

PATH CREATION IN ICT INNOVATIONS FOR DEVELOPING COUNTRIES : EVIDENCE FROM A CASE STUDY IN BANGLADESH

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Abstract

Recently, there has been widespread interest in innovation through ICT for development (ICT4D) projects focusing on the poor communities in developing countries. This study conceptualizes ICT innovation challenges of developing countries as a source of ambiguity and freedom to reflect during innovation process. It is argued that entrepreneurs take advantage of such experiences and start to look for options to transform traditional practices for ICT innovation. The study illustrates that ICT innovation in developing countries is a process of path creation involving three practices: experimenting and exploring ideas in real time, disembedding traditional practice, and mobilizing actors through translation. Such practices are explored in an ICT innovation initiative in Bangladesh. Drawing on the findings, theoretical implications in understanding the entrepreneurial process through which ICT innovation in developing countries can be successful have been discussed and several practical implications for entrepreneurs have been outlined.

Keywords : *ICT innovation, ICT4D, developing countries, path creation, Bangladesh*

JEL Classification : *O31, O32, O33, O53*

1. INTRODUCTION

Innovation has traditionally been presumed to be associated almost exclusively with advanced and developed economies (Xiao et al., 2013; Zedtwitz et al., 2015). Recently, there has been widespread interest in innovation projects leveraging ICT for delivering information and services to the poor communities in developing countries, as a means to poverty alleviation and socio-economic development (Andrade and Urquhart, 2009; Brown and Grant, 2010). At the same time, studies show that the processes of innovation in these countries are unique and radically different than those in other settings (Xiao et al., 2013; Khan, 2017, 2020).

Variation in innovation process for developing countries has been explained in terms of the unique challenges found in these settings. The literature typically focuses on a web of socio-political factors (Venkatesh and Sykes, 2013) like resource constraints, weak infrastructure (Khan, 2017), and institutional voids (Ravishankar, 2013) as inherent challenges in these settings. In addition, reaching out to masses of very low income and low literacy – located predominantly in developing countries (Pitta

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et al., 2008; Silvestre and Neto, 2014) – appear to be challenges that are difficult to address (Viswanathan and Rosa, 2010; Hall et al., 2012). In a study, Hall et al. (2014) explained that these challenges play a key role as a “lever” or “hurdle” in innovation dynamics and the success of ICT innovation projects.

As such, it is now well-acknowledged that innovation practices followed in developed countries cannot be exercised by the entrepreneurs in developing countries (Avgerou, 2008; Barrett et al., 2015; Khan, 2017, 2020) or an established set of solutions cannot be adopted here (Srinivas and Sutz, 2008). Rather, entrepreneurs need to revamp their established practices and routines, and do something new for ICT innovations to be successful (Heeks, 2012; Khan, 2017, 2020). In a study on implementation of mobile health in emerging markets, Braa and Nielsen (2013) argue that such innovations in these markets are about accepting and living with the contextual challenges. But, the process by which entrepreneurs deal with these challenges is underexplored.

Hence, in this study, the focus is on the entrepreneurial process to address the challenges of ICT innovation in developing countries and the key research question is: *“How do entrepreneurs address the contextual challenges for successful ICT innovation in developing countries?”*

To address this question, the study draws on the theory of path creation (Garud and Karnøe, 2001) and shows how entrepreneurs facing the contextual challenges get opportunities to transform existing practices and technologies to create new paths for ICT innovations in developing countries. These concepts are explored by drawing on a successful ICT innovation initiative from Bangladesh. This initiative is the first of its kind innovation in agriculture sector in Bangladesh.

The paper is structured in few sections. The next section reviews the literature on ICT innovation and the challenges of such innovations in developing countries. It follows an in-depth discussion on the notion of path creation. The research approach and a description and analysis of the case are then presented. In the final section, the contributions and implications for theory and practices are discussed.

2. LITERATURE REVIEW

2.1 ICT Innovation Challenges in Developing Countries and Suggested Solutions

ICT has widely been considered as an engine for innovation (Boland et al., 2007). Following Khan (2017, pp. 21), ICT innovation, for this study, has been defined as “the development process of applying a technology-driven novel solution, in order to successfully create an improved environment to the intended setting” (e.g., a developing country in this context).

The extant literature discusses different challenges intrinsic to ICT innovations in developing countries, ranging from inadequate infrastructures (Srinivas and Sutz, 2008; Andrade and Urquhart, 2009; Khan, 2017) like power supply (Ovia, 2005) and internet connectivity (Thapa and Saebø, 2011) to weak ICT and data policy (Latifov and Sahay, 2013). Other challenges include scarcity of people with appropriate ICT

skills (Walsham, 2012; Khan, 2017), poor project management (Thapa and Saebø, 2014; Khan, 2017, 2020), resistance to change (Thapa and Saebø, 2014), lack of support of the management (Xiao et al., 2013), lack of leadership skills (Krishna and Walsham, 2005), and political instability (Thapa and Saebø, 2011).

In addition, ICT innovation projects in developing countries often fail to incorporate and align the interests of local communities (Andrade and Urquhart, 2007; Walsham, 2012) in the innovation process. In this regard, Khan (2017, 2020) stated that low income and illiteracy of the local communities, as well as their negative mindset regarding automation make innovation projects complicated. The scalability of ICT innovation projects has also been challenged since those projects fail to overcome the rigid structure of participant organizations (Madon and Sahay, 1996) to manage the increasing complexity and to respond to unanticipated effects (Sahay and Walsham, 2006). The literature also shows that a major concern among researchers is the sustainability of those projects as they often suffer from loose political support and commitment (Madon et al., 2009) and are overdependent on foreign donors (Baark and Heeks, 1998).

Researchers, in turn, have proposed a number of theoretical frameworks to explain the overall success or failure of such projects, including the critical success factor (CSF) and critical failure factor (CFF) models (Heeks and Bhatnagar, 1999), economic and financial sustainability models (Best and Maclay, 2002), the “design-reality” gap model (Heeks, 2003), the sustainability failure model (Kumar and Best, 2006), and bricolage or improvisation (Ali and Bailur, 2007), among others. For example, for ICT innovation initiatives in developing countries, Heeks (2002) suggested a flexible, incremental and modular approach to close the gap between design and reality in his proposed framework “ITPOSMO”. Other researchers (Rolland and Monteiro, 2002; Braa et al., 2007) have also proposed a reflexive design process ensuring a continuous iteration of innovation objectives with the local context. In a recent study, Khan (2020) stated that entrepreneurs in such contexts should adopt contingency approach for successful ICT innovation. However, irrespective of perspectives or research orientations, researchers recognize that, innovation approaches in developing countries must be different than those in developed ones (Avgerou, 2010; Khan, 2017, 2020).

The approaches need to be different, since those unique challenges made it almost impossible for the entrepreneurs to predict the interaction between ICT and the contexts it is being embedded in, prior to the initiative being taken (Diniz et al., 2014). Ravishankar (2013) argues that the contextual challenges here breed ambiguity, since they simultaneously offer both risks and opportunities. One of the well-known challenges found in developing countries is weak infrastructure. Developing the infrastructure or the distribution network to reach the poor adds to the costs of offering the product or service, making the whole project prohibitive (Garette and Karnani, 2010). The choice of a particular technology could provide cost reductions but might require a higher level of literacy from the users (Berger and Nakata, 2013)

than choosing an alternative solution. As such, entrepreneurs experience ambiguity to achieve the appropriate cost-quality trade-off acceptable to the poor communities in developing countries.

Again, many researchers (e.g., Rolland and Monteiro, 2002; Braa et al., 2007) suggested flexible, reactive and reflexive strategies for ICT innovations in developing countries which point at the need for entrepreneurs to reflect on challenges as sources of new possibilities. A reflective strategy would enable entrepreneurs to take advantage of sources of ambiguity, while reflecting on contextual contingencies. By being immersed within such an ambiguous context, entrepreneurs need to develop an understanding of the knowledge value of the ICT innovation and what is needed to succeed (Hall et al., 2012). They also need to understand the value placed on the ICT innovation by cultural norms and political influences (Hall et al., 2012). Thus, challenges induce entrepreneurs to visualize possible solutions (Henfridsson and Yoo, 2014) from different angles, and create different paths of action (Garud and Karnøe, 2001).

The next section explains how the challenges entrepreneurs are faced with in developing countries offer opportunities to create new path.

2.2 Conceptualizing ICT Innovation as a Process of Path Creation

The notion of path creation (Garud and Karnøe, 2001) has emerged as a powerful theoretical perspective to conceptualize innovation (Boland et al., 2007). The theoretical construct of path creation was developed in reaction to the theory of path dependence (Arthur, 1989). According to the path dependence perspective, “the past intrudes into the present as a constraining force, contingencies that arise are experienced as unanticipated unprepared moments, and the future presents itself as a fundamentally uncertain terrain” (Garud et al., 2010, pp. 768). Khan (2017) stated, “this perspective considers that human actors play a passive or conservative role with respect to alternatives available in their environment (Boland et al., 2007) and emphasizes the contingencies and exogenous shocks to understand a technological innovation and its adoption (Garud et al., 2010). Research in this tradition argue that firms may follow a shaped path while being constrained (locked-in) by their technologies (David, 1985), innovation process (Thrane et al., 2010), their services, strategies and business models (Prahalad and Bettis, 1986), organizational routines, skills and competencies, regulations, and social norms (Karnøe and Garud, 2012). Through such constraints, they become path dependent.”

In contrast, Garud and Karnøe (2001) state, “the path creation perspective emphasizes the active role of entrepreneurs, who translate emergent ideas into actions, deviate from their original intentions to shape paths in real time, and create new futures.” With this perspective, initial conditions are constructed by actors who mobilize specific sets of events in pursuit of their initiatives. Following Garud et al. (2010), Khan (2017) states, “unlike the path dependence perspective, the path creation perspective considers emergent situations not as contingencies, but as conditions

to be cultivated. Entrepreneurs use self-reinforcing mechanisms to strategically manipulate such contingencies rather than waiting for ‘exogenous shocks’ (i.e., externally driven events or mechanisms such as market changes and the introduction of new technology) to escape ‘lock-in effects’ and shape the trajectory of a change program. Lock-in refers to situations where actors are unable to move to a new state despite all involved preferring to do so”. Such a situation may arise from historical accidents, organizational routines, skills and competencies, regulations and social norms, inefficient technologies or lack of coordination (Liebowitz et al., 1995). According to path dependence, in such situations, actors become unable to adapt to changing environments as they cannot but follow sequential patterns of activity. Only exogenous shocks can bring about significant change and shape behavioural patterns.

From the perspective of path creation, actors are ever vigilant to implement such self-reinforcing mechanisms as offering incentives, engaging into alliances, and making targeted investments to initiate and then endogenously sustain a change program to avoid lock-in (Garud et al., 2010). Garud and Karnøe (2001) mentioned, “in this process, fully formed plans and visions are not preconditions, rather they emerge as part of the entrepreneurial process”. Hence, the new technologies and innovation processes that become successful in a market reflect the dynamic interplay of distributed actors (Stack and Gartland, 2003).

Garud et al. (2010) state that an emergent phenomenon can be explored and well understood through the path creation perspective. Hence, by drawing on path creation, this study focused on phenomena in the making: how the constraining effects of challenges in developing countries are translated to successful ICT innovations in these countries. In such cases, entrepreneurs are pushed to experiment with new ideas and explore their expertise and knowledge deviating from traditional innovation practices (Boland et al., 2007). Hence, it can be argued that the trajectory of successful ICT innovation for developing countries is stimulated by entrepreneurs’ ‘mindfulness’ (Garud and Karnøe, 2001) as they address emerging challenges. As Garud and Karnøe (2001, p. 2) explain:

“Mindfulness implies the ability to disembed from existing structures defining relevance and also an ability to mobilize a collective despite resistance and inertia that path creation efforts are likely to encounter”.

In addition, due to the net of interdependent actions of diverse actors in developing countries, entrepreneurs need to relate and fuse the ambiguity that arises from the multiplicity of opinions, beliefs, routines, and artefacts through interactive “translations” (Garud and Karnøe, 2001). Drawing on Callon (1986), Garud and Karnøe (2001) define ‘translation’ as a process that generates a ‘shared space’. Besides the creation of a shared space, translation also implies the transformation of the idea itself through interactions with different actors at different points in time.

Translation helps to create paths by offering a common ground among participants and by helping them to overcome resistance and indifference (Andrade and Urquhart,

2010; Braa and Hedberg, 2002). Translation enables entrepreneurs to overcome the lack of alignment between policy and implementation, resistance to change, lack of resources, and other institutional voids (see for example, Madon et al., 2007; Andrade and Urquhart, 2010; Nurdin et al., 2014).

In summary, by drawing on three practices of path creation, namely, *experimenting and exploring ideas in real time, disembedding traditional practice, and mobilizing actors through translation*, this study seeks to examine the ways by which entrepreneurs address the challenges in ICT innovation in developing countries. It is argued that challenges during innovation facilitate entrepreneurs to combine their existing knowledge with emergent ideas and technological and human resources, to create a new path deviating from the established innovation practices. In the next section, the research setting and methodological approach have been discussed which is followed by the presentation of case studies of ICT innovation in Bangladesh.

3. RESEARCH SETTING AND APPROACH

3.1 Research Setting

The research setting for this study encompasses one ICT initiative (Sugar-Corp - pseudonym) for the poor communities in Bangladesh. Sugar-Corp started with SMS-based purchase orders (e-Purjee) issued to sugarcane growers' during the crushing season to supply a specific amount of cane to sugar mills on a scheduled date. By incorporating other services and managerial tools, this simple initiative eventually turned into a digital procurement system of sugarcane replacing the 85 years' legacy of sugar mills.

In selecting the case, the primary interest was to find out successful ICT innovation targeting the poor in developing countries. Developing countries are largely dominated by poor communities, who are underserved, increasing challenges to deliver any products or services to them. This particular case study was selected because it aimed to develop the poor communities through ICT innovations. Also, the initiative was found to be implemented successfully, yielding high user satisfaction (Sugar-Corp Public document, 2013). In addition, the project by Sugar-Corp was 'new-to-the world' (see Avlonitis et al., 2001) undertaken by local entrepreneurs.

Finally, the study was undertaken in Bangladesh since current research in the ICT Innovation literature is mainly conducted in sub-Saharan countries, India, and Latin America (Thapa and Sæbø, 2014; Khan, 2017; Khan, 2020) and only a few number of cases are based in Bangladesh relative to those countries (Warnholz, 2008; Khan, 2017).

3.2 Data Collection

Adopting interpretivism as a philosophical stance (Walsham, 1995), a combination of semi-structured interviews, unstructured interviews (for users), direct observations, and document analysis were conducted for the collection of data. Semi-structured interviews were used to get deep insights of the events being explored (Nandhakumar and Jones, 1997) and also to seek a new angle on the topic being investigated (Kvale,

1996). In total, 26 interviews (21 semi-structured and 5 unstructured interviews) were conducted.

To provide a cross-sectional view of how innovation unfolds, interviewees across different levels were approached in the case study (Eisenhardt and Graebner, 2007). Flexibility was given to the interviewees to choose English or Bengali language during the interview. The interviews lasted for 50 to 90 minutes and were conducted at the interviewees' work place. These were tape recorded and transcribed. During the interviews, written notes were also taken. To ensure that farmers could share about their personal experiences freely and openly, unstructured interviews (Kvale, 1996) were conducted in their native language, Bengali. For interviewing the farmers, a sugar mill in Faridpur was visited and farmers registered with that mill were interviewed. The researcher also observed the Sugar-Corp innovations at work in the Faridpur sugar mill, and also at the central office in the capital of Bangladesh, Dhaka. Finally, project plans, company websites, progress reports, survey reports, campaign materials (e.g., brochures, posters), news clippings relating to the innovations were accessed which yielded a large volume of archival data. These documents allowed to get the background information on the project operation and the interpretations made through the data analysis process could be verified and confirmed.

3.3 Data Analysis

A large volume of data was yielded from interview transcripts, observation notes, and other materials. Following Miles and Huberman (1994), those data were descriptively coded into two initial groups of concepts (Appendix A) underpinning the research question. The first group represented the challenges (e.g., low income, illiteracy, and negative mindset of the users, etc.) for which entrepreneurs could not exercise their existing solutions and innovation practices, while the second group of concepts focused on the stream of actions that formed the new innovations in Sugar-Corp. The connections and relationships between these two groups of concepts (Strauss and Corbin, 1998) were examined and sought answers of how and under what circumstances new actions were performed. It was noted that new sets of actions were associated with conditions entrepreneurs experienced while they encountered various challenges. As a consequence, a considerable effort was given to identify and highlight those interview extracts relating to occurrences of such experiences (and conditions) that facilitated actions. After a recursive iteration between this extracted data set and theoretical constructs (e.g., strategic ambiguity), it was identified that entrepreneurs experienced 'ambiguity' and 'freedom to reflect' offered by the first group of descriptive concepts relating to challenges.

Following this initial coding, further investigation on the concepts, relating to a sequence of actions observed, was done, to look for patterns of responses. These patterns were grouped into three themes: experimenting and exploring ideas in real time, disembedding traditional practice, and mobilizing actors through translation, inspired by the theoretical perspective of path creation (Garud and Karnøe, 2001). These themes collectively indicate (Appendix B) whether a new path had been created by the entrepreneurs.

On this basis, a narrative was constructed of how entrepreneurs negotiate challenges in developing countries while experiencing ambiguity and freedom to reflect, and how these experiences induce them to transform existing practices and technologies to create a new path for ICT innovation.

The whole process of analysis was iterative to look at the empirical data and relate them with the theoretical framework that guided the data collection. Data collected from different sources were also cross-checked via multiple respondents to avoid any inconsistencies (Gomm, 2004).

4. SUMMARY OF THE CASE : SUGAR-CORP

In November 2010, Sugar-Corp launched the first of its kind ICT-based initiative in the agricultural sector of Bangladesh named “e-Purjee”. The traditional system was paper-based, which used a hand-written small paper as purchase order- “Purjee”, indicating that the farmers had to bring the stated amount of canes to the mill within three days. In case a farmer receives the purchase order (Purjee) late, he was not able to bring his harvest at the right time and failed to supply on due date losing vital income, and in extreme cases, causing a total failure to sell the harvest. Similarly, a “No Cane” situation at the mill yard could arise and mills could run under capacity causing significant loss of public resources if few of the Purjee receivers could not supply canes on the scheduled date due to late notification. Considering the extreme importance of Purjee, unscrupulous and corrupted staffs in the sugar mills used to take advantage of it and farmers had to bribe the staff for getting their Purjee on time and even to ensure that their Purjee was not sold to others illegally. Eventually, the country is forced to import more sugar.

In response to such known-to-all, long term problems of uncertainty in the previous paper-based system, Sugar-Corp, aiming at the instant delivery of sugarcane purchase orders to the farmers, initiated an SMS-based purchase order, e-Purjee (electronic Purjee). This simple award-winning SMS-based system, through a series of innovations, turned into a successful Digital Sugarcane Procurement System (DSPS) that Sugar-Corp did not envisage when they started.

The idea of ICT-based Purjee originated in 2008 by an IT manager of Access to Information (A2I- a government development program). From the very beginning, the senior managers of Sugar-Corp were hesitant to initiate such a project, expressing concerns whether the illiterate farmers would be able to use the technological system and accept it. They were also concerned due to their (Sugar-Corp employees’) lack of computer knowledge and resource limitations. However, as a consequence of the initiator’s relentless persuasion, and in alignment with the Bangladesh government’s “Quick Win” digital service innovation project, senior managers agreed to support the project. However, Sugar-Corp could not start the pilot project in the very first year, being confronted with enormous internal resistance from a “syndicate” of employees and influential farmers. One of the interviewees told us:

“It was a big syndicate. Many of the employees’ interests were involved in it. So, it was very difficult for senior management to implement such a system.”

Another interviewee added:

“As it was related to their [farmers’] livelihoods, they became very concerned and were afraid of what was going to happen. In fact, we, ourselves, were not even that much sure of the impact and output of the system.”

Before reinstating the halted project, senior managers interacted with internal employees, farmers, and the local communities to explain their idea. The decision to choose mobile phones as the suitable platform was straightforward due to the lack of ICT infrastructure and unavailability of internet facility. However, the entrepreneurs in this case (senior managers of Sugar-Corp, a project coordinator from A2I, and technical service providers from A2I) found themselves in trouble when they recognized that some of the farmers did not have mobile phones. One of the interviewees explained:

“Most of the farmers or their family members had a mobile phone. We were in dilemma in devising a mechanism to reach those who did not have a mobile.”

Again, the initial plan was to send SMS in Bengali as farmers are mostly uneducated. Even though there was a major concern of whether they would be able to read SMS even in Bengali, the entrepreneurs had to send SMS in English. As reflected by one of the interviewees:

“We thought of sending SMS in Bengali, but as the basic handsets did not support Bengali apps and fonts, we had to write the message in English. Otherwise the farmers had to buy new sets which would be nothing but ruining such an innovation.”

At the end of 2009, amid such concerns, the project was piloted in two sugar mills (Mobarakgonj and Faridpur mills) with the help of A2I and was successful though it faced some challenges. The success was largely attributed to the intensive training of the users and the massive promotional campaigns of the ICT project. The main challenge faced was that, initially, many farmers used to come to the mill with their canes without noticing the date and amount of cane to deliver, as noted in the SMS. To address this challenge, the entrepreneurs trained the farmers’ family members or their neighbours (especially school-going kids in those families), who had a mobile phone and who could use the phone on behalf of the farmers. Fostering such an initiative was a real challenge and required lots of efforts.

Despite this challenge, senior managers experimented with how these SMS facilities could be explored in other relevant services. In the course of time, this SMS-based system became a multi-aspect solution, which included notifications about occasional cancellations of cane supply due to factory breakdown or extreme weather conditions, as well as notifications about payment rescheduling and for farmer’s feedback. Showing the e-Purjee to mill staff, farmers received the right to claim that

their Purjee had been issued, but they struggled and often offered bribes to collect the paper copy, which was still a prerequisite to get the payment for the canes supplied by them. Senior managers thought of eliminating the printed Purjee, but this could not be implemented as it would create difficulties in payment systems. Hence, in the next initiative, a web-based Purjee management system was introduced by Sugar-Corp that facilitated e-Purjee receivers to get it printed. Sugar-Corp negotiated with A2I so that the farmers could get a Purjee printing facility from a Union Information and Service Center (UISC) located at their vicinity or from any computer connected to the Internet at a low cost. An interviewee explained:

“Neither do we have the resources to develop the massive infrastructure, nor can they (farmers) buy computer, printer or internet connections. So, we had to look for another way to facilitate the printing of Purjee.”

In the meantime, Sugar-Corp came to an agreement with the government-owned mobile operator- “Teletalk” to provide SMS facilities at a discounted price. The entrepreneurs (managers of Sugar-Corp and a project coordinator from A2I) recognized difficulties in monitoring and managing e-Purjee distribution by the 15 mills scattered throughout the country. Noticing some of the employees taking advantage of the system’s limitation, they thought of developing an online dashboard that would instantly update the issuance of e-Purjee, thus facilitating senior management to observe real-time data on cane production and crushing. Sugar-Corp’s senior managers were initially reluctant to implement such a dashboard, as they lacked available resources (hardware, software, internet, etc.), and internal technical expertise to operate such systems. However, after help from A2I and receiving training on relevant software, senior managers eventually developed the online dashboard with additional features to provide notifications when an SMS was dispatched from any mill or when a farmer provided feedback. Despite such initiatives, unethical practices in e-Purjee distribution by some Sugar-Corp employees continued, though these were reduced by a large extent.

Sugar-Corp, with the help of A2I, developed and piloted an e-gazette to ensure that the field staff could not manipulate the data collected from surveys conducted each year. This e-gazette would help to calculate the amount of sugarcanes, and the number and date of Purjees to be issued against each farmer, based on a few preset parameters. The pilot was unsuccessful due to erroneous data entered in the database and produced multiple errors. Consequently, to ensure the quality of software at a low cost, the Sugar-Corp authority started correspondence with other software developers directly, bypassing the government’s established rule of public tendering. Sugar-Corp eventually got World Tech (a software firm) involved. Sugar-Corp needed to outsource technical expertise due to a lack of in-house expertise.

However, the farmers were happy with the innovation as they did not need to bribe Sugar-Corp staff anymore. One farmer told us:

“A simple SMS changed our life. I never thought of getting Purjee sitting at my home.”

Another farmer said:

“I could not believe it. We thought it would be another way of getting money from our pockets and we would have to bribe more. [...] But now I pray to the Almighty for them who have done it for us.”

Following Sugar-Corp’s success with their initiatives, the innovation is being replicated in another mill corporation in Bangladesh.

5. EMPIRICAL ANALYSIS

This section focuses on the analysis of the challenges and the events identified in the empirical study. Guided by the relevant theoretical lens, the researcher examined how the entrepreneurs seek responses to those challenges. Finally, it is explored how the entrepreneurial actions emerge as a process of path creation for successful ICT innovations in developing countries.

5.1 Experiencing Ambiguity and Freedom to Reflect during Innovation

Based on the descriptive coding of empirical data, the challenges and actions identified are classified into two groups (Appendix A). It is important to recognize that both the challenges and actions unfolded in a random manner rather than linearly. The study shows that entrepreneurs in Sugar-Corp faced many contextual challenges (e.g., illiteracy of the users, low income of the users, lack of ICT infrastructure and unavailability or weak connectivity of the internet, change of position/role of employees within the organization).

The empirical data shows that due to inherent challenges into the innovation process, Sugar-Corp entrepreneurs could not exercise a traditional approach to ICT innovation. The analysis of Sugar-Corp (Appendix B) reveals that the complex flow of actions entrepreneurs undertook was a consequence of their experience of *ambiguity and freedom to reflect* that they went through while they sought responses to those challenges.

For example, a high level of ambiguity among Sugar-Corp entrepreneurs was found from the very beginning of the innovation. Though they realized the potential of ICT to offer benefits to the farmers, they were still hesitant to initiate such an ICT project considering the inherent challenges (e.g., the illiteracy of the farmers, lack of ICT infrastructure, lack of technical expertise and resources) they would encounter. It was observed that Sugar-Corp entrepreneurs were uncertain about the continuity of the initiative taken since the pilot project was abandoned due to internal and external resistance to Sugar-Corp. While reinstating the halted project, entrepreneurs were faced with ambiguity in getting many farmers having no mobile phones to use the e-Purjee system. In addition, they found that illiterate farmers having mobile phones would not be able to understand the SMS sent to them in English. They could not

develop mobile apps in the local language as it would not be supported by the basic handsets the farmers used. Those same farmers could not buy new or upper end handsets as well, which would support the local language. Sugar-Corp entrepreneurs also faced ambiguity as they struggled to devise a way to print the e-Purjee and make it available to the farmers, while addressing the lack of ICT infrastructure and internet connectivity. Again, being unsure of how to create poor farmers' awareness and build their interest in the new system, they adopted a conventional electronic media (e.g., television, radio) while simultaneously selecting non-conventional means (e.g., 'miking', banners, posters, handbills with graphics, face-to-face communication).

Finding themselves in such an elongated ambiguous state, entrepreneurs began experimenting with and exploring novel ideas as well as redirecting activities and resources. They started interacting with the farmers and local community to elucidate their idea, engaged human-assisted kiosks (UISCs) to facilitate printing e-Purjees, and developed a web-based Purjee management system, even though they tried to avoid web-based systems initially. They introduced an SMS-based system for order cancellation, payment rescheduling, and also for users' feedback that they did not envisage for. This shows that entrepreneurs did not have clear objectives or a vision to achieve 'goal ambiguity' during the ICT innovation process (Cohen and March, 1986).

The analysis also shows that while approached with an action being in an ambiguous state, entrepreneurs in many instances faced an emergent challenge (Beech, 2011). For instance, Sugar-Corp entrepreneurs came up with the idea of engaging the farmers' family, their neighbours, and also the school going kids to notify the acceptance of SMS or to read out the English SMS of a nearby mobile owner. It required frequent interaction with that community and intensive training for all. In spite of the implementation of various ICT initiatives, the immoral practices of some unscrupulous employees continued and emerged as a challenge to the Sugar-Corp entrepreneurs to monitor and control the e-Purjee distribution systematically. In response to this emergent challenge, an online dashboard was developed, and an e-gazette system was piloted by Sugar-Corp entrepreneurs which were not originally envisioned. While doing so, they deliberately sought to overcome the constraints imposed by accepted norms (e.g., bypassing advertisement for tendering to ensure low cost of systems development).

The empirical examples, thus, illustrate that being unable to adopt the established practices due to the contextual challenges, Sugar-Corp entrepreneurs experienced ambiguity and freedom to reflect during ICT innovation. They sought to respond to the challenges by imagining a possible solution (Henfridsson and Yoo, 2014). Drawing on Garud and Karnøe (2001), the researcher's analysis of those responses identified a set of themes (as shown in Appendix B), namely, *experimenting and exploring ideas in real time, disembedding traditional practice, and mobilizing actors through translation*. These themes collectively represent the entrepreneurial process of ICT innovation in developing countries leading to path creation.

5.2 ICT Innovation in Developing Countries as a Process of Path Creation

The analysis in Sugar-Corp found the presence of constituent elements for path creation (Garud et al., 2010). For example, the technological means, users' preferences, service evaluation policies, organizational routines, entrepreneurial skills, and competence for the respective target settings did not preexist in Sugar-Corp. The ambiguity experienced by entrepreneurs and their experimentation with different novel initiatives (e.g., engaging UISCs, developing and adopting a web-based Purjee management system, etc.) during the process of innovation indicate there was no established technological means to reach the target market. The farmers' requirements and preferences were not readily available rather knowledge was generated through learning by using. Existing organizational and social norms were not supportive. Instead such norms led to reluctance, resistance, and conflict of interest and required translation to co-opt different actors into collective action. The analysis shows entrepreneurial competence was constructed through *experimenting with, and exploring ideas in real time*.

It was found that while some of the entrepreneurial initiatives were reflections to emergent challenges (for example, engaging family, neighbours and school-going kids, developing online dashboard and an e-gazette), those emergent challenges were never considered as 'contingencies', but instead provided entrepreneurs the freedom to pursue specific courses of action. The analysis showed that there were several instances during the innovation process for Sugar-Corp at which the project might have been halted. For instance, the project could have ended when the pilot was abandoned due to internal resistance and farmers' non-acceptance; when the entrepreneurs found that many farmers did not have mobile phones after choosing mobile as the platform; or when they realized unethical practices existed even after introducing the e-Purjee. Instead of wrapping up the project or waiting for "exogenous shocks", the entrepreneurs in this case undertook a variety of deliberate actions to transition to a new state (e.g., interacting with the farmers through conventional and non-conventional means to share the benefits of the innovation, offering massive training programmes for both the farmers and internal employees, motivating local influential people, developing new systems, etc.). Again, to transform the simple but challenging initiative, several novel ideas were implemented successively as reinforcement mechanisms. For example, Sugar-Corp entrepreneurs introduced SMS for order cancellation and payment notification free of charge, they engaged UISCs for printing e-Purjee at a nominal charge, they allowed mobile-based feedback, and developed a web-based Purjee management system. As such, new ideas and artefacts emerged and were transformed to accumulate heterogeneous resources and diverse interests, thereby generating a transformational force (path creation) (Caron and Turcotte, 2009).

It was found that during this process of path creation, entrepreneurs in Sugar-Corp were extensively experimenting and exploring ideas in real time rather than following a fully formed plan (Garud and Karnøe, 2001). It was also found that, entrepreneurs

were trying to break away from the traditional practices and they were not sure whether the innovation would work at all. An example of *disembedding* traditional practice by Sugar-Corp is the series of ICT initiatives they implemented that were far from their 85 years of traditional work practices. It took almost two years to place themselves at the periphery of the traditional and established practices, overcoming all the existing boundaries within and outside the organization.

The third theme, *mobilizing actors through translation* stemmed from the fact that exploration of novel ideas and deviation from traditional practices required the support of different actors (internal employees, mobile operators, software firms, government, etc.). Entrepreneurs had to set the innovation process in motion by translating and transforming (Karnøe and Garud, 2012) disinterested (e.g., local leaders) and often hostile actors (e.g., internal unscrupulous employees who strongly opposed) into supportive ones. As such, these themes collectively elucidate the emergence of new paths (Garud and Karnøe, 2001) for ICT innovations in developing countries, provided that they are “new to the world”.

However, the emergence of the path in Sugar-Corp cannot be attributed to an organization or a single individual. Rather, the path is a consequence of the collective actions of all diverse actors who offered critical inputs (e.g., idea, funding, technological platform, technical support, regulatory support, requirements, feedback, etc.) at different points in time to address the contextual and concomitant challenges of the ICT innovation process. Entrepreneurship is, thus, viewed as a larger social process that focuses on collective actions (Garud and Karnøe, 2003).

The following section discusses how the findings relate to the extant literature to develop a novel understanding of ICT innovation in developing countries.

6. DISCUSSIONS AND IMPLICATIONS

The case analysis demonstrates a process of path creation, whereby challenges were appropriated by entrepreneurs for successful ICT innovations in developing countries. During the process, the entrepreneurs experienced ambiguity and freedom to reflect that induced them to engage in three practices of appropriation, namely, experimenting and exploring ideas in real time, disembedding traditional practice, and mobilizing actors through translation.

The study shows that once an ICT-enabled initiative is taken, few challenges embedded in the context, though well recognized, create high levels of ambiguity, despite entrepreneurs' prior knowledge of those inherent challenges. Earlier research supports this finding arguing that the interaction between ICT and the contexts it is being embedded in, is nearly impossible for the designers to predict (Diniz et al., 2014).

Findings of this study contradict the suggestion by Berger and Nakata (2013) that a solid project planning and management is needed for ICT-driven service delivery targeting the poor in developing countries. Instead, the findings support the reactive and reflexive strategy suggested by other researchers (e.g., Braa et al., 2007). Consistent with the extant literature (e.g., Ali and Bailur, 2007), this study

indicates ‘twists and turns’ may appear anytime during ICT innovation projects, and it shows that, through experimentation, exploring novel ideas, or deviating from traditional practices, entrepreneurs continually learn how to reflect these unintended consequences or emergent challenges. In such a process, errors are red herrings (Garud and Karnøe, 2001) and entrepreneurship flourishes over time through accumulation and refinement (learning from errors) of knowledge realizing time as a resource (Schumpeter, 1934). As such, this study, focusing on innovation dynamics, expands the literature (e.g., Ali and Bailur, 2007; Khan, 2020) by illustrating how entrepreneurial learning that reflects emergent contingencies can reduce the downside risk of ICT innovation projects.

In this regard, this study shows how, an innovation network, formed by mobilizing actors through translation at different points of time during innovation, can address such risk. The actors involved in the network range from users to local community to experts across different sectors and to global bodies. The innovation network not only enables experimentation and exploration to address the knowledge and resources gap (Walton and Heeks, 2011; Nurdin et al., 2014) and/or institutional voids (Chikweche, 2013; Ravishankar, 2013) but also increases the propensity to take risk (Lumpkin et al., 2013) while deviating from traditional practices. Extant literature on ICT for innovation explained interaction and translation among diverse actors as indispensable for successful innovation (Andrade and Urquhart, 2010; Heeks and Stanforth, 2014). The findings add to that literature by exploring how such an innovation network emerges through translation while the innovation unfolds prior to agreement or partnership. It also shows how this network enables successful implementation of the innovation while addressing inherent challenges.

Researchers (Pralhad, 2012; Braa and Nielsen, 2013) claimed that successful innovation in emerging markets is about accepting and living with challenges. Counterintuitive to the common approach of explaining challenges as obstacles or factors leading to innovation failure (e.g., Heeks and Bhatnagar, 1999; Kumar and Best, 2006), this study is one of the earliest papers to give a theoretical perspective of how entrepreneurs can take advantage of the ambiguity and the freedom to reflect offered by the inherent challenges in ICT innovation and how it can be used for creating new paths.

The analysis in Sugar-Corp showed the presence of the key constituent elements for path creation (Garud et al., 2010). It was observed how entrepreneurs actively constructed the ‘initial conditions’ that did not preexist, how ‘contingencies’ were considered as emergent contexts for action and how ‘lock-in’ was aimed to escape from generating ‘self-reinforcing mechanisms’. Paths did not result from the lone input of a single actor (such as, the lead firms (Sugar-Corp), the mobile operators, software development firms, or users), nor was it shaped by a fully formed formal plan or preexisting forces. Rather, a path emerged as diverse actors got involved in different ways and shaped the flow of actions while interweaving resources in real time (Karnøe and Garud, 2012).

The analysis also suggests that a path is created when the innovation is new-to-the-world (Avlonitis et al., 2001). This adds to the literature (e.g., Khan, 2020) which shows contingency approach is the appropriate approach for ICT innovation in such contexts. In this regard, it may be argued that adopting contingency approach will lead to the process of path creation. However, the degree of innovativeness has a significant impact on how a path takes shape for innovations in developing countries. As the term refers, by 'path', specific directions were not provided here, since a path may progress along different routes (Garud and Karnøe, 2003). Researcher's position in this regard is not unique (see for example, Karnøe and Garud, 2012) and the literature also supports the findings that different and/or multiple paths can emerge during social construction of a technological innovation (Garud and Rappa, 1994; Garud and Karnøe, 2003).

Conceptualizing ICT innovations for developing countries through the path creation perspective has a number of implications for the ICT innovation literature. Earlier studies have focused on project management (Thapa and Sæbø, 2014)) and/ or leadership (Krishna and Walsham, 2005; Walton and Heeks, 2011) as influencing factor(s) for successful innovation. The study suggests that ICT innovation is neither a random outcome nor a fully formed planned event, rather entrepreneurs decide on which idea to explore and how, and which resources (social or material) to mobilize and how. Exploring ICT innovation 'in the making', it is showed how entrepreneurs are embedded in the social systems that motivate their ideas. The researcher's perspective on entrepreneurship, hence, adopts a socialized view, that is often missing in the mainstream entrepreneurship literature (Garud and Karnøe, 2003).

Further, the study showed how ICT can be a disruptive force for development projects that transform the social and economic conditions of the target settings. For example, creating technological awareness, eliminating intermediaries, reducing unethical practices in organizations, changing mindsets, enhancing technical and communication skills are few of the benefits identified. On the other hand, this study also showed how local contexts shape the technology, provided that entrepreneurs are mindful. Some research discussed the scalability and sustainability of ICT innovation projects as central issues and identified several influencing factors (see for instance, Kumar and Best, 2006; Sahay and Walsam, 2006; Madon et al., 2009). Instead of focusing on particular factors, by drawing on the path creation perspective, it adds to the literature that 'mindfulness' enables entrepreneurs to make ICT innovation projects scalable and sustainable.

As mindfulness allows reflection (through experimentation and exploration of new ideas), entrepreneurs can navigate appropriate actions based on an emergent contingency (e.g., increased complexity, unanticipated effects) required for scalability (Sahay and Walsham, 2006). Similarly, mindfulness entails deviation from established practices and rigid structure (Garud and Karnøe, 2001), something which might be required both for scalability (Madon and Sahay, 1996) and sustainability (Walton and Heeks, 2011) of developmental projects. In addition, by mobilizing collective action

through translation, mindful entrepreneurs can skillfully deal with other sustainability challenges like resource constraints (Best and Kumar, 2008) and loose political commitment (Madon et al., 2009) for ICT innovations. As it is seen in Sugar-Corp, by adopting the three appropriation practices, entrepreneurs successfully offered a broader range of services to the target setting and later expanded their innovation to a wider context. Their deliberate effort to make both projects sustainable in the long run was also observed. Although such a dynamic process may induce a lengthy innovation, long timeframes are argued to be key for path creation (Garud and Karnøe, 2001), and also for scalability and sustainability of ICT innovation.

The findings of this study also have several implications for practice. First, the findings indicate that the practitioners (e.g., entrepreneurs) must change their mindset to accept challenges as expected and to consistently cultivate them to create value from them. Entrepreneurs must recognize that a prior market research at the beginning of the innovation is not at all adequate for ICT innovation in developing countries. Rather, they need to immerse into the poor communities to understand their situated challenges so that an affordable value can be offered through continuous interactions with those communities.

Second, despite the suggestion that mobile phones are the most acceptable technological platform (e.g., Chaudhuri, 2012), human agents and ICT need to be integrated to deliver the appropriate services to the poor for their development. They should not be blatant on technological artefacts rather they should attempt to improvise both the technology and the context itself. Hence, one of the major concerns for practitioners should be to reduce the degree of deviation since larger deviation might invite more challenges to create awareness, build interest, and use the innovation.

Finally, an implication for policy makers is that they should provide a supportive political and institutional framework, which would accommodate experimentation with new innovations. This would foster a culture of innovation in the firms reaching out to the poor communities.

The study has few limitations that should be recognized before applying the findings to other situations. Although this study encompasses a successful ICT innovation, the challenges may vary due to the type of organization, sector of services, and type of initiatives. The study did not explore the impact of those variations on the anticipated process of ICT innovation. Further research could be undertaken to explore such impact. Again, more research is needed to understand that for me-too (Oke, 2007) innovations, whether a new path will be created or it will follow a predefined path given that the entrepreneurs are successful in innovations.

Moreover, the farmers in Sugar-Corp have been provided a subsidy. This sort of subsidy has been considered as strategic niche management (Kemp et al., 2001) and it is claimed that such initial protection can be withdrawn in a controlled way. However, it might be interesting to see in future studies how this path takes an alternate shape when the protection is withdrawn.

7. CONCLUSION

While the unique challenges in developing countries have been mainly attributed as the reasons for which innovation approaches in those countries significantly vary than that of developed countries, in this research, it has been showed how entrepreneurs appropriate those challenges for a successful ICT innovation. ICT innovations in developing countries is explored from the perspective of path creation. It is argued that entrepreneurs can take advantage of the ambiguity and freedom to reflect as they face challenges during innovation. Thus, challenges induce them to identify options to transform their existing practices and shape developing country contexts and the technologies being introduced towards new paths.

This study shows that path creation entails distributed efforts by many different actors, who offer valuable inputs into the innovation process in real time. It demonstrated that due to the contextual challenges involved, entrepreneurs do not have unbounded options to exercise and therefore, need to be “mindful”. Hence, the researcher argues that ambiguity and freedom to reflect experienced during ICT innovation in developing countries trigger entrepreneurial mindfulness and, in turn, allows entrepreneurs to appropriate inherent challenges. It also shows that a path may take different directions due to the dynamic interplay between the entrepreneurs and the context, and can be created through a process involving three appropriation practices- experimenting and exploring ideas in real time, disembedding traditional practice, and mobilizing actors through translation. The researcher argues that such a dynamic approach of innovation might enable mindful entrepreneurs to reduce the downside risks of ICT innovation projects and help to facilitate their scalability and sustainability. However, given the novelty of the research dimension and the focus on a single country context, more research in other developing countries is encouraged for generalization and further insights.

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Appendix A

Table A1 : Major challenges and key actions/events in Sugar-Corp

Major Challenges Faced	Key Actions/Events Undertaken
Unavailability or weak connectivity of internet	Negotiating with Government and A2I
Illiteracy of the users	Selecting mobile phones for sending e-Purjee
Low income of the users	Choosing local language (Bengali) to send SMS
Lack of ICT infrastructure	Changing SMS language into English
Resistance from influential farmers	Negotiating with mobile operator
Negative mindset of the users	Negotiating with technical service provider
Resistance from internal employees	Setting up minimal required infrastructure within the organization
Scarcity of technical people in the organization	Training selected internal employees
Change of role or position of employees within the organization	Face to face training session for farmers
Lack of adequate fund	Adopting different promotional campaigns to reach and convince the farmers
Scarcity of resources within the organization	Involving family members of the farmers, their neighbours and nearby school going kids
	Utilizing mobile phones for payment rescheduling and order cancellation
	Utilizing mobile phones for taking feedback of the farmers
	Developing a web-based e-Purjee management system
	Negotiating with A2I for facilitating e-Purjee printing through UISCs
	Using UISCs for getting printed copies of the e-Purjee from the web-based system
	Developing an online dashboard for monitoring real-time distribution of e-Purjee
	Outsourcing technical expertise to resolve temporary problems
	Negotiating with software development firm
	Developing an e-gazette and piloting

Appendix B

Table B1 : Coding and Analysis of Empirical Data from Sugar-Corp

Descriptive Coding: Identifying Challenges	Extracts relating to experiences of ambiguity and freedom to reflect from the empirical data	Theoretical Coding A: Clustering of experiences faced by entrepreneurs	Theoretical Coding B: Grouping of entrepreneurial actions mediated by ambiguity and freedom to reflect
Lack of ICT infrastructure	Most of the farmers or their family members had a mobile phone. We were in a dilemma in devising a mechanism to reach those who did not have a mobile. [...] We thought of that (accepting e-Purjee instead of hard copies of e-Purjee for payment) but could not implement as it would make the system more complex. Neither we have the resources to develop the massive infrastructure, nor can they (farmers) buy computer, printer and internet connections. So, we had to look for any other way to facilitate the printing of Purjee.	Theoretical Coding B: Grouping of entrepreneurial actions mediated by ambiguity and freedom to reflect	Theoretical Coding B: Grouping of entrepreneurial actions mediated by ambiguity and freedom to reflect
Low income of the users	These people did not even know how to read Bengali, let alone English. We thought of sending SMS in Bengali, but as the basic handsets did not support Bengali apps and fonts, we had to write the message in English. Otherwise the farmers had to buy new sets which could be nothing but ruining such an innovation. [...] It was a tough job, but we did it. We went to their (farmers') houses; talked to them, their families and neighbours. You know, in villages, they have big joint families. We found almost every alternate house has a kid who goes to school. We trained all of them, showed how the SMS would look like, which part of it was important and what to do once they received an SMS. The system could not prevent corruption fully. They (corrupted employees) identified the loop holes and started exploiting it. When we got complaints, we talked to A21, higher officials of the government, World Tech and decided to develop an online dashboard and an e-gazette to control it.	Appropriating Practice: Experimenting and exploring ideas in real time Examples: Selecting mobile phones for sending e-Purjee Utilizing mobile phones for payment rescheduling, order cancellation and taking feedback of customers Developing an e-Purjee management system that is web-based Using USCS for getting printed copies of the e-Purjee from the web-based system Developing an online dashboard for monitoring real-time distribution of e-Purjee Developing an e-gazette and piloting it Involving family members of the farmers, their neighbors and nearby school going kids	Appropriating Practice: Experimenting and exploring ideas in real time Examples: Selecting mobile phones for sending e-Purjee Utilizing mobile phones for payment rescheduling, order cancellation and taking feedback of customers Developing an e-Purjee management system that is web-based Using USCS for getting printed copies of the e-Purjee from the web-based system Developing an online dashboard for monitoring real-time distribution of e-Purjee Developing an e-gazette and piloting it Involving family members of the farmers, their neighbors and nearby school going kids
Illiteracy of the users	There were few innovative people in the senior management who deliberately wanted it to be successful. They tried to motivate the non-cooperative employees. [...] They arranged training for few officers and staffs to work on it. [...] The most challenging task was to make the farmers accept and use the service. We relentlessly communicated with them and local communities. We employed trainers, distributed handbills with graphical presentation, used posters, bill-boards and banners. We advertised in the radio and state-owned television as well. Even we did not know what is a server, what is a domain, how to run a computer. [...] We did not have to worry that much as they (involved partners) co-operated us in every possible ways.	Ambiguity: Experiencing ambiguity in selecting means to goals	Appropriating Practice: Disembedding traditional practices Examples: Utilizing ICT to replace the 85-year-old hand to hand service delivery despite farmers' poverty, illiteracy and negative mindset Utilizing ICT in Sugar-Corp to replace established organizational practices despite senior management's lack of technical know-how, lack of internal technical staffs, other required resources and internal resistance in Sugar-Corp
Low income of the users	There were few innovative people in the senior management who deliberately wanted it to be successful. They tried to motivate the non-cooperative employees. [...] They arranged training for few officers and staffs to work on it. [...] The most challenging task was to make the farmers accept and use the service. We relentlessly communicated with them and local communities. We employed trainers, distributed handbills with graphical presentation, used posters, bill-boards and banners. We advertised in the radio and state-owned television as well. Even we did not know what is a server, what is a domain, how to run a computer. [...] We did not have to worry that much as they (involved partners) co-operated us in every possible ways.	Freedom to reflect: Constrained by the challenges, yet simultaneously got freedom to reflect on emergent contingencies	Freedom to reflect: Constrained by the challenges, yet simultaneously got freedom to reflect on emergent contingencies
Resistance from internal employees	There were few innovative people in the senior management who deliberately wanted it to be successful. They tried to motivate the non-cooperative employees. [...] They arranged training for few officers and staffs to work on it. [...] The most challenging task was to make the farmers accept and use the service. We relentlessly communicated with them and local communities. We employed trainers, distributed handbills with graphical presentation, used posters, bill-boards and banners. We advertised in the radio and state-owned television as well. Even we did not know what is a server, what is a domain, how to run a computer. [...] We did not have to worry that much as they (involved partners) co-operated us in every possible ways.	Freedom to reflect: Constrained by the challenges, yet simultaneously got freedom to reflect on emergent contingencies	Freedom to reflect: Constrained by the challenges, yet simultaneously got freedom to reflect on emergent contingencies
Scarcity of technical people within the org.	There were few innovative people in the senior management who deliberately wanted it to be successful. They tried to motivate the non-cooperative employees. [...] They arranged training for few officers and staffs to work on it. [...] The most challenging task was to make the farmers accept and use the service. We relentlessly communicated with them and local communities. We employed trainers, distributed handbills with graphical presentation, used posters, bill-boards and banners. We advertised in the radio and state-owned television as well. Even we did not know what is a server, what is a domain, how to run a computer. [...] We did not have to worry that much as they (involved partners) co-operated us in every possible ways.	Freedom to reflect: Constrained by the challenges, yet simultaneously got freedom to reflect on emergent contingencies	Freedom to reflect: Constrained by the challenges, yet simultaneously got freedom to reflect on emergent contingencies
Negative mindset of the Users	There were few innovative people in the senior management who deliberately wanted it to be successful. They tried to motivate the non-cooperative employees. [...] They arranged training for few officers and staffs to work on it. [...] The most challenging task was to make the farmers accept and use the service. We relentlessly communicated with them and local communities. We employed trainers, distributed handbills with graphical presentation, used posters, bill-boards and banners. We advertised in the radio and state-owned television as well. Even we did not know what is a server, what is a domain, how to run a computer. [...] We did not have to worry that much as they (involved partners) co-operated us in every possible ways.	Freedom to reflect: Constrained by the challenges, yet simultaneously got freedom to reflect on emergent contingencies	Freedom to reflect: Constrained by the challenges, yet simultaneously got freedom to reflect on emergent contingencies