information without disturbing them.

People also associate meanings and perceptions with the use of mobile telephony and thereby develop their perceptual construct of the technology. For example, the *beeping* or *miscall* mechanism is used by the users in developing world to reduce usage cost (Zainuddin, *et al.*, 2005; Rashid and Elder, 2009). Mobile telephony can be perceived as a fashionable product and as a means to ensure safety and security (Campbell, 2007). It can also be a source of annoyance in public places such as mosques (Kriem, 2009). In Bangladesh making calls to random numbers has been tried by young bachelors to find their matches (Chakroborty, 2004).

While the literature on appropriation helps us to understand the dynamic cycles of technology use leading to acceptance or rejection over time, it has not generally done enough to capture

the dynamic processes through which people adapt technology and their personal, social and occupational practices to benefit from the use. Our research aims to explore how adoption and adaptation can make mobile telephony more usable to farmers in Bangladesh. It does so by addressing two main questions:

- What are the factors that influence the usability of the mobile telephony for rural Bangladeshi farmers?
- How farmers in Bangladesh appropriate mobile telephony to make it more usable?

## RESEARCH PROTOCOL

This paper reports on ethnographic research undertaken to observe farmers' use of mobile telephony in the rural settings of Bangladesh. The fieldwork, which was conducted over a four month period, aimed to find out how the social and cultural relationships and lifestyle interact with the mobile telephony to make it more usable for farmers.

Two different regions Shaturia and Joyag were selected for the fieldwork<sup>2</sup>. Local NGOs and telecentres facilitated access to farmers who did not have their own mobile telephone sets<sup>3</sup>.

Five groups were formed in each of the regions and each group had five members. All the group members worked personally in the field. Some of them received support from their family members. Their personal and work lives were intertwined, not separate.

During the first month of the fieldwork focus group discussions (FGD) were conducted to identify farmers' information needs and perceptions about mobile telephony. Each group was given a mobile telephone set with connectivity. Eazyfone Ltd<sup>4</sup> supplied five Nokia 8290 sets. In addition, five Nokia 1200 sets with Bengali interface were purchased. These cost BDT 2,500 each (equivalent to GBP 20) and belong to the lower price range. The initial connection comes with minimum credit, however the group members had to pay for subsequent top ups.

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<sup>2</sup> The fieldwork was done as a part of a doctoral research. The broader objectives of the research required investigation of some rural telecentre projects. The two regions were selected due to the presence of two well known telecentre projects in those areas. For more information, see Dey *et al.* (2008) and Dey *et al.* (2010).

<sup>3</sup> All the farmers are male. In Bangladesh by and large only the men work in the field. However, there was balanced representation of farmers from different age groups and natures of land ownership (i.e. land owners and sharecroppers)

<sup>4</sup> [www.eazyfone.com](http://www.eazyfone.com)



Group use of mobile 'phones was arranged for two reasons: to make the intervention cost effective and also to observe how the group members interacted among themselves to learn how to make effective use of the technology. The sets rotated among the group members so that each farmer had two consecutive weeks of hands-on use of a phone. At the end of two weeks the farmers in the group met to discuss their experiences of using the phone, covering usability and usefulness, difficulties and innovations. All ten groups simultaneously used those sets. Hence, the entire process took ten weeks altogether.

The investigator (the first author) stayed in those localities and observed the rural settings including physical environment, culture, practices and lifestyle. Video recordings and diary notes were used to capture these observations. He met the farmers' groups every two weeks (he visited each region on alternate weeks) and had an informal discussion with them. He also interviewed the particular group members who had used the mobile 'phones during the two week period. The investigator also asked the farmers to demonstrate their expertise in using mobile 'phones by reading or typing text messages, by identifying the symbols and texts on the screens, and by saving numbers if they could do so. These practical demonstrations helped in two ways: first he came to know about the ability and expertise of the farmers, if they had any; and second he observed farmers' innovative use of the technology. Eight focus group discussions (on a couple of occasions two groups were merged due to time constraint) and thirty five interviews (not all fifty farmers continued using the mobile telephones or attended formal interviews) along with ethnographic observations and informal discussions provided rich and thick data for this research.

All recordings were digitised, then translated from Bengali and transcribed using *Transana*. The transcripts were then coded in NVivo. Thematic coding was used for analysing the data. Data analysis involved both bottom up and top down approaches. For example, difficulties and benefits of using mobile telephony were categorised by using open coding (bottom up approach). However, existing models (i.e. Carroll *et al.*, 2003) and research findings (Donner, 2008) were used to develop codes for appropriation (top down approach). The following table provides a list of codes (nodes) from the NVivo with the corresponding sets (areas of investigation).

**Table 1 Codes and their categories**

<b>Sets</b>	<b>Nodes</b>
Mobile telephone use by farmers	can do more than sending and receiving calls, difficulty with language, ease of use, exploring the benefits and self efficacy, help from others – facilitating conditions, lack of time to explore functions, self learning, literacy, mobile phone functions, motivation behind learning functions, not everyone has same level of self-efficacy, only send and receive calls, tariff and other high end use, weekly expense to top up and terminologies.
Benefits Generated by the use of mobile telephony	Emotion and satisfaction, exploring the benefits and self efficacy, mobile telephony hedonistic use, mobile telephony use for non-farm economic work
Appropriation	Innovative use of mobile phones, keeping mobile phones, life without mobile phones, making sense of applications, miscall a practice, miscall is not always appreciated, reference groups' influence, saving numbers on diaries, terminologies, willing to purchase a set for his own, younger users are more comfortable.

## **FINDINGS**

The effective use of the mobile telephone depends on the user's particular purpose. If the 'phone helps them achieve their aims, so that they derive benefits from the technology, they may adopt it. But if there are too many usability difficulties, they can either reject it, or go through a period of adaptation and invention, until they find ways of integrating the technology into their lives (an appropriation process). In this section we present some detailed findings relating to difficulties, benefits and appropriation of mobile telephony by Bangladeshi farmers.

Before presenting a detailed description of farmers' use of mobile telephony, some salient facts relating to overall 'phone use are briefly summarized:

- Of the 42 farmers using mobile phones, the average farmer spent TK 30 per week<sup>5</sup>. Given a regular tariff for the pre-paid connections (pay as you go) of TK 2.30 per minute, this implies a usage of approximately 13 minutes per week. Financial constraint is the likely reason for this limited use.
- Of the 42 farmers, 60% had education up to high school level. The rest who were illiterate or had education up to primary level could hardly read and write English, let alone type in English on a mobile keypad.
- Seventeen (17) out of 42 farmers only managed to receive (or dial) phone calls and for other applications received help from their children and friends. Only two of 42 farmers demonstrated expertise in typing text messages.

### *Usability difficulties*

The farmers in the two villages had a number of difficulties in using the mobile ‘phones that restricted the extent to which they could use them.

Through observation and interviews it was noticed that the farmers could master the following functions:

- Switching on and off a mobile phone
- Charging the set
- Receiving calls
- Making calls
- *Miscall* operation

Once they had gathered confidence about using the aforementioned functions, they explored the following:

- Learning about tariffs and finding cheaper call rates
- Saving and retrieving numbers
- Exploring and playing games
- Messaging

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<sup>5</sup> TK: Bangladeshi Currency Taka; 1 USD = 70 Bangladeshi Taka

Language was a major impediment to farmers' use of the mobile telephony. Most handsets sold in Bangladesh only support English. The majority of the farmers have education up to secondary school level and are not proficient in English. They admitted their problems with English:

*“Q: Do you think you would have been much comfortable with Bengali*

*A: Certainly.*

*Q: Do you know what we mean by "Menu",*

*A: No*

*Q: Do you know what “contact” is?*

*A: It means agreement.*

*Q: No that is contract. Contact is different. Now can you read this (a Bengali message “kemon aachhen” written with English alphabet which means “how are you?”)*

*A: Yes I can read this”*

The farmers were not familiar with the terms used in the mobile industry, like ‘messaging’, ‘hash’, ‘network coverage’, ‘user busy’. On eight occasions it was found that they had difficulties in making sense of these specialist terms. E.g.

*“Q: Do you understand what (which symbol on the screen) is network, what is charge?*

*A: Yes I understand the charge and network.*

*Q: Do you understand the difference between line busy, switched off and out of network?*

*A: I am not sure about the differences. But they often say ‘the mobile cannot be connected now, please try later’”*

This lack of understanding of technical terms is related to an underlying “mobile computer illiteracy”. E.g., a user needs to understand that the phone set does not work if it runs out of charge. This happened to a couple of farmers in the sample who did not realize that their sets had run out of charge. While these difficulties are not major by nature, they can cause anxiety as one of the farmers explained:

*“Q: What kind of problems did you come across?”*

*A: One day I found the mobile telephone was totally blank. There was nothing on the screen. But light was blinking. I did not understand that it ran out of charge. I did not know how to put the mobile into charge either. My son took it to Mr. Aziz’s house and got it sorted.”*

After realizing that the English interface limits farmers’ ability to use mobile telephony, the Bengali interface was introduced to the farmers<sup>6</sup>. The introduction of the Bengali interface, nonetheless presented problems of its own. Many of the words used in the interface have double meanings. For example, the “select” button is translated to “*Nirbachon*” in Nokia’s Bengali interface. In Bangladesh “*Nirbachon*” is widely used as a synonym of “election” – as in national poll. Due to inappropriate translation the meanings of Bengali words used in the interface have become ambiguous. For example, the word ‘contact’ is translated as ‘*Shamparka*’, which normally means ‘relation’. Three of the farmers responded in the following ways:

*“Q: Do you think language is a major problem?”*

*A: Yes language is certainly a major difficulty. It would have been easier if everything were in Bengali.*

*Q: Do you understand what “Nirbachon” means?”*

*A: Yes, it is the election.”*

Typing in Bengali requires skills in the use of mobile phone keypads since 61 characters (including the short form of vowels) are to be typed using 10 keys. This is certainly more difficult than typing 26 English letters using 9 keys, assuming that the user can read and write both languages. Figure 1 presents the list of keys on a Nokia mobile set and the corresponding Bengali characters. If someone types a Bengali text message the receiver’s phone set also needs to have the software to display that. Difficulties with typing and navigation also limit the use of other functions such as saving and retrieving numbers.

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<sup>6</sup> The five groups who had Nokia 1200 could try Bengali interface. It was observed that the use of Bengali in mobile telephony was not widespread in Bangladesh when the fieldwork was conducted in 2007/08.



*A: Mobile phone is good. It is useful. But I am not sure poor people like us should use it or not. When you have it in your house, it is hard to resist from making phone calls. You will always be tempted to use it.*

*Q: Do you intend to get a set for yourself?*

*A: I might (smiles).*

*Q: But you were doubtful about its bad sides. Weren't you?*

*A: My wife actually has become habituated with it. She has been insisting me to get a set.”*

In broader terms there are three perceived benefits which motivated the farmers' use of mobile telephony. These are: benefits that satisfy social needs, benefits that satisfy livelihood needs and benefits that satisfy hedonistic needs. Benefits that satisfy livelihood needs are of two major types: those meeting agricultural information needs and those facilitating non-farming activities. The following table presents different benefits and the frequencies of their appearances on the transcribed texts:

**Table 2 Benefits generated by the use of mobile telephony**

<b>Benefits</b>	<b>Description</b>	<b>Frequency</b>
Meeting social needs	Facilitating social communication	25
Meeting livelihood information needs	Getting information about sources and prices of fertilizers.	7
	Getting solutions for plant and pest diseases.	12
	Other use (i.e. contacting an engineer to repair an irrigation pump machine)	1
	Getting non-farming information like securing overseas employment.	3
Meeting psychological needs	enhancing self esteem	10
	Satisfying hedonistic needs (i.e. playing games, children play with different applications)	5

As can be seen from the table, social communication was the dominant use, but use was also made of the 'phone in farming. It is important to appreciate that farming families organise their work and lives to achieve both social and economic goals. In a country like Bangladesh that has poor landline infrastructure and a weak transport system, mobile telephony provides an easy and cheap means for social communication. However, social communication often involves more than purely social issues. Farmers contact their relatives and friends to discuss their financial problems and agricultural issues.

*“Q: What are the purposes you used the mobile phone for?”*

*A: I called my relatives and I also contacted people for farming and non-farming economic activities.*

*Q: Which relatives did you have contact?*

*A: I contacted my sister and my maternal uncle. Both of them are based in Shaturia.*

*Q: What sort of issues you did discuss with your relatives?*

*A: Household things. ...I also discussed about farming. You can see the cucumber plants are not growing fast. Also the leaves of the paddy plants are getting white. I have shared my experience with them about these.”*

The farmers used mobile 'phones to learn about sources and prices of fertilizers. They also used the 'phones to contact NGO workers and agricultural extension workers (known as block supervisors) to seek advice on pests and plant diseases.

The use of mobile telephony also provided psychological comfort to the farmers. In rural Bangladesh there is a popular practice of borrowing mobile telephone services from friends and neighbours. Some of the elderly farmers in this research used to borrow mobile telephones from their neighbours, and younger family members. Possession of their own mobile telephones gave them independence and enhanced their self esteem. They also derived comfort from being connected with their friends and family members.

*Q: Have you found mobile phone useful?*

*A: Yes I have enjoyed using mobile phone. I want to get one for myself as well.*

*Q: Do you think it has increased your social status?*

*A: (Smiles) – I do not need to borrow mobile phones from any other friend or relative. I also can phone even in the late night and early morning. I am enjoying this.*

The mobile telephone was a source of enjoyment and pleasure for farmers and their family members. Five farmers registered similar opinions during interviews. One farmer



demonstrated his skills in playing games on the mobile telephone. Mobile telephony also generated great enthusiasm among the children who were keen to play with the sets and explore different functions. The satisfaction of the farmers and their emotional state are captured in the following:

*“Q: How much did you spend in the last few days?”*

*A: There was an initial balance of TK50 and then I put another TK40 on top of that.*

*Q: So you have used up total of TK90.*

*A: What can I do? This is also a kind of entertainment for the children, they play with it. My wife uses it. So I do not mind spending a bit extra.”*

Set against these generally positive opinions, there were five farmers who abstained from making much of use of the mobile telephones in addition to the eight who did not take part in the project. These five farmers took part in the research and like others they kept mobile telephone sets for two weeks but they did not develop a positive perception about their use. When they were asked whether or not they intended to buy a mobile telephone, they either said they would not or they remained unsure about it. While such reactions may be the consequence of financial constraints, other reasons include a lack of interest, a lack of expertise or the inclination to stick to current practices. For example, one farmer explained that he did not need to use a mobile telephone as he lives next to the village bazaar and can get agricultural information by visiting the shops in person. His daughter made the use of the ‘phone instead as it was kept at home most of the time.

### *Appropriating mobile telephony*

A question that can be raised is: how did the farmers manage to achieve such benefits, when they experienced difficulties in operating the mobile telephone sets? In answering this question, account needs to be taken of two important means by which difficulties were overcome. The first of these is farmers’ learning from experience or with the help of friends and family members. The second is their improvisation – making sense of different applications, adjusting their lifestyle to use both the artefact and applications and/or by innovating new means.

The farmers resorted to their children and other farmers (who had used the mobile ‘phones before they did) to get help. Mostly they needed help to make calls, check balances and save and retrieve contact numbers. In most cases their sons and daughters go to school and are

comfortable with English and modern technology. These young people helped their parents to understand or use the different functions/applications and often did it for them.

Farmers' use of the mobile telephone involved different types of adjustment.

Place of use of the artefact: It was found that the farmers did not like to carry the mobile telephone sets when they were in the field. Bangladeshi rural people do not wear trousers or shirts. They wear a special dress known as *lungi*. This is like a female skirt that needs to be wrapped around the waist. They do not have any pockets. Hence, carrying mobile 'phones is not convenient although one group used a string to hang the set around their neck. In most cases, the farmers were also scared about dropping or losing mobile 'phone sets in the field and so preferred to leave the sets at home. Effectively the mobile telephone was used as a fixed device thereby changing its original nature of use. It is also found that in rural societies shared use of mobile telephony is popular. One mobile telephone set is shared by all family members and sometimes by the neighbours as well.

Making use of complementary tools: Where farmers had difficulty utilizing certain features of mobile telephony, they sometimes found means to overcome these problems by continuing to use old-fashioned procedures. Thus, instead of saving and retrieving using the set, seven farmers recorded contact numbers in diaries and retrieved them as necessary.

Using features that did not require technical literacy: The colour of the keys and the icons of the menu enabled the farmers to understand what and how to select (e.g. by pressing the green button). This they found easier to comprehend than the Bengali words *Nirbachon* or *Shamparka*. Making sense of the applications through pictures and colours saved the farmers from reading and understanding either the English or Bengali menu.

Creating new ways of using the technology: Like other price sensitive users in developing countries, the farmers in this research made considerable use of the *miscall*. This involves dialling a number and hanging up before the call is answered. The 'missed call' message will let the recipient know that a call has been made and by whom. In particular contexts this allows the person who made the call to communicate information to the recipient without paying the usual tariff. There appear to be two reasons behind the popularity of *miscall*: one is financial constraint and the other a lack of expertise to send and/or receive text messages. In the entire farmers' group only two persons could use text messaging. When, a call costs

TK2.30 per minute, texting costing TK0.50 could have been a cheaper option. However, the farmers used *miscall* as an alternative to sending messages.

The farmers, do not send *miscall* to everyone. Whether or not it is acceptable to send a *miscall* to someone depends on the social, financial and cultural relationship with the other person. For example, one farmer used to send *miscall* to his eldest son who works in the city and is expected to pay for the farmer's mobile 'phone use.

Adjusting farmers' life and work practices to adapt to mobile telephone use: One farmer's wife told us that her granddaughter used to check the mobile telephone set every morning before going to school. Later on she realized that the granddaughter checked the time on the mobile telephone. It is a small change in lifestyle but it represents a change in the pattern of technology use (checking time by using a mobile 'phone instead of looking at a wall clock). In some cases, the mobile phone started to replace the normal mode of communication. One farmer requested that his friend purchase a bag of fertilizer on his behalf from the bazaar through a voice call. Previously he would have visited the bazaar to get fertilizers. Some farmers became so habituated to the mobile 'phone that they intended to purchase their own sets in near future<sup>7</sup>. The environment and infrastructure also respond to the gradual increase of the mobile 'phone use. Thus rural tea-shops have added mobile top up to the services they provide. The shops are not the authorized dealers of any mobile telephone company but they send the top up requests to the nearby authorized dealer through text or voice messages. They charge an extra amount to cover their messaging cost and a service fee in addition to the top up amount. Without the provision of this service, topping up mobile phone credit in remote village areas would be extremely difficult. As the farmers became more familiar with the use of mobile technology, they started to know at what time of the day calls would cost them least. Interestingly terminologies like *miscall*, FNF (friends and family—a popular package introduced by mobile phone operators in Bangladesh to make cheaper calls to selected contacts), charge and network subsequently became parts of their vernacular.

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<sup>7</sup> No farmer had actually bought the set while the investigator was in the field. However there was strong indication that many of them would buy

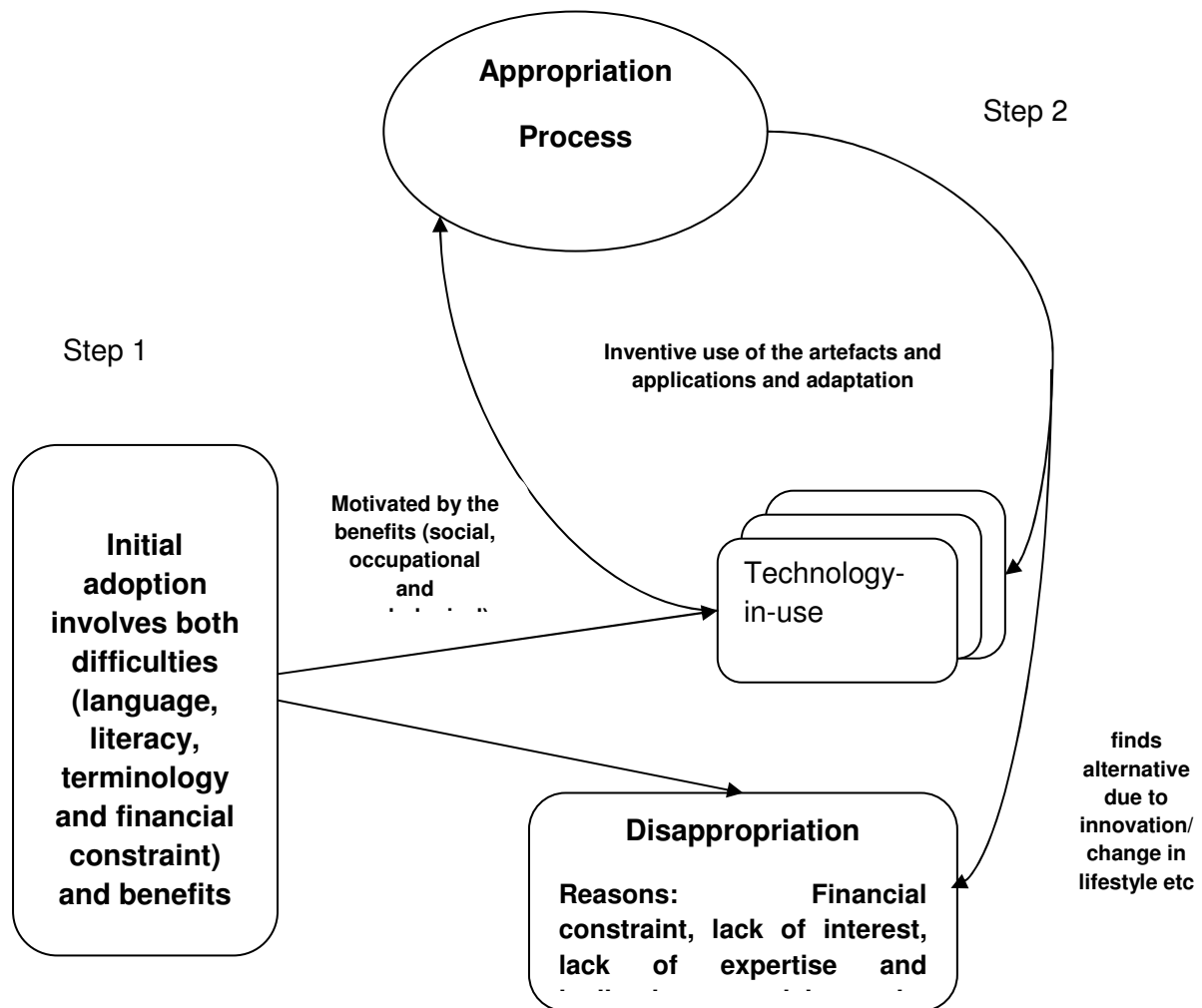
## **DISCUSSION**

This research explores how farmers integrate ICTs into their lives and work. This takes time: it is not something one can understand through a quick usability test, or a single psychometric questionnaire. Figure 2 illustrates our understanding of the observed appropriation processes. It can be divided into two steps.

The first one is – the use of mobile telephony that includes both difficulties and benefits. This is termed initial adoption. It explains the usability of mobile telephony in terms of process, outcome and affect. Once, the technology is adopted, its use and appropriation is extended but it is also possible that disappropriation would take place.

The second step denotes appropriation of mobile telephony and the recursive relationship between use, appropriation and disappropriation, as defined in the appropriation literature. According to the model the initial adoption can have two impacts - either further continuation of use or disappropriation. If beneficial outcomes outweigh difficulties and associated costs, users would continue with the use. Their subsequent use goes through a continuous process which involves appropriation and integration of the technology in daily lives. The use continues until users find other alternatives or encounter major difficulties that again lead to disappropriation.

**Figure2. Farmers' use and appropriation of mobile telephony to overcome usability problems**



Source: Research findings

The adoption process enables users (the farmers in this research) to get outcomes from the use of the mobile telephony. According to Dillon (2001) usability can be measured through the outcome, process and affect of using a technology. There can be both positive and negative outcomes.

The outcomes which can provide social, occupational or emotional benefits motivate the farmers to overcome difficulties by being innovative, seeking support from their friends/family members and learning the uses of the technology. The main use was for social communication, which supports Donner's (2007) findings. There is also evidence relating to farmers' use of mobile telephony for occupational purposes (to meet agricultural information needs). The boundary between work and social life in rural Bangladesh is very thin. Ribak

and Rosenthal (2006) found that the use of ICTs effectively shrinks the gap between domestic and professional life, as many people work from home. The findings of this research also show that in rural Bangladeshi society the farmers often find it difficult to detach their personal and social life from farming activities. We found that the farmers' use of mobile telephony facilitates social communication and in doing so also supports discussion about farming issues. The farmers' use of mobile telephony also engendered emotional benefits. Some of the farmers were so pleased after using mobile telephones that they decided to buy their own sets. Hence, usability can involve a dialectical process that entails both difficulties and benefits.

The *process* as described by Dillon (2001) cannot be captured by examining only the initial adoption. Subsequent adaptation and innovative means of using mobile telephony – which we term as appropriation - need to be investigated as well. For the majority of farmers in our sample, support from friends and family members was vital in enabling them to overcome usability problems as also was farmers' own creative use of mobile telephony. Recent research by Donner (2008), Meso, *et al.* (2005) and Sinha (2005) in the field of ICTs for development has produced similar findings in the context of other developing countries. However, there appears to have been little attempt to place these within the theoretical framework of technology appropriation. The present findings support Donner (2008)<sup>8</sup> by confirming the use of the '*miscall*' mechanism as a popular tool among the price sensitive mobile phone users in developing countries. This use of mobile telephony also explains how human actors may redefine the use of a technology in accordance with situational and contextual requirements. The introduction and integration of '*miscall*' along with other words like '*SMS*', '*network*' and '*charge*' in the local vernacular are examples of cultural appropriation, as described by Jamison and Hard (2003). It is important to remember that these words had no place before the introduction of mobile telephony in the rural society, just as the word '*googling*' never existed even a decade back. Financial constraints and lack of expertise to type messages make "*miscall*" a viable option for the farmers. Similarly, lack of expertise to navigate (due to language and literacy related barriers) forces the farmers to write down numbers in diaries.

The present research supports Isaac *et al.* (2006) by considering that appropriation can complement adoption and enable users to overcome difficulties by developing situational and

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<sup>8</sup>In the literature review it is discussed that Donner (2008) analyses *miscall* by using adaptive structuration theory (DeSanctis and Poole, 1994)

contextual use. The model employed (Figure-2) resembles that of Carroll *et al.* (2002, 2003) in identifying factors that influence both appropriation and disappropriation. However, it includes the role of social and cultural factors which are not clearly explained in Carroll *et al.* The research also identified specific useful outcomes influencing appropriation, and difficulties leading to disappropriation, in rural Bangladesh. In addition, it justifies a viable method for studying usability which is superior to the snapshot provided by the use of questionnaires in that it allows some account to be taken of the way in which a technology is appropriated over time, in a particular social setting.

## CONCLUSIONS

The research found some usability difficulties that might have been revealed by a traditional lab based test, and others that would not. However, the usability test would not have been shown us how some people over time adapt their behaviour to overcome the difficulties. This is a people perspective, not a device perspective. The rural farming context is important to study, as it makes a difference to the people (their literacy, technology experience, and desired benefits) and the infrastructure. The modified model of appropriation makes clear the factors and processes that mediate effective use through adaptation or rejection.

Mobile 'phone usage is growing fastest in developing countries. The use is no longer limited to large businesses and teenagers. It is time that academic and market researchers started to pay more attention to how people in other situations, such as rural villagers, learn to make effective use of mobile telephony. Their needs are not the same, nor are their skills or attitudes. To understand this, we need to study the dynamic processes of appropriation and disappropriation of technologies, as they become embodied in communities and society.

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