Connecting Rural Masses to the Information Superhighways: An Assessment of Union Digital Centres (UDC) in Bangladesh

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SUMMARY

The Union Digital Centre (UDC) is one of the e-government innovations in Bangladesh that aims to serve as a one-stop delivery point for information and services in rural areas. Developed under the public-private-people's partnership (PPPP) model, it has been operating in all 4551 unions for the last five years. This thesis evaluates the operations of UDC with a particular focus on its role in connecting rural masses to digital information and services. In doing so, it has identified three critical aspects for detailed investigation: roles and significance from a beneficiary perspective; participation of major stakeholders; and issues of its sustainability. Since the UDC is a new scheme to provide people with a shared access to information, the study uses '*The Diffusion of Innovation*' theory as a framework to understand its impacts on users and to project future use by non-users. It also uses the '*Stakeholder Theory'* to identify the stakeholders and discuss their roles in operations and management and their contributions to sustainability. A pluralistic research approach combined with mixed method has been adopted. Data were collected through surveys of 538 entrepreneurs across the country and 154 users from 16 UDCs of 4 districts. Interviews were conducted among 43 respondents including management officials, UP representatives and entrepreneurs from 4 districts and the project management

The findings show that the UDC has made modest inroads in providing users with access to information, comparative advantages and bridging the digital divide. However, it is yet to have significant impacts on broader development goals through improvement of livelihood. The study has explored roles of stakeholders to current progress and found an imbalance in their contributions in terms of overdependence on government's supports. Inadequate engagement of entrepreneurs is linked to weak involvement of other stakeholders.

One of the key objectives of the study was to assess the issues of sustainability. It has identified the strengths and opportunities emanating from the partnership ecosystem to predict sustainability. It finds that both financial and social outcomes of the project are dependent on partnership components such as infrastructure and service inputs from government and entrepreneur's investment. In the light of this, the study recommends more effective engagement of relevant stakeholders with an increase of these factors.

Although the overall record of the UDC is not impressive, as a new initiative it holds a promise to redefine the nature of service delivery and broaden people's access in the future. One of the contributions of the present study is that it has considered the UDC as an innovation showing how the attributes of innovation can help it for wider diffusion. Given the lack of previous studies, this work has developed a model of contribution from each stakeholder in a telecentre project of a developing country, where the private sector is weak. The models for financial and social sustainability demonstrate pathways with collaborative involvement of all stakeholders.

DECLARATION

I certify that this thesis does not incorporate without acknowledgment any material previously submitted for a degree or diploma in any university; and that to the best of my knowledge and belief it does not contain any material previously published or written by another person except where due reference is made in the text.

Signed.....

(Md Gofran Faroqi)

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ABBREBRIATIONS

A2I Access to Information

ADC Additional Deputy Commissioner

AP Assistant Programmer

ADP Annual Development Program

BDT Bangladeshi Taka

BCC Bangladesh Computer Council

BMET Bureau of Manpower Employment and Training

BTRC Bangladesh Telecommunication Regulatory Commission

CFA Confirmatory Factor Analysis

CSC Common Service Centre

DC Deputy Commissioner

DESC District E-service Centre

D-net= The Development Research Network

EFA Exploratory Factor Analysis

GOB Government of Bangladesh

ICT Information and Communication Technology

ICT4D ICT for Development

IS Information System

ITU International Telecommunication Union

LGD Local Government Division

LGSP Local Government Support Project

MDG Millennium Development Goals

NESS National E-service System

NILG National Institute of Local Government

NWPB National Web Portal of Bangladesh

PMO Prime Minister's Office

PPP Public-Private Partnership

PPPP Public-Private-People's Partnership

SARI Sustainable Access for Rural India

SEM Structural Equation Model

SOF Social Obligation Fund

TEB Technical Education Board

UDC Union Digital Centre

UN United Nations

UNDP United Nations Development Program

UNO Upazila Nirbahi Officer

UP Union Parishad

UAMS UDC Activities Management System

CHAPTER 1. INTRODUCTION

Background

The Information and Communication Technology (ICT) -led new public administration reform, known as e-government, has attracted many developing countries to adopt it as an enabler of development and good governance. Such countries have been persuaded to use it as a tool to improve efficiency in public service delivery and to fight against problems such as poverty, illiteracy, underdevelopment and corruption by empowering people with information. This kind of acceptance is founded on the belief that by virtue of its inherent qualities, e-government entices citizens in their search for a better livelihood, ensuring their participation in public policy and promoting better governance and economic development (Bhatnagar 2009; Hanna 2010; Madon 2009). However, the application of e-government in developing societies seems a daunting task as it requires mobilisation of significant human, technological and financial resources, transformation of organisational structures and business processes, work habits and cultures. Added to these challenges is the digital divide arising from income, education, remoteness, gender, age, language, and awareness disparity that makes the inclusive access to information or services nearly impossible (Gant 2008; Misuraca 2007; UN 2014).

Faced with these problematic economic and social realities, the governments of these societies often bypass mammoth infrastructural and management costs by adopting the cheaper and more convenient means of introducing e-government. This innovative strategy, often known as quick-win, attempts to introduce e-governments through: shared access points; spreading mobile technologies to connect rural masses; inculcating computer literacy in younger generations and adopting public-private partnerships (PPP) to curtail cost and reach out with greater efficiency. The aim of such leapfrogging strategies is to connect backward sections of the population who mostly live in distant rural areas (Hanna 2010; Misuraca 2007). As a popular innovation in this regard, telecentre is widely used to provide the underserved groups with benefits of ICT for leveraging economic development and enhanced quality of life (ICTA 2010; Proenza 2001).

Telecentre is a shared point to access ICT, including internet and services. It contains both ICT and non-ICT equipment such as computers, printers, photocopiers, scanners, phones and internet, and other facilities to provide a variety of information and services. While the concept first appeared in the developed world it is more pertinent for developing countries which are in more desperate need of economic and social development. It empowers the disadvantaged by disseminating information about the knowledge economy (Hanna 2010; Oestmann & Dymond 2001). This innovation not only enables the disconnected people with an unprecedented amount of information and services but also assists in addressing demands for greater accountability and transparency, thereby ensuring the inclusion of poor, vulnerable and disadvantaged rural

communities. It builds a platform for knowledge and human development by improving, for example, health, education and employment, and the promotion of economic and environmental sustainability (Hanna 2008; UN 2012, 2014).

Among its various forms of ownership, such as government, private or community led, the increasingly popular form of telecentre is one which is managed and run by local entrepreneurs and communities backed by the government (Proenza 2001). A widely practiced strategy for such 'social outsourcing' by governments is franchising through the PPP model where infomediaries, from within the community, help with connectivity and social networking. Engaging the community, in turn, helps with volunteering, awareness generation and widespread participation, ownership, financial and social sustainability for the telecentre (Roman & Colle 2002; Shadrach & Sharma 2011). Researchers (Bhatnagar 2004; CEG-IIMA 2004; Harris 2007; Madon 2009; Proenza 2001) have found many tangible and intangible benefits for citizens generated by partnership telecentre projects.

In India, for instance, on evaluation of G*yandoot*, the Sustainable Access for Rural India (SARI) and other Indian Common Service Centres (CSC), researchers (Bhatnagar 2009; Kumar, R & Best 2006; Shadrach & Sharma 2013) report benefits of quick access and increased quantity of information. They also find time and cost savings, reduced incidents of harassment and corruption, and priority given to urgent requests. Moreover, telecentres facilitate access and value-added services, knowledge creation and dissemination; spread e-literacy; arouse feedback from the community members. These issues ultimately empower citizens by mobilising economic, political, and social aspects of inclusive information society development. Because they serve such diverse purposes, assisted by a blend of equipment, this particular type of telecentre is known as a Multipurpose Community Telecentre (MCT) (Hanna 2010; Heeks 2009).

In many countries, the telecentre has become a mini-enterprise and locus of entrepreneurial development triggered by collaborations between public and private sectors. It can infuse local entrepreneurship by providing, for example: information and office services; internet access; teleconferencing; computer literacy; e-learning and e-commerce at affordable costs. Hence, the telecentre is increasingly regarded as more than just a shared access to facilities and services. It can also play a key role in promoting human capital, social networking, home-grown entrepreneurship and rural development (Hanna 2010; Liyanage 2009).

However, the scrutiny of the performance of many of the telecentre schemes has also produced scepticism among researchers about their impacts. From a beneficiary perspective, the merits of these projects are especially judged against their ability to include rural people, especially those who are adversely affected by the digital divide(Heeks 2002; Kumar, R & Best 2006). Many researchers cast doubt that telecentres serve the backward sections of the population. Questions are also raised about their scalability and sustainability, especially of those which are dependent

on external funding, such as that from the government or donors. Many donor supported telecentres struggle to continue operations once the financial support is withdrawn (ICTA 2010; Madon 2009; Proenza 2001). Scaling up the area of operations with cost effective technologies and the right mix of services and increasing impacts have also been found to be problematic. Researchers, therefore, underscore the importance of the development of enabling conditions to transform telecentre into an effective vehicle of entrepreneurship and social development. Collaboration between local communities and national institutions forms the telecentre ecosystem. The ecosystem promotes all stakeholders acting together to ensure relevant inputs for sustainability involving cost-effective technologies, relevant content and agile connectivity. The sustainability of the model is also dependent on business plan and entrepreneurial skills (Hanna 2010; Hanna & Knight 2012; Heeks 2002; Karim, Quamrul & Samdani 2011; Kumar, R & Best 2006; Liyanage 2009; Madon 2009; Shadrach 2012; Shadrach & Sharma 2013).

Bangladesh, as a developing country in South Asia, traverses similar challenges for wider applications of e-government. Though the policy initiatives to connect citizenry to online information and services have been in place for more than a decade, they have only been able to achieve some basic computerisation/automation of government agencies associated with a few infrastructure developments. Citizens have limited interface with e-initiatives. This was largely due to government's solitary efforts with limited capacities (BEI 2010; Siddiquee 2012). The necessity to establish wider access for people to information has received greater attention after the enactment of the Right to Information Act in 2009. This is also for the aim to achieve the Millennium Development Goals (MDG) using ICT by 2015. It is expected that achieving MDGs would enable the country to join the list of middle income nations by the year 2021, a concept popularly termed as 'Vision 2021'(Faroqi 2015a; Jabbar 2009; Karim, Quamrul & Samdani 2011).

To translate this vision, the relevant techno-centric ICT for development (ICT4D) agenda adopted by the government is 'Digital Bangladesh', a program for providing ICT enabled services at citizens' doorsteps (Jabbar 2009; Karim, Quamrul & Samdani 2011). Subsequently, a number of acts and policies, including those on ICT and telecommunication, were realigned to provide electronic services through a bottom-up approach involving various stakeholders in the implementation process (IGS 2009; Siddiquee & Faroqi 2013). Like its recent approach to forging PPP in infrastructure development, the government emphasises a similar strategy for building ICT infrastructure and the provision of digital services with a view to mobilising additional resources and developing further capacities (GOB 2011). For development of partnership driven e-services, the responsible government body is Access to Information (A2I), the advisory and technical assistance unit in the Prime Minister's Office, assisted by the United Nations Development Program (UNDP) (A2I 2011c).

The A2I has developed a quick-win solution to connect the citizens by establishing Union Information and Service Centres (UISCs) in all *Union Parishads*, the lowest tier of local government units. This is a shared access point that aims to serve as the focal point of service delivery. In operation since 2010, and recently renamed as the 'Union Digital Centre (UDC)' it utilises a public-private-people's partnership (PPPP) model involving the government, the local government, the private entrepreneur *(Uddakta*) and the people. Launched jointly by the A2I and the Local Government Division (LGD), the UDC envisages the creation of a knowledge-based society by bringing various government, commercial and social information and services to rural people (approximately 70% of the total population). This would decrease the digital divide and ensure participation of the masses, particularly those not traditionally having access to digital information, such as women, the poor, and illiterate (A2I 2010, 2011c, 2015; Faroqi 2015a).

Run by two entrepreneurs- one male and one female partnered under PPP- the UDC is armed with ICT and other equipment initially supplied by the government. It is equipped with computers, laptops, internet modems, scanners, webcams, photocopiers, printers, multimedia projectors, digital cameras and solar panels. Services include government information and services, local government certificates, financial services and commercial office services. In order to support the delivery of these services and to make the model economically viable, the government has partnered with banks, public and private enterprises, mobile phone companies and non-government organisations (A2I 2010, 2011c, 2015). It charges prescribed fees for delivery of information and services, from which the entrepreneur makes his or her income. It is expected to be sustainable by generating sufficient revenue through these services. Involving the private partner and being tagged with the local government unit, the project targets to develop entrepreneurship and build community ownership (A2I 2010, 2011b, 2011c).

Unfortunately, as with similar projects in other developing countries funded externally and targeted at infusing economic and social impacts and developing entrepreneurship, the UDC is experiencing problems.

Statement of the Problem

The provision of information and service delivery in Bangladesh is mostly concentrated in administrative units like the Upazila (sub-district) and the District levels. On the other hand, the service recipients mostly live in distant rural areas who need to travel to these places and meet public officials to receive official information and services such as copies of public records, welfare benefits, and availing themselves of livelihood services and knowledge of market prices. Visits involve substantial time and costs such as travel, food, bribes and loss of an income for time spent away from work. Alongside incurring these costs they also face the realities of public offices such as the absence of providers, harassment in case of not paying bribes and low responsiveness. For these they are sometimes required to pay additional visits and costs. Inefficient public officials are

also prone to providing incorrect information, tampering or concealing records for personal gains, and other corrupt behaviour. For poor people the amount of the bribe and other costs are disproportionate to their income and this often becomes unbearable. Similarly, the traditional providers of government channels points are not transparent about their decisions, hardly disclosing the actual price, the time required and the basis for decision. Thus, service recipients, unaware of their legal rights, succumb to the monetary desires of the provider. It is difficult to ascertain whether or not the introduction of the *Right to Information Act 2009* and the Citizen Charter in public offices under the *Secretariat Instructions 2008* has changed these circumstances (Bhatnagar 2009; Jabbar 2009; Sarker 2013).

The problems become more complicated due to the prevalent use of manual delivery systems in public offices, which usually takes more time. Records kept physically in a haphazard way are not easy to find quickly when required. Additionally, people have to stroll around counters for a single service and must often submit excessive documents. Moreover, the administrative structure in government offices or local government institutions is so hierarchical that it is unthinkable to have easy access and receive friendly treatment. Because of structural and societal barriers, and people's positions being weakened by issues such as poverty, illiteracy and gender imparity, a large portion of the population is marginalised in terms of receiving information (Jamil 2007; Sarker 2013).

Often, citizens have severely limited access to traditional communication channels such as newspapers, radio, television and internet. A recent study shows that 25% of the country's population are completely in 'Information darkness', meaning that they have barely any access to communication mediums (BEI 2010). This situation is worse for rural areas where 36% of rural people have no access. Along with their socio-economic fragility, this situation makes them more vulnerable and often means they cannot access necessary information and services from government offices (Hussain 2008). Hence, they rely on information from informal networks of trusted family, friends and local leaders, but these networks do not adequately satisfy their information needs (BEI 2010). Having no other recourse, rural people often utilise touts or intermediaries and peons for getting access to the public offices and receiving services. Traditional intermediaries[1] are people who mediate between government employees and the recipients (for applying for, paying and receiving the information or services). These intermediaries are known to exploit their clients heavily (Jabbar 2009; Sarker 2013).

The aforementioned human-related problems indicate that ICT could play a pivotal role in improving access to information/services. However, the government's attempts to present them

1 Often, these middle people are put in place by the topmost authority for smooth channelling of kickbacks to the top, thereby avoiding bargaining at the bottom. At times, lower staff intermediaries continue seeking bribes using the justification of their low salaries. These people usually do not possess any empathy for the needs of recipients, and are interested only in the money. Often recipients have to surrender to this corrupt system, if they really intend to receive services. (Jabbar 2009; Jamil 2007; Sarker 2013).

electronically from conventional points are only in the early phases. Not only are the government information and services far away for rural people, but also some private office services are still distant due to their inadequate development in the vicinity of rural areas. Sometimes, to photocopy a document or to type an application, rural people have to travel a long distance, usually to the nearest sub-district (Upazila) centre or semi-urban locations, and spend a large amount of time and money (Sarker 2013). Moreover, people cannot access the few available online information and services because of the digital divide. They lack both the ICT hardware and the understanding to use them (UN 2014).

The UDC has the potential to eradicate or at least minimise all these problems of inaccessibility, cost, time and distance. The problems of intermediaries, unresponsiveness, unaccountability, and lack of transparency can also be solved. It is established nearer to people's abodes in the Union Parishad (UP) with the promise of the right information at the right time and right place. It is a shared access point where the entrepreneur is meant to assist people, irrespective of their social standing and bridge the digital divide for them. It stretches from the semi-urban areas to the remotest rural locations with the objective of hassle-free service delivery. It aims to promote easier and cheaper financial transactions of people without bank accounts by being within distances of a few kilometres. Other benefits include the provision of a range of computer literacy skills, improvement of livelihoods, increased participations of citizens, decentralisation of service delivery and closer ties between the government and citizens (A2I 2012b). The UDC also envisions the creation of Information Technology (IT) infrastructure in the UP to increase efficiency through prompt delivery. The ultimate goal is to connect the UP with the global and national network and make it into a vibrant knowledge-based institution, ensuring easy access for common people to information and fostering local entrepreneurship (A2I 2011c).

Needless to say that to generate such benefits in terms of information and services UDCs would require an effective back-end support. But to what extent are the government bodies ready to offer such backing? The current situation suggests that most of the government departments at the *Upazila* and district levels are still running their businesses manually with semi-skilled/unskilled personnel without being connected to the UDC (A2I 2012b). Challenge also looms large from a lack of relevant e-content. At present, though some of the information are put on different government websites, online services are very rare (Jabbar 2009; Sarker 2013; Siddiquee 2012). Moreover, online contents are limited to basics of organisations and to some downloadable forms. This unpreparedness of implementing agencies is consistent with the lack of a comprehensive policy on UDC to facilitate any difference. Thus, it is relevant to ask how effective the UDC can be without relevant contents and policy back up (Siddiquee & Faroqi 2013)..

Even with these preparations in place, implementation hurdles may arise from the socio-economic backwardness of citizens. Bangladesh is still confronted with challenges of poverty, malnutrition,

illiteracy, gender discrimination, and others. These socio-economic problems themselves posit challenges to the adoption of ICT manifested through people's inability to purchase and learn the technology. It still remains a challenge for people with low levels of education and income to reap the full benefits of new technologies, including wide access to knowledge and information (Pigato 2001). Despite availability of shared access points, poor rural people often remain averse to ICT which has little meaning to their daily struggle of life (Natalie & Gil-Garcia 2005). Furthermore, the lack of awareness among disadvantaged sections of the population may pose a formidable challenge. Worldwide, women are generally reluctant to adopt new technology (UN 2012). Along with this, there are additional socio-cultural factors that restrict women's mobility in Bangladesh (A2I 2012b).

It is also challenging to be aligned with the needs of people. In rural and agrarian based society the information and service needs are highest for land, agriculture, health, education and legal matters (Benjamin et al. 2007). In rural areas of the country they are still served through distant provider agencies. For these issues it is important to question how effectively the UDC can provide the promised benefits of telecentre, ensuring both quantity and quality of information and services. It is also important to consider whether the charges levied by these entrepreneurs are excessive compared with the cost of using traditional intermediaries, even if they are coercive. PPP models elsewhere in the world have also been criticised for charging excessively and being less sensitive to the public interest(Abelson 2007; Hodge 2004). As the UDC's clients are often mostly poor, illiterate women, it is worthwhile to examine how the model works for them in reducing their economic burden and bridging the digital divide. The dilemma between financial viability and pro-poor service delivery dictates a need to pay detailed attention to whether the UDC can create any advantages for rural people.

To overcome the challenges and have desired impacts, the UDC adopts a management approach comprising various stakeholders, including local people. The UDC expects to have greater potential to reach people as it is hosted by the people's representative body, the UP, throughout rural areas of the country. It can thrive on an untapped market which is densely populated with demands for various information and services. Whilst the country's position is 94th in terms of land area, in terms of population it ranks 8th in the world, with estimated 160 million people living in 147500 square kilometres (WPR 2014). More than 60% of its population are of an age below 29, leading to a demographic dividend of potentially young people (BBS 2010). Among the youth (15-29), 41% are neither in employment nor in education or training (NEET), and amongst females of this age, the figure is 66% (Sarah 2014). Only 6.3% of the population have access to the internet (UN 2014). Telecentres thrive mostly in countries with more unemployed young people and limited access to the internet (Proenza 2001). Considering this potential, and the involvement of the UP, the model is branded as a public-private-people's partnership (PPPP) (A2I 2015).

The uniqueness of the model is also manifested in the involvement of the entrepreneur through partnership. This feature reflects an expectation that the UDC would be sustainable by harnessing investment and efficiency gains from the private sector. While the government provides the basic ICT equipment and training, entrepreneurs are required to purchase additional equipment and contribute operating costs to support business growth. The entrepreneur is given the responsibility to bridge the digital divide, and generate further entrepreneurship amongst rural people (A2I 2011b).

Given multiple partners involved with distinct roles, it is worthwhile to identify how robust the concept of UDC is to get support from all and promote sustainability. In the current context UDC has to face a host of implementation challenges emanating from the stakeholders' involvement. These include inadequacy of contents, unavailability of competent private operators, lack of back-end support, management inefficiency, and deficiency in support from the UP. The capability of UDC to connect the rural citizenry online can further be questioned given the current rudimentary standard of the internet across rural areas (UN 2012, 2014). Additionally, many rural areas lack electricity to support ICT operations (A2I 2011c; IGS 2009).

The UDC has been established with finance from the government who still supports it in different ways. Thus, it is important to know how the UDC is going to survive once that financial support ceases (A2I 2011c; IGS 2009). This is why the development of entrepreneurship among local operators is critical for future ownership. Availability of competent entrepreneurs and their skill development are, thus, pertinent issues. Investment by entrepreneurs may be an issue as the poverty rate among rural people is very high and the probability of unemployed youth obtaining financing is not likely to be high (A2I 2011c; ICTA 2010; Shadrach & Sharma 2013).

For survival and promotion of the UDC the role of the host organisation, *the Union Parishad,* is crucial as it is the local advisory body to supervise the functions. The role of local representatives to engage to the general public in the ICT led e-governance is necessary to make it locally owned (A2I 2012b). There are problems of poor governance in the local government such as corruption, nepotism, inefficiency, patron-clientelism and lack of participation (Crook & Manor 1998; Hulme & Siddiquee 1999). Similarly, it is too simplistic to assume that the UDC would get all the supports it needs from the bureaucracy with its advocacy for more transparent and accountable processes in the public service delivery. Typical challenges arising from bureaucracy relate to resistance and lack of cooperation in supplying services, finance and monitoring (ICTA 2010; Shadrach 2012). Heeks (2003) identifies the gap between policy and practice as the 'design-reality gap'. Since the UDC is a delivery point it needs to obtain supply from provider agencies to lead its way to self-sustainability, but such support is yet to be fully established (Faroqi 2015b).

The initial observation and conversation with relevant stakeholders suggest that this project suffers from a very high rate of drop outs of entrepreneurs because of a number of operational and

management challenges. The lack of adequate income serves as a major disincentive for many entrepreneurs who leave the UDC premise causing concerns for entrepreneurship development (A2I 2015; BBS 2014; Siddiquee & Faroqi 2013). By the end of the 4th year, in 2014, nearly one quarter of centres were shut down because of drop outs of entrepreneurs. Almost half of all UDCs are without female entrepreneurs and they were regularly present in only approximately 5% of centres. UDCs that are not vibrant in operations experience fewer visits by people frustrating its entrepreneurial and social objectives (BBS 2014; Prothom_Alo 2015).

At the other end of the spectrum, some UDCs are performing well in terms of income of entrepreneurs and services to people with associated benefits of reduced costs, time and hassle, and corruption free delivery (BBS 2014; Faroqi 2015a; Prothom_Alo 2014; Rahman & Bhuiyan 2014; Siddiquee 2012). Despite such apparent strengths and weaknesses of the project there have been few studies to ascertain attributes of its impacts, management and sustainability. Given the potential challenges emanating from management practices, it is imperative to understand what strategies the UDC adopts to ensure sustainability in terms of financial targets, social outcomes and entrepreneurship development.

Thus, the UDC project, though in its relative infancy, should be assessed in the light of a number of questions. The proposed study is an attempt to investigate these questions with the objectives outlined in the following section.

Research Objectives

(1) To describe and evaluate the role of UDC as a focal point of service delivery in rural areas and its impacts on intended beneficiaries.

(2) To assess the stakeholders' involvement under the PPPP approach to management and to identify the challenges involved in the process.

(3) To examine issues of sustainability and to ascertain the factors those contribute to it.

To reach the objectives, the study has a number of specific questions.

Research Questions

(1) What are the policy, management and implementation strategies in place to enable the operations of UDC?

(2) What levels and range of information and services are offered by the UDC? Are those compatible with the demands of rural people?

(3) Does the operation of UDC contribute to the quality of delivery by improving access, reducing time, distance and cost, and better administration?

(4) What are the impacts of UDC in bridging the digital divide and improving people's livelihood?

(5) Who are the stakeholders and how do they contribute to the operation?

(6) What are the challenges for the UDC arising from stakeholders' engagement?

(7) What factors are responsible for entrepreneurship development?

(8) To what extent the existing strengths of partnership ecosystem of the model ensure its sustainability?

(9) What lessons can be drawn based on the findings and experiences of similar projects?

Significance of the Study

A number of factors have made ICT led e-government an important national agenda in Bangladesh, particularly in rural areas. Firstly, against the backdrops of socio-economic problems the introduction of shared access points is considered as a leapfrogging strategy that will ensure the targeted development while escaping costly investment. Secondly, while major public sector reform initiatives in Bangladesh have, thus far, failed to reach the doorsteps of people with an efficient service delivery system, the government sees one-stop services from the UDC as a transformational initiative to ensure easy access and better governance of delivery. Thirdly, as a quick win strategy, the UDC is expected to transform the UP into a vibrant, knowledge-based institution by triggering demands for e-services that will push electronic transformation in the upper echelons of government to supply them (A2I 2015; Jabbar 2009; Karim, Quamrul & Samdani 2011).

The structure of the quick-win strategy for e-government in Bangladesh can be shown as follows:

Figure 1: The bottom up approach (lower to higher) for Quick-wins in Bangladesh

The figure implies that the success of the whole of e-government is dependent on the success of the UDC that will serve as the focal point of delivery and result in need-based electronic transformations in other government units. The management of the UDC, therefore, must ensure efficiency and effectiveness. The efficiency increases productivity while the effectiveness guarantees sustainability. Development of efficient systems mainly depends on long-term learning of the innovation process, which is lacking in the current context. Identification of problems and

strengths will enable us to develop sustainable strategies through a bottom up approach, that is, through learning from real stakeholders (Hudson 2001).

Despite such significance, there has been little study on UDC. Though some reports, government documents, articles and web literature present an introductory picture, emphasising some gross benefits they fail to address actual details and challenges. Thus, there is essentially no academic research on the project. Therefore, this research is significant for of the following reasons:

(1) The primary significance of the study will be the contribution to academic knowledge in the field. Exploration of the problem through empirical research and in-depth analysis of relevant policy and literature can lead to better understanding that can benefit researchers, academics, consultants, policy practitioners and readers. This study aims to introduce a new understanding of the problem and build up the conceptual framework and theoretical underpinnings that can serve as useful resources for further incremental work, action-plans or academic research. Explanation, comparison with best practices and logical derivations through detailed research can test the efficiency of existing policy process and management initiatives and enrich the policy process effectiveness.

(2) It is important to know what the UDC can provide and whether it can offer the necessary information because the concept is aligned with developmental goals. As it does attempt to bring efficiency in the delivery of administration, understanding the impacts in that regard is of significance, in particular identifying any advantages or disadvantages compared to alternative delivery channels. Understanding its effects on bridging the digital divide and improving people's livelihood is equally important for achieving the relevant developmental goals.

(3) Though there are some studies on similar projects in a few other developing countries, the concept of UDC differs from them because of its breadth and involvement of multiple partners. It involves a massive number of people with formidable socio-economic backwardness. A distinguishing feature of the project is the PPPP approach. No study has previously focused on operational sustainability of a telecentre project, considering beneficiaries as partners. Developing a management model considering people as partners can thus be expected to provide new insights. Similarly, ascertaining the contributions of the government and local government units, with inefficiency and lack of capacity in place, and the direct partnership with home grown and inexperienced entrepreneurs, with investment capacity in doubt, is necessary to provide a clearer knowledge of the goals and impacts on relevant stakeholders.

(4) Given the level of dropouts of entrepreneurs, largely from limited income, understanding and predicting a sustained level of income is of critical significance. There is an urgent

need to develop a model and test for financial viability as most externally funded telecentres face challenges with the exit of largesse finance (Kumar 2005). This study focuses on the financial sustainability of the UDC by identifying the factors involved in the interplay of partners. Correctly ascertaining the factors behind it will have implications for preventing drop outs and subsequent closure of centres.

(5) Finally, understanding the partnership inputs in the UDC and the interrelationship among them can illuminate pathways of how they contribute to the survival and growth of the system. Given the lack of empirical studies to provide any model to explain what factors contribute to the sustainability of the project, this study's contribution would be providing a sustainability model incorporating social and financial dimensions. The model development will render a clearer message to its relevant stakeholders and help with implementing the intended mission.

Chapter Organisation

This remainder of this thesis is organised into seven more chapters:

Chapter 2 is the literature review that explores existing literature on similar telecentre projects to identify the unexplored area of the topic to which this research can significantly contribute. It introduces three theoretical foundations, namely the Diffusion of Innovation Theory, Stakeholder Theory and Sustainability Discourse to draw necessary hypotheses for the UDC.

Chapter 3 details the methodology in terms of research approach, location and design, techniques of data collection and instruments-reliability and validity, sampling techniques and sample size, data organisation and analysis and limitations of the study.

Chapter 4 discusses the policy and management issues of e-government, the key players and their roles to introduce and support the UDC. It also introduces the policy and management aspects of the UDC to create a point of reference in subsequent chapters for identifying the gap between policy and practice.

Chapter 5 explores the levels and range of services offered by the UDC and their compatibility to the needs of the community. It assesses its impacts in terms of improved quality of delivery and governance and evaluates the impacts on bridging the digital divide.

Chapter 6 assesses the involvement of stakeholders in operations. It describes the roles of public partners such as the government and UP in infrastructure and service development, performance management, training and monitoring of the project. The entrepreneur's involvement and people as partners are discussed subsequently. Finally, it determines the contributions of each partner to the success of the project.

Chapter 7 identifies the constraints and challenges in stakeholder engagement and suggests some measures by which they can be addressed for ensuring sustainability. It develops the income sustainability model, necessary for entrepreneurial development. Furthermore, it addresses why the partnership ecosystem is vital for the sustainability of the UDC for both financial and social outcomes.

The final chapter highlights the lessons that can be learnt, based on the empirical findings and experiences of similar projects in other developing countries.

CHAPTER 2. THE LITERATURE REVIEW

This chapter provides a critical review of the telecentre model, what it can offer to people especially its benefits to people, its management under partnership and the sustainability. This chapter is organised into four sections. The first section outlines the definition of the telecentre and its purpose and identifies fundamental domains of assessment covered up to now. The second section embarks on the literature related to assessment of impacts on the community. It introduces the *Diffusion of Innovation Theory* and contextualises key elements of the theory in regard to telecentre impacts. At the end of the section, three hypotheses are proposed in the light of the literature and given the lack of previous research. The third section reviews the literature on partnership telecentre management, identifies the stakeholders under Public-Private-People's Partnership (PPPP) and analyses their involvement using the framework of the *Stakeholder Theory*. This section discusses their possible roles and contributions towards the progress of a telecentre and comes up with a hypothesis. The analysis of stakeholder behaviour continues in the last section to show its association to sustainability. It evaluates how effective involvement of different stakeholders is related to five types of sustainability. It develops a sustainability framework indicating the directions among them and draws five subsequent hypotheses.

Telecentre and the theoretical genesis

Branded in multifarious other names such as 'community information and communication centre', 'telecottages,' 'cyber cafes' or 'kiosks' telecentre's common target is to connect and network underserved groups by giving them access to ICT tools and internet, provide e-government services, information on economic activities and learning. Connectivity by telecentre is given the utmost importance for isolated groups to share their dialogue and local information to solve community problems (Hanna & Knight 2012; Madon 2009; Misuraca 2007). Since its inception in the 1980s in many European and other developed countries, many national governments and international agencies embarked on establishing telecentres on a wider scale, known as telecentre movements, to curtail various information and service needs (Harris 2001). Though commenced in developed countries, it is more suitable for developing countries (Hanna 2010).

Telelcentres are emerging as a crucial element of a broader agenda to offer wider access and connectivity to rural and disadvantaged communities in developing economies to mainstream them in the development platform. The key assumptions for this movement for developing countries as identified by Colle (Notdated, p. 6) are: "(a) Information and communication are important to rural development and poverty alleviation; (b) ICTs extend, accelerate, and magnify the development potential of information and communication; and (c) Shared community facilities are the most feasible approach to achieving universal ICT access in the early 21st century". Among these assumptions pull factors or demand side factors are juxtaposed with supply side or push factors

such as rapid growth in technological innovation and market search of computer and internet companies across the globe (Mukerji 2008).

Based on their extent of ICT capacity and the subsequent capability of service, Jensen (2002) classifies the telecentre into four types such as (a) micro or standalone telecentre (akin to phone shop or basic communication technology centre providing some basic services); (b) mini; (c) basic and (d) full service centre. As the number of technologies increases so does the upgradation from one type to another. A full scale telecentre has more variety and increased number of technologies including advanced ones such as computers, photocopiers, multimedia projectors, high speed internet, telecom facilities and video-conferencing equipment. They enable a cohort of services such as telemedicine, distance learning, online banking, web browsing, scanning and photocopying. Some of these telecentres also offer spaces for community meetings or local business use (Jensen 2002; Oestmann & Dymond 2001). Colle (2000) identified a number of other variables associated with telecentre typologies as presented in the Table 1.

Table 1: Telecentre Typology based on multifarious attributes.

Attributes	Types of Telecentre	
Focus	Narrow Focus (only technology access)	Multipurpose such as Full scale Telecentre
Inclusion	Community based (represents broader constituency)	Establishment (Top-down government or business organisation based)
Attachment	Stand alone	Attached (part of another institution)
Theme	Thematic (specific to theme such as education, health, etc.)	Universal (whole community needs)
Networking	Independent	Networked (works with other telecentre)
Operation	Public sector led	Private sector led
Orient	Profit oriented	Service oriented
Fund Source	Public	Private
Charging users	Commercial	Free
Location	Urban	Local

Source: Colle 2000 cited inHarris (2001, p. 74).

Consistent with these types a number of management models are in place: government led, PPP franchised, NGO-run, school/library/local government based, cooperative and commercial cyber cafes (Hanna 2010). Among its various types the government often chooses the model which is managed and run by local entrepreneurs and the community (Proenza 2001).

Because of newness of the approach of application of ICT for development and thus subsequent research infancy, telecentre still lacks a solid theoretical background with a conceptual model or theoretical framework (Roman 2003). It traces its theoretical premises from various disciplines. It provides equipment and connectivity (technical construct) to offer access (close to economic, social and psychology concepts) to information system (IS) for capacity building, empowerment (development discourse) (Bailur 2007; Colle 2002; Whyte 1999). Since it uses various cross-linked

conceptual underpinnings it cannot be completely bound by a single theoretical framework (Roman 2003). The prevailing research are clustered around three key domains such as impacts, management practice and sustainability, each of them being explained often using distinct theoretical frameworks (Bailur 2007; Harris 2001). These three key issues are interlinked and to some extent sequential: the sustainability analysis is meaningful once it is determined that the project has impacts on the community supported by managerial best practices (Bailur 2007; Hudson 2001).

Impacts on users

In order to understand the impacts on users, termed also as social acceptability, the communication theoretical framework - the Diffusion of Innovation' by Everett M. Rogers - is appropriate (Hilbert 2011; Kumar, R & Best 2006; Roman 2003). Roman (2003) finds the theory's suitability for telecentre for a number of reasons. First, it has the predictive potential which is useful for planning and design of a telecentre. Second, it provides stimuli to further research to contribute to theory building, and finally it has versatility to fit the needs of multidiscipline. He resembled it to the *Middle-range theory* defined by American Sociologist R K Merton as "Middle range theories lie between the minor but necessary working hypotheses that evolve in abundance during day-to-day research and the all-inclusive systemic efforts to develop a unified theory" (Merton 1968 citen in Roman 2003, p. 55). It has also an advantage of embracing contextual factors especially within developing countries to understand social dynamics and assimilation of technology (Roman 2003). So, this theory can be applied as the guiding principle for evaluating a telecentre considering it as an innovation (Kumar, R & Best 2006).

Diffusion of Innovation Theory

In his seminal work, *The Diffusion of Innovation,* Rogers (2003) defines diffusion as "the process by which an innovation is communicated through certain channels over time among the members of a social system''. An innovation connotes an idea, practice or object perceived as new by the people or other unit of adoption. It is likely to be regarded as somewhat uncertain and potentially risky by most members of the social system. The adoption precedes knowledge on it, persuasion and decision. Initially, the innovation spreads slowly till a certain number of related people have adopted. Then the rate of diffusion accelerates until the most members adopt it in the middle period. It is followed by a decline in the tail end, because of saturation in diffusion there are fewer numbers of potential new adopters. As the number of new adopter tappers off, the number of non-adopters withers away resulting in completion of the diffusion process. This oscillation of diffusion rate over time forms an *S* shaped curve when presented in cumulative percentages (Hilbert 2011; Rogers & Shukla 2001). Rogers (2003, p. 281) categorised individual adopters over the period of the curve into five types: 'innovators', 'early adopters', 'early majority', 'late majority' and 'laggards'.

Telecentre can be regarded as an innovation in terms of its newness as an idea and an institution in the community. It is also a store of innovation containing other innovations in its technology collection and services. Thus, it has a number of ramifications for diffusion research such as diffusion of ICT in remote areas, spread of new ideas and acceleration of development (Harris 2005; Roman 2003). Roman (2003) considers three most pertinent points of Diffusion Theory for telecentre as:

> "the perceived attributes of innovations: how the community perceives the telecentre and the services it provides, (2) the communication process: how telecentre innovations are communicated and shared and how other innovations are created or sought for at the telecentre, and (3) the consequences of adoption: studying costs and benefits and general socioeconomic impact of community telecentres" (Roman 2003, p. 56).

Perceived attributes of innovations

According to Rogers (2003) the perceived attributes which drive the rate of diffusion are 'relative advantage', 'compatibility', 'complexity', 'trialability' and 'observability'. The last two are not as important to the telecentre model and they do not have much connotation for community perception (Roman 2003). In the following sections the first three attributes will be examined and contextualised within the broader research on telecentres.

Relative advantage

Relative advantage means how the innovation is perceived to be better than the preceded system. The degree of relative advantage can be measured in economic returns in terms of costs and benefits. It also includes aspects such as convenience, satisfaction and social prestige. The better the perceived relative advantages an innovation has, the greater the rate of diffusion would be (Rogers 2003).

In the context of telecentre research we can examine the relative advantage of a number of potential benefits for users. The Union Digital Centre (UDC) carries potentials for providing benefits to citizens of many similar projects across developing countries. On evaluation of the project *Gyandoot* in India the study by *Centre for Electronic Governance (CEG) and Indian Institute of Management, Ahmedabad (IIMA)* (2004) finds benefits of reduced harassments of people by government officials, time savings, request given priority, quick access and reduced incidents of corruption (CEG-IIMA 2004). On an identical note, (Kumar, R & Best 2006) reports that the introduction of Sustainable Access in Rural India (SARI) project saved time and cost, reduced corruption and established easy and hassle free access. Encouraged by the initial success of *Gyandoot*, *SARI* and other similar projects the government of India has undertaken many similar projects in other rural parts generally known as Common Service Centres (CSC) (Shadrach 2012).

Bhatnagar (2014) found a number of 'efficiency gains' from several similar interventions worldwide in terms of improved quantity and quality of service, empowerment of citizens and administrative efficiency. Subsequently, he developed key dimensions of impact analysis for clients such as " (a)

Direct and indirect economic costs (number of visits, travel costs, travel time, waiting time, elapsed time for service delivery, service fee and cost of bribes); (b) Governance (corruption, accountability, transparency and participation); (c) Quality of service (error rate, decency, fairness and convenience)" (Bhatnagar 2009, p. 140). The calculation of distance, time and costs is considered as the most direct and measurable benefits for citizens. On the other hand, less tangible issues such as quality of delivery and governance, accessibility and convenience are mostly measured based on users' perceptions (Bhatnagar 2009). Hudson (2001) finds two types of impacts such as short-term and long-term impacts of telecentre projects. The short term impacts are improvements in access to information, savings in time and cost but more long term impacts relate how those information resulted in better outputs and outcomes, that is,more incomes or education and better socio-economic development.

Because of greater potential of relative advantages, telecentres are increasingly becoming the platform for providing e-government information. It is also considered as the extension of national communication infrastructure (Hanna 2010). User perspective e-government research focuses on what users value most and what they expect of the government in terms of their needs (Mitra & Gupta 2008). Hernon and Nitecki (2001) cite eleven questions of 'How' citizens look for an e-government program based on their priorities, expectations and satisfactions. These eleven 'Hows' ask about the cost, number of services, timeliness, thriftiness, accuracy, responsiveness, completeness, value, reliability, courtesy and satisfaction. While some of these benefits are tangible, others are intangible.

Bhatnagar (2000, 2004) reports a number of less tangible benefits in many of the ICT led programs for rural people. For instance, the use of ICT in utility bill collection in many parts of the developing world has reduced queue and waiting time and ensured accuracy in billing and accounts receivable as well as ensured receipt of payment to citizens (Bhatnagar 2004). Likewise, the IT facilitated market information in rural India empowered the small farmers to avoid the disproportionate share claiming by the middle man and obtain their bargaining capacity with consumers in *Warana Wired Village Project* of Maharashtra. Rural small farmers and producers usually lack information about market prices of their commodities, crop production management, weather forecasts and credit facilities. ICT can empower them breaking the barriers of asymmetric social structure that monopolises the information (Cecchini & Raina 2002).

In Bangladesh, the potential for UDC for generating some relative advantages in terms of both direct and indirect benefits is reported in studies by Bhatnagar (2014); Hoque, MS and Sorwar (2014); Rahman and Bhuiyan (2014); Sarker (2013); Siddiquee and Faroqi (2013). In general, these benefits are easy access, convenience, less cost and time, development of livelihood and new skill acquisition. However, their assessment is very much about the potential of UDC without establishing any point of comparison with alternative providers and to determine as to what kind

and extent of benefits are generated. Neither of these studies are articulate about less tangible issues.

From the discussion above it appears that the telecentre model has potential relative advantages to provide benefits in terms of economic and non-economic terms compared to the alternative system. Certainly, the potential is highest if it can provide the government services locally, which are usually distant to rural people and afflicted with governance problems in delivery. Such benefits range from reduction of time and cost, hassle free and error free information, reduced corruption and better quality. However, to optimise relative advantage, information and services have to be consistent with needs and priorities of people.

Compatibility

The second attribute of diffusion is the compatibility that refers to the degree in which the members of the social system perceive innovation as consistent with their values, experience and needs (Rogers 2003). Kumar, R and Best (2006) studied compatibility by linking the socio-economic profile of users to the relevant contents, that is, how contents are aligned with the needs of existing profile of users in SARI Project. Researchers (Roman 2003; Roman & Colle 2002) underscore on the needs assessment research by telecentre practitioners and promotion of community participation for knowing the circumstantial relevance and consistency with demands. This issue is related to another diffusion of innovation theory supply-push and demand-pull theory which enunciates that “innovation is most likely to occur when a need and a means to resolve that need are simultaneously recognized” (Zumd 1984 cited in Roman 2003). The most formidable challenge for telecentres today is the mismatch between its supply and needs of stakeholders which affects its survival (ICTA 2010). Shore (1999 cited in Oestmann & Dymond, 2001) mentions a demand list created by villagers in Pondicherry, India. The demanded content comprises government welfare programs for poor families, competitive market prices of agricultural equipment, seeds, fertiliser and pesticides for farmers, insurance for crops and families, a directory of doctors with specialities and hospitals, timetables for buses and trains, and veterinary and animal husbandry programmes. Based on the field survey, Rahman and Bhuiyan (2014) categorise some livelihood information sought by people from different occupations: farmers (broadly pertaining to agriculture, land laws and disaster management), youth and unemployed (employment search), housewives (agriculture, health and land and human rights, income generating activities, communication with relatives and remittances), students and teachers (online contents, exam results, admission, education loan or scholarship), service holders (circulars, forms, MPO of educational institutions), entrepreneurs (business information on SMEs, training, credit), people’s representatives (development project). Many of these services are offered from government. Hence, greater attention is needed to identify them to be offered from a telecentre. A comprehensive categories of services can be established by the government by following the stage model as postulated by benchmark studies by the United Nations (UN 2014) and other scholars such as(Layne, Karen & Lee, Jungwoo 2001; Moon 2002;

Yildiz 2007). The stages form the basis of a country's ability to deliver online services to their citizens accessing directly the web or through a telecentre:

The first stage termed as the '*emerging presence stage'* is featured by the existence of government web sites with static and limited but basic information providing citizens with few options to operate and interact. The second stage is known as the '*enhanced presence stage'* incorporating a greater amount of downloadable databases and information on policy and governance issues. Although interaction is a bit advanced at this stage it is unidirectional streaming from the government to the citizens.

The third stage, the '*interactive stage'*, on the other hand, provides considerable options for interactions where citizens are able to reciprocate with the government through the internet to harness a whole range of services online. This stage further contains specialised databases and downloadable forms; citizens are able to apply for services such as the tax payments and license renewals. The fourth stage levelled as the '*transactional stage'* facilitates complete, secure, and two-way transactions between the citizens and government. The transaction assists citizens in obtaining a variety of online services such as visas, passports, licenses, and permit renewals, tax payments, e-procurements and other interactions between the government and citizens. Broadly dichotomising as cataloguing and transactions these four stages create government's electronic interface with citizens.

The fifth stage, the '*connected or integration stage',* represents the most sophisticated level. It is characterised by an integration of services and the institutions offering them aim to remove physical barriers and offer the most, if not all, public services spotlessly and mirrors all services provided in person, by mail and by telephone. It enables them to share functional areas to integrate their operations. The final stage is the horizontal integration where a multitude of functional domains are integrated in the same electronic system and presented through a central portal (Layne, K. & Lee, J. 2001; Moon 2002; UN 2008, p. 16; Yildiz 2007).

Each of these stages is characterized by a different level of sophistication and interface with citizens and others. However, it must be noted that while each stage is distinct, different stages can occur simultaneously. In developing countries the stages can happen without strictly following the chronological order or linearity as they have a much faster learning curve (Yildiz 2007). Telecentre is one such innovation point where a combination of services which may belong to different stages can be offered.

As can be assumed from one stop character of telecentre, it can be a depository of information and services from both government and private providers. A number of studies find that the presence of telecentre has increased the access to information from various sources to those who suffer from information poverty (Hanna 2010; Harris 2001; Kumar, R & Best 2006; Madon 2009; Proenza

2001). Information is critical to the development. Studies by Community Informatics (CI) focus on how the presence of ICT can improve the access to information for improving information on poor people's educational, economic, social and cultural goals. In fact, the telecentre is regarded as an infomediary assisted knowledge broker centre. It can infuse learning of new things, modify existing information, disseminate skills and ideas and help role play and thus build useful knowledge within the community. Learning leads to capacity building and to undertake new roles (Harris 2001).

Kumar & Best's (2006) study of SARI project in Tamil Nadu, India finds a statistically significant relationship between the presence of KIOSK and an increase in rates of services like the delivery of birth and death certificates and pension benefits in the year 2001-2002. The SARI also introduced internet use, email and computer education (Madon 2009). Telecentre provides a forum for increasing participation of people for another demand driven service- the e-literacy. The *Akshaya Project* in Kerala contributed to augment computer literacy of grass root people. Research shows that it has encouraged people to use technology to satisfy their livelihood and social needs. Akshaya has been found to generate employment, enhanced IT literacy and communication and increased internet services. Women are reported to gain more from employment in areas of typing and computer publishing (Kuriyan, Ray & Toyama 2008; Prasad 2012).

In Bangladesh, for instance, the Development research network (D-Net) as a social enterprise has been working since 2001 to promote 'access to information and knowledge' of rural citizenry though developing contents on livelihood issues and disseminating them through *Tathya Kalyanies* or info ladies (D-net 2016). One of the big players in the similar mission is *Grameenphone* that run Community Information Centres (CIC) in all upazilas. The CIC is equipped with computers, digital camera, SIM, EDGE Modem, printer, web camera and other necessary equipment. Though owned by private entrepreneurs, *Grameenphone* supports these centres by providing support networks, training to the entrepreneurs, and advisory services[2]. In association with Grameen Phone, CARE Bangladesh has launched information boats in the Hour areas of *Sunamgonj* district that also provides information on basic livelihoods such as health, agriculture, literacy, market prices in exchange of nominal prices[3] (Islam, AM & Tsuji 2011).

Complexity

The third attribute of diffusion is the complexity that refers to the degree in which an innovation is perceived by the unit of adopters to be difficult to comprehend or use. In contrast to relative

2 The study by Islam & Tsuji (2011) reports that a good number of people visit CICs for services like e-mail, chatting, surfing, browsing, web searching, knowing about local commodity price, health information through health line, agricultural information, cell bazar (shopping through mobile phone) and some other livelihood information. Some also visit for knowing exam results, admission schedules, online newspaper reading and job search, online entertainment, music and games (Islam, AM & Tsuji 2011).

3 *Tathyo Toris* (Information boats) are equipped with computers with internet and e-mail facilities, digital contents, printers, scanners, digital cameras, photocopiers and so on. It is making marginalised people in the most inaccessible part of *Sylhet Division*, *Sunamgonj Haor* (inhabitants of a number of water locked villages) aware what IT can offer(Islam, AM & Tsuji 2011).

advantages and compatibility the complexity influences diffusion negatively and slows its pace. Hence, less complexity is desirable for greater diffusion (Rogers 2003). This can usually happen in regard to users of telecentres who have relatively less education or are illiterate resulting in minimum or non-use. Moreover, mediation of external operator to use computer can add to the mystification, if not well communicated. Simpler appliances, customised applications and easier interface are helpful to mitigate complexity (Kumar, R & Best 2006).

The innovation that has greater comparative advantages, compatibility and less complexity will experience quicker adoption (Rogers 2003). Kumar (2011) have identified two additional attributes that can increase the diffusion of KIOSK use are contiguous location and affordability. Remote physical location and lack of flexible operating hours are also reported to affect the people's awareness, accessibility and usage rate (Rahman & Bhuiyan 2014). Once the innovation comes into existence it must be followed by communication to spread (Rogers 2003).

Communication of innovation

Diffusion is a particular type of communication in which participants create and share information on a new idea or content with one another (usually between those who use or have knowledge about innovation with those who have not) through certain channels. The two means of communication include mass media and interpersonal channel. Usually, mass media is important to create awareness about the innovation while the interpersonal communication is crucial for persuasion and final adoption (Rogers 2003). Roman (2003) considers this aspect of diffusion theory have links to social network theory. Diffusion Theory enunciates that "individuals who are isolated or at the periphery of social networks- are less likely to hear about an innovation, will hear about it much later, and will not have as much opportunity for social comparison" (Kincaid 2000 cited in Roman 2003 p. 58). In regard to telecentre infomediaries, volunteers and local organisations can facilitate interpersonal communication (Roman 2003). The interpersonal communication works more effectively in a situation where members are mostly from similar socio-economic background (language, beliefs, education, socio-economic status, etc.) which Rogers (2003) refers to as *homophily*. This implies that when telecentre operators, volunteers, and local promoters share homophilious traits with the community it can maximise diffusion (Roman 2003). However, there needs to have certain degree of heterophily, or dissimilar characteristics in technical skill for telecentre operators for new information exchange with people who do not have it (Rogers 2003).

Consequences of innovation

According to Rogers (2003) the consequences of diffusion can be positive or negative or both. Assessing consequences is most likely to be influenced by value judgment and thus difficult to measure. In developing countries diffusion will lead to widening the existing socio-economic inequalities between lower and higher status segments of the population. This is also supported by

Ascroft and Chege 1976 (cited in Roman, 2003) that diffusion process may result in inequitable development if preventive measures are not adopted. Kumar, R and Best (2006) found SARI kiosks being used more by people of higher socio-economic status. Rahman and Bhuiyan (2014) illustrate that age, sex, literacy, education and socio-economic status affect adoption and use. The 'S' curve in the diffusion theory assumes an increase in the digital divide in the early stage (Hilbert 2011). Rogers (2003) describes that early adopters have relatively better socio-economic status and greater education than later adopters. If the existing social structure is highly unequal the diffusion will lead to even greater socioeconomic gap, but not inevitably. According to him (Rogers 2003), three strategies adopted by diffusion agencies can reduce the gap: (a) greater awareness generation of innovation by facilitating information of it to non-users, (b) more access to evaluation information on innovation by peers and (c) larger slack resources for adopting innovation.

This early trend of diffusion imbues implications for digital divide which is considered as the result of existing socio-economic inequalities rather than its cause (Harris 2002). Rogers (2003) also considers that the digital divide- the gap between individuals in ICT and internet use- is the consequence of lack of economic resources, electricity and telecom infrastructure and appropriate government policy. To him (Rogers 2003) one strategy to bridge the digital divide is the adoption of shared access point or telecentre.

Impacts on digital divide

The term digital divide is often used to refer to the inequality that exists between people who have and who do not have the access to and the capability to use modern information and communication technologies (ICT) including the internet (Gurstein 2003). ICT facilitates access to information which is key to the social and economic activities that comprise development process as Kofi Annan, the former Secretary-General of the United Nations, puts it:

> "The new information and communications technologies are among the driving forces of globalisation. They are bringing people together, and bringing decision makers unprecedented new tools for development. At the same time, however, the gap between information 'haves' and 'have-nots' is widening, and there is a real danger that the world's poor will be excluded from the emerging knowledge-based global economy" (Anan 2002 cited in Harris 2002).

This statement indicates that the socio-economic divides can widen the digital divide. Inequalities along these dimensions such as education, income, gender, age and geographic locations are more of a result of lack of access to information than access to technologies (Harris 2001; Hilbert 2011; UN 2012). Digital Divide is just one element of developmental divide and it cannot be understood ignoring pre-existing role of information within development. While the telecentre facilitates somewhat limited direct access to ICT, it has a more prominent role in promoting access to information to catalyse development (Heeks 2002) (Harris 2002). Whyte (1999 cited in Harris 2005) recommends several questions to ask for assessment of telecentre impact on community development i.e whether it is negative or positive; benefits some people more than others; whether

catalyses for other positive innovations and initiatives at grass root level and whether it helps people to help themselves.

Thus, the digital divide is not merely the divide in technology access as understood by the phased-digitalization-definition and the business-model definition[4]. Rather it can be perceived better with a 'purpose' definition which integrates it with various socio-economic divides (Harris 2002). It sees the use of ICT and internet not merely as the traditional technology as was the case in 1990s but as a development tool to ensure sustainability in efforts to eradicate poverty, provide literacy and ensure better quality life (UN 2012, p. 89). This is consistent with *the Rural Livelihood Framework*.

'The Rural Livelihood Framework' as proposed by Frank Ellis (1998) theorises that interventions aimed at improving livelihood assets and resources of rural poor and promoting diversity in the pursuit of livelihood have potential for poverty reduction. Combining diverse strategies and sources of livelihood enables poor people to be less vulnerable to risks and shocks. A livelihood that can cope with shocks and strains and provide for forthcoming generation is a socially sustainable livelihood (Chambers & Conway 1991; Ellis 2000). Soriano (2007) finds in rural villages in Wu'an, China that telecentres play catalytic roles in assisting the poor's access to livelihood assets and resources and enables them to take on diverse livelihood strategies. There are positive implications for reducing poverty in a number of dimensions of livelihood: economic capital leading to better earning or production; human capital such as the spread of e-literacy or adoption of new techniques for agriculture and social capital which might include hosting a community meeting and knowledge exchange.

Enhanced access to education, health, government and financial services, market information can empower poor and benefit them economically. Key arsenals to attack poverty such as increased opportunity, enhanced empowerment and improved security equip poor gain economic benefits from the market. Empowerment enables them to receive horizontal treatment from provider agencies while the improved security minimises the risks of losing the financial game. Empowered by the ICT, rural poor can access to cultural, economic and political opportunities, transparency guarantee and protective security which can create money, knowledge and human capability, and thus contribute to poverty reduction (Bhatnagar 2004; Mitra & Gupta 2008). On the other hand, lack of access leads to discrimination in opportunity and helps to perpetuate poverty (Hanna 2010). Cecchini and Scott (2003) found several cases of ICT applications in India such as Computerised milk collection centres, Healthcare Delivery Project and Gyandoot that contributed to the poverty reduction.

[4] The phased-digitalization-definition sees the process in three phases i.e. degrees of progress in terms of infrastructure, skills, and competition in the first phase, diffusion of devices in the second phase and impact in the final phase. The business-model definitions meticulously calculate the relationship between the info-density investment and output from Info-consumption of ICTs (UN 2012).

The impacts of bridging digital divides are far reaching since they have inseparable nexus with socio-economic inequalities. The intimate relationship between digital divide and other social problems encourages policy makers and researchers to focus on them through an integrated approach. For instance, removing gender digital divide would enable policy makers to reduce gender inequalities, thus performing two actions with a single shot. Bridging other forms of digital divide such as that of poor-rich, rural-urban central-local, will transform it into digital dividends. It is, therefore reasonable to ask whether the disadvantaged people are included and whether the application available there are friendlier for those disadvantaged groups. And if so, what difference is achieved in terms of stated goals and explicit targets (Hudson 2001; UN 2012).

We have introduced the Diffusion of innovation theory and its pertinent points to the telecentre model including attributes of diffusion. We have discussed the consequences of innovation and introduced the concept of digital divide and rural livelihood framework. For UDC we now draw the following hypotheses based on the discussion on the literature.

(1) The UDC has increased the rural people's access to information and services (Compatibility of Diffusion Theory[5])

(2) The UDC has relative advantages in terms of time cost and distance reduction, improved the quality of delivery and better governance of it.

(3) *The UDC has impacts on bridging the digital divide and improving the rural livelihood.*

One of the problems with the diffusion theory is that it assumes that attributes of innovation themselves would ensure diffusion and use which some scholars (Green 2001; Rissola & Centeno 2011) refer to as 'technological determinism'. It attributes the sloth in adoption to the individual characteristics whereas the external factors may hinder the uptake (Garrido 2012). Hence, they assume that it is more of the political and economic contexts and the physical and social environment that shape the innovation development and use. Moreover, we have seen that telecentre has comprehensive goals to achieve benefitting many stakeholders. Such comprehensive goals require all-inclusive and hybrid approaches with integrative, multi-stakeholder, and multi-channel implementation strategies (Hudson 2001). Hence, we need to focus on framework that involves multi-stakeholders in the implementation and management of broader goals.

[5] We first discuss the 'compatibility' before 'relative advantages' because it is related to socio-economic profile of users and relevancy of contents (Kumar, R & Best 2006).

Management of telecentre

From the background knowledge of partnership telecentre typologies discussed in the first section it emerges that there are various stakeholders involved in it. We know that the UDC is established on the concept of public-private-people's partnership (PPPP) considering people also as stakeholders. Though there are various theoretical approaches for different telecentre projects depending on contexts and types Bailur (2007) has used Stakeholder theory for analysis of a similar project, *the Gyandoot* in India. This theory is applied as an analytical tool to understand who stakeholders are and as a best practice template to assess what has been accomplished in regard to stakeholders, their behaviours and ways of management and problems with its application for an ICT4D project (Bailur 2007). This theory can give two advantages such a tool for better understanding for impacts, best practices and sustainability and an improved reference framework to management to improve practices (Bailur 2007; Mishra & Dwivedi 2012). As a broader framework it is relevant and yet with the potential of incorporating a subset of theories from other disciplines within (Bailur 2007; Scholl 2001). Moreover, the use of concepts such as 'public-private partnership', 'community participation', 'stakeholder's involvement' (Kuriyan & Ray 2009; Proenza 2001; Roman & Colle 2002) consolidates the appropriateness of the theory for telecentre.

Stakeholder Theory

Stakeholder theory owes its origin to the management literature branches such as organisational management, strategic management, business ethics, corporate planning process, e-government, project management and Information System (Mishra & Dwivedi 2012). The early use of the word 'stakeholder' and its meaning, "those groups without whose support the organisation would cease to exist" or shareholders were pioneered by Freeman (1984) to include those who affect or are affected by the organization's mission. That is, those who have 'stake' and not merely the 'stock' in an organisation. To him, the purpose of an organisation is to create value for its stakeholders, failure of which can lead to its collapse (Freeman 1984).

Ever since Freeman's work, there have been considerable debates on the underpinnings of the theory for different disciplines. Based on previous research Bailur (2007) identifies three perspectives in them, such as: Descriptive, Normative and Instrumental. Donaldson and Preston (1995 cited in Mishra & Dwevedi 2012) states that the descriptive perspective offers a model of the organisation; the instrumental perspective provides a framework to assess the relationship between practice of stakeholders and performance of the firm. Despite having both of these perspectives the stakeholder theory is, in essence, the normative in terms of identification of them by interests and considering them as intrinsically valuable. They also see the perspective as managerial in that it recommends attitudes, structures and practices and requires that simultaneous attention be given to the interests of all legitimate stakeholders. Stakeholder theory provides the advantages of determining who are role players in a project, and if and how they can

be managed (Mishra & Mishra 2013). It appears that stakeholders matter in an intervention, from any perspectives discussed earlier, therefore, identification, their involvement and management are paramount. On review of the generic literature Freeman (1984), its use in information system (Pouloudi & Whitley, 1997) and international development (Gavin & Pinder, 1998) Bailur (2007, p. 69) developed a framework for stakeholder analysis for telecentre projects presented in Figure 2.

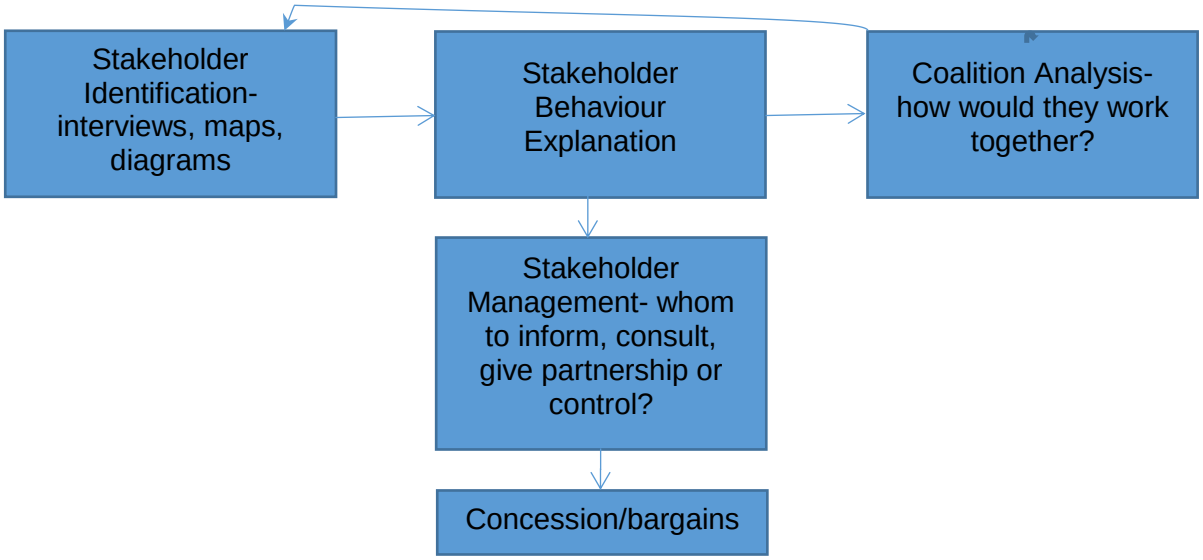

Figure 2: Stakeholder Framework.

First, is to identify stakeholders, understand and explain their behaviour and anticipate on how they work together, how conflict may arise. This process might have to be reiterated several times.

Second is the stakeholders' management strategy: ascertaining the portfolio of their responsibilities and how each of them should be involved- whom to inform, consult, and give partnership or control. The concessions can be provided if the existing strategies do not work.

Finally is the coalition analysis –how would stakeholders would work together which can lead to the identification again (Bailur 2007; Mishra & Dwivedi 2012).

In any information system the relevant stakeholders are: "all those who have a practical concern for the effective application of new technologies, and who are in a position to take or to influence decisions about why and how they are used" (Boddy and Buschanan 1986 cited in Islam, M.S. & Gronland 2007, p. 168). We can assume that the key stakeholders in a PPP telecentre would be the government, the private sector, the entrepreneur and the community. In the next section we discuss their potential behaviour and management in light of the stakeholder's framework.

Stakeholders and their behaviour in a PPP telecentre

The UDC bears similarities with other telecentre projects founded on PPP approach in many developing countries. The PPP approach is often chosen by governments to achieve much desired

sustainability through integration of entrepreneurial and social objectives (Naik, Joshi & Basavaraj 2012). While the public sector initially takes the responsibility to jumpstart the field by building and equipping these centres it expects the private sector would ultimately operate and own them making it an enterprise through investment, competition, and innovation in the service provision. The public sector would continue to support back end in terms of policy, infrastructure and connectivity, services and capacity building (Hanna 2008, 2010). Studies (Jensen 2007; Kuriyan & Ray 2009; Shadrach & Sharma 2013) on these partnership projects have found quite a number of evidences where the private sector performs below expectations as well as the public sector takes time to supply government's promised supports. The local government's role also falls short of engaging the community and necessary promotion. Despite such limitations there are many cases where the telecentre has reached the sustainability mark winning the initial hiccups from effective collaboration of partners.

Government as stakeholder

The government plays the key role by conferring supports that range from policy, finance, technical or managerial assistance to service and infrastructure development to offshoot the telecentre. The policy support ensures the roadmap for diffusion of telecentres; the financial support confirms the investment while the technical support relates to the able management and partnership strategy to keep them in continuous operations. The supply of services that are related to people's livelihood and have potentials for opportunity costs helps to achieve the developmental goals. The infrastructure development includes low cost broadband connectivity and power supply guaranteed in remote communities (Jensen 2007; Roman & Colle 2002; Wellenius 2003). Similarly, it identifies the private operators and gives them partnership and stake in the model for sustained delivery (Shadrach & Sharma 2011). However, as many developing countries find it challenging to fund continued supports many telecentre projects end in weak performance or eventual shut down (Hanna 2010; Proenza 2001).

Telecentre's own financial sustainability then becomes crucial for the survival. Though financial sustainability is not the sole target of telecentres owned by the government, as is the case with many other government services, under PPP it attains significance since the aim of the partnership is to reduce subsidies over time. Continued government's financial support is discouraged for two reasons: first from shortage of funding and second it can lead to inefficiency and unresponsiveness which this new reform of governance aims to overcome (Hanna 2010; Harris 2007). High subsidization in developing countries experiences wastage forcing government to stop or limit the funding (Proenza 2001). However, emphasis on the market approach can run the risk of downplaying other objectives such as social sustainability. As the target is to bridge the digital divide and ensure welfare of marginalised groups, stress on self-finance would lead telecentres to provide services that are commercially viable at the cost of social development goals. Thus, a careful balance between subsidy and revenue is underscored by scholars to achieve sustainability

in all dimensions. The 'social enterprise model' comes between them to balance between economic gains and social targets (Hanna 2010; Harris 2007; Proenza 2001). For achieving both of these ends the government identifies the private operators and give them partnership.

Entrepreneur's involvement

The emphasis for entrepreneurship development comes from the necessity for survival, growth and expansions of the model when the external support will cease to continue. While the government provides the infrastructure or the initial hardware of the telecentre it expects the much needed software, the efficiency, would come from the private sector with subsequent entrepreneurship developed for growing the business (Jensen 2007; Shadrach & Sharma 2011, 2013).

The conventional PPP requires the government to make an arrangement with the leading private sector to share long term risks and returns in financing, designing, constructing, operating or owning public infrastructure or services (Hodge 2004). Like privatisation and outsourcing it enables the government to eliminate the borrowing needs in implementing projects and providing 'value for money' by transferring risks to the competent risk manager. For private partners it holds incentives to convey projects in time and within budget, and to operate the asset with care (Flynn 2007; Webb & Pulle 2002). Contrary to the approach of building service/infrastructure with the finance from the private sector many telecentres under PPP in developing countries are initially established with the finance from the government (Sharma 2011). This happens due to fragile private sector in rural areas and unwillingness of few available ones to invest in an emerging industry with uncertainty, given the poverty base of users as well as government's commitment to keep the price lower for the disadvantaged. To support infrastructure, services and operations of telecentres, governments in some developing countries take two approaches: first engaging specialised private or public sectors in harnessing investment and efficiency from local level operators and second, the direct partnership with home grown entrepreneurs, especially for operations and investment (ICTA 2010; Shadrach & Sharma 2013). The second approach risks the investment and efficiency gains in the context of poverty, illiteracy and digital divide generally prevailing in the rural community (Kuriyan & Ray 2009; Liyanage 2009).

Hence, the government attempts to back up the entrepreneurship development process by creating some conducive conditions in the stakeholder's management. This is somewhat contrary to the classical notions and attributes of entrepreneurship which stresses on spontaneity and ingenuity. The Schumpeterian definition of entrepreneurship is the assumption of risk and responsibility in designing and implementing a business strategy (Schumpeter 1949). Ronstadt (1984) operationalises the assumptions and defines entrepreneurs[6] as individuals who take risks in investing time, career choice and equity for creating value in products or in service. However,

[6] (Kilby 1971 cited in Balachandran & Sakthvelan 2013) lists a host of functions of entrepreneurs such as exploration of market opportunities, resource command, and competitiveness, rapport with the bureaucracy, customer and human resource management, control over production, oversight, quality control and innovation.

this induced entrepreneurship can be justified with the recent use of the term 'social enterprise' that connotes reforms in mindset to pursue business not just for profit but also for social and environmental ends (Cuckier et al. 2011) such as the mission of a PPP telecentre. Though it can be regarded as a platform for entrepreneurship generation, PPP itself can generate imbedded problems from unclear goals, resource constraints, tension over power sharing and differences in motives between partners (Abelson 2007). Moreover, if operators are only acquainted with charitable funding they tend to neglect financing from their own (Liyanage 2009).

The government has, therefore, roles in engaging the private partner not only by triggering a seed of investment but also creating an enabling environment through training, consultation, monitoring and rewarding (Kuriyan & Ray 2009; Shadrach & Sharma 2011). Entrepreneurship development is very crucial for financial sustainability of telecentres since a good entrepreneur employs business techniques to survive through difficult times and contribute to community development (Cecchini & Scott 2003). As a community member, who knows the dynamics of it, the operator can help with networking, access to information and value-added services, knowledge creation and dissemination, spread e-literacy, arouse feedbacks from community members and ultimately empower them by mobilising political, cultural and social aspects of inclusive information society development (Hanna 2008; Misuraca 2007). It gives the government opportunity to use the private sector as agents of change as well as for the latter to earn a living and profit and spin-off the development (Datta & Saxena 2013). The development of entrepreneurship is, thus, central for attaining operational efficacy and becoming sustainable in future out of fragile private sector[7]. Key determinants are entrepreneur's engagement with the community, needful services, appropriate technology, increased income to reach break-even point and profit, investment, market skill and external support (Kuriyan & Ray 2009; Shadrach & Sharma 2011).

People as stakeholders

From any perspectives of stakeholder's theory, the 'normative' in particular, telecentre's users can be considered as intrinsically valuable since the very aim of such intervention is to ensure their development (Bailur 2007). According to Scholl (2001) this particular dimension of stakeholder theory emanates from 'Business Ethics' which "assumes that each stakeholder of the firm has an intrinsic value regardless of his/ her actual power or legal entitlement. It seeks to formulate correct ethical norms for managerial behaviour" (p.736). In a particular type of PPP telecentre government identifies local government units for symbolising people's indirect participation as well as for getting cooperation in hosting, financial assistance, mass awareness and local level supervision.

[7] In a developing country it is difficult to find willing to private sector invest where the returns are not certain, given the poverty base of users. Moreover, the government have a mission of providing public goods to those who are disadvantaged and who are inaccessible due to digital divide. Hence, telecentre in developing countries must be designed as a social enterprise that has both goals: profit and public welfare. The entrepreneur of such model can more suitably be considered as a 'lifestyle entrepreneur' who thrives on both causes. The leadership in government has, therefore, roles in engaging the private partner by establishing careful balance between revenue and subsidy (Sharma 2011; Silva & Rodrigures 2005).

For Indian *Gyandoot Panchayat Model* the *Gram* or *Janpad Panchayat* (the smallest unit of local government) provides the physical space, invests in equipment and other infrastructure purchase and pays utility bills (CEG-IIMA 2004). Naik (2011) adds that locating telecentres in local government units provides advantages such as proximity to people, confidence in the system and mass awareness. Rahul de (cited in Naik 2011), however, warns that giving management control in these units has the risk of middleman capture like that of a government agency. Because local government units in developing countries are not immune from illiteracy, governance problems and lack of participation (Crook & Manor 1998). There is a growing debate on how conducive their involvement in some of the important components of stakeholder's management such as entrepreneur's identification and recruitment, their control and supervision when the target is to promote telecentre as an enterprise (Wellenius 2003).

People's direct participation as customers or stakeholders of telecentre is more obviously linked to its sustainability. The demands for financial sustainability, for instance, may appear inappropriate given the small cliental base with inadequate spending behind services (Cisler 2002 cited in Kumar 2005). However, such participation must include the disenfranchised sections to serve the development goals such as improve the living and welfare of low-income and poor what makes telecentre different from commercial cybercafés (Proenza 2001). As there will be always some people who are unable to pay due to poverty, yet with 'targeted provision of public goods', the desirable base for financial sustainability in an Indian village context is considered as 15-20% of approximately 5000 people (Sharma 2011). But, an extreme landscape with scattered population or low density and limited modes of transport, challenges the essence of shared access to ICT (Proenza 2001) which is not the case for Bangladesh (Worldbank 2015). Taking advantage of the untapped market at the bottom of the pyramid can ensure both financial and social sustainability (Liyanage 2009). Roman and Colle (2002) suggest that awareness generation of the benefits of ICT, business plan consistent with community culture, contents related to the fabric of the locality can boost widespread participation. Involvement of people as stakeholders is crucial since it gives a sense of community ownership and local wisdom, echoes local values and needs, also resources the telecentre with volunteers as well as technical expertise and subsequently the formation of social capital (Hanna 2010).

So far, we have seen how different stakeholders can be involved through the partnership and what their behaviour and roles might be. Stakeholder theory is more of a perspective rather than a theory that implies that stakeholders exist and bear significance from any of the three perspectives-descriptive, normative, or instrumental (Bailur 2007). The stakeholder theory assumes that the partnership among players should be well-balanced and well inclusive which promote long term sustainability of a project. It also underscores the needs of local community and the problems to fulfil that (Freeman 1984; Mishra & Dwivedi 2012). In the context of discussion above we can assume that all stakeholders are not likely to be well balanced in the partnership context of a

telecentre in a developing country. At least for initial few years during the period of establishment of telecentre it appears that the external support is heavier than that of the private entrepreneurs. Also increased people's participation accounts more for the progress in terms of financial and social targets. More specifically, our hypothesis from this section, therefore, is:

(4) *The current progress of the UDC depends more on the external support from the government and the increased people's participation than on the investment from the private entrepreneurs.*

The stakeholder model has its limitations. First, Freeman (1984)acknowledges that stakeholders need to show honesty, transparency and flexibility during consultation time. It often does not happen because everyone has hidden interests which only emerge, as the time advances, as barriers and challenges. For instance, some may find it difficult to express themselves as stakeholders or some may provide disguised responses who are intimidated of change. Similarly, government officials, donors or technical staff can create confusions among users guiding their responses to questions. Second is the difficulty in determining the primary or secondary and important or influential stakeholders. This is because there is always a gap between theory and practice as some stakeholders such as users considered as primary at the beginning may be relegated to be secondary over time. Also, this levelling becomes complicated with the constant change in stakeholders over time making also their management and coalition increasingly a difficult task. Hence, the stakeholder theory is rather a tool for problem analysis than a solution provision, often, like doing a post-hoc analysis to see who emerges as important or influential, primary or secondary (Bailur 2007). Freeman (1984) suggests that it is difficult to predict as who are crucial for success or failure. Such a gap can pose a challenge to ICTD project in regard to the sustainability.

Sustainability

The discourse of telecentre's sustainability dates back to the beginning of the concept in the 1980s as a broad and complex issue (Fillip & Foote 2007). The main reason for the importance of sustainability discourse is the ecosystem gap(Shadrach & Sharma 2011). For general use, the ecosystem is defined as interconnecting and interacting system or a complex network (Morelli 2011). In Ecology, the term sustainability refers to integral components and properties that help with enduring survival of a natural ecosystem (Shadrach 2012). Depending on its type the telecentre ecosystem refers to the interconnected engagement of stakeholders surrounding it that includes its patrons or donors, policy and implementation managers, content developers, backend service and network infrastructure providers, operators or local entrepreneurs, civil society and the community at large, who are in an interdependent relationship and interacting with each other (Hanna 2010; Harris 2002; Shadrach 2012).

Telecentre has a back end support in terms of investment, service supply and partnership development involving numerous stakeholders. The collaboration among them nourishes local champions though a cohort of supports including capacity development on business and technical skills, web networks, contents and peer-learning. The ultimate effect of this chain of activities is the entrepreneurship and social capital development of the community (Sharma 2014). Freeman (1984) also views organisations as interdependent networks driven by 'open systems' rather than being independent silo entities. Interconnections and support from all stakeholders of the network are critical for a project's survival. Without establishing effective relationships among various stakeholders of the network the objectives of the organisation will remain far from achieved. Hence, besides identification of stakeholders managing relationships, an understanding of stakeholders' behaviour in different settings is important. The thorough investigation of the expectations and needs of multiple stakeholders will increase the rate of acceptance of a project. It also minimizes conflict among stakeholders (Islam, M.S. & Gronland 2007).

In a telecentre project the effective intertwined stake holding promotes multidimensional sustainability such as policy, organisational and operational, financial and social. Though it is not clearly discernible as to which leads what, the literature points out that the financial and social outcomes are driven by policy, organisational and operational sustainability (Ali & Bailur 2007; Masiero 2011; Shadrach & Sharma 2011).

Financial sustainability

Financial sustainability means the ability to continue operations backed by necessary resources from service charges or donations or in-kind supports that help to carry out ongoing expenses such as for internet, utility and rent of facilities, adequate income to the entrepreneurs and maintenance of equipment and assets (Liyanage 2009). When the equipment is donated, estimating repair cost and scheduling depreciation for replacement, if necessary, are important. Even real cost estimation of donated buildings and utilities and value of volunteering need to be included in the recurring costs Hudson (2001. {Best, 2008 #186) identifies income of operators after incurring the recurrent costs as the key indicator of financial sustainability of the SARI project. They observed that most kiosks were closed within a few years of inception because of lack of adequate income for operators. Researcher suggests that for financial sustainability the telecentre's governance structure needs to be streamlined to promote it as an enterprise (Proenza 2001; Roman & Colle 2002).

The experiences of Drishtee and e-Choupal in India, for instance, have led some researchers to believe that business approach lies at the heart of financial viability which, (Oestmann & Dymond 2001) once ensured, can generate social outcomes {Shadrach, 2012 #107}. Oestmann and Dymond (2001)consider that in developing countries telecentres are in comparative advantage for financial sustainability from (a) offering basic telecom infrastructure in underserved areas, (b)

receiving block funding from government service departments if they can prove themselves as cost effective outlets and (c) capitalising higher demands from low access to computer and internet of household and business. Financial sustainability also leads to entrepreneurial sustainability which cling operators to the telecentre. It is true that when skilled people find a better market place they would usually be lured away from the project but the prospect of sustained income can help with quicker replacements (Baark & Heeks 1999).

However, financial viability is considered as the skewed or narrow sustainability (Shadrach & Sharma 2011), which is essential for survival, but must be followed by social impacts for long term sustainability by achieving the developmental goals (Liyanage 2009).

Social sustainability

While financial sustainability is an immediate concern the long term sustainability implies the social sustainability through community acceptance (Hanna 2010). For access to ICT and usage, education level and income are considered as powerful explanatory factors. In developing countries people, especially women, who are also victims of cultural barriers, are lagging behind in these two factors and, hence, are subject to digital divide (Hilbert 2010). Telecentre is designed to reach the bottom of the pyramid by giving benefits to low income and disadvantaged groups (Liyanage 2009; Oestmann & Dymond 2001). People use these centres with or without fees for ICT literacy, communication or business purposes (Liyanage 2009). A number of studies, however, note weakness of telecentres to provide benefits to disadvantaged sections (Cecchini & Scott 2003; Kumar 2011; Kumar, R & Best 2006). For wider inclusion: the location of the centre; contents consistent with needs; mass awareness; flexible operating hours; affordability of price; subsidised schemes for young and disadvantaged; community members skilful to use equipment or find assistance to use them without barriers such as cultural or political, are contributing factors (Badsar et al. 2011; Hudson 2001; ICTA 2010). The study by Rahman and Bhuiyan (2014) finds some aspects that can negatively affect sustainability are: less ability of the poor to pay; high service charges; cultural aversion to new technology; lack of security for ICT resources; geographical characteristics and natural disasters.

A telecentre can facilitate the development process in three 'E's: 'Effectiveness', 'Equity' and 'Efficiency'. Effectiveness comes from quality of services such as health and education, equity refers to the inclusive ability to reach all and efficiency is the ratio between output and cost by savings in time and cost (Hudson 2001). Facilitating the government information has impacts on improving the transparency and accountability to citizens (Bertot, Jaeger & Grimes 2010). Besides individuals, beneficiaries can be organisations such as schools or religious institutions (Hudson 2001).

Social impacts can be for short, medium and long terms (Liyanage 2009). Better access to information can yield to productivity and socio-economic development in the long run, such as

women who learn new skills improve life quality or small entrepreneurs who secure additional expertise find new markets. For measuring inclusive social sustainability the key issues are types of users and volumes, trends, change or growth in composition of them (Hudson 2001). The social sustainability, in turn, helps with financial sustainability (Madon 2009; Shadrach & Sharma 2013). These two types of sustainability, however, are dependent on reducing the gap in the ecosystem milieus of policy, organisation and operation (Fillip & Foote 2007; Shadrach & Sharma 2011).

Policy sustainability

The policy environment emerges from the visionary political and committed executive leadership that pioneer the introduction and diffusion of these centres (Kumar 2007). Broader policy goals determined by the political leadership have to be transfigured into actions by the competent managerial leadership. Often, central agencies headed by the chief information officer play crucial roles in terms of developing strategic goals, resource mobilisation, outsourcing of technical inputs, developing benchmarks, process reengineering, application development, forging public-private partnership and impact assessment (Worldbank 2004). One effective policy strategy is to embrace incremental change preceded by pilot projects rather than offering everything in one spell in the implementation phase (Cecchini & Scott 2003). Instead of colossal investment, smaller scale projects can be designed for equipment, services and applications (Oestmann & Dymond 2001). Heeks (2003) identifies the discrepancy in terms of design-reality gap where the e-government project adopts large visions from outside failing to take into consideration the ground realities. The gap exists on 7 dimensions such as Information, Technology, Processes, Objectives and Values, Staffing and skills, Management systems and structures and finally time and money. Hence, based on the experiences of innovation and challenges piloting policies have to be following demand-driven approach(Liyanage 2009) From time to time telecentre initiatives should be streamlined with the national development goals(Shadrach & Sharma 2013). Transparency of management policies and accountability to partners and stakeholders facilitate better implementation (Liyanage 2009). It is important that political and policy commitment continue to engage other players in the ecosystem (Shadrach 2012).

Organisational sustainability

Organisational sustainability connotes to management practices, model choice, financing, monitoring and evaluation. Project managers play critical roles in identifying goals and benefits, successful implementation techniques, championing human resource development, negotiating with consultants and vendors and managing outsourced development efforts (Hudson 2001). Systemic planning in all aspects of operations is an integral part of management efficacy (Liyanage 2009). Coordinating among stakeholder organisations and sectors related to finance, technology, services, franchising, training and monitoring for a multi-purpose telecentre is a complex task. Bringing them for one purpose and resolving conflicts requires highest policy commitment. At times it may be necessary to reorganise the entire setting. Clear specification of objectives is necessary

to avoid incoherent understanding among different stakeholders interpreting goals differently (Freeman 1984; Hudson 2001).

Choosing an appropriate model for organisation has meanings for sustainability. There are various models of management with their comparative advantages and disadvantages. NGO/local government led models are not encouraging for entrepreneurship or promoting business (Wellenius 2003), rather they are more efficient to provide their own services. A subsidised model lacks a business plan and market analysis as well as the impetus for competition; it distorts markets for emerging local entrepreneurs (Oestmann & Dymond 2001) making telecentres as supply-driven rather than demand-driven. Hence, support from private investment and entrepreneurship is underscored for sustainability. In India two trends hold sway. One is community owned social enterprise advocated by the M S Swaminathan Research Foundation (MSSRF) in Information Village Research where ownership is predominantly managed by community and not-for-profit organisation with a view to provide community based services, capacity development of disadvantaged people, value addition in solving societal problems as well as impregnate business potential (GGA 2007; Shadrach 2012). The other model is developed following the success of e- Choupal, Drishtee and n-Logue founded on principles of first ensuring financial viability which is naturally followed by social outputs to achieve a 'double bottom line' (Shadrach 2012, p. 128). When the private sector was seeing the rural people as emerging industry the government of India legitimised this movement through PPP by making them partner to provide its own services and ensure developmental goals. The establishment of Indian Common Service Centres (CSC) is founded on the second approach (Shadrach 2012).

As discussed earlier, investment or efficiency gains from emerging private sector in developing countries is easily said than achieved (Kuriyan & Ray 2009). Hence, telecentre needs flexible funding until it earns its own sustainability to cover initial offshoot and subsequent operation costs from private or public investment (Oestmann & Dymond 2001). Funding is needed not just for equipment, but also for staffing, training and system operations (Jensen & Walker 2001). In developed countries the initial finance comes from the state or federal government and in developing countries mostly from international donor agencies or from universal access funds established by the government levied from telecom providers. For instance, in many Latin American countries the smart subsidies collected from telecom providers under universal service obligation (USO) is used for establishing faster connectivity, quality contents and telecommunication to support telecentres established for poorer areas. Finance can also be ensured from block funding from government service departments such as education and health who use telecentres as their outlets at the grass root level (Oestmann & Dymond 2001; Shadrach & Sharma 2013).

For future entrepreneurship and ownership it is important to consider with whom the government is making partnership. Entrepreneur's selection is a crucial element of planning a telecentre as an enterprise model. At least a full-time and devoted entrepreneur needs to be engaged for operations of equipment or managing other employees or volunteers to provide flawless services (Liyanage 2009). In the CSC entrepreneurs are selected by a specialised agency the Service Centre Agencies (SCA) engaged by the government under PPP who recruits them following the guidelines of State-level Designated Agency (SDA). The requirements including Village Level Entrepreneur's investment and entrepreneurial ability, commitment to social work and respect to the community are advertised in the local newspapers (DOIT 2007). Similar practice, however, is not completely alien to Bangladesh. The Grameenphone Community Information Centre (CIC) conducts diligence checks in financial ability and interviews by a selection committee on entrepreneurial capacity, leadership qualities, motivation, aptitude, life issues, experience, strategic priorities and delivery capacity for assessing suitability of the applicant. Other components for empowerment of entrepreneurs for a cost-effective business are training, supervision, right location and access to equitable finances (Liyanage 2009).

Human resource development lies at the core of ecosystem efficiency. Since telecentre is a nascent initiative, training is needed for planners and policy-makers, managers and operators depending on their competence and needs. However, keeping technical experts in the community is challenging since it usually has demands in the industry with greater salary packages (Murray, Cathy & Brooks 2001). Appropriate compensation to motivate and retain them in the project should be exercised. Volunteering can be embraced but heavy reliance on it can be counterproductive for retention (Oestmann & Dymond 2001). An entrepreneur's satisfaction and back end support received, cordial partnership and networking at various levels are productive to the extension and sustainability of a telecentre. To overcome challenges and become vibrant, a telecentre needs to sustain innovation and creativity and evolve with socio-cultural, economic and technological practicalities that shape them. Users should be engaged in a way to evolve, improve and invent the products and services. It is possible that networks facilitate peripheral navigation, that is, enabling operators/managers to look around and become acquainted with innovation in management strategies, products and services, technology and community accommodation and so on (Liyanage 2009).

Challenge often emerges from the lack of capacity to monitor and evaluate the progress (ICTA 2010). Sometimes the monitoring and evaluation are done by specialised agencies set by the government. Various online and offline tools are used to check whether the project is able to provide the intended benefits. In some cases the local bureaucracy or the local government units are engaged in monitoring which hold coordination meeting, ask for reports and returns, make field visits and inspections. However, for broader outcome evaluation specialised agencies can be more effective to know the progress (Jensen 2007; Shadrach 2012; Shadrach & Sharma 2013).

Though government's supports are needed to ensure initial offshoot, telecentre must not derail from its track to self-sustainability. It may happen that charges for services are not perfectly aligned with recovery of investment cost initially but it must be as the time progresses. Hence, the operational sustainability attains significance (Oestmann & Dymond 2001).

Operational sustainability

The operational sustainability relates to the existence and performance of technology, connectivity, services, skills of entrepreneurs, generation of adequate income and cost-benefit analysis (Hudson 2001; Jensen & Walker 2001; Liyanage 2009). The business model has to be supported with cost-effective technologies and appropriate combination of services (Hanna 2010, p. 227). Acquiring some significance to meet the development and education service needs of the community can increase potential for income (Liyanage 2009). Low cost and regular connectivity, electricity and basic telecommunication infrastructure are also crucial for financial sustainability (Best & Maclay 2001; Wellenius 2003).

Equipment

At its basic, telecentre is the ICT equipped outfit (Liyanage 2009). Technology centres on the notion of telecentre from its genesis to growth (Jensen & Walker 2001). The right choice of ICT equipment and associated hardware and software is critical for sustainable operations. The common focus of all telecentres is on the use of technologies to enhance connectivity, bridge the digital divide, and promote social and economic development (UNDP 2007). Hence, for operating in a sustainable manner technologies need to be up-to-date, economically viable and socially appropriate that can aptly and optimally serve the local demands, function reasonably and adapt to the infrastructure limitations. These properties are defined by "Canadian thinker Ursula Franklin as 'holistic technologies': open-ended systems that lend themselves to human creativity, innovation, and generativity" (Liyanage 2009, p. 9).

Telecentre should develop capacity to embrace technology upgrade. However, it is also important not to be guided by 'technological determinism', that is, to adopt latest fashionable technology. Since finance has to be kept for other operational matters technology choice has to be driven by local needs and telecentre's strategic goals rather than unfounded expectations (Jensen & Walker 2001). Underutilisation from illiteracy, and lack of e-literacy, language barrier, unawareness and technology avert culture, fragile connectivity and internet high cost is also needed to be taken into consideration (Oestmann & Dymond 2001; Wellenius 2003).

After meeting these considerations telecentre technology can be of various types. Whereas the basic ICT can somewhat serve the elementary purpose, for effective and sustainable operation the application of advanced ICT is crucial. Advanced ICT supports an edge in facilitating an effective management, storage, processing and delivery of information and income (Telecentre_magazine

2009). Combination of various types of technology such as telecommunication, ICT and other equipment can offer multimedia services (Oestmann & Dymond 2001).

The telecommunication technology includes telephone lines, telephone, fax and internet. The three basic lines bring services on its backbones such as fax, audio conferencing, e-mail and internet (dial-up, broadband). However, a single line can also be used for these services with reduced speed. While the shift from dial-up to fixed broadband has been rapid in the developed world in developing countries the pace is slower. Dial-up connection prevails there with the slowest mode of access. Without telephone line cordless cellular phone can be used to provide phone services as well as financial transactions. Low cost internet based application for fax and phone service is also an option. For internet, with the absence of any telecommunication line, a telecentre has to rely on ISP service or wireless connection. Without any internet link it has to depend on stand-alone computer based services constricting its income potential (Jensen & Walker 2001).

Faster Internet has connotations for both people's increased visits and thus commercial viability of telecentre (UN 2012). Internet is necessary to improve daily life, video conferencing and online learning and transcending business into e-commerce. Satellite and wireless promotes access from anywhere with lower costs and better speed which in turn expands the market base of these services. Liberalisation and privatization are twin vehicles of technological advancement and wider access to the internet (Oestmann & Dymond 2001). Wellenius (2003) stresses that reasonable data transmission quality that enables access to e-government services and general use of internet has influence to sustainability. He (Wellenius 2003) suggests that sustainability of telecentre in many developing countries is paralysed by a number of obstacles related to connectivity such as deferral in connecting to the national telecommunication network, narrow bandwidth, inadequate reliability and dearer prices. At least 34 Kbps (Kilobytes per second) or higher can facilitate some efficacy in the internet use for multiple purposes.

In rural and remote areas since the number of users is less from not having the ICT or digital divide, ISPs are not usually interested to invest in infrastructure or equipment. Hence, wireless internet service remains the most viable option. Among a number of wireless broadband types such as Wireless ISP, WiMAX, Wi Fi, Satellite and Mobile broadband, the last one is more ubiquitous, less costly and at the fastest growth with the evolution of mobile connections in developing countries. Mobile phone towers are used to connect wireless to computers and mobile phones(Ergen 2009; ITU 2014). Upgrading is continuing in the nature of the service, transmission, speed and bandwidth, which are known as generations, such as 2G, 3G and the latest being 4G (ITU 2014). For internet cost minimisation some countries have implemented discounts introducing tariff policies. Telecentre can even be supplier of leased internet within its locality such as for schools, clubs, clinics via LAN or wireless to create and fulfil internet based service demands (Jensen & Walker 2001).

The ICT and other equipment include office equipment such as computers, printers and photocopiers, scanner, binding machine and so on.

Computers

One or two computers usually remain engaged in administrative and service delivery work. For internet access and ICT training there must be multi-computer environment. For increase in computer number less costly options can be network computer (NC) such as 'thin client', 'private clouding' or purchasing second-hand from recyclers verifying the compatibility of needful software. The NC environment also equips access to all standard computer and internet applications. Local Area Network (LAN) by using Ethernet over twisted pair cabling or Wireless (if available) allows easy expansion and connectivity among computers even with neighbouring buildings or areas (Jensen & Walker 2001; Wellenius 2003). However, without compatible applications telecentre cannot earn the market profitability.

Printers and Photocopiers

Depending on the types of services such as desktop publishing, printing and photograph, a telecentre needs to adjust printers such as with black and white and/or colour printers. Multifunction laser printers or cheaper Xerox machines that can also be connected through LAN/Wireless with multi-computers serve various functions such as fax, photocopying, printing, scanning and e-mailing (Wellenius 2003).

Other equipment

Other equipment include CD writer/burner, digital camera/video camera, projector, laminator, binding machine, radio and TV. CD writer/burner machine or software facilitates recording, storing and distributing community or cultural events, music CDs and copying CD-ROMs (Jensen & Walker 2001). Digital Camera allows photo-shoots, picture files to be copied and sent through email attachments, photographs for passport/VISA/ID service, record important events and VIP visitors and video camera in addition helps with video community and cultural events and emailing video clips. There are also internet compact cameras. If telecentre provides training or educational programs a projector coupled with a screen may be useful. Otherwise, in many cases it remains underutilised and hence renting it might be a cheaper option (Jensen & Walker 2001; Wellenius 2003).

Equipment purchase in bulk through central tendering is more efficient for cost reduction, quality control and obtaining warranty. Substantial savings can be gained from buying second-hand but reliable equipment. Before the purchase a demonstration or field-testing arrangement can be undertaken. However, central maintenance or repairing is more costly and time consuming than the arrangement with a local service agency. Ensuring security of the equipment is a must (Jensen

& Walker 2001). Adequate space is needed for hosting the equipment as well as for community members' meeting, training or business promotion (Oestmann & Dymond 2001).

Services

Rural people, even the poor, are ready to pay a significant portion of their income on information and services from telecentre when they find time and cost savings. The application and services can only generate demands if they are consistent with the community conditions and needs. Diversification of services enables telecentres to avoid competition merely with telecom service providers. Without the right of mix of services the equipment and internet remain underutilised resulting financial viability being at stake (Oestmann & Dymond 2001). The development of regional and national content platform can serve local needs. The demands for various needs such as from emergency, personal and entertainment needs should be analysed. Also, applications for business and enterprises, government services and sector specific applications as for agriculture, education, healthcare, tourism, NGO information and services can boost up the cliental base (Bhatnagar 2009; Madon 2009). Services, however, differ as per the scale of country's overall development (Wellenius 2003).

The UNDP (2007) categorises services as ICT services i.e. telephone, fax, photocopying, compose, computer use and access to internet which are also termed as office services (ICTA 2010) and developmental services such as on health, education and vocational skill, agriculture and e-commerce for local business (crafts, artworks and cooperative products) promotion and e-government services (UNDP 2007). Services common across Indian CSCs are private commercial services (B2C) such as office services, internet access, utility bills and ticketing. However, with the emerging state involvement in the roll out a portfolio of government services (G2C) were introduced in several states that include certificates (birth or death, domicile, caste, income, solvency, nationality), land record, property tax pay, various licenses and employment application. There are other types such as financial inclusion services for account opening, deposit or withdrawal, wage, pension, loan and credit card distribution, micro-credits and collection of bio-metric information. Other services emerging to the scene are educational services i.e. admission, registration and exam results, exam venue and eLearning courseware. Many educational institutions have already forged partnership with CSCs to deliver curricula (Dass 2011; Shadrach & Sharma 2013). In Bangladesh Rahman and Bhuiyan (2014) classifies UDC services as three types such as government services, Information services and commercial services.

One of the key elements that facilitate variety of services is the transactional facility or the e-payment system. It allows internet based banking, shopping and e-commerce by supporting payments through debit and credit cards or internet. For ensuring security of transactions, the central payment system along with digital signatures should be in place to bring all payment

systems under one platform. With e-payment, reliable and quicker postal service is necessary to deliver goods (Lowry et al. 2006).

Entrepreneur's competency

One of the success factors of the telecentre model is that it is managed by local entrepreneurs who have a stake in the model (Wellenius 2003). However, it is also challenging to find competent entrepreneurs given the fragility in private sectors in rural areas. Hence, local entrepreneurs have to be supported and groomed to maximise opportunities to scale, for the viability of a telecentre. Best and Kumar (2008) found that the duration that the kiosks remained opened was dependent on the technical and operational support from the project management and the prior computer training of the operators. Deteriorating technical support in terms of poor internet connectivity from n-Logue and failure to proliferate the service basket caused fragility in financial sustainability. Discontinuity in supply of e-government services from Taluk and district administration made a ditch in the income base.

Various types of training such as operational, management and marketing have connotations for enterprise development. For skill acquisition and professional development contents may include communication, roles of managers, basic business, financial and computer skills, information generation, need assessment and evaluation techniques, training and participation skills, personnel management, marketing and public relation skills. Business and financial skills are more important for sustainability (Roman & Colle 2002). Once trained the entrepreneur can impart distance formal education, literacy and numeracy, language skill, training on techniques of agriculture, and provide remote professional development such as for vets and nurses. ICT training, employment in IT and computer aided training methods are also among the endless possibilities these centres can offer (Hanna 2010; ICTA 2010).

A multipurpose telecentre in Brazil has developed various modules for service recipients such as on public service, tele-office, business and education. Telecentres there have impacts on formal education of both on the spot and distance modes that give backings to literacy, workforce training, and computer skill development. Training modes can be face-to-face or online, resource-based, and hands-on learning. Training materials need to be adapted or adopted with collaboration with other partners (Murray, Cathy & Brooks 2001). For entrepreneurial capacity development the entrant needs to be empowered with the authority to investigate the market, understand local needs, determine the locations, and choose the combination, pricing and quality of services, to manage expenditures and income and to tackle resource limitations at their discretions (Wellenius 2003).

Time factor

Various sustainability dimensions discussed earlier have to succeed the test of time since the sustainability connotes attaining a stable financial competency within a certain timeframe. Time

factor is important becasue each year of operation leads to improvement in performance. At minimum a telecentre needs 3 years to reach financial viability overcoming the performance fluctuations from piloting or initial period of operation. Some might attain the target of both social impact and financial goals in the medium to long term taking a time of five to seven years (Liyanage 2009; Oestmann & Dymond 2001). However, during this period it is important telecentres continue to get supports from political patrons and administrative leadership, lack of which can result in sustainability failure (Best & Kumar 2008; Bhatnagar 2009). With the transfer of architect officers many telecentre in India, for instance Gyandoot and SARI, have experienced decline in supports and subsequent dwindle in the operator's income and visits by people (CEG-IIMA 2004; Kumar, R & Best, ML 2006)[8]. Similarly, trends in terms of increase or decrease in number of people are also important for social acceptability (Hudson 2001).

Kumar and Best (2006a) note that without continuous institutional, operational, and technical support, telecentres are doomed to fail. They, therefore, come up with a Sustainability Failure Model that presents a framework to examining the sustainability failure longitudinally.

The model presents five types of sustainability failures as mentioned beneath:

(i) Financial/economic sustainability failure: For instance, a donor supported program is likely to discontinue once the funding is withdrawn.

(ii) Cultural/social sustainability failure evolves when benefiting some groups and missing out others lead to tensions over time.

(iii) Technological sustainability failure emerges when field hardware and software becomes obsolete and incompatible with the central office IT and lag behind in updating contents and, therefore, culminates in network degradation or failure.

(iv) Political/institutional sustainability failure results when the champions of the project leave without substituting like followers and befitting institutional structures.

(v) Environmental sustainability failure becomes evident when a project lacks plans to reutilise relatively old equipment (Kumar, R & Best, ML 2006).

[8] Kumar, R and Best, ML (2006) found that after one year of successful operation the SARI project could not continue because of transfer of architect officers, lack of adequately trained personnel, lack of sustained leadership, commitment and institutionalised practices as the new officials failed to show up the same level of vigour and coordination and efficiency for consistent monitoring and evaluation of project performance[8]. Previous study on the project by Srinivasion (2004) also found that weakening support from the local official caused from lack of institutionalisation and shift in traditional top-down power relations played crucial roles to the failure of the project. Similarly the *Gyandoot* had started to experience decline of users in later years from the problems of transfer of founder officials, lack of support from back-end process, slow internet connectivity, inadequate power supply, unresolved grievances and lack of updated information (CEG-IIMA 2004).

When used in conjunction with two other models namely the Critical Success Factor (CSF) [9] and Critical Failure Factor (CFF), the Sustainability Failure model can portray an accurate picture of the longitudinal success or failure of a project (Scott, Golden & DeLone 2009). Both CSF and CFF further consolidate that both financial ability and social outcomes are products of policy, organisational and operational efficacy.

These three forms of sustainability supports are often considered as backend factors, which can have impacts on financial viability (Kumar, R & Best, ML 2006) and social sustainability (Shadrach & Sharma 2011). While these studies have defined sustainability with its financial and social dimensions and identified responsible factors they are less articulate about the directions as which prompts to what and the extent they do so. The previous studies lack any effort to put explanatory factors relevant to partners in one framework to explain the sustainability. There are lack of data-driven empirical studies to ascertain the sustainability dimensions under public-private partnership as well (Best & Kumar 2008). Though theoretical studies provide useful insights and anecdotal lessons they fall short of systemic approach of bringing all the factors in one place to test the hypothesis. Assumptions based on experiences have to be substantiated through formulation of hypothesis and testing of it to control inessential factors (Hudson 2001). Pure qualitative approach falls short of determining causality or generalisations for all projects of a similar kind (Johnson & Onwuegbuzi 2004)**.** More specifically, there is a lack of studies to ascertain how back end support in terms of technology, services, and continuity of policy, organisational and operational support from relevant partners including entrepreneurs can be linked to both financial and social sustainability. We first attempt to develop a hypothesis about financial sustainability.

Since entrepreneurs' inadequate contribution in investment mainly arises from their vulnerable economic positions in the society, it is necessary to support them with sufficient income opportunities for future investment and financial sustainability of the model (Kuriyan & Ray 2009; Liyanage 2009). Again, as major factors of income sustainability evolve from involvement of partners with different inputs and people's participation (as the literature suggests) we can draw the hypothesis that:

(5) *Partnership involvement in terms of infrastructure inputs, entrepreneurship and people's participation contributes to the entrepreneur's income sustainability.*

[9] The CSF is defined as evident success in certain areas of the implementation process which eventually leads to replicate it in order to ensure spread of the success in the entire system. On the other hand, CFF detects the failures in an implementing project and traces the causes of such failures. An effective implementation process must determine the critical failure factors (CFF) and devise strategies to avoid them (Vevaina 2007). For e-government projects Heeks and Bhatnagar (1999) list several critical factors that determines success or failures of a project in dimensions like (1)information factors relating to provision of content,(2)technological such as both availability and compatibility of hardware and software, (3)competent human resources with skill training for the use of technology, (4) pragmatic management and efficient organisational practice, (5) process reengineering to embrace new reality, (6) ICT pro organisational culture to support new projects, (7) reduction of structural rigidity, (8) strategic decision, (9) support from political stakeholders and finally (10) modification of external environment. These critical factors are later synthesised by Heeks in the design-reality gap into seven critical dimensions (Heeks 2003), as mentioned earlier.

However, financial sustainability is only the first survival strategy and it must be followed by broader sustainability that incorporates other dimensions such as entrepreneurial and social (Liyanage 2009; Shadrach 2012). Based on these theoretical discourses we, therefore, develop a sustainability framework for telecentre under PPPP showing directions of relationship and incorporating other dimensions as in Figure 3:

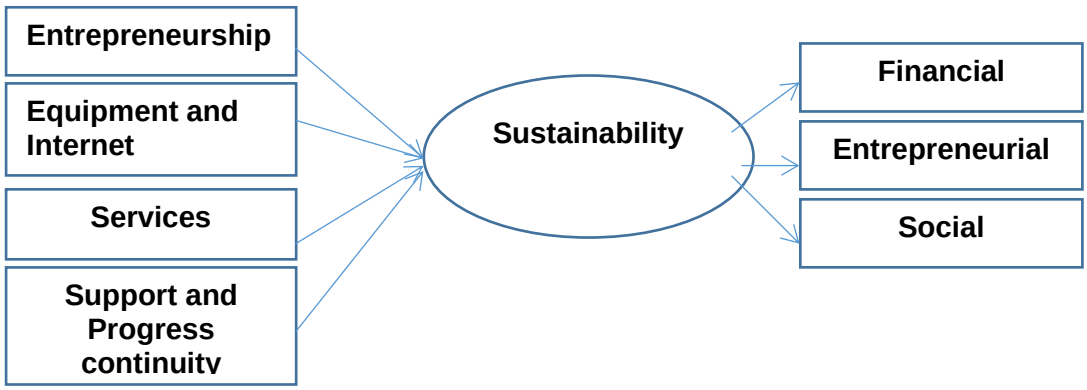

Figure 3: Sustainability Framework of Telecentre under PPPP

From this framework our hypotheses are:

(6) *Entrepreneurship has positive relations to the sustainability (Financial, Entrepreneurial and Social identified earlier).*

(7) *Equipment and Internet have positive relations to the sustainability.*

(8) *Services have positive relations to the sustainability*

(9) *Support continuity over time (policy, organisational and operational) and progresses (financial and social outcomes) have positive relations to the sustainability.*

Conclusion

This chapter has presented a critical review of literature on three aspects of telecentre assessment, namely, benefits to users, its management and future sustainability. It has discussed that telecentre is an innovation and the *Diffusion of Innovation* theory fits more than any other theoretical framework to understand the scale of telecentre use among members of rural communities. The theory is relevant because a telecentre attempts to provide information and services compatible with the socio-economic profile of the community, it has certain relative advantages, follows some communication processes and targets to produce impacts especially in regard to bridging the digital divide and improvement of rural livelihood. The diffusion theory is often criticised for being techno-centric without broader focus on the surrounding socio-political contexts and the players. Hence, the *Stakeholder Theory* was embarked on to identify the key stakeholders surrounding a partnership telecentre project and to understand and explain their behaviour. This was reviewed in the context of the telecentre model in developing countries under public-private partnership where the much desired efficiency and investment gains from fragile private sector mostly remain unattained, therefore, resulting in an imbalance in the partnership.

This along with lack of effective engagement of relevant partners poses challenges to the telecentre which can even lead to its premature closure. Subsequently, we have brought forward the concept of ‘Sustainability’ and its dimensions. We have contextualised how those dimensions come from interplay of stakeholders of a telecentre to ensure overall sustainability of the project. From all three sections, nine hypotheses are drawn. To collect data and information to test the hypotheses, we shall explore the Methodology section in the next chapter.

CHAPTER 3. RESEARCH METHODOLOGY

Introduction

In the following six sections, this chapter aims to present the methodology for studying a partnership telecentre in terms of the relevant research approach, scope and location, study design, collection instruments and analysis tools. The first section introduces the research approach. The second section provides the research scope and locations. The third section outlines the research design to collect data by establishing sources of data and collection techniques, recruitment basis of key respondents and the sampling procedure. The fourth section presents the key concepts concerning the data collection instrument, the types of instruments used to capture data, the scale development of quantitative surveys and includes a theoretical discussion on validity and reliability. This is followed by the section five that focuses on data analysis: missing value analysis, both descriptive and inferential techniques of data analysis including the Structural Equation Model (SEM) and its properties. The final section expands on some of the limitations of the methods chosen and justifies why these have been used in the current research.

Research Approach

As we have discussed in the literature review, telecentre research involves a wide range of issues related to various disciplines, notably the Information System (IS) and Management. From a philosophical perspective, information system and management research assumes both the potential of the knowledge of the phenomena and the limits of it, which makes them relevant to ontological and epistemological branches of knowledge (Becker & Niehaves 2007; Edwards 2011; Hirschheim 1992). The ontological research explores the nature of reality, kinds and conditions of social phenomena, their interrelationships. While the epistemology refers to our conviction on knowledge, criteria to acquire it and the challenges of achieving valid knowledge (Blaikie 2009; Schwandt 2001). Both types of philosophical branches allow approaches such as the positivist, interpretivist and pluralistic (Babbie 2007; Blaikie 2009). Positivism asserts that by human senses the objective social reality can be observed and only experience derived knowledge is acceptable that are uncontaminated by any speculative notions. Value judgments are excluded from scientific knowledge as their validity cannot be determined (Blaikie 2009). Quantitative methods based on statistical analysis that aim to be value-free, objective, impartial and time and context free generalization are often derived from the positivist approach (Johnson & Onwuegbuzi 2004; Keat 2013; Straub, Boudreau & Gefen 2004).

Interpretivism considers the knowledge of reality, as interpreted by participants, a social product based on their interpretation of surrounding society. Constructs evolve from typical social actors involved in typical courses of action in special settings (Blaikie 2009). The qualitative method often

relies on interpretivist approach by repetitive process of gathering and testing data until a lucid interpretation is reached without depending much on ascertaining causal relationships. Instead, qualitative purists, as they use alternative concepts such as 'constructionism', 'idealism', 'relativism', 'humanism', 'hermeneutics' and 'postmodernism' (Johnson & Onwuegbuzi 2004) argue that the research is value-laden and time and context free generalisation is unsuitable since it is impossible to differentiate causes and effects completely. On the other hand, quantitative purists suggest that while interpretivism helps to ask right questions and add confidence to any conclusions drawn, this approach is unable to test the hypothesis to see whether it is correct and thus to draw any generalisations (Gray King et al 1994 cited in Lin 1998). Both of these purists argue their approaches are incompatible (Johnson & Onwuegbuzi 2004).

The pluralistic approach that attempts to combine different methods in the same research project, therefore, is capable of focusing on different aspects of reality and as such provides a richer understanding of the project (Mingers 2001). Kaplan and Duchon (1988) identify this multi-approach as a triangulation process combining different research approaches that can be used to cross-validate research findings. Hirschheim (1992) comments that the grown-up era of post-positivist, the belief in methodological pluralism, has become stronger with the assertion that there is no single appropriate method of science but many methods should be supported regardless of their epistemological origins. In many cases a pluralistic approach is considered to be an appropriate strategy for Information System research as well as e-government research (Scott, Golden & DeLone 2009). 'Mixed method research bridges the schism between quantitative and qualitative research' (Johnson & Onwuegbuzi 2004, p. 15).

From the literature review it was further supported that telecentre research allows both quantitative and qualitative research. Ascertaining tangible issues such as economic benefits to users, relationships among partners and sustainability dimensions require quantitative measures while assessing less tangible longer term impacts, tacit relations and hidden interests among stakeholders and actual interplay of partners can be more illustratively done through qualitative research. Hence, this research adopts the mixed method. The quantitative method leads this research to use the survey technique while the qualitative approach is based on the interview, focus group discussion, informal observations and secondary sources.

Scope and Locations of the Study

Scope of the study

This study focuses only on the Union Digital Centre (UDC) in Bangladesh based on the PPPP model and can be applicable for similar telecentre model. The respondents are relevant stakeholders in the partnership identified based on the analysis of existing literature, consultations with experts including supervisors and personal observations of the researcher. They are only the

intended beneficiaries of services in the UP area, the entrepreneurs, the UP representatives, management officials from Upazila and District administrations and the central project management officials. Different stakeholders are chosen because they can help to cross-validate and supplement information from each other (Kumar, R & Best 2006). The ethics approval letter for the research is attached with Appendix 1.

Recruitment of key informants

User Participants

User participants are citizens who receive services from a UDC project. Citizens are selected because they are the users of the system and targeted to be the key beneficiaries or stakeholders. Information from this kind of respondents would help to understand the types of services rendered by the UDC, compatibility of them to fulfil their needs and impacts on other intended benefits. They can also give information any impact of the UDC on their livelihood and longer term impacts.

Entrepreneurs

Private entrepreneurs (both male and female) are chosen because they are the key implementers of the project who run day to day operations of the centre, work as partners with the UP and government and mobilise mass people to create a customer base. They are considered as the best source of quantitative data on management and sustainability as they preserve information relating to involvement of all other stakeholders and are accessible through their shared blog as well as through their workplace, the UDC. Most inputs related to operations and partnership such as on equipment, services, people's participation, their investment and entrepreneurship, computer competency, services and technical assistance from government and cooperation from the UP are practically experienced by them. Hence, they are surveyed online countrywide as well as interviewed in-depth from those who operate in UDCs of research locations.

Management Officials

Management officials are government officials such as an Assistant Programmer (AP), Upzilla Nitbahii officer (UNO), Additional Deputy Commissioner (ADC) and Deputy Commissioner (DC) in the district. Other management officials include UDC project management officials at the A2I and LGD and the ICT secretary. Management officials (AP, UNO, ADC and DC) are recruited based on their positions as they are directly related to the project who run day-to-day implementation, see the management and monitor the progress. Project Management officials and other related government officials are also recruited for their relevant official capacity who see the implementation of the project across the country, provide policy guidelines, infrastructural and technical supports and forge partnerships.

UP representatives

The UP representatives such as *Chairmen* and *Members* are recruited based on their positions and they are expected to give information on the role of *Union Parishad* as the host organisation, mass mobilisation and participation, resource mobilisation, local ownership and entrepreneur's involvement.

Locations of the study

A total of 16 UDCs from 8 Upazilas (sub-districts) from 4 districts[10] in Bangladesh have been chosen as the area of study based on purposive sample. 4 districts represent 4 greater old administrative divisions covering the entire Bangladesh. The selection for the districts is guided by their overall performance and advancement in back-end preparation[11] in consultation with the A2I as well as their spread of geographical locations across the country. Geographical locations of the districts from which UDCs have been chosen are marked in the Figure 4.

Figure 4: Districts of UDCs in the Map of Bangladesh

Two Upazilas are chosen from each district. Upazilas are also selected from different socio-economic backgrounds (literacy and poverty) and levels of urbanisation, that is, one mainly

[10] There are as many as 4550 Union Parishads under 488 Upazilas in 64 districts in Bangladesh within 7 administrative divisions (NWPB 2015).

[11] For instance, *the Jessore* district is chosen as it is the first piloted district where district e-service centre as well as service support for UDCs are introduced. For wider application of e-government programmes and innovative management the district is called as 'Digital Jessore' (A2I 2015)

inhabited by urban or semi-urban people and the other primarily by rural people to understand the different effects of the telecentre model. From each Upazila, two UDCs are selected, the best performing UDC and a poor performing UDC. The difference in performance is determined based on the consultation with the district administration as well as examination and comparison of UDCs' monthly reported income to it. UDCs from different geographical locations with distinct socio-economic backgrounds and their performance can enable the researcher to make a comparative analysis of their status with improvement in representation and generalization for the total population of Bangladesh.

A brief introduction of the study area and demographics are produced in the Table 2.

Table 2: Study area and Demographics

Geographical Regions			**Population and Demographics**			
Districts	**Sub-district (Upazila)**	**Study Unions**	**No of villages**	**Area (Skm)**	**Population**	**Literacy rate**
Comilla				3085	530,4000	55%
	Adarsa Sadar		193	142	526356	58%
		Durgapur (South)	22	10	53,259	70%
		Kalirbazar	17	9	46376	59%
	Homna		158	180	206384	39%
		Ghagutia	14	10	17822	25%
		Mathavanga	10	9	16355	73%
Jessore				2606	2764547	57%
	Jessore Sadar		256	435	615903	63%
		Arabpur	16	26	41361	84%
		Fatehpur	14	29	48780	70%
	Bagarpara		191	270	195020	53%
		Dohakula	21	8	23300	60%
		Basuary	17	10	24448	30%
Bogra				2919	2988567	49%
	Bogra Sadar		122	176	446263	55%
		Arulia	10	19	32193	48%
		Namuza	20	15	25270	40%
	Gabtoli		211	239	319588	46%
		Gabtoli	12	14	18661	50%
		Naruamala	19	15	30288	49%
Rajbari				1092	1015519	52%
	Rajbari Sadar		212	322	331631	57%
		Alipur	19	9	24418	48%
		Khankhanapur	25	7	28218	40%
	Kalukhali		212	169	155044	51%
		Ratandia	20	28	29462	46%
		Kalikapur	20	11	17995	56%

Source: Compiled by the researcher from (BBS 2011; Chowdhury 2011; NWPB 2015).

The four districts cover approximately 7% of total area and the population of those districts cover about 8% of total population of the country.

Research Design

It is an exploratory study since no study has so far been conducted on the research questions. The study has chosen the case study methodology that enables the researcher to explore one or more cases in-depth as an illustration, which is also known as a 'bounded system', that ultimately aims to explain how the total system works (Creswell 2007, p. 73). Moreover, it would be practically impossible for the researcher to study around 4547 UDCs managed by large number of entrepreneurs, UP representatives and management officials and millions of beneficiaries across the country, given time and financial limitations. Specific illustration of 16 UDCs facilitates to pay a detailed focus on the problem while the outcome is generalizable for the whole of the UDC model. The case study methodology allows multitude of methods including experimental, correlational, interpretative or qualitative, simulation and logical argumentation, that serve the purpose of triangulation (Johansson 2003).

Sources of data and collection techniques

A combination of both primary and secondary sources has been used and data and information were collected using both quantitative and qualitative techniques.

Primary sources

The primary data are collected from users, entrepreneurs, management officials and UP representatives using both quantitative and qualitative techniques. For primary sources of data, this research has applied techniques including a questionnaire survey, an internet survey, in-depth interviews, focus group discussions and informal observations. The primary data and information are used especially to answer research questions 2-9.

User Surveys

The questionnaire was designed to elicit information on experiences with the previous delivery system of conventional providers compared to the UDC system from the same respondents to identify differences in benefits relevant to both systems. This survey mode was mixed type- both face-to-face by the researcher himself aimed at getting optimum responses[12] and contact through mobile phone (Dillman & Messer 2010). Despite a limitation of the face-to-face survey being the interviewer effect, it has the advantages of clarifying, motivating or probing behaviours. Cautions were adopted to minimise the interviewer effect by reiterating the confidentiality as well as the spontaneity of the respondents by the researcher (Couper & Bosnjak 2010). Since citizens do not access services on their own online, the internet survey is not taken into consideration for collecting data on their experiences with the system. The researcher gave respondents the

[12] The presence of survey interviewer can maintain sampling design, locate respondents and persuade participant's motivation to optimum responses(Schaeffer, Dykema & Maynard 2010).

questionnaire and in some cases, especially for women and illiterates, he helped them in filling the questionnaire.

Some respondents were contacted through the mobile phone by the researcher, whose phone numbers were collected from entrepreneurs. These recipients are especially beneficiaries of services that were not being offered from the UDC during data collection period, for instance, the Malaysia Registration[13]. Yet, the study has emphasised some of the prominent services to understand their impacts. A mobile phone survey is useful to maintain the quality control on sampling, greater respondent's selection, questionnaire administration and data capture. It is also a cost effective and quicker way of data collection. The major disadvantages are limited length of interviews as well as unwillingness to participate (Lavrakas 2010). Some among the respondents, therefore, were contacted repeatedly (as from not completing the questionnaire on one occasion due to their time limits).

Internet Survey of Entrepreneurs

To know the implementer's experiences on problems and potentials of UDC an online questionnaire using *Survey Monkey* was administered putting a link to it in the *UDC Blog* to get responses from entrepreneurs. The UDC Blog members are mostly entrepreneurs, with some Upazila Nirbahi Officers (UNO) and other top officials from field administration to the secretariat (A2I 2015). However, before conducting the survey, permission had been sought from the project management authority and after acquiring the approval, the endorsement was used as a forward to the survey questionnaire. Spontaneity of the respondents was sought to answer questions in the web post with the link. The internet survey is preferred since it has the advantage of speed for reaching a large number of people at low cost using complex instruments with visual features and dynamic elements. It has other inherent attributes such as it is self-administered, computerised, engaging and easily distributed. It can motivate respondents to provide honest, accurate and complete answers (Couper & Bosnjak 2010). The internet survey has been used to receive information from a greater number of entrepreneurs across the country and for making a comparison to the findings in the study area through qualitative techniques.

Interview

The most important qualitative technique used was interviewing the entrepreneurs, management officials, UP representatives in the research *locations* and the central project personnel. The in-depth interview has also been conducted by the principal researcher using distinct semi- structured interview schedules for different stakeholders. The in-depth interviewing was chosen because it can give detailed information and freedom to move from a framed questionnaire to elicit insightful

[13] The Malaysia Registration Campaign occurred during January–March 2013 but the field survey started mid- April 2013.

information and observations of respondents (Berg 2009). All conversations were recorded with permission from the respondents and later transcribed into English.

Focus Group Discussions

From the service recipients of UDC who were surveyed, some women, especially those who are illiterate and poor, were invited to attend the Focus Group Discussions (FGD)[14]. The principal researcher himself facilitated two of such FGDs- one in *Durgapur* and the other in *Arabpur* UDC. All discussions were recorded and later transcribed in English. FGD is designed to collect further detailed information on the improvement of the causes of the women by the UDC. It enables the researcher to focus on the shared problems such groups face collectively. Since disadvantaged people in rural Bangladesh especially the underpowered women are less articulate and often shy to speak, filling the survey questionnaire alone would be insufficient to obtain adequate information(Blaikie 2009; Creswell 2007).

Informal Observation

Informal Observation is another technique that was used to see people's general view and participation, the mode of service delivery, real cost and time involved, the treatment of the people by the operators, the grievance redressal, operator's sincerity, equipment performance and the UP's engagement. This role sometimes required the researcher to be a complete observer, or to be an active participant as an insider to gather the information, of course, with permission from the authority. Field notes both descriptive and reflective ones were taken while experiencing the observation using a protocol (Blaikie 2009; Creswell 2007).

Secondary sources

The research depends on web pages, books, journals, reports and policy documents as the secondary sources that have assisted in extracting information on theoretical and descriptive aspects. Policy documents such as circulars and letters were collected from respective government offices such as district administration, the LGD and the A2I office. Specifically, the secondary sources have been utilised to write the literature review, the policy and management issues in Bangladesh and to supplement empirical findings. The secondary sources of data were collected to answer research questions related to policy, management and implementation strategies, learn about information and service sources, operational issues, constraints and challenges of it and to facilitate a comparison between UDC and other similar models in a few other developing countries. While their uses are not limited to answer any research question, they are more broadly used for research questions 1 and 9.

[14] "Focus groups are advantageous when the interaction among interviewees will likely to yield the best information, when interviewees are similar and cooperative with each other, when time to collect information is limited and when individuals interviewed one-to-one may be hesitant to provide information" (Creswell 2007, p. 133).

Usage of such multiple sources of data collection purports to depict a detailed description of the problem, the chronological and day-to-day development. Such multi-methods are also chosen for triangulation/cross-checking purposes and/or to complement each other in order to validate the research (Mingers 2001; Olsen 2004).

Sampling

Selection procedure

The survey questionnaire was given to nearly 250 users of the UDC who came for services as well as those who already had received services from there. Some respondents were approached randomly on the spot in the UDC premise, as the researcher had been sitting there on typical working days. Others were chosen randomly from the service recipient lists kept in the UDC and contacted through the mobile phone and physical visits. For both types of selection choices, careful attention was given to maintain the proportionate allocation of male and female as well as the recipients of prevailing services such as local government, commercial and e-government services. Despite the sample selection method is not based on complete probability still attempts to incorporate the geographical representations, UDC performance variations and proportionate allocation of gender and service type were purported to maintain an overall representation of the entire UDC service users (Wright & Marsden 2010).

Entrepreneurs across the country were selected for the online survey using their shared blog, *the UDC Blog* available at http://UDCbd.ning.com/. The involvement of entrepreneurs in the research was entirely voluntary and the participation of male entrepreneurs heavily outweighed females. Still, there was adequate overall participation from all 7 administrative divisions of the country. This is partly because this open-access survey was widely advertised in the UDC blog with help of the project administration that featured the survey in the main page of the blog several times. The number of active entrepreneurs in the blog is approximately 3000. The incidents of multiple completion or 'ballot stuffing' (Couper & Bosnjak 2010, p. 534) have been found to be very negligible checking the ID of participants. Hence, each respondent is considered as representing one UDC. Some duplication may have happened from the participation of both male and female entrepreneurs from the same UDC. The maximum possibility of that are 51 cases, which equates to the total number of female entrepreneurs that participated in the online survey. Even that can be justified on the argument that female entrepreneur's information on major variables can add to the difference due to her gender.

Sample size

The sample size for user group is determined by using G-power sample size estimation software. Specifically, the statistical test for user survey that was hypothesised was the *related sample t-test*, since it aims to study the difference caused from the introduction of the UDC (Hypotheses 1-3 in chapter 2). The research assumes the following constants: a two tailed test would be used; the

power is hypothesised to be 0.8; the alpha level 0.05; and finally, given the lack of previous research and no other resources could give suggestion of effect size to be used; a medium effect (0.5), according to Cohen (1988), is hypothesised. This gives the calculated sample size for the user group to be 34. Those numbers have been overestimated by 20% to accommodate some of the missing data and drop-outs and relevant issues resulting in 40 for the user group. Though the actual sample size conducted for some sub-samples is less than 40, for majority of cases the sub-sample sizes are more than the estimated ones. In total, 154 service recipients responded to the questionnaire. The aim was to collect at least 10 respondents from each of 16 UDCs. Some UDCs ended up with only 8 or 9 of respondents available within the time limit. It should be mentioned here that among the total respondents 36 people participated in the phone survey (Cohen 1988, 1992; Faul et al. 2007; Gray & Kinnear 2012).

Regarding the entrepreneurs' survey the statistical test that was hypothesized is associational, specifically, the use of correlation and regression coefficients, to see how certain components of partnership contribute to UDC's financial attainment and sustainability (Hypotheses 4-9 in Chapter 2). Using the same software the sample size is determined with certain assumptions of constants such as a two tailed test, the power to be 0.95 the alpha level 0.05, and finally, given the lack of previous research a medium effect (0.5), according to Cohen (1988), is hypothesised. This gives the calculated sample size to be 100 for entrepreneurs. However, the actual sample sizes for all subsamples are greater than the calculated one as 624 entrepreneurs responded to the questionnaire put online (Cohen 1988, 1992; Faul et al. 2007; Gray & Kinnear 2012)..

Selection procedure and sample size for qualitative interviews

Other respondents such as entrepreneurs in the research area, UP representatives and government officials are chosen purposively based on both judgment and quota sampling criteria considering them the most advantageously placed to provide information while confirming some groups' adequate representations. Specifically, a combination of quota, purposive and convenience sampling had been used to select respondents from them (Battaglia 2008; Fink 2009). Among users surveyed 10 women participated separately in two FGDs. 19 entrepreneurs, including 3 female entrepreneurs were interviewed using an in-depth instrument. Besides, 8 UP chairmen and 6 members participated in the interview. Among management officials in the district 4 Assistant Programmers (AP), 4 Upazila Nirbahi Officers (UNO), 2 Additional Deputy Commissioners (ADC), 2 Deputy Commissioners (DC) were interviewed. The central project management officials interviewed consisted of 2 consultants from A2I, 1 official from the LGD and the Secretary of the ICT division. The total participants for interview and FGDs are 53.

Instruments and Scale development

The key variables pertaining to user benefits, management and sustainability as understood from the literature review are operationalised to connote their intended meanings in a measureable way

.The questionnaire, the interview schedule, the FGD schedule are constructed based on concepts/ variables incorporated in the research questions, hypotheses and operationalized subsequently (Appendix 1).

The questionnaire for users

The questionnaire for users essentially involved closed-ended options with a limited number of open-ended questions. For closed-ended questions, different formats of quantification have been used to classify, rank and measure the responses, while the open-ended questions were targeted to bring out information on qualitative aspects. The questionnaire was designed to elicit information about demographics of users, awareness about the UDC, levels and range of services provided from the UDC to see impacts on cost and time reduction and bridging the digital divide. To measure impacts on quality of delivery the questionnaire incorporates variables of time, trips, distance, cost, and perceived ease in access related to service takings from both UDC and alternative systems. To understand the improvement in the governance of delivery it incorporates variables such as involvement of intermediaries, perceptions of hassles and satisfaction with the governance of both systems. The amount of livelihood information and services and the future need of services consistent with their demands are also incorporated in the questionnaire. User satisfaction on governance of delivery and perceptions about easy access, provisions for local participation and how grievances are redressed, access to livelihood information and services and future need for services are measured in scales. Final items in each of the scales are chosen from a pool of items generated from the literature and then reviewed by supervisors and the researcher during the field piloting. The response formats were developed in Likert scale to assess beliefs and opinions either in a 5 point (Very poor =1, Poor, Just Satisfactory, Good and Very Good =5) or in a 6 point (Strongly Disagree =1, Disagree, Slightly Disagree, Slightly Agree, Agree, Strongly Agree =6). Considering the respondent's ability, and the fact that many had a low level of literacy, the wording and the response options were kept simple (Bhatnagar 2009; DeVellis 2012; Kumar 2005).

The FGD schedule

On the other hand, the FDG schedule is completely based on open ended questions for some selected women that asked for their participation, any benefits they receive and any problems they encounter due to their underprivileged status. During the FGD an introduction about the research and personal acquaintances were followed by discussion following the sequence of the instrument (Blaikie 2009; Creswell 2007).

The online survey questionnaire for entrepreneurs

The entrepreneur's survey questionnaire contained both open-ended and closed-ended options with the mixture of both qualitative and quantitative formats. It asked for information on entrepreneurs' demographics, his/her computer skill and, investment, income and satisfaction on

the job. Information on the involvement of other partners in the model such as government and the UP in regard to equipment, services, technical and training assistance, management support are also asked in the questionnaire. People's participation including those from disadvantaged backgrounds was asked from them since they could provide better ideas from their dealings with customers. Problems of partnership, need for future services, sustainability issues are included in the questionnaire. From a pool of items generated from the literature review, with considerations of both contents and their association with each other, final items were reviewed by supervisors and assessed by the researcher during piloting in the field and then incorporated into the questionnaire. Different formats of response are used such as for frequency and ratings of opinion and importance. The length of the response format is kept simple considering the target population's ability and the time they can afford. To measure availability and working conditions, frequently asked services, perceived progress in 1 year, need for future services, and the entrepreneur's satisfaction, it uses various scales with 5 points. For understanding the problems of UDC it uses ranks from 1= most important problem to 7 = least important one. Similarly, some interval variables such as income, investment, number of people, were categorised considering respondent's time and to get a better response rate. However, consideration was also given to test the scale's validity and reliability using relevant measures as discussed later (Bhatnagar 2009; DeVellis 2012; Kumar 2005).

Interview schedules

The interview schedules for entrepreneurs, UP representatives and the management officials were semi-structured with both open and closed ended options to elicit responses on issues of back-end support, infrastructure challenges, management hurdles, and progress evaluations and monitoring. The entrepreneur's interview schedule was designed to elicit in-depth information on aspects including: the type of equipment used and the services provided; the costs and time involved in the provision of services; the public-private partnerships; levels of turn out by local people and the financial viability of the project. The extent of support received from the local government and local administration and any operational problems were also asked.

Interview of management officials aimed to facilitate information on management hurdles and policy perspectives, the extent of back-end preparation, strategic goals, congruity between policy and practice, mobilisation of financial and human resources, monitoring and evaluation of UDC activities, impact assessment on development and governance issues. Local government representatives were interviewed to extract information on the extent of involvement of Union Parishad in the project, mass mobilisation and their participation and entrepreneur's commitment.

The questionnaires, interview schedules and the FGD schedule are attached in the Appendix 1. The validity and reliability of the measures included in the questionnaire are discussed beneath.

Validity and Reliability

Validity and reliability are important to develop standard measurement criteria. In physical sciences both validity are reliability are more definitive as there are always some standard measurement units that produce consistent results over time. However, in social sciences where measures are less tangible validity and reliability become crucial. "Validity and reliability are research techniques used to assess the accuracy of measurement scale" (Bannigan & Watson 2009, p. 3238). Validity refers to the degree to which a measurement scale measures what it is supposed to measure. Reliability, on the other hand, states the extent in which a measure produces the same result over times whoever performs it, in other words, the precision and stability of a measurement scale. In short, validity consists of correlations between the test and the world outside it, while reliability consists of correlations within the test (Babbie 2007; Bryman 2008; Kumar 2011).

Validity

This research uses a number of validity criteria[15]. First, it has used *face validity* to assess the relevance of certain attributes to measure a concept. The opinions of supervisors who are familiar with the field are asked to judge how the items in the questionnaire are logically linked to the objectives of the study (Bannigan & Watson 2009; Kumar 2011).

Second, this study has also applied more formal assessment of *content validity* to see whether a scale has included the full range of relevant components and excluded all the irrelevant ones for measuring a concept. Both techniques of non-statistical procedures are used to determine content validity: (1) review on clarity and completeness of a concept by the researcher himself based on existing theoretical literature and (2) by taking into consideration of supervisors' evaluation on how content items are related to the construct (DeVellis 2012). However, this study does not use any *criterion validity* since there is no valid and reliable instrument developed previously in this field which can be treated as gold standard to compare with (Kumar 2011).

Among the 'construct validity' types such as convergent, divergent, factorial and discriminant validity[16] this study has used factorial validity. Factorial validity involves factor analysis, which is "a statistical procedure for reducing a large set of variables into a smaller set of variables with common characteristics or underlying dimensions or some common themes" (Polit & Hungler 1995, p. 642 cited in Bannigan & Watson, 2009). This study has used the Exploratory Factor Analysis (EFA) to determine key latent variables which are not easily observed (hidden structure)

[15] "Validity indicates the degree to which an instrument measures the construct under investigation" (Bohrnstedt 2010, p. 372). There are different types of validity such as content validity or face validity; criterion validity that is concurrent and predictive validity; construct validity including convergent, divergent, factorial and discriminant validity (Lynn, 1986 cited in Bannigan & Watson 2009, P. 3240)

[16] It does not use convergent and divergent validity for reasons that there is no previous measurement or pre-existing result for reference and there is no theory to suggest as which items should be correlated to and which should be uncorrelated from each other (even after extensive literature review). Moreover, the use of discriminant validity is not considered since the study does not aim to show the degree as how people differ from each other on certain attributes (Bannigan and Watson, 2009).

in a large set of variables and which are related to objectives that enhances the interpretability of the data (Costello & Osborbe 2005; Treiblmaier & Filzmoser 2009).

Exploratory Factor Analysis data from the Entrepreneur Survey

The Exploratory Factor Analysis (EFA) is conducted for data from Entrepreneur Survey for ascertaining a number of latent concepts from a set of variables, as the sub-sample sizes are relatively adequate[17], which are subsequently used in regression analysis using Binary Logistic Regression Model and Structural Equation Model (SEM) in Chapter 6 and Chapter 7. The EFA is used since there were no previous hypotheses or adequate theories as to the underlying interrelationship pattern of observed variables. In fact, a two-stage approach is chosen to determine the appropriate number of factors using EFA at first and then confirm them in the measurement model, which is referred to as Confirmatory Factor Analysis (CFA) that facilitates construct validity analysis and reliability estimates (Garson 2013). The EFA also explains the amount of variance by factors as well define the content of them. As per the assumptions the EFA was conducted on the data that are proxy to interval scale and approach to normality. Also, our relatively large sample size can deal with missing values (Garson 2013; Suhr 2006). Factor analysis is preferred for its solution of only shared variance partitioning it from unique variance and error variance, which the Principal Component Analysis (PCA) does not discriminate. Common factorial model is also the foundation of reflective measures (Edwards 2011) as we used in our SEM models (discussed later). Among a number of extraction methods, therefore, the Principal Axis Factoring (PAF) is chosen, as is also for the data does not completely meet the assumptions of normality (Costello & Osborbe 2005). A number of considerations are applied for retaining the factors such as Eigenvalues>1, scree plot, proportion of variance accounted for and the interpretability criteria. The interpretability helped to reorganise a factor based on loading, commonness on conceptual meaning and difference among factors. Among the rotations 'oblique rotation' is chosen since it allows correlation among factors (Costello & Osborbe 2005; Garson 2013; Suhr 2006). However, as mentioned earlier, other qualitative approaches of validity such as face and content validity are also assessed for all scales.

Reliability

Reliability, in essence, assesses the extent to which a measurement score is free from random error while administered in a measurement scale. In other words, it is the proportion of observed variation in scores implying that the less variation an instrument produces the more likely it approaches to higher reliability. Reliability or consistency can be measured in different ways such

[17] Sample Adequacy is judged based on the Kaiser-Meyer-Olkin Measure. Given the small sizes of some sub samples in the user survey no exploratory factor analysis is conducted. It is also discarded since there is no point of comparison or further plan to use valid concepts in any causal model. Hence, the validity of constructs of user survey is determined through qualitative ways such as face validity and content validity. Like that of validity analysis, the reliability analysis using statistical procedure for user survey is not conducted considering the inadequate sub-sample size as well as for no further plan to use constructs in any model.

as stability, internal consistency and interrater reliability[18] (Bryman 2008). This research uses the *internal consistency* method from composite items determined through EFA, which is economical as well as the best identifier of error in the sampling contents (Garson 2013; Huysamen 2006).

Among several procedures of internal consistency, such as the 'split half technique' 'Kuder Richardson formula' and 'Cronbach's alpha' this study prefers the last one named as also 'coefficient alpha' since it can identify the major sources of error due to sampling instrument items. The higher value of internal consistency can also ensure higher value for test-retest reliability (Huysamen 2006, p. 34; Streiner 2003a). Despite limitations with 'Cronbach's alpha' such as reliability size dependent on sampling attribute especially heterogeneity, alpha affected by length of the item-scale as well as number of dimensionality of items, this study adheres to it since it is an exploratory study as there is no previous reported reliability score as well as dimensionality is assessed using Exploratory Factor Analysis (EFA) before estimating alpha value (Osburn 2000; Streiner 2003). The number of items for concepts is also modest, not too long. For exploratory study a lenient cut-off value of 0.60 for alpha can be accepted (Garson 2013). However, when the Cronbach alpha value becomes small as for fewer items (less than 10) reporting mean inter-item correlation can be considered, the optimal value of which ranges from 0.2 to 0.4 (Pallant 2012). The reliability analysis of concepts from Entrepreneur survey established through factorial validity is presented in Chapter 6 and 7 using Cronbach's alpha.

Data Analysis

Information and data gathered through survey, interview and focus group discussions have been subject to qualitative and quantitative analysis. The comparison between UDC system and alternative system is essentially based on the difference question which is solved using both descriptive and test statistics concerned with related samples. The difference of perceived impact between two systems is assessed through using statistical tests like *t* tests of different types. On the other hand, data from the Entrepreneur survey was mostly used for associational research to ascertain relationships among variables that are linked to the sustainability of the UDC. Both descriptive and inferential statistics are used to assess the kind and strength of association among them. Data collected through surveys are analysed using the SPSS version 22. Interview findings are processed through using QSR NVivo9. The models are developed using the binary logistic regression and Structural Equation Model (SEM) using Analysis of Moment Structure (AMOS) software (Nvivo9 2012; SPSS 2012). The referencing is presented with the help of EndnoteX7 (EndNoteX7 2014).

Missing value analysis

[18] This study chooses not to use *stability* or ascertaining whether the same result is produced from repeated administrations of the instrument through a test-retest method presuming the difficulty of using the same respondents over time. Neither does it use *interrater reliability* technique as it is a self-administered scale (Bannigan & Watson 2009).

The User Survey

The user survey mode was either face-to-face or via mobile phone by the researcher with the aim of obtaining the best possible responses from participants. Yet many questions remain unanswered due to a host of reasons. These include ‘not required’ (missing at random or MAR), ‘unwillingness of respondents’, or ‘inability to answer certain questions’ (not missing at random NMAR) (Allison 2010) . There are as many as 35 questions in the user survey questionnaire with a few of them being open-ended. The pattern of missing value is analysed per questions using SPSS and the details are presented in the Appendix 2.

The Entrepreneur Survey

624 entrepreneurs across 7 administrative divisions of the country have participated in the survey. However, given the freedom to answer or not to answer any question or due to factors such as slow internet connection, the number of missing values in the responses is also considerable. 86 entrepreneurs just answered the first page of the survey (maybe they were not aware or did not want to progress further) which contained only the first 4 preliminary questions out of the total 18 questions over 4 pages contained in the full online questionnaire. Since they have not contributed to other important questions and are shown as missing in the system they are excluded from the data. For the remaining 538 respondents, 70 completed pages 1 and 2 up to question 10. Another 49 respondents answered up to the page 3 of the questionnaire that ends with question 15. Apart from these there are some respondents who missed a few items of a particular question. This trend of missing values is most likely caused by respondents skipping or not completing questions, hence, missing at random (Allison 2010). In these circumstances the pattern of missing responses is analysed question by question. The decision is made based on the merit of the question and possibilities for not answering which is, along with coding and data organisation, detailed in the Appendix 2.

For both surveys missing values are dealt mostly using pairwise deletion in SPSS (Graham 2009). And for some variables of entrepreneur’s survey missing values are replaced by best proxies based on logical choice and illustrated in the Appendix 2, For instance, in a ‘Yes’, ‘No’ question missing values are treated as ‘No’ (Buhi, Goodson & Neilands 2008). For model using SEM missing values are assessed by the use of Full-Information Maximum Likelihood (FIML) available in AMOS that provides more accurate standard errors and better estimates (Graham & Coffman 2012).

Data Analysis techniques of surveys

For descriptive analysis, statistical measures like proportion and percentage distribution, average, range and standard deviation and graphical charts have been used to describe and identify the relationships among the variables. The inferential statistics followed the descriptive statistics. For

impact analysis from difference based on the user survey (hypotheses 1-3) t-tests such as Wilcoxon Signed Rank, paired-sample t test, and McNemar Test are used depending on meeting the assumptions of normality in the data. However, to understand the difference in people's participation across administrative divisions, as from entrepreneur's survey, one-way ANOVA is used. For Entrepreneur survey data mostly associational measures such as Chi-Square, Correlation, Regression coefficient and Binary Logistic Regression along with scatter diagrams are used (hypotheses 4-9). Given the lack of previous research all effect sizes are interpreted as per Cohen's (1988) interpretations. The regression coefficient equation is presented through the use of SEM (Aguinis & Edwards 2014; Garcia-Granero 2009; Gray & Kinnear 2012; Pallant 2012). Justification of using each tests is further elaborated in empirical chapters from 5-7.

The structural equation model

The Structural Equation Model (SEM) through AMOS is used as a confirmatory approach to the development of constructs through EFA as well as to establish causal relationships among them. The SEM allows both measurement and structural model at once. It facilitates multiple regressions, analysis of covariance and path analysis with complex models. Though this study does not estimate any relationship among dependent variables it, however, estimates the relationships among latent concepts. Contrary to EFA, that assumes error terms as uncorrelated, which may result in misspecification of the model, the CFA in the SEM estimates the nature of measurement error associated with observed variables and allows correlations among them. However, the SEM can also be used for exploratory factor analysis. It has enabled us for the assessment of direct, indirect and total effects (Buhi, Goodson & Neilands 2007; Garson 2013; Petter, Straub & Rai 2007; Schreiber et al. 2006).

Model conceptualisation

The model conceptualisation is done based on an extensive literature search as well as incorporating the researcher's own opinions. A number of factors have been identified by the researcher for determining the relationships among stakeholders and ascertaining dimensions of sustainability of telecentres separately (as discussed in the literature review). These factors are identified first through extensive literature review and are later constructed using several indicators and put in a causal framework using the SEM in this research.

There is clearly a lack of research on explanatory framework based on the integration of different perspectives that relate to all partners. Most previous studies either focused on supply side or demand side perspectives. The supply side perspectives limit its focus on the government and its partners' steps in regard to ICT infrastructure, resource mobilisation, performance and change management. On the other hand, demand side stresses on the benefits to various stakeholders, such as citizens, business, civil society in terms of availability and ease, trust, perceptions and beliefs. Moreover, most of such models are based on web applications of e-government (Elsheikh

& Azzeh 2014). The 'progress' and 'sustainability' models presented in this study consider these varied perspectives together in the discussion linked as independent and dependent factors. Ascertaining the relationships among factors is central to theory building (Edwards & Bagozzi 2000). However, an equal importance for theory development is relationships between constructs and measures for connecting abstract constructs to observable data. There are two options for establishing directions of relationships between them: reflective vs formative measures (Edwards 2011).

Reflective vs Formative measures

Reflective measurement treats constructs as causes of measures, "such that measures are reflective manifestations of underlying constructs, as outcomes of unobserved latent variables. On the other hand the formative measure considers measures as causes of constructs or measures form or induce an underlying latent variable" (Edwards 2011, p. 1)

It is preferred to stay with the 'reflective' measurement with some of its parts being 'formative' as predictors for reasons, as discussed beneath.

The use of the latent constructs based on the common factor model, as used in this thesis, requires the use of reflective measurement. The reflective measures are considered as outcomes of constructs (Hardin et al. 2010; Howell, Breivik & Wilcox 2013). In the closely related fields, the Information System (IS) or management, the use of formative measures is discarded for a number of reasons. Formative measures reflect distinct aspects of the construct or multidimensionality whereas the reflective measures exhibit the same dimension. When conceptually distinct ideas channel into a single construct in formative measures it leads to conceptual ambiguity. Formative measure has very low internal consistency since it refers different facets of the construct. In order to have identification the formative measure needs to be supplemented with at least two reflective measures. Instead of assigning error to unique measures, which is usual, the formative measurement attributes error to the construct. Treating formative measures as error free produces biased estimates of the loadings, similar to that measurement error leads to bias in regression coefficient estimate (Edwards 2011; Hardin et al. 2010; Howell, Breivik & Wilcox 2013).

Given the shortcomings with formative measures, researchers (Edwards 2011; Hardin et al. 2010; Howell, Breivik & Wilcox 2013) have recommended alternatives. These include replacement of formative measures with constructs respecified with reflective measures, use of two or more reflective indicants in the model for clarity in meaning and interpretation of the latent variable. This transforms formative parts just as predictors to being able to capture the multidimensionality of the concept. This research follows these recommendations.

Assumptions of SEM

In this case despite having some missing values, the sample size is still more than 300 for all subsamples and the missing values are taken care of during analysis by using estimates of means

and intercepts and Maximum Likelihood available in the AMOS. The Maximum Likelihood assumes that measured variables are continuous and have multivariate normality. Violation of multivariate normality and coarse categorisation of variables can lead to inaccurate assessment of χ^2 tests of model fit and biases in parameter estimates and standard error. The risk is more when fewer than 5 categories are employed (West, Finch & Curran 1995). All of the measured variables in the SEM framework are either ordinal or categorical. Some of the continuous variables such as 'investment', 'income' and 'people visiting' have been categorised for the convenience of data collection and to get better responses. Yet, the number of categories is $\geq$ 6 for any of them which can be treated as continuous (Finney & DiStefano 2006). Similarly, other ordinal variables are Likert scale with at least in 5 scale format. Composite scores treated as continuous variables from most of these ordinal variables are used in the model (Rowe 2002). Composite scores created through item parcelling approximate normality (West, Finch & Curran 1995). These considerations of continuous variable and normality are also employed for other inferential statistics used in the study such as Factor Analysis, ANOVA and Correlation Coefficients.

The second assumption relates to multivariate normality. The initial check-up for multivariate normality is done through the univariate normality analysis which shows that most of their distributions are approximately normal as determined by examining normality plots, skewness and kurtosis, for example the values of both the latter being <2. And, overall similar values of mean and 5% trimmed mean for all variables also suggest that there are very few outliers (Pallant 2012; West, Finch & Curran 1995).

To assess multivariate normality the alternative estimation technique, bootstrapping, is adopted. Bootstrapping is the intensive computational method that offers a different approach to conventional goodness-of-fit tests and parameter estimates by taking repeated samples from the study population. By doing so, it produces an empirical sampling distribution of parameter estimates. In case of deviation from normal theorem (NT) for any case it produces a more accurate distribution compared to the theoretical distribution (West, Finch & Curran 1995).

The missing values prohibit conduct multivariate normality analysis and bootstrapping in AMOS. In order to allow bootstrapping on a sample of 500, a separate analysis was undertaken with the data set imputed to start with by Expectation Maximization (EM) (Abraham & Russell 2004; Graham 2009). The results from bootstrapping were compared with the solution based on original data in terms of differences in parameter estimates, standard error and significance level (Graham & Coffman 2012; Nevitt & Hancock 2001).

Assessment of model fit

A number of benchmarks and fit indices are used to assess how the underlying models fit to the observed data as presented in the Table 3. These indices are more or less commonly agreed by researchers. In general, if majority of indices suggest a good fit then it is more likely to be a good fit

(Buhi, Goodson & Neilands 2007; Hooper, Couglan & Mullen 2008; Hu & Bentler 1999; Schreiber et al. 2006).

Table 3: Cut-off values of fit indices for SEM Models

Cut-off value for validity and Fit Indexes	Acceptable threshold
Squared multiple correlation or reliability of indicators	Ranges from 0 to1. But the higher the better for reflecting a well construct.
CMIN/DF	The ratio of $\chi 2$ to *df* $\leq$ 2 or 3
Normed Fit Index (NFI)	$\geq$ .95
Incremental Fit Indexes (IFI)	$\geq$ .95
Tucker-Lewis index (TLI)	$\geq$ .95
Comparative fit index (CFI)	$\geq$ .95
Root mean square error of approximation (RMSEA)	< .06 to .08

Because our initial models fit well and our parameter estimates are statistically significant in most cases the re-specification and modification was discarded (MacCallum, Browne & Sugawara 1996).

Limitations and Justification of Methodology

It is considered that there are some limitations in the methodology. The justifications for the approach taken are outlined below.

Conducting the user survey using related sample is designed to facilitate a point of comparison as to whether there any real difference is caused by the introduction of UDC relative to an alternative delivery system. This is not an ideal way of measuring changes, as it relies on recollection of memory of the same respondents. Yet, it is adopted since the baseline data prior to the introduction of UDC is not available. Where the baseline data is not available the design can be 'After Only' approach, where data on the system is collected retrospectively to compare with the new system or questions are asked to identify contrary-to-the fact issues (for example: If you did not have the telecentre, how would you do this?) (Bhatnagar 2009; Hudson 2001). Moreover, using independent samples for service recipients from multiple alternative delivery points which are located at distant and sporadic places was not suitable either, considering the time and budget limitations (Bhatnagar 2009).

One of the key limitations of the internet survey method was the challenge of selecting probability samples of the general population. Yet, considering that large number of respondents participated in the survey from all administrative divisions of the country proportionate to their numbers, this limitation has been argued about. The limitation of the sampling is that it could not reach those entrepreneurs who are not active (around 6000) in the blog. Therefore, a qualitative approach of interviewing 19 entrepreneurs from 16 UDCs was undertaken to validate and supplement the quantitative inputs. Non-responses also presented a challenge in terms of larger number of

missing values(Couper & Bosnjak 2010). Also, the limitations of missing values and ways it was dealt with, as well as justifications for using various data collection techniques and analytical tools have already been discussed.

Conclusion

This chapter has adopted a mixed method of studying impacts on users, management of stakeholders and sustainability of the UDC with a variety of data collection techniques and data analysis tools. It was argued in the beginning why mixed method, guided by pluralistic approach, is appropriate. It was discussed that to know the citizen's perspective, a survey is the suitable tool supplemented by FGD. Further, to know the implementers' perspective in terms of impacts on the agency and larger society, both surveys and interviews can provide good results. The use of non-probabilistic sampling procedure, though, poses questions for generalizability, but this can be justified when coupled with cautious efforts to cover geographical representation, gender balance and service varieties. Adopting adequate sample size determined through G*Power allowed for some higher level statistical tests, adding credibility to the results. Scale development was undertaken along with the assessment validity and reliability. We have tried to deal with the missing values more scientifically and used them for different tests and model. The data analysis tools were chosen appropriately to shun violations of assumptions related to each type of inferential statistics. The use of SEM has allowed for the development of models for management and sustainability, putting key dimensions related to them in one place and determining their relationships. Again, careful considerations were made from model choice to assumptions fulfilment to ensure credibility of knowledge. The methodology is fully illustrated in the empirical findings beginning from chapter 5.

CHAPTER 4. THE GENESIS OF UDC

Introduction

The aim of this chapter is to present an overview of e-government to understand how the Union Digital Centre (UDC) has emerged as a recent phenomenon in Bangladesh. This is done in two sections to answer the first research question as to what policy, management and implementation strategies are in place to enable the operations of UDC. The first section deals with the development of e-government initiatives in general. The policy perspectives, management and implementation strategies on e-government are introduced to develop a background knowledge of the UDC as an incremental cornerstone to the overall policy development. The discussion covers related policies on ICT infrastructure, right to information, and electronic government to which the UDC owes its policy genesis. Implementation practices are subsequently highlighted to be acquainted with key government players backing the UDC with backend preparations in terms of services, connectivity and management. The second section specifically focuses on the policy and implementation strategies of the UDC. The discussion commences with the policy guidelines of the UDC, identifies the management structure and describes implementation responsibilities of each relevant stakeholder. The specification of government's roles, the UP involvement, and duties and responsibilities of operating entrepreneurs is made to understand the current practices. This acts as a point of reference to practices on the ground presented in subsequent chapters based on empirical evidences, and helps to identify the gap between policy and practice.

The Development of E-government

The UDC traces its policy pedigree to the 'Vision 2021' for digital Bangladesh and a host of other policies, acts and guidelines for citizen centric e-government. The constitution of Bangladesh proclaims objectives for establishing an equitable society through sustainable economic development based on rightful distribution of wealth and opportunity among citizens. The Vision 2021 cherishes to achieve the equitable development through an inclusive information society powered by the ICT. This is recognised by the present *Awami League* government (2009- current) in 'A Charter for Change' in its election manifesto prior to the election held in 2008. This vision for transformation to an inclusive developed society is popularly expressed in the strategic nomenclature the 'Digital Bangladesh' that states that: "The vision for an inclusive society is that all citizens are able to participate in the creation of wealth and its equitable distribution enabled by informed decisions with the help of ICT at an affordable cost. Such an inclusive society also creates digital opportunities for common citizens to participate in governance"(A2I 2011b, p. 16). 'Digital Bangladesh' is thus the cornerstone of e-government which is aligned with the nation's development strategy. Broadly, the agenda includes a digitized smart government, growth of e-services, countrywide telecommunication infrastructure development, ICT promotion, capable

human resource development, PPP investment, and bringing information and services to the doorsteps of people to eradicate the digital divide (A2I 2015; GOB 2009a; Siddiquee 2012).

The 'Strategic Priorities of Digital Bangladesh (SPDB)[19]' is later incorporated in the driving document for national development, the 6th Five Year Plan 2011-2015 (SFYP). The Plan introduces seven core targets to achieve MGD and Vision 2121. One of them relates to the development in ICT to use it as the key tool for achieving all other targets for building Digital Bangladesh. The SFYP also underscores on establishment of "e-governance of through Digital Bangladesh initiatives in all government offices and at all district levels to provide better and speedier service, and to improve the transparency and accountability of public service agencies" (GOB 2011, p. 9). It envisions that e-governance will enable citizen's access to comprehensive informational and transactional services[20]. One of the means of ICT led e-governance is expected to be accomplished by establishing community e-centres at the Union level (GOB 2011).

This visionary planning agenda, however, is the latest addition over incremental development in the policy arena that has been building up over a decade. Previous policy milestones are *the National Information and Communication Technology Policy, 2002/2009, the National Information and Communication Technology Act, 2009, the Right to information Act 2009, the Secretariat Instructions 2008 and the Broadband policy, 2009* (A2I 2011a; Sarker 2013).

Following is a brief discussion on relevant acts and policies on e-government.

Relevant policies and acts

The plan for application of science and technology for modernisation of public administration, however, is as old as the independence of the country in 1972. Efforts afterwards slowly progressed by adopting computer aided applications in management information system and office works throughout the 1980s and 1990s. However, specifically the urge for electronic government for citizen centric services was ushered to the governance debate in 2000, when the Report of the Public Administration Report Commission recommended the use of ICT in government operations termed as 'electronic government' (Hoque, SMS 2006, p. 347).

Subsequently, emphasis for ICT led government has been enshrined in different policies. In 2002, the government adopted *the National ICT policy* that aimed to mainstream the ICT in national

[19] SPDB is a document developed by A2I which provides situation Analysis and Required Intervention of ICT led development for each sector. A number of other subsidiary policies such as on broadband internet, mobile banking, telecommunication, and mainstreaming ICTs in sectors such as education, health and agriculture advocated by A2I are guided by this document(A2I 2011a).

[20] For this all government agencies must create necessary information, forms, applications and documentations online; adopt legal and operational framework for interoperability; create nodal unit for monitoring progress; enhance local connectivity to establish access to poor and other disadvantaged groups; undertake digitization of key records and embrace digital process in operations and develop capacity building of officials. The SFYP assigns the overall coordination responsibility of these initiatives to the Prime Minister's Office, assisted by Bangladesh Computer Council (BCC), by taking leadership and framing friendly legal policies. Capacity building of human resources and improvement of infrastructure rest on the BCC while the digitization of records and processes reengineering remain the responsibility of respective ministries/agencies (GOB 2011).

development by its extensive use in information generation, utilization and application. The policy outlines the visions of e-government in the country and to build a knowledge-based society by 2010. To reach the doorsteps of people it placed importance on establishing telecommunication infrastructure, connecting to a submarine fibre optic cable network, extending internet facilities to rural areas, establishing cyber kiosks in post offices and unions, ICT industries, e-commerce and e-government (GOB 2002). Although the policy lacks the development of specific strategies or action plans it does outline the broader framework of e-governmental strategies. Consequently, the changes and modifications have been adopted in *the ICT policy 2009*. Additionally, this policy identifies the action plans, the actors, the expected deliverables and benefits and goals for short, medium and long term consistent with the priorities of Digital Bangladesh (GOB 2009a). The specificity of action plans helps government agencies to embark on particular tasks on e-government including quick-wins such as the UDC (Mahmood & Babool 2009).

To help with the implementation of ICT policies, a number of ICT friendly legal provisions are also enacted. *The 2009 ICT Act* is aimed at preventing cybercrimes. *The ICT (Electronic Transactions) Act 2009* purports to facilitate e-commerce by safeguarding the online dealings and hindering the threats to computer communication. Specifically, for e-government it facilitates electronic filing in government agencies and ensures efficient delivery of electronic records from government offices, online financial transactions, digital signatures, dispute resolution for electronic transactions and defence against cybercrimes (BCC 2014; Mahmood & Babool 2009). However, many provisions of these acts largely remain unimplemented from the limited scale of e-government operations (Siddiquee 2012).

The Right to Information Act 2009 marks another step forward in fulfilling the constitutional pledge to ensure people's right of access to seamless information. This right includes the right to seek, receive and impart information and ideas regardless of frontiers. This act also empowers citizens to opt for legal measures to appropriate authority if their access is denied. It is believed that this would curtail the monopoly of public officials over secrecy and promote transparency and accountability in the politics and public administration (GOB 2009c). Similar obligation to ensure people's access to information is also underscored in the Citizen Charter articulated in '*the Secretariat Instructions 2008'*. Every ministry, according to the instruction, should frame a citizen charter and also upload it to its website. It is expected that this charter would increase government's responsiveness and accountability to the citizens since it inscribes a host of measures hospitable to answerability. The imperative to establish UDC is considered to have come from these policies which imposed somewhat obligation on government agencies to provide mass people access to information (Sarker 2013).

These policies and acts described earlier helped different ministries/divisions develop their management information system (MIS), websites, and portals. However, there were no common

standards followed. Inlands of information were created using incompatible technology and processes and thus making data interchange across departments next to impossible. A recent step like '*Bangladesh e-governance Interoperability Framework (BD-eGIF)'* adopted by the Prime Minister's office in 2007 is an important policy drive to establish congruity between processes, policies and management across departments. This attempt is expected to bolster ICT-enabled joined-up approach for delivering client-centric services[21] (Bhuiyan, MSH 2012; Zaman 2007).

Enacting *the Bangladesh Payment and Settlement Regulations, 2009* and establishing the Controller of Certifying Authorities (CCA) office for recruiting Certifying Authorities to introduce digital signatures are aimed at securing online payment and a move towards transactional e-services (Bhuiyan, SH 2011). *Mobile Financial Policy Guidelines 2011* adopted by Bangladesh Bank promotes mobile banking services to millions of unbanked rural people (Sarker 2013).

Improvement of infrastructure to reach up to rural areas is underscored in policies such as the *National Broadband Policy, 2009* and *Rural Connectivity Policy Guideline 2010*. The Broadband Policy aims to promote superior internet networks to provide efficient services and ensure economic development. It introduces the deliverables and relevant modalities for optimum and cost effective development of broadband network through the PPP approach. It sets short, medium and long term targets to achieve 30% broadband penetration by 2015 (GOB 2009b). The Rural Connectivity Policy Guideline Policy 2010 facilitates private sector involvement for developing unified fibre optic internet connectivity from disjoint fibre cables owned by public entities[22]. A host of other policies are also adopted for enabling the efforts to connect the disconnected. *The PPP Policy 2010*, for instance, invites private investment in telecommunication infrastructure and service development and the *Cyber Security Policy 2010* aims at ensuring internet security. Similarly, incorporation of the ICT component in various sectoral policies such as education, health and agriculture are all targeted to ensure better services (A2I 2011c; Sarker 2013).

Thus, though these policies do not particularly mention the concept of UDC, since it did not emerge then for most cases, yet measures articulated in them are all targeted to establish a one-stop service delivery point to provide seamless and spotless information and services at the grassroots. The efficacy of UDC as a focal point of delivery is largely dependent on the development of infrastructure, services and interoperability, online transactions, a central database and the implementation of a competent management strategy sketched in these policies.

[21] Subsequent enactment to establish the 'National Identity Registration Authority (NIRA)' in 2008 to provide 18 services such as passport, bank account and the endorsement of National Identification Law in 2010 are all measures to consolidate information exchanging across departments (Bhuiyan, SH 2011). Towards interoperability a number of measures including Unicode-compliant NIKOSH font (Bangla language) usage for preparing public document are suggested. Citizen Core Data Structure (CCDS) is another technical interoperability adopted by the Cabinet Division in July 2011 with version 1.0 that requires every agencies to fill 11 (eleven) mandatory fields on citizen's information inputs while the other 6 six optional fields are related to respective public department's personalised requirements (Bhuiyan, MSH 2012).

[22] Previously, such involvement of private sector to use fibre of optic cables of Bangladesh Railway led to unprecedented growth of mobile phone service at the cheapest rate in the world (A2I 2011c).

Management structure

The management structure involves a number of public sector organisations with the Prime Minister's Office (PMO) and the Ministry of Post Telecommunication & IT in the leading positions. The National ICT Task Force (NTF), recently renamed as Digital Bangladesh Task Force (DBTF), headed by the Prime Minister and also represented by public, private and civil society organisations has been constituted with the responsibility of advising and overseeing the policy matters. To assist with the policy formulation and coordination across various e-initiatives, an e-governance cell has been established within the PMO. Under this cell an advisory and technical project 'Access to Information (A2I) Programme' located at PMO and supported by the UNDP and USAID now plays a catalysing role in promoting e-services at citizen's doorsteps including the UDC ((A2I 2015; Mahmood & Babool 2009; Siddiquee 2012).

The Government Organization entrusted with the overall development and promotion of the ICT sector was the Ministry of Science and Information & Communication Technology (MSICT). Recently reorganised, the Information and Communication Technology Division of MSICT is now attached to the Ministry of Posts, Telecommunication and Information Technology (MPTIT). This change is aimed at integrating the ICT application and the infrastructure development which is overseen by the MPTIT. The ICT division is responsible for the promotion of ICT policy innovation and implementation. The Bangladesh Computer Council (BCC), an autonomous body under the MPTIT, is one of the main implementing agencies for the promotion of ICT. For e-government programmes, the BCC is given the responsibility of computerisation, advisory services for e-initiatives, ICT training for government officials and ICT extension projects (BCC 2014).

BCC is now implementing one of its most significant projects: the development of a national network infrastructure known as *BanglaGovNet* (Bangladesh Government wide Network). This project is designed to provide an intranet backbone to all ministries, divisions, directorates, departments, district headquarters and 64 Upazilas and computerising them so as to bring them under a single network. Up to now it has established data resource centres called ICT centres in 62 districts and 61 Upazilas and in a large number of ministries/divisions connected with the National ICT centre in the BCC. Its aim is to promote faster interaction between government units by accessing and sharing information using a secured broadband connectivity, integrated information management system, electronic file management and electronic mailboxes. Once fully implemented, this will facilitate greater back-end connectivity support to the UDC. However, up to now, the majority of Upazilas have remained out of reach of the BanglaGovNet. Consequently, a new project called National ICT Infra Network for Bangladesh Government (Info-sarker) (duration: June 2013 to July 2015) was undertaken by the BCC to expand the coverage area of BanglaGovNet to reach all Upazilas of the country by deploying additional routers, switches and servers. In addition, the project aimed to maximise the automation of work processes through

integrated information management system utilizing National E-service System (NESS) (BCC 2014).

While these two projects deal with the infrastructure development and information sharing across various government units, another project called National E-service System (NESS) undertaken by A2I especially focuses on the development of e-services for citizens though portals at district and Upazila levels. NESS[23] is an initiative that brings together all e-services under one framework which is capable of embracing mobile and online applications. It contains a system input to convert paper forms into digital ones and an e-financial platform to facilitate transactions. In the district, NESS is now replacing the previously introduced digital system *the District e-Service Centre (DESC)*[24] which lacked these two components (A2I 2015).

Thus far discussed, efforts are only at the preliminary stage to establish interconnectivity and provide back-end public services to the UDC. Meanwhile, the A2I and few other management authorities have developed partnerships with several public and private organisations to supply services and technical supports to the UDC. At the forefront of such partnerships are private banks (e.g. BRAC Bank, Dutch-Bangla Bank, Mercantile Bank, Trust Bank and One Bank) that signed contracts with A2I and LGD to engage entrepreneurs as their mobile banking agents; life insurance companies (e.g. *Jibon Bima*) that let UDCs to open life insurance policies; mobile phone companies (e.g. *Robi* and *BanglaLink*) that allow for mobile recharge or flexi load, and NGOs (e.g. British Council, Practical Action, *Ankur* ICT Development Foundation) that provide English language training and other services for awareness (Asad-uz-Zaman 2011).

Partnership with Technical Education Board (TEB) enables entrepreneurs to provide computer training to rural youths who then become eligible to appear in exams held by TEB. The Ministry of Health provides telemedicine (health consultation using Skype) facilities to rural poor by connecting with their duty doctors online. The Bureau of Manpower, Employment and Training (BMET) conducts online recruitment of overseas employment through UDCs under G2G (Government to Government) program. For instance, recently it has completed registration for employment in

[23] By hosting together all the key providers such as from government and non-government NESS will keep adding e-services from various sources. After initial piloting in Jessore in March 2013 NESS is targeting to introduce 44 additional e-forms with existing 182 ones in all 64 districts. By transforming the DESC by 2015, NESS expects to create 60,000 system users in approximately 400 directorates and Ministries, 16,000 government offices from Upazila and district level and 5470 e-service counters. It will benefit approximately 16 million citizens directly using NPF or e-service App Store from mobile devices or from thousands of countrywide access points including UDCs (A2I 2015).

[24] The DESC has been an ICT-based system in the Deputy Commissioner's (DC) office supporting citizen and entrepreneurs of UDC for placing applications and requests for various information and services. Requests and required documents for services can be submitted in the district office (over the counter), by mail and online. Documents received in the counter are scanned and the client receives a tracking number along with an automatic SMS message stating the delivery date. Piloted first in Jessore in 2010 and later replicated in 10 other districts, the system was eventually rolled out across all 64 districts in November 2011. Requests are logged into the system where their status is monitored by the DC as well the officials in the Cabinet Division (A2I 2011a).Despite some progress with online submission of application, digital file management, SMS notification, online tracking system the DESC could not provide full of digital system because of lack of e-services and interconnectivity with other offices including those at Upazila. Hence, empowered by National Portal Framework (NPF) NESS's mission is to connect all offices stretching from ministry to Upazila with e-services to make these layers one-stop delivery points (A2I 2015).

Malaysia and Hong Kong through UDCs. It provides facilities to check visas from UDCs to protect overseas job seekers from forgery and deceit (Siddiquee & Faroqi 2013). The district administration which is under the cabinet division provides land copies from the UDC. A contract between the entrepreneurs and *Pally Biddut Samity* (PBS under the rural electrification board) enables the payment of their electricity bill. Moreover, the UDC is the nearest access point to apply online for services from the DESC/NESS. Ministries and divisions that do not have direct contractual arrangement with the UDC allow entrepreneurs to access their websites and provide people with information, downloadable forms, or any other interactive services, where requested.

The establishment of the connectivity up to grass root level is the responsibility of the Bangladesh Telecommunications Regulatory Commission (BTRC), another autonomous body under MPTIT. Telecom providers, both fixed and mobile, as well as ISPs are regulated by it. In the absence of a robust wired connectivity BTRC can allocate required frequencies to allow 3G/4G/LTE connectivity to mobile operators to make voice and data services available to a remote population. In the mobile phone sector, along with the state owned company *Teletalk* of BTTB other private providers are *Grameen Phone, Robi, Airtel, Bangla Link* and *Citycell*. For privatisation and competition, mobile tele-coverage today reaches most of the remote areas (66.6% area) with an estimated 133 million subscribers as of November 2015. The significance for the growth of mobile telephone for e-government is that the government can provide e-services through SMS and internet facilities from these providers. As a result, the number of mobile internet users has grown to 51 million by 2015 which accounts for 96% of total internet users. Other 4% consists of ISP+PSTN (3.4%) and wireless WiMax (0.6%), the former being fibre optic broadband connection while the latter is wireless broadband[25] (BTRC 2015).

To speed up the internet bandwidth and faster connection, fibre optic cables have also been laid in many parts of the country. The country joined the Global Information Superhighway (submarine cable connectivity) in 2006 through the SEA-MEA-WE 4 project taken by BTRC. This project was later transformed into a company called the Bangladesh Submarine Cable Company Limited (BSCCL). By 2014, the SEA-MEA-WE 5 cable is projected to increase the speed of internet speed 10 times higher to serve as an alternative submarine connection (BTRC 2015). However, due to the absence of telephone lines/fibre optic cables in remote and rural areas, broadband was not able to be offered there (GOB 2009b; Prothom_Alo 2013). BTRC has recently offered licenses to two companies namely, Power Grid Company and Fiber@Home on *Nationwide Optical Fibre Telecommunication Transmission Network* to build and maintain a common telecom transmission network across the country (Bhuiyan, SH 2011; BTRC 2015; Joy 2010). There is no shortage of bandwidth too after the connectivity with global information superhighways through SEA-MEA-WE

[25] BTRC awards the responsibility to set up broadband wireless infrastructure to companies like *Augere Wireless Broadband* and *Bangla Lion Communication Ltd* that now have reached up to 56% of the district headquarters with wireless broadband connection. Along with these there are now 17 ISPs that are licenced by BTRC to provide wireless internet service (BTRC 2015).

4 since 2006. The problem is the 'last mile connectivity' meaning lack of a thriving demand base for broadband[26] (Hasan 2015).

Another important institution for building payment infrastructure structure which is a prerequisite for transactional services under e-government is the Bangladesh Bank- the country's central bank. In cooperation with the Ministry of Finance and the Ministry of Law and Parliamentary Affairs the bank is working to shape legal issues of e-payment and online money transaction. As an immediate effect, the Bangladesh Payment and Settlement Systems Regulations, 2009 have come into force. It has also started to pilot the National Payment Switch (NPS) in three banks in a bid to allow online transactions and bring all credit/debit cards of all banks under a single network (Bhuiyan, SH 2011; The_Daily_Star 2012).

Because of these policy developments and consequent involvement of various public organisations and cooperation from private sector some levels of e-readiness for services, connectivity and human capital has developed over time, which carries clear implications for the UDC.

E-government readiness

This sub-section focuses on the e-government readiness in terms of three major components: online services, the telecommunication infrastructure, and the human capital development to connect rural inhabitants through the UDC (UN 2012).

E-services

The early initiatives focused on the development of ICT infrastructure and automation of existing governmental offices seeking to enhance efficiency in operations. With the launch of the A2I program, e-government initiatives received a further boost which saw a shift in focus from institution-building to delivery of services at various levels (Siddiquee 2012). The latest UN Survey (2014) shows that in Online Service Index (OSI) Bangladesh's position is 98th out of 194 counties, with a 75% utilisation of emerging information services, 34% of enhanced information services, 14% transactional services and 18% connected services (UN 2014). Bangladesh has made commendable progress in respect of informational service and/or online presence of the government. All offices of the government from the *Union Parishad* to the central secretariat have websites containing information about the office, the organisational hierarchy, services provided, achievements, relevant policies and contact details (Bhuiyan, SH 2011; Siddiquee & Faroqi 2013). Bangladesh's low position in the overall e-government Development Index (EGDI) (148th) can be attributed to very low state of infrastructure and human capital (UN 2014).

26 For this, of 250 Gigabytes of existing bandwidth (200 from BSCCL and 50 from International Terrestrial Cable Company (ITCC) importing from Mumbai) only 42 Gigabytes are utilised. About 90% of this used bandwidth is supplied by ITCC to ISPs because of its cheaper price compared to that of BSCCL. As a result, BSCCL has recently decided to export a portion of its unutilised bandwidth to India for its eastern provinces, notably, in lower price than it takes from ISPs within the country (Hasan 2015).

Connectivity

When e-services are ready, a seamless connectivity is essential to offer them widely, and to avoid a potential digital divide. Yet, the country's overall connectivity infrastructure is very fragile, and not able to establish wider access. In the Telecommunication Infrastructure Index, Bangladesh's position is 161st with an estimated 6.3% internet users, 0.62% fixed phone users 62.82% mobile users, 0.33% fixed (wired) internet subscribers and 0.47% wireless broadband users per 100 inhabitants (UN 2014). The lower percentage of internet users indicate that an overwhelmingly majority of citizens still remain outside the connectivity to receive benefits of e-services which justifies also the interventions through UDC shared access points. The potential of UDC is thus heavily dependent on the establishment of an affordable and broadly accessible ICT infrastructure to deliver online services. With the recent readiness discussed above, Bangladesh's position appears to be at a very preliminary stage in providing proliferated infrastructural support for internet connectivity throughout UDCs across the country.

Human capital

The competent human resources, along with enriched human capital, are very important for e-government since they indicate the citizen's preparedness to adopt technology and receive relevant e-government information and services. In the Human Capital Index, the country's position is 176th with an adult literacy rate of 57.73%, gross enrolment ratio 56%, expected years of schooling 8.10 and mean years of schooling 4.80 in the world (UN 2014).

These lower positions in both telecom infrastructure and human capital and lack of their immediate resolve suggest that some kind of intermediation is necessary to reach those who are disconnected with somewhat better developed e-contents. The establishment of UDC closer to people reinforces this assumption to progress further in e-contents, connectivity and human development. It can also be justified, in turn, that better readiness will strengthen the supports for UDC. The next discussion centres on the policy and implementation guidelines of the UDC.

The UDC: Policy and Management

The specific policy genesis of UDC stems from some sporadic management directives adopted by the A2I, the Cabinet division, the LGD and its wing the National Institute of Local Government (NILG) through office memorandum, guidelines and demi official letters (DOs). After the initial piloting of the project at 100 UPs with help of A2I in 2009 an office memorandum was issued by LGD to field officials such as Divisional Commissioners, DCs, UNOs and UP Chairmen underscoring the need for establishing another 1000 UDCs in selected Unions[27]. The implementation mode is detailed in a Manual attached with a memorandum titled as *UDC Implementation Manual.* The manual describes the need and importance of UDC, roles of

[27] However, the concept of UDC is a new model to replicate its earlier version, known as Community E-Centers (CEC) in a much wider scale (A2I 2011c).

stakeholders like UPs, the administration, LGD, A2I, development partners and technical support organisations. It prescribes to form a management committee constituting of local elites and headed by the UP Chairman to oversee set ups and operations. It sets prior qualifications for recruiting the entrepreneur, the modality of partnership, duties and responsibilities of relevant stakeholders. It has also listed types of service and information to be offered from the UDC (LGD 2010).

This is the first founding policy document that triggered the formation of UDCs within in a short period of time. After full scale commencement in November, 2010 the A2I issued an *Operational Guidebook* on May, 2012. Like its predecessor, the implementation manual*,* the operational guidebook reiterated issues like contract between entrepreneurs and the UP, the management committee, equipment purchase and maintenance. It especially, emphasised on investment by the entrepreneur, the role of partners like district administration, the Upazila administration and the LGD (A2I 2012a). However, both of these documents did not specify development of back-end processes to supply the information and services to the UDC, or the development of infrastructure and human resources to for effective support to UDC, since they are covered by broader policy framework. These policy packages and acts deliver the normative structure which are owned and operated by a management structure to which our next discussion follows.

Implementation stakeholders and strategies

Since the UDC is based on a PPPP approach a host of partners from government, local government and private are involved in the implementation. The policy roles and functions of each of these partners are described in this section.

The Access to Information (A2I)

Major drives regarding citizen-centric services especially for rural people through 'quick wins' have been promoted by the A2I[28]. As a quick win initiative the UDC traces its origin from A2I initially piloted and later replicated elsewhere in the country with policy and management directives from it. The two policy documents mentioned earlier combined with other secondary documents and interviews with management officials guide our discussion in this section.

Though the A2I document did not specify its own charter of duties on UDC the LGD circulars assign A2I responsibilities of content development, supply of it, and capacity building of UP and the

[28] A2I is in charge of developing strategic vision, goal setting and implementation strategies of emerging quick-win e-government projects; coordinating of ongoing ones of various governmental bodies. The vision it promotes is to utilise the ICTs as a tool (1) to make government services hassle-free, faster, cheaper, more inclusive and at citizen's doorsteps and to (2) bring efficiency, effectiveness, transparency and accountability to administration (A2I 2010). More specifically, it identifies the gaps in online service provision and promotes design and delivery of new e-services, provides back office support such as training and workshops of government key stakeholders for confidence building and enabling e-leadership. In addition, it lobbies with the government for allocation of budget, builds partnership with private sector and NGOs for e-contents, financial and technical support. The 2nd phase of the program has added monitoring, evaluation and research on key programs undertaken by establishing some baselines and targets in order to improve Bangladesh's performance in e-government ranking (A2I 2011a).

UDC. In fact, it performs a host of responsibilities including forging partnerships, lobbying for involvement of development partners for financial and technical assistance, as well as engaging technical support organisations for assistance and skill development of entrepreneurs, mass awareness building programmes, technical assistance to operation and maintenance of equipment (A2I 2012a).

The A2I is not directly involved in financing of any training, which is done by other government agencies such as the BCC. It provides advisory and counselling services to the district implementing offices on effective methods of training. For instance, it guides the district and Upazila administrations as how to categorise the capacity of entrepreneurs such as 'Weak', 'Medium' and 'Advanced' following certain criteria and advises on the duration and suitable contents of training needed for each of them. Importantly, it provides training of the trainers (TOT) consisting of management officials on management strategy, evaluations and progress reporting using online tools. Moreover, the A2I send office communications (office memorandum, quasi-official letters, for example) to UPs and local administration on problems, solutions and innovations. For example, it draws the attention of UP or administration to intervene, based on specific media reports. To oversee the UDC's day-to-day operations, the A2I relies on the district and Upazila administrations (A2I 2011b, 2011c, 2015).

The Local Government Division (LGD)

The UDC is hosted in the UP, the regulatory body of which is the LGD under the ministry of Local Government, Rural Development & Cooperatives. As to the policy prescriptions of A2I the initial piloting was carried out with its training agency, the NILG. At first the NILG introduced 30 UDCs in 2009 installing some equipment and providing training of entrepreneurs and UP chairman and members. Since the piloting demonstrated success another 100 UPs were added with the help of A2I and UNDP. As NILG advocated for broadband connection BTCL installed broadband connection by a project financed by the World Bank in those 100 UDCs (Interview with NILG official, 2013)[29].

The A2I asked the LGD to provide legal and policy support to host UDCs in the UP. Accordingly, it provided policy circulars outlining how to set up new ones, recruit entrepreneurs and contract with them and responsibilities of UP. It has also a mandate to implement awareness-building programmes, lobby with development partners for technical and financial assistance, seek inter-ministerial coordination, and monitor and evaluate UDC performances. For initial purchase of equipment the LGD permitted UPs buying equipment from the Local Government Support Project (LGSP) fund. The LGD also encourages UPs to make publicity for awareness building programmes. Though A2I wanted to own the project by the LGD, as being the host ministry, it did

[29] In March, 2010 when the Prime Minister has declared to introduce UDCs from 1000 UPs the LGD sent money from its LGSP to train up entrepreneurs in the DC office with the help of BCC and there was a 10 day training for Entrepreneurs. Among 1000 UDCs 400 were without electricity which were later supplied with solar panels along with additional 613 by the BCC. In November, 2010 the whole country came under UDC coverage (Interview with NILG official, 2013).

not respond in the same manner and hence the principal oversight responsibility of UDCs still lies with the A2I (Interview with the ICT Secretary 2013).

The Bangladesh Computer Council (BCC)

To help with the UDC awareness building BCC organises trainings for government officials, and entrepreneurs at field level, workshops for key stakeholders such as public employees and people's representatives including Upazila Chairman and UP Chairman and members. Under a current project called, 'Basic ICT skill transfer up to Upazila level' it provides skill training to grass root officials, entrepreneurs, and school teachers in all districts. BCC also provides technical and training support to the UDC by their APs employed in the district ICT centres located at the DC office. Its technical supports to UDC include troubleshooting, password resetting, software maintenance, performance evaluation and basic training on computer programmes, networking and freelancing.

The District Administration

The District Administration, which consists of several Upazilas and Unions and is headed by the DC, is the key implementing agency of UDCs in the field to provide back-end support. Guided by the policy directives of A2I, LGD and BCC it plays pivotal roles in establishing new UDCs in consultation with the UP, providing logistic and technical support, training of entrepreneurs and officials, promoting campaigns for awareness, monitoring performance and conducting evaluations. To perform all these DC is assisted by an ADC who acts as the e-government Focal Point in the district and who is, in turn, assisted by an Assistant Commissioner (ICT), the AP, and the District Information Officer (DIO). The AP helps with technical and training assistance while the DIO aids in mass awareness campaigns.

The district administration also plays roles in recruiting and replacing entrepreneurs and settlement of disputes between the UP and entrepreneurs. It monitors progresses through the dashboard for daily report upload and organises district digital fairs where the best performers are awarded. The district administration is also required to convey e-consultation to entrepreneurs for training or any other technical problems. The DC guides the UNO as well as the UP chairman or secretary in management of UDC, awareness building, additional equipment purchase and maintenance, entrepreneur's capacity building, alternative entrepreneur selection and alternative place for UDC in case of not having adequate customers. The DC is also responsible for evaluating the progress of UDCs based on reports collected from all Upazilas and presenting them in the District Coordination Meeting participated by local representatives and heads all other government departments in the district. The consolidated evaluation report on achievements and problems is then forwarded to the Divisional Commissioner. It also monitors the supply of services by external partners as engaged by the A2I. In association with A2I, the DC negotiates with other agencies in providing their services from the UDC. Such services, as introduced in few districts, include the

payment of electricity bills, online passport applications, mobile banking, telemedicine, and vendor licensing. Its own back-end service support is implemented via the DESC or NESS (A2I 2014).

The Upazila Administration

The administrative unit, subordinate to the district, is the Upazila administration headed by the UNO which oversees the functions of several Unions. Along with implementing the directives from the district administration or other higher government offices, the Upazila administration is responsible for a host of other duties. The UNO is the focal point in the Upazila and is required to assist with the district focal point by looking after UDCs within his/her jurisdiction and participating in the coordination meetings at the district. The UNO is assigned with the supervision of room allocation by the UP, basic equipment purchase, solar equipment collection from the BCC, alternative place nomination, training, recruitment of entrepreneurs, equitable distribution of income between male and female entrepreneurs, monitoring of working hours and performance by online and physical visits. Other responsibilities include publicity and awareness campaign, pursuing documentation on progress especially on income, people's participation and coordination between entrepreneurs and the UP. The UNO also facilitates computer training of local youths from the UDC by engaging local TEB/Youth Development Board/BCC who take exams and provide certificates. This official has the supervisory responsibility to keep UDCs dynamic, functional and operative and, if required, to guide UP Chairman, secretary and entrepreneurs in that end (A2I 2012a; LGD 2010).

The Union Parishad (UP).

According to the Local Government (Union Parishad Act, 2009), section 47 (c), 50 and 78 the Union Parishad is obliged to ensure public welfare, use of ICT for establishing good governance as well as right to information of citizens. It consists of one Chairman and 12 members (9 from 9 wards and 3 women). Besides being the host of UDC its other main responsibilities relate to promotion of the concept, recruitment and contract with the entrepreneur. The UP requires the arrangement of a contract with the entrepreneur on establishment and operations for a period of 3 years with a scope of renewal, if both parties are satisfied. For initiating the UDC it needs to purchase basic ICT equipment and furniture, pay its utility bills, allocate two rooms without rent and maintain security. For operational efficiency and people's participation, the UP is required to form a UDC management committee consisting of a member of the UP and citizens of the locality, the UP chairman and the secretary being ex-officio chairman and member secretary respectively. The Committee is mandated to hold a regular meeting every month for discussing and evaluating the UDC's activities and progress. It is also expected to play an effective role in publicising the UDC across the wards of the UP. The LGD circular suggests fees for online services to be determined by the UDC management committee. The UP is asked to prefer UDC for doing its paid office works. It cannot discharge entrepreneurs without due process, which is mediation by the UNO and subsequently confirmed by the DC. Instead, the UP is asked to assist in solving all of the

entrepreneur's problems and assist him/her in mass awareness programmes (A2I 2012a; LGD 2010).

The Entrepreneur

Entrepreneurs are private individuals who are employed from interested local unemployed youths with some computer literacy background usually by the UP chairman in consultation with the UNO who assesses their competency. Each UDC appoints two entrepreneurs -one of them a female - on PPP basis who are not salaried but expected to earn from the delivery of services to citizens and become self-employed in the long run. Two alternative entrepreneurs are also engaged by the UNO who can assist with the delivery process and hope for future employment in case of drop outs of regular entrepreneurs. For employment, the age limit is 30 with at least higher secondary education completed and having some levels of computer skill. The entrepreneur must have the capacity to invest at least 50,000 Taka. Entrepreneurs will work on advice of the UNO and in coordination with the UP Chairman and the UP secretary and report their monthly income, operational issues and other problems to the UNO (LGD 2010).

Entrepreneurs also have a responsibility to offer their best to confirm citizen's access to all commercial and government e-services curtailing their needs. They can introduce new services consistent with the mission of the UDC. Citizens' grievances regarding services need to be forwarded by them to the relevant authority via the UP chairman. They will undertake awareness-building programmes to increase the demands of various e-services locally. Using multi-media projectors and laptops, they will organise campaigns on e-services in local markets and educational institutions located at different wards and, if required, they will take assistance from the UP and the UNO.

Entrepreneurs need to maintain and repair the equipment. If necessary they will invest to increase the number of equipment. As entrepreneurs are not conventional employees they will take necessary steps to increase its income to make the UDC economically sustainable. Other responsibilities include uploading daily report on UDC operation and income in the online monitoring tool, the UDC Activities Management System (UAMS), writing about innovations, success and examples of best practices in the UDC blog, so that others become encouraged to share their experiences. Furthermore, they are required to submit monthly progress report in the UDC Management Committee. The UP chairman submits this report to the Upazila coordination meeting organised by the UNO for discussion.

Entrepreneurs are also asked to train up their alternative colleagues and engage them in a way that they can contribute to increase the number of service recipients and overall income. When the alternative entrepreneurs acquire operational skills and competence they must be allocated certain duties and responsibilities so that they develop a sense of belonging to the UDC and are provided an opportunity to earn. A number of services are listed to be served from the UDC as mentioned

earlier. Special emphasis is given for training on computer and income generating activities using the ICT. Since government services are not ready to be offered online the entrepreneur is asked to consult with nearby government officials like agriculture and health officials to avail information and services. The policy directives also require entrepreneurs to maintain a formatted entry register containing the name of the service and its price and monthly accounting register describing the income and expenditure(A2I 2012a; LGD 2010).

Conclusion

We have seen how different policies and implementation initiatives of e-government over the past few decades have led to the genesis of the UDC. These polices have generated dividends such as specific actions plans, relevant implementing agencies, management reengineering and involvement of private sectors. As a result, the country has moved forward with some levels of back-end preparations in online services, connectivity and human resource development all of whom have implications to serve through the UDC. With the appearance of UDC, more stakeholders have been added such as the UP, the private entrepreneurs and more importantly, the people. While there are a range of sporadic directives and a host of management partners related to the enabling conditions of establishment and management of the UDC, there is a lack of specific policy and a coherent management structure. In the meantime, sporadic guidelines from A2I and LDG serve as a modus operandi of the UDC. The implementing stakeholders mostly serve as back end provider of services, connectivity, training, monitoring, performance management and operations for the UDC. These are discussed here to assess how the nascent UDC performs compared to how it is meant to in the subsequent empirical chapters.

CHAPTER 5. UDC AS THE FOCAL POINT OF DELIVERY: AN ASSESSMENT FROM BENEFICIARY PERSPECTIVE

Introduction

The aim of this chapter is to assess the impacts of Union Digital Centre (UDC) in generating intended benefits for rural people in order to answer research questions 2-4. This is done in the light of the Diffusion of Innovation Theory outlined in the literature review and tests hypotheses 1-3. It is organised into four sections based on the User survey and FGDs, interview findings and some secondary sources. The first section presents the demographics of users, identifies the level and range of services and their compatibility to socio-economic profiles of users and tests whether UDC has contributed to an increase in access to information and services. The second section assesses the change in quality of delivery in terms of the tangible and intangible difference made by the UDC compared to an alternative system. The effects of communication are examined in the third section. The last section evaluates the effects on bridging the digital divide and reaching the unreached people by examining UDC's reach across demographics and geography and impacts on the improvement of people's livelihood.

Demographics of respondents (users)

Table 4 shows the percentages of gender, education, occupation, age and income of UDC users. We can see from the table that men account for two-thirds of UDC service users. Further, compared to the overall proportion of illiterate people in the country (42%) (UNICEF 2013), only 30% of UDC service users are illiterate. Consequently, it appears that most people using information and receiving services are literate and educated. This trend is further supported by large representations of students (20%) compared to any other occupations. Ultimately, the services are more likely to be accessed by younger people, who are also on lower incomes. According to the Bangladesh Bureau of Statistics (BBS 2014) each month 3.91 million people receive services.

These early users which consist of approximately 3.5% of the total rural population of the country can be assumed as 'innovators' or early adopters, as per Rogers' (2003) S-shaped adopter distribution. It is still a potential of adoption by middle and later users such as early majority, late majority and laggards. The match between the socioeconomic profiles of users and the characteristics of early users identified by Rogers (2003) such as literate or better educated, higher social status, except in the case of income (this exception is later elaborated in section 4) can also be noticed here.

Table 4: Percentage Distribution of Users by Gender, Education, Occupation, Age and Income.

Variables	Attributes	N	%
Gender	Male	103	66.9
	Female	51	33.1
	Total	154	100.0
Education	Did not attend school	45	29.8
	Year 5 or below	34	22.5
	Year 6 or below	19	12.6
	SSC	23	15.2
	HSC	21	13.9
	Bachelor and Above	9	6.0
Occupation	Farmer	19	12.3
	Day Labourer	9	5.8
	Teacher	6	3.9
	Industry worker	8	5.2
	Govt. employee	3	1.9
	Fisherman	2	1.3
	Transport worker	5	3.2
	Unemployed	10	6.5
	Student	30	19.5
	Small Tradesman	19	12.3
	Household worker	24	15.6
	Other	19	12.3
Age (Years)	<=25	52	36.6
	26-45	58	40.8
	46-65	30	21.1
	=>66	2	1.4
Income (Taka)	No income	34	24.1
	1-3000	24	17.0
	3001-6000	30	21.3
	6001-10000	33	23.4
	=>10001	20	14.2

These demographic variables are elaborated and further used for discussion on the digital divide which happens along these attributes in section 4. Following is a discussion on how information and services are aligned with the socio-economic profiles of users. It can provide some indication as to how compatible they are and what their potential is for creating relative advantages contributing to wider diffusion in the future.

Levels and range of services offered by the UDC

The UDC provides a range of information and services. For the 154 participants of the user survey Table 5 illustrates the list of information/services they received from the UDC during the visit of the researcher. These information or services are broadly categorised into three types based on their original sources. From the list presented in the Table 5, no 1 to 8 as 'government' and no. 9 as 'local government or Certificates' and the rest from 10 to 15` are classified as 'commercial' information and services. These classifications are also validated later in the 6th chapter from frequently asked services from the entrepreneur's survey using Exploratory Factor Analysis (EFA) and internal consistency.

Table 5: Information/Services received by Users

Name of Information or Services	N	%
Land Certificate copy	7	4.5
Electricity bill payment	16	10.4
Applying for passport	2	1.3
Telemedicine	2	1.3
Applying for overseas job (Malaysia)	10	6.5
Government forms download	2	1.3
Education information or services (registration/admission/result check)	5	3.2
Mobile banking	4	2.6
Certificates	63	40.9
Photcopy/compose/print/laminating/scanning	13	8.4
Skype conversation	3	1.9
Applying for job or job search	2	1.3
Photoshoot	11	7.1
E-mail or internet browsing	3	1.9
Computer Training	11	7.1
Total	154	100.0

Government information and services

Collectively, 31% of respondents received government information and services. The government information and services are further categorized into: informational, interactive and transactional services[30]. However, these categories are also applicable for all web based `services irrespective of types such as birth certificates or some commercial services discussed later.

Informational

For informational services the UDC depends on both websites and offline CDs supplied from the project management. The online information and services can be served from various websites developed by the government for its public offices as discussed in the previous chapter. One of the major sources of online information for UDC is *e-Tothyakosh* that provides access to numerous livelihood and other needful information for rural people (e-tothyokosh 2015). The National Web Portal of Bangladesh National Portal (NWPB) provides an access link to some 25,000 government websites (NWPB 2015) . Local information portal, *the Union Parishad Portal,* is also created by entrepreneurs in almost all unions that contains information on representatives' and office contacts, UP activities as well UDC services. Similarly, the district and Upazila portals provide rural people access to specific information they need through the UDC. Entrepreneurs are empowered to seek any information from any department of these local administrative units using e-mail addresses of officials in charge[31]. Without providing any identification, entrepreneurs can download these forms

[30] Government Services are levelled based on the stage model identified by United Nations E-government survey (2014) and Moon (2002) discussed in Chapter 2.

[31] They are also supplied with offline CDs and video clips from A2I containing contents of livelihood information on agriculture, health, education, awareness against dowry, child labour, child marriage, repression against women and children, eve teasing, population control and environment protection. Some entrepreneurs display them using the

that can also be levelled as one-way interactive (Bhuiyan, SH 2011). Though some education information[32] and forms download as listed in the above table can be considered informational services, very little evidence was obtained to suggest that the UDC provides them widely. Only 2 respondents have government forms downloaded.

Interactive services

There is a host of both-way interactive services as listed in Table 5. These include overseas jobs (Malaysia registration)[33] (6.5%), education services such as admission/registration/result check (3.2%), consultation with doctors through mobile phone or video call known as *telemedicine* (1.3%) and application for a passport (1.3%). The BMET has empowered UDCs to register overseas job seekers. A staggering number of 1.4 million job seekers applied through UDCs in 2013 for employment in Malaysia and 11,758 were selected by lottery. Under G2G agreement the process was transparent and least costly and emancipated recipients from the clutches of human traders known as *Adam Bepari* as well as exploitative manpower business agencies (Hasanuzzaman 2013). The UDC also has created a database for employment seekers matching their skills in all Union areas which can be used by BMET for employment search across the globe.

A number of schools and *Madrasahs* (religious school) that do not have an adequate number of computers with internet connection rely on UDCs for registering their students with photo uploads for public exams. Teachers also apply online for registration/ MPO/Subject/Index/Designation correction or for Selection Grade/Time Scale or welfare benefits. The UDC also enables checking results of public exams with printing facilities available. Some entrepreneurs have a collection of mobile phone numbers of Upazila/district doctors, available also at the Ministry of Health website. They can provide *telemedicine* to their clients through online consultation with doctors at the Directorates of Health using Skype. The Department of Immigration and Passports allows online application for machine readable passport (MRP) in which entrepreneurs can register their clients and submit the initial application with photo upload.

While these services are interactive, as they permit an interface with the provider, most of them do not allow financial payment. Though entrepreneurs can upload applications or submit online, clients still need to visit those providers in order to make financial transactions or to validate their online applications with supporting documents, if required. However, both of these obligations can

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multimedia projector at different growth centres as well as *wards* of the Union mainly for two purposes: making people aware of those issues as well as marketing of UDC products (A2I 2015). The Jatiya e-tothyakosh also enables entrepreneurs to links with other government portals for forms download, online applications and e-book download. For example, using the hub of digitised forms 'Bangladesh Government Digitised Forms -e-Citizen Services Application' web portal available at www.forms.gov.bd. 1013 different kinds of service forms for various public services including forms for certificates, licenses and allowances, e-books or taxes can be downloaded. Of recent development in this regard is the development of Service portal called 'Sebakunja' that provides information related to 353 types of government services(e-tothyokosh 2015).

[32] 5 respondents for education information and services are considered to receive education services not information related thereto.

[33] The overseas employment (Malaysia Registration) is considered as government service as it is introduced by government under G2G arrangement with Malaysia, the process of which is now completed.

be avoided through a complete application of e-transaction and integration. The country's progress in transactional services is hampered by inadequate development of an online payment system and the absence of a legal framework for e-payment and digital signatures. Likewise, integration across departments for data sharing is only at the inaugural phase (Bhuiyan, SH 2011; Zaman 2007).

Transactional services

Despite inadequate development of e-payment system the UDC provides a number of transactional services by facilitating payments through locally developed payment software or mobile phones. Such services include land certificate/record copy (4.5%) electricity bill pay (10.4%), mobile banking (2.6%), admission and job application fees of some providers and mobile recharge. Land copies are being provided in some districts through UDCs by allowing entrepreneurs to enter into the DESC/NESS. The payment for stamps and court fees is made through locally developed payment system or through mobile provider or by entrepreneurs visiting the district centres themselves. Similarly, in many districts the Pally Biddut Samity (PBS)[34], facilitates electricity bill paying from the UDC for up to 10 million subscribers across the country. Entrepreneurs can pay bills on behalf of clients through the PBS website and at a nominal fee (5/10 Taka). Finally, the mobile banking facilitated by the UDC saves people's real time, costs and reduces the hassles of queuing before traditional banks, as well as playing a role in fostering economic and business development (A2I 2015; Siddiquee & Faroqi 2013).

Local government services – Certificates

Compared to any other type of service, more people received certificates (Table 5), which accounts for 41% of total users. The introduction of UDC in the UP has transformed manually processed certificates (births) into digital ones. Previously, certificates were given all manually by providing an entry into the certificate registers and issuing handwritten paper documents in the UP pads which were subject to tampering and forgery. Most UDCs now provide certificates, especially birth certificates, through providing an online entry into an online registration system at http://br.lgd.gov.bd/press.html developed by the LGD. This site permits entrepreneurs to record new births and verify existing ones (LGD 2015a). Entrepreneurs countrywide have contributed to 40 million online entries of birth previously kept in volumes of registers. At this stage only birth certificates are available online since other certificates are still provided manually and generally at no cost. Besides, majority of UP office works related to computer compose, printing and photocopying are done through UDCs (A2I 2015).

[34] Though PBS is an autonomous body who owns, operates and manages rural distribution system of electricity the bill payment is regarded as e-government service since government is the producer as well as bill collection is traditionally done by government banks.

Commercial information and services

28% of the respondents received commercial services which are usually offered by local private shops, organisations or individuals. These are photocopying/compose/printing/laminating/scanning (8.4%), applying for job or job search (1.3%) and photo shoots (7.1%) (Table 5). Some of these services are new in rural areas, providing convenience access to services including computer training (7.1%), Skype conversation (1.9%) and email or internet browsing (1.9%). One of the quick wins of UDCs is the spread of computer literacy[35] in the grass root level which otherwise had not been possible. Up to 2014, 30000 youths received computer training from UDCs (A2I 2015). The increase in computer literacy enables some members from the community to further disseminate e-literacy (Hanna 2010). Some of the other people oriented commercial services are visa application and processing, mobile call and recharge, English learning, song load and data entry (A2I 2015).

We have seen that the UDC has introduced a number of information and services that are new in the rural area as well as brought some government services nearer to people. Hence, it can be assumed the UDC has increased rural people's access to information and services.

Impacts on access to information and services

Overall, 49% of recipients had not used services from the previous delivery points, known as alternative system. Among them government offices at the district, educational institutions (board/school/college/universities) and banks/bill collection agencies collectively constitute for only 21% of the total alternative delivery points. The UP accounts for 32% of the alternative providers while the highest percentage (47%) of services provided from the UDC is used to be provided by the private individuals/shops/organisations. It is noteworthy that people used to take some of the government services through private intermediaries or from private shops, which also contribute to this higher percentage of last alternative agencies. Interestingly, though there were options for 'ministry/division' and 'government offices at sub-district' as alternative providers in the questionnaire, none were mentioned. This is because either UDCs do not provide any government services that are currently provided from these units or some of their services are widely available electronically. With the introduction of the UDC some services of these alternative providers are now available from it.

People did not have any experience for a number of services such as telemedicine, online passport application, forms download, skype conversation and online job application or job search. As per service categories already established we are examining the people's experience with the alternative delivery system in Table 6.

[35] Approximately 500 UDCs are affiliated with local Technical Education Boards (TEB) to provide trainings on computer potentially to students or unemployed youths that qualifies them for a job market or entrepreneurship. Other UDCs that have no affiliation with the TEB, provide trainings and offer certificates to incumbents signed by local administrators such as UNO or ADC (Interview with A2I Official, 2013).

Table 6: No experiences of users of alternative delivery points as per service categories

Categories of Information and Services	Previous Taking from Alternative		
	N	%	Chi-square & P value
Government	27	56.3	$\chi^2 = 10.60$; $p<0.01$; Cramer's V=.264
Certificates	21	33.3	
Commercial	27	64.3	
Total	75	49.0	

Note: P value is based on Chi-square test of Independence and considered significant if P<0.05

We can see from the above table that a greater percentage of recipients of government (56.3%) and commercial (64.3%) types of services did not have experience of service takings from the alternative delivery points. Do these proportions of recipients having services from the UDC for the first time differ significantly across service types for the entire population of users? This is determined through using test statistic, the Chi-Square Test of Independence. The χ^2 Test of Independence with a value of 10.60 is significant beyond 0.01 level. Therefore, the null hypothesis that the UDC has not increased people's access to information and services is rejected. The relevant effect size 'Cramer's V' is found to be .264, which is a small effect, according to Cohen (1988, cited in Gray & Kinnear, 2012, p. 419). However, this significance of difference might be driven by more people (66.7%) having experienced certificate takings previously. Yet, with more people now receiving government and commercial services, this suggests that the UDC has some impacts in enhancing people's access to information and services.

Despite the presence of a variety of service types, there are imbalances among them as certificates outshine all other types and there are fewer government services. Also, more people received services compared to information (Table 5). These issues raise questions of compatibility as to how relevant the content is to rural people's needs (Rogers 2003). We have seen that researchers (Colle 2002; Kumar, R & Best 2006; Roman & Colle 2002) warned about the mismatch between what a telecentre offers and what is needed on the ground. Hence, they suggested the need assessment consistent with people's socio-economic profiles before introducing services. Their own assessment comes up with a number of relevant needful contents such as information related to welfare, market price, agricultural equipment and produces, veterinary contacts, travel and livelihood information to have real impact. Some of the needful information and services, as found in a few telecentre projects across developing countries such as the Gyandoot, the Akshaya, the CSC, the Nenasala (Bhatnagar 2004; ICTA 2010; Rahman & Bhuiyan 2014; Shadrach & Sharma 2013), along with some other ones are also felt by users in the study area to have access from UDC.

Need for services from the UDC

In question 30 (User Survey in the appendix 1) recipients were asked to rate important information and services, consistent with their needs that they want to receive from the UDC. A list of potential future information or services that are rated as important to rural people is presented in the Table 7.

Table 7: Ratings of Importance of Future services/information from the UDC

Name of Information or Services	N	Mean	SD
Online Passport/VISA	41	5.59	.706
General Diary/Case filing with Thana	41	5.32	.722
Land certificate/Land Tax	42	5.29	.742
Local News	39	5.28	.793
Health Consultation with doctors at Upazila or District	36	5.14	.798
Right to information on UP and government activities	34	5.09	.900
Agriculture information or services from Upazila or district	37	5.05	.743
Distribution of allowances for aged/widow/disabled using mobile banking	35	5.00	.767
Matrimonial information	34	4.91	.621
Court related information	36	4.89	.747

Note: 1=Not Important at all ……6= Very Important. Mean and SD are calculated using these values.

From the sorted (descended) mean presented in the above table it can be seen that for the first eight types of information/services[36] the average ratings ranges from 'Important to Very Important' with greater means and smaller standard deviations. All except local news are government information services. Other potential services that rural people rate as important to be offered from the UDC are still rated typically between 'Slightly Important to Important' with relatively smaller means and standard deviations. However, no information or services listed above have been rated as less important or not important at all. Also, noticeable is that the list contains a number of information needs. People's importance on the need for government information and services from the UDC is fuelled by problems they currently encounter in receiving them as evident from the interview quotes below.

Passport

> "With the introduction of digital system in the Passport Office corruption has now changed its agents giving greater benefits to those who can better handle the computer. People have to surrender to intermediaries since officials usually find heaps of mistakes with direct applications and, therefore, make delay and in some cases ask to reapply. Intermediaries enjoy an unfettered right of access to the office" (Service Recipient 2, Arabpur UDC, Jessore 2013).

This statement implies that despite the development of digital system in the passport office, people's easy access is still being barred by the presence of intermediaries and corruption. The

[36] It should be mentioned here that the list is prepared through consultation with users and entrepreneurs during piloting.

situation can be assumed to be same or worse for some other service providers that do not have digital system as described below.

Police Station

> "Filing complaint/GD to the police is an arena of harassment and corruption. Whatever good one can write it would not be accepted. It has mandatorily to be written by a special writer (Muhuri, usually, intermediaries) informally appointed to demand payoff for writing the draft; the portion of which goes to the police. After the petition written the client has to wait to see the duty officer and if he finds any mistakes, which is usual, additional money and, sometimes, a pack of cigarette have to be offered" (Service Recipient 3, Arabpur UP 2013)".

Land Certificate/Land Tax

> "Availing Land certificate and rent receipt from the Land Office is very harassing. We cannot get the service easily since we have to wait long and pay bribes as well as address land officials and staffs as 'Sir' with an approach of being submissive and compromise to our social prestige. It may be that the service recipient has travelled a long and the service is needed urgently, but the concerned officials remain absent or appear late to pay any heed. Even with the digital system introduced in the DC office the harassment has not been reduced to a great extent, the recipient still needs to go there physically paying costs and time" (Service Recipient 5, Arabpur UDC, 2013).

The service recipients come up with the solution:

> "Hence, if people can avail these services from the UDC they are saved since it is very close to our homes. The entrepreneur cannot be corrupt since we know him; he is accountable to us and the UP. He/she helps with writing and lodging any request. We do have the number of the entrepreneur with whom we can contact anytime and can know the progress. When it is finished we can collect it easily in our convenience without wasting any valuable time or facing harassment or can request the entrepreneur to send the service in our nominated address (Service Recipients from various UDCs in Jessore and Comilla, 2013).

In the current provision some of these needful contents are being provided by very few UDCs. This issue will be discussed further in the livelihood impact analysis in section 4 and in chapter 6.

Clearly, the types of information and services being offered from UDC now, except certificates, are conventionally provided from various alternative points which are usually distant public/private agencies. These alternative points, except the UP where the UDC locates itself, are faraway places for rural people, which usually require them to travel extensive distances, wait longer and cost dearer and face corruption and other problems, as we discussed earlier. So we have hypothesized that the UDC could potentially contribute to relative advantages and improve delivery system. These hypotheses are tested from our collected data and presented in the following section.

The comparative advantages of UDC

In this section we examine the comparative advantages of the UDC over alternative points in the light of Diffusion Theory in terms of impact on time, trips and distance and cost. This section will also assess less tangible benefits such as impacts on administration of delivery in terms of ease in

access, influence of intermediaries, participatory and grievance redress provisions and level of satisfaction with governance issues.

Impacts on time and distance

By examining the sample averages of variables: days, trips, minutes and distance, it was found that some are markedly different for the two systems. The relevant population statistics *Wilcoxon Signed Ranks Test*[37] is used to test whether this difference also applies for the population average difference and is presented in the Table 8.

Table 8: Time taken and Distance travelled between Alternative delivery points and the UDC.

Variables	Median (25th and 75th percentiles)		*P* values based on Wilcoxon
	Alternative	UDC	
Days	1 (1, 1)	1 (1, 2)	.316
Trips	1 (1, 1)	1 (1, 2)	.122
Time (Travelling and Waiting) in minutes	120 (77.50, 180)	95 (57.50, 180)	.001
Distance (from house/usual place of travel from) in meters	3000 (1500, 4500)	1000 (500, 2000)	.001

We can see from the above table that for number of days and trips the Median values are the same for both systems. Though the Interquartile Range (IQR) suggests increased days and trips with the UDC, these differences are not significant (α = 0.05). On the other hand, for travelling and waiting time[38] required and the distance the Medians and IQR suggest a decrease due to the UDC. These differences are also statistically significant (α = 0.001). The relevant effect size *r*[39] measures the magnitude of this difference which is calculated using the rank values available in the Appendix

[37] The comparison starts from question 10 which asks about the number of days, trips, travelling and waiting time required and the distance of the alternative delivery point from the service recipient's house or usual place of travel from. It is paired with the question 20 that also asks for the same information for taking delivery from the UDC. Beyond sample statistics comparison that can be inferred for the population is made though using t-statistic for related samples with calculation of effect sizes. Checking the assumptions of normality by using normality plots and tests, skewness and kurtosis for all data it is found that some of the data are non-parametric while others are approximately normal and hence Wilcoxon's Signed Rank test for the former and related sample student t test for the later are used. For all services the dependent variables such as the number of days, trips, hours and distance and cost related thereto are not normally distributed presumably for very asymmetric nature of these variables. Wilcoxon Signed Rank Test calculating asymptotic and exact significances by using the mean ranks is, therefore, preferred (Field 2013; Gravetter & Wallnau 2013; Pallant 2012). It measures the mean rank difference between the two scores related to two situations from the same sample and infer whether the population mean rank difference is equal to zero (indicating no change) or far from zero (indicating there is a change). Thus the null hypothesis is symbolically: H_0: $\mu_D = 0$. The alternative hypothesis states that there is a difference between the treatments and symbolically is: H_1: $\mu_D \neq 0$
The Wilcoxon test begins with pairing each respondent's score under the Alternative system with the same participant's score with the UDC. A set of difference scores is obtained by consistently subtracting the UDC scores in each pair from the Alternative system score. The differences are then ranked in order of their absolute values regardless of sign. The signs are then restored and the sums of the positive and negative ranks calculated. The test statistic *W* is the smaller of the two sums ranks of the same sign (Gray & Kinnear, 2012, p. 212)

[38] It should be mentioned that the waiting time means the time required from the provider's end.

[39] For Wilcoxon Matched-Pair test, the effect size measure prescribed is matched-pairs rank biserial correlation using the formula: $r = \frac{4*|T-(\frac{R_+ + R_-}{2})|}{N(N+1)}$, Where R_+= Sum of Positive Ranks; R_-= Sum of Negative Ranks; T = the smaller value between R_+ and R_- and N = Number of pairs of scores (Gray & Kinnear 2012, p. 214).

2 table 2.1. For minutes spent for travel and waiting time $r = 0.32$ (a medium effect according to Cohen (1988 cited in Gray & Kinnear 2012 p. 209) and for distance travelled $r = 0.47$ (a medium effect).

The question is why the UDC has not decreased the number of days and trips when this is what it was supposed to do. It should be mentioned here that the sample selection was not completely random. Some of the recipients of government services had to be chosen, though the service type was no longer available. This is because the researcher was determined to assess the impacts of government services. Still the preponderance of certificates and commercial services from the UDC which takes the same or more processing days or trips might be the clue, as the field observation also hints. Hence, it is necessary to assess the impacts according to service categories we established in the previous section. For this the researcher has split the data file according to the 3 categories of services and presented in the Table 9 and applied the test statistic Wilcoxon Signed Rank Test.

Table 9: Time taken and Distance travelled between Alternative and the UDC as per service category.

Service Types	Variables	Median (25th and 75th percentiles)		P values based on Wilcoxon
		Alternative	UDC	
Government Information/ Services	Days	1 (1, 1)	1 (1, 1)	.028
	Trips	1 (1, 1)	1 (1, 1)	.015
	Time in minutes	180 (120, 300)	40(30, 60)	.001
	Distance in meters	4000 (2000, 5000)	1000 (500, 2000)	.001
Certificates	Days	1 (1, 2)	2 (2, 3)	.001
	Trips	1 (1, 2)	2 (2, 2)	.001
	Time in minutes	120 (90, 170)	180 (120, 255)	.001
	Distance in meters	2000 (1000, 3000)	2000 (1000, 3000)	1.00
Commercial Information/ Services	Days	1 (1, 1)	1 (1, 1)	.414
	Trips	1 (1, 1)	1 (1, 1)	.705
	Time in minutes	90 (60, 142.50)	60 (32.50, 90)	.001
	Distance in meters	4000 (3000, 5000)	1000 (500, 1200)	.001

There is a very different output in terms of statistical significance as can be seen in the above table. For government information and services, though the UDC has not contributed to reduction of days and trips, its impacts are obvious for minutes required as the median differences suggest, which are also statistically significant ($\alpha = 0.001$). In contrast, for certificates the UDC has contributed to increase in number of days, trips, and minutes as median values indicate and *p* values for differences are significant ($\alpha = 0.001$). There is no difference created for distance since the UP and the UDC are located in the same premise for almost all cases. For commercial

information and services there is no median difference or statistical significance for the difference for the number of days and trips required to receive services as $p \leq .414$ and $p \leq .705$ respectively. In fact, it takes the same number of days and trips between the two systems in most cases. However, for minutes spent for travelling and waiting and the distance, there are reduced median values for UDC and the difference is significant ($\alpha = 0.001$). This happened due to the fact that most alternative commercial service providers are still far away from rural people compared to the UDC.

The magnitude of these significant differences in days, trips and distance is calculated using the effect size '*r'* and interpreted as per Cohen's (1988 cited in Gray and Kinner, 2012) classifications[40]. Overall, the reason for smaller effect sizes for number of days and trips for government information and services can be explained in the manner that UDCs do not provide many of government services that require a number of days and trips except the land copy. Moreover, participants were not asked about the number of days, trips and minutes related to Malaysia registration, another government service, previously taken from private intermediaries. Also, some electronic government information and services are available in nearby shops and can be availed in the same number of days and trips the UDC takes.

On the other hand, most alternative delivery points are more distant to the rural people that require more travelling as well as waiting time. The large effect sizes for them reflect this reality. For certificates the UDC contributes to the increase in number of days, trips with medium and minutes with large effect sizes. The reasons for this will be explained later when the costs related to certificates are discussed. For commercial information and services large effect sizes for time and distance suggest that most alternative private providers of them are still far away destinations for rural people compared to the UDC.

Impacts on costs

Is there a difference in average costs of service delivery between the alternative system and the UDC? The median for service charge, other costs and total costs between the two treatments and the relevant test statistics are presented in the Table 10.

[40] For government services the effect sizes *r s* are: number of days= 0.04(trivial); number of trips = 0.04 (trivial); Minutes spent = 0.84 (large); Distance = 0.60 (large). For Local Government (Union Parishad) Certificates the effect sizes *r* s are: number of days = 0.40 (medium); number of trips = 0.38 (medium); Minutes spent = 0.51 (large). For commercial information and services the effect sizes *r s* are: Minutes spent = 0.71 (large); Distance = 0.70 (large).

Table 10: Costs between the Alternative and the UDC.

Variables	Median (25th and 75th percentiles)		*P* values based on Wilcoxon
	Alternative	UDC	
Service Charge and Bribe (if any) in Taka	30(5, 100)	50 (20, 100)	.262
Other costs (travel, food and wage loss)	80 (40, 120)	50 (27.5, 100)	.001
Total costs	125 (72, 280)	120 (62.5, 231.25)	.001

The above table suggests that though there are Median and IQR differences in regard to service charge and bribe (if any) between the two systems, increased value with the UDC, it is not statistically significant (α = 0.05). However, the Median and IQR values of 'Other costs' and 'Total costs' are smaller for the UDC and there is sufficient evidence that these costs in two different treatments are different (α = 0.001).

The effect size '*r'* for *Other costs* = 0.34, a medium or typical effect; for *Total cost* = 0.38 which is also a medium effect. Given the alternative points are more distant compared to the UDC, which requires more travel time and costs as well as the increased costs related to the wage loss from time spent otherwise, we notice a significant change with medium effects in other costs, which ultimately affects the total cost.

Contrary to the goal that the UDC would decrease the service charge, especially the effect from bribes (Jabbar 2009; TIB 2012), it rather contributes to the increase as the median value suggests, though the difference is not statistically significant. Hence, it has again become necessary to assess the difference in costs as per service category.

This is assessed through the relevant test statistics, the Wilcoxon Signed Ranks Test and is presented in the Table 11.

Table 11: Costs between the Alternative and the UDC as per service categories.

Service Types	Variables	Median (25th and 75th percentiles)		P values based on Wilcoxon
		Alternative	UDC	
Government Information/ Services	Service Charge	20(0.0, 400)	20(10,100)	.008
	Other costs	80 (50, 225)	50(10, 50)	.001
	Total cost in Taka	230(80, 880)	70(30, 225)	.001
Certificates	Service Charge	20(10, 50)	50(50, 100)	.001
	Other costs	70(50, 120)	90(55, 180)	.002
	Total cost in Taka	100(70, 180)	180(110, 235)	.001
Commercial Information/ Services	Service Charge	40(15, 2500)	35(15, 1800)	.007
	Other costs	90(30, 120)	30(20, 57.50)	.001
	Total cost in Taka	130(72, 2500)	80(50, 1800)	.001

Median values for service costs, other costs and total costs are greater for alternative delivery points for Government and Commercial information and services (Table 11). The differences for these variables between the two systems are also significant (α = 0.05). Hence, it can be said that the UDC has contributed to the reduction of all types of costs for these two types of services. On the other hand, there are greater median values for all kinds costs related to certificates of UDC and the differences are also statistically significant (α = 0.05) for all variables. In other words, the UDC has contributed to the increase in all types of costs regarding certificate delivery. The magnitudes of the significant differences in costs of service delivery show the extent of reduction or increase of costs between the two systems which are produced using 'r' (from rank values in the appendix table 2.2) and interpreted as per Cohen's (1988, cited in Gray & Kinnear, 2012) classification and found to be small, typical or larger than typical effect sizes[41].

Thus, it can be said that the UDC has contributed to the significant reduction of costs for all types of services with varying effect sizes except certificates. For certificates it contributed to significant cost increase with large or medium effect sizes, instead. Because of this increase, especially, in service charge of certificates, no significant difference was found in the overall service charge between the two systems (Table 10). It is noteworthy, that other costs related to certificates increased by medium effect mainly due to delays in delivery and subsequent wage loss of recipients. However, there is a small effect size (r = 0.16) for service charge of private commercial information/services between the two systems. Similarly, as UDCs do not provide plenty of government services and it has also introduced new charges for some services such as electricity bill pay (only 5/10 taka per bill) the medium effect size for it might be the consequence.

In general, the UDC is better placed to reduce time and distance since it is located very close to rural people's homes which, in turn, requires less costs in terms of 'Other costs' such as for travel, food, and wage loss '. Reduced 'service charge' added with 'Other costs' make the 'Total costs' significantly lower with the UDC delivery system that are reflected in large effect sizes. For certificates it worked the other way round.

Similar to the increase in time and trips of delivery of certificates, we saw that all types of costs also related to this service increased. What caused the increase? The interview reveals that before the introduction of the UDC hand written certificates were issued by the UP secretary and sometimes using the dummy seal of the UP Chairman. For this it could have been offered instantly and the resulting cost was also relatively less. Yet, such certificates were a major source of forgery

[41] For costs related to Government Information/ Services the effect size r s are: Service Charge = 0.35 (medium) ; Other costs = .75 (large); Total cost = .81 (large). For costs related to certificates the effect size r s are: Service Charge = 0.67 (large); Other costs = 0.49 (medium); Total cost = .66 (large). For costs related to commercial Information/Services the effect size r s are: Service Charge = 0.16 (Small); Other costs = 0.68 (large); Total cost = 0.68 (large).

and corruption since it could be tampered with, taken several times by changing names and/or birth dates through bribery. Nevertheless, under the new system, a person's credentials first have to be verified by the UP chairman with the help of a concerned UP member followed by an entry with the UP register by the secretary. Afterwards, the person needs to visit the UDC and complete the relevant forms online with the help of an entrepreneur. Once the online entry is accomplished the printed certificate needs to be signed by the UP Chairman before delivery. This lengthy process involves multiple actors and desks, with further delays caused by slow internet access and electricity blackouts.

Similarly, the service charge has increased since people now have to pay the entrepreneur for computer work in addition to prescribed fee. As the time of delivery has increased, it has also contributed to the increase of travel cost from extra trips and wage loss from extra hours spent. Yet, people are still happy since they are getting an authenticated certificate from the UDC which cannot be forged. An accurate and authenticated certificate is very essential as it is used for vaccinations, admission in schools, recruitment, passport, licences and permits, prevention of crimes and confirmation of the true identity or age of a person (UNICEF 2010).

Despite the merits of electronic birth registration system, it cannot be totally claimed that the UDC is immune from the problems of the previous system. The researcher's interviews and observations suggest that it is still carrying the legacy of forgery and corruption. In some cases the UP secretaries have handed over the responsibility of providing certificates to entrepreneurs even with their online passwords, presumably, upon a mutual understanding. So, entrepreneurs enjoy discretion to input information and print the certificate. Verification of place of birth by the UP member and age by immunisation authority or doctor or previous school certificates or other designated authorities, as the birth registration law requires, are not followed strictly. Hence, there is a possibility that a foreigner can obtain the country's birth certificate.

The researcher heard some instances where people obtained certificates changing names and/or birth dates to get admission in schools, passport, overseas employment, marrying an underage or even to obtain bail from the court. Altering is easier for those who have not yet put information online by changing/inserting in the manual entry of the register as they wish. The researcher met two such service seekers who wanted to change birth information, one for sending his minor brother overseas by raising age, and another to get rid of two dates of birth, one he created to serve another purpose. The birth registration website contains a number of such stories in which punitive measures have been taken against beneficiaries and perpetrators including the UP representatives and entrepreneurs. Nevertheless, it is impossible to know how many similar incidents have gone unnoticed. Moreover, as the system is not integrated to share information with other agencies such as passport, licensing and voter registration a number of fraudulent agencies are also serving the demands for fake certificates.

It was discovered that one entrepreneur was sacked due to his involvement in the forgery of a birth certificate which was used for transferring inherited property. The aggrieved party sued against the issuing authority, the UP, which prompted his removal. Acting in their own self-interest or being enticed by financial reward are not the only reasons why an entrepreneur may forge a birth certificate, some are forced to do so by pressure from influential quarters. Another story of an alleged forgery for a UP of *Rajbari* district is:

> "In one UP of Rajbari district a man aged 22 was jailed for violence against a woman. A birth certificate was issued from the UP office stating that he was a juvenile which enabled him to get bail from the court. Following the release the defendant committed homicide of the complainant. After investigation of the police it was revealed that the birth date was mutilated with an attestation of the chairman. Hence, a criminal case was filed against offenders including the Chairman, for which he was arrested and suspended from the office. Fortunately, entrepreneurs or the secretary were not involved in the dealings (Interview with entrepreneur no.15 and crosschecked with the administration).

Opportunities for forgery or dependency of entrepreneurs on certificates for their earnings can lead to corruption which can be learnt from the increased service costs of certificates[42]. We also heard a few stories of overcharging from some recipients. People are charged more when a birth certificate is sought for overseas employment or when the client shows urgency. Every so often, it is made in the pretext of slower internet saying that it could be done quicker if more money is paid. One service recipient expressed his anger before the researcher as to why the charge is imposed for what he used to take free. No receipt of money is delivered. For most cases the UP ratifies these charges to maintain entrepreneurs who are not salaried. But, there are growing concerns expressed from recipients as well as from some UP representatives to curtail this cost.

From the above discussion it appears that the UDC's record to establish comparative advantages in terms of tangible benefits is mixed depending on the kind of services it provides. It also hints to the fact that there are ambivalent results in regard to less tangible issues such as for administration of delivery and improved quality of service.

Impacts on delivery governance

The impacts on governance of delivery are assessed using concepts such as ease in access, involvement of intermediaries, participatory and grievance redress provisions and people's level of satisfaction on less corruption and error, and more transparency and empathy.

[42] The legal fee for online birth registration up to 2 years is= 0 Taka; for 2 years onward = 5 Taka for each year; for original copy in Bangla or English = 0; for additional copy = 25 and for correction 10 Taka (LGD 2015a). No evidence was found that any of the UPs meticulously complied with these fixed fees especially 5 Taka for each year, either from their lack of awareness or from the UP Chairman's reluctance to charge his voters. However, we found no recipients of birth certificates from the UDC without incurring a fee whatever the prescribed fee applicable for him/her. Fees taken from them range from a minimum of 25 to a maximum of 250 Taka. The average service fee taken for certificates is found to be 75.25 (N= 61) Taka. On the other hand, with the previous system, the service fee ranges from Taka 0 to 120 with a mean of 34.26 (N=34). Though in a few cases there are reports of sharing with the UP, for most cases the UP does not claim anything from entrepreneurs especially whose incomes are low and there is no other variety of services to earn from.

Ease in access

As the UDC has established a closer access point to rural people it has much incentive for ease in access. Due to its proximity to people and the enhanced opportunity for direct participation, it can be assumed that there would be fewer hassles. Literally, whether the UDC delivery system has made a hassle free service as compared to the alternative delivery system is examined by using both descriptive and test statistics. When calculated, the percentage distribution clearly shows a higher percentage, 87% of users consider UDC delivery system as hassle free. On the other hand, 73% recipients think the alternative delivery system as hassle free while 27% people find it as 'not hassle free'. This difference of proportions for population is tested using the McNemar Test[43] presented in the Table 12.

Table 12: Hassle freeness between Alternative and UDC.

Hassle Free or not (Alternative)	Hassle Free or not (UDC)		Chi-square and P value
	Yes	No	
Yes	85	8	$\chi^2 = 14.05$; p<0.01 (Exact); Cohen's *'g'* =.17
No	33	1	
Total	118	9	

Note: P value is based on McNemar test and considered significant if P<0.05

The McNemar test presented above shows that the difference for population proportion is statistically significant (α = 0.01). There is sufficient evidence for hassle free status in two conditions. In other words, more people are considering the UDC delivery system as hassle free compared to the alternative delivery system, the magnitude of which is measured through Cohen's '*g*'[44] , when calculated is found to be 0.17, a medium effect (Gray & Kinnear, 2012 p. 439). It should be mentioned here that people who consider alternative delivery point as troublesome are mostly recipients of government information or services such as land copy or Malaysia registration. The harassment experienced when seeking information and services of various government offices is reported by a UP member from his knowledge of the sufferings of common people in his area:

> The government office is the place for big predators that eat small fishes, exploiting the poor and illiterate. May be the request can be served quickly, but it will take long time by seeking unnecessary documents and forcing clients to pay extra and additional visits. Now with the UDC people are greatly relieved. To get a land copy, for instance, people just mention plot number, khatian number, the name of the owners to the entrepreneur and then they get the service very easily within few days (UP Member Interviewee no.2, 2013).

In contrast, those who consider the UDC as not hassle free have received certificates. Among them, 31% consider the process as not hassle free because of the extra time taken for waiting,

[43] The test chosen is *McNemar Test* as there are two related samples and the variables are binary. The null hypothesis for the test is that the two population proportions: proportions of those who considers it Hassle Free versus proportion of those who consider as Not Hassle free are equal and is symbolically:

$H_{o:}\ \pi_1 = \pi_{2;}$ The alternative hypothesis symbolically is: $H_{1:}\ \pi_1 \neq \pi_2$ (Pallant 2012; Gray & Kinnear 2012)

[44] $g = | P - p |$, where *g* is the difference between *P*, the proportion of outcomes in the target category and *p*, the probability of the outcome under the null hypothesis (Gray & Kinnear, 2012).

unavailability of the chairman or entrepreneur, slow internet connectivity or electricity breakdown, plus the increased cost.

For other types of information and services when people do not have to travel long distances, spend hours and incur costs, which is often unaffordable for them, it can be assumed that the UDC has established easy access. The respondents also perceive that it has established easy access to government information and services, in general, which are less accessible to them. The claim is partially supported through the use of Wilcoxon Sign Rank Test (produced in the Appendix Table 2.3). The median differences on the ratings of two systems regarding easy access to government information is in favour of the UDC (UDC MD = 5 and Alternative MD=4) and the difference is also significant ($\alpha = 0.05$). However, for government services there is no difference in median values. This may be for that not all UDCs provide government services widely.

In places where they are offered, people's easy access can be supported from the findings of FGD consisting of some women:

> "Few days back I appeared in the UDC during huge rain and did money transfer with mobile banking in just 5 minutes. Sometimes, I become astounded seeing the quickness, ease and the less cost. It has cut my additional costs too. The benefits from the computer are enormous. For instance, the electricity bill pay has become so easy. A mum can carry on her household works and the dad can do his job while the bill is paid by their child on the way to the school. At times, housewives come to pay the bill keeping the rice pan boiling on the kiln" (FGD2 participants, Arabpur UDC, 2013).

This suggests that people can avail the service during bad weather especially during the monsoon or foggy days of winter because it is in their neighbourhood. They can also get delivery without hampering their work or duty and causing subsequent wage loss.

The influence of intermediaries

Traditionally, service delivery system, especially the governmental ones in Bangladesh, are characterised by the involvement of intermediaries as discussed in the first chapter. With the introduction of the UDC, people no longer have to take help from intermediaries for some government services. When the percentage of involvement of intermediaries is calculated (not shown here) it was found that none have received services from the UDC while 9.7% had an experience of receiving services from alternative delivery points. This involvement is related to services that are provided from the government offices such as land copy and traditionally intermediary run services such as applying for overseas employment (Malaysia Registration). As not many UDCs provide these kinds of services, the impact is not too profound.

The land copy is provided from the government office which is beset with problems of corruption and thus requires the assistance of intermediaries. The government employees allow them to avoid direct tussle with the service recipients over extra pay, with risks involved (Jabber 2009;

Sarker 2013). The state of hassle for receiving services from government offices can be cited here from the direct statements of a service recipient:

> "I went to the DC office for a land copy. As I did not have much education I had to rely on a Muhuri (deed writer/intermediary) to write my application form. I paid him 300 Taka for all costs. After waiting for nearly four hours I was told by him that my land record did not exist in the office dossiers. I was bewildered by this shocking news before I was advised to go home and visit another day after making an appointment with him over phone. In the meantime, he would continue searching with the help of Record Room staffs. After 5 days I again contacted him and came to the district, which is about 55 kilometres away from my home, and I was told that my land record had not yet been recovered. It needed extensive search from among volumes of record books by a number of staffs which would cost me more. If I agreed to pay another 3000 Taka he might register a similar request. Having no other means, as the land copy was urgently needed for land transfer, I bargained to pay 2000 and finally it was settled in 2500. He solaced me that he was willing to do so only for my help. After incurring another 15 days I received my land copy from him costing me 2800 taka in total along with my three days travelling and food costs. I had to spare my regular works for those three days. With the UDC I received similar service for another land record within 7 days travelling two times and costing no more than 100 taka. It's unimaginable'' (Service Recipient 2, Comilla 2013).

Likewise, previously, the overseas job opportunity was entirely regulated by an intermediary class, *Adam Bepari,* in collusion with overseas employment agencies who used to exploit rural people through overcharging. Among services studied it was found that 'Overseas Employment for Malaysia' is the most expensive and the difference in total costs[45] between the two systems is bigger than any other service type (With alternative *M* = 264444 Taka, *SD* = 37703; with UDC *M* = 32556 Taka, SD= 2068). Some UDCs are now providing both of these services without the involvement of intermediaries permitting people's participation direct or through their near ones. For some government services, which are yet to be offered from UDCs, such as Passports, the UDC *Entrepreneurs* work like intermediaries as they have access to government offices as they are authorised to fill up passport applications. However, no evidence of coercion through overcharging was found.

Participatory and grievance redress provisions

In conventional government service delivery systems, people cannot access the service instantly and have to wait longer than whatever little real time it may need. People have no say in the processing neither have the opportunity to express any grievance to the authority as they understand that it will not be addressed. Rather, it may anger the provider and make the delivery either delayed or not be delivered at all (Sarker 2013). On the other hand, most UDC services can be provided instantly before the presence of clients. This is because the operation is ICT enabled and the entrepreneur is in a haste to finish the job quickly to serve other awaiting clients. Henceforth, people feel that they can participate and express their grievances, if any, more easily to the entrepreneur. People's ratings for these two variables (in a 6 scale from strongly disagree to

[45] It should be mentioned that the UDC only charges the registration fee related to this cost which is around 500 taka. The remainder is taken by the BMET. Since the UDC is used as a forum to reach out people, hence, it is considered as a UDC service.

strongly agree) differ between the two systems in terms of their means; *M* = 3.59, *SD*= 1.04; *M* = 3.71, *SD* = .937 (for participatory and grievance redress provisions of alternative system respectively) and *M* = 4.13, *SD*= .907; *M* = 3.86, *SD* = .848; (for participatory and grievance redress provisions of UDC respectively). The hypotheses on better participatory and grievance redress provisions of UDC are tested using the *Paired sample t test*[46] (Appendix table 2.4).

The participatory provision between the two systems differ significantly α = 0.05 with the relevant effect size Cohen's *d*[47] found to be .15, a small effect (Gray & Kinnear, 2012, p. 198). However, there is no statistical significance for different means of grievance redress. In fact, UDCs have not developed any robust system to send grievances to respective authorities. However, we heard one incident from an entrepreneur in *Jessore* about an allegation made by a few female students on 'eve teasing' (harassment of young women) which he e-mailed to the Deputy Commissioner. Soon the police arrived on the spot and apprehended some offenders which created public awareness about the UDC.

Levels of satisfaction with governance issues

Since the UDC has contributed to the reduction of time, cost and removal of intermediaries and established hassle free, and participatory provisions to some extent it has much connotation for governance issues related thereto in terms of less corruption, error-free, transparency and empathy to recipients. People's ratings of the satisfaction on the governance issues surrounding the delivery[48] is presented in the Table 13.

Table 13: Level of satisfaction on governance issues.

Variables	***Mean (SD)***		***P values based on* t**
	Alternative	UDC	
Satisfaction on easy access	3.71(.915)	4.32 (.690)	.001
Satisfaction on corruption freeness	3.47(1.11)	4.12 (.710)	.001
Satisfaction on error free and consistent information	3.65 (.824)	4.07 (.622)	.001
Satisfaction on transparency	3.43 (1.03)	3.99 (.674)	.001
Satisfaction on empathy to recipients	3.49 (1.07)	4.41 (.651)	.001

Note: 1= Very Poor--------5 = Very Good

Higher means for the UDC (Table 13) on the level of satisfaction suggest for less corruption and greater error freeness, transparency and empathy to clients. To generalise about the population difference the *Paired Sample t test* is used and found to differ significantly between the two systems in all of them even at α < 0.01. The effect size Cohen's *d* (not shown here) is either small

[46] As the data is approximately normal the Paired Sample t test is preferred.

[47] *d* estimated with $d = \frac{M1 - M2}{Spooled}$ where, $S_{pooled} = \frac{\sqrt{s_1^2 + s_2^2}}{\sqrt{2}}$ (Gray & Kinnear 2012)

[48] Like the impact questions the recipient's level of satisfaction responses are paired from both systems to have a comparative point. Clearly, there are mean differences between the two systems

or trivial for all cases. For matters related to government information and services it can also be supported from our interview findings that people have easy access to these service outlets, they can watch what is going on in the process of delivery as decisions are taken before their presence, and they are not charged extra or coerce with paying bribes hence they feel it is less corrupt. As UDCs provide services using ICT so the chance of mistakes is at a very minimum.

Most UDC entrepreneurs live near their workplace and hence they can, if they want, come to the office on time and their eagerness to earn money meant they would serve people with a helpful and responsive manner. Service users do not have to address entrepreneurs as 'sir' and there is hardly any hierarchical distance between people and entrepreneur. The relationship is horizontally aligned and is often assisted by the UP representatives. Contrary to vertical relationship between government official and service recipients, the entrepreneur is more friendly and approachable to the rural citizens. Inspired by this responsiveness they feel that the entrepreneur is empathetic to their needs. The UDC provides flexible access to services as most entrepreneurs open during early/late hours, that is, outside standard office hours. The frequency distribution of 'remaining open during working hours' shows that 72% people find it open whenever they want to visit, 24% find open most of the time and only 4% find it open sometimes. Contrary to the traditional providers such as the government ones which suffer from absence of providers (Sarker 2013) these percentages carry certainly positive impacts.

Regardless of not having plenty of government services or wider access to the ICT from the UDC, people still hold very optimistic views of it. An important element of their confidence building is evident from the trust they place on that ICT can be used to give better citizen services or information. From their ratings of agreement from Strong disagreement = 1 to Strong agreement = 6, the larger mean (5.13) and smaller standard deviation (.634) with range values from 2 to 6 support this claim. As they possess very high convictions on benefits from ICT use in the UDC delivery system some also feel encouraged to learning computers (30.5%) and use internet (21.5%) which are greater compared to their eagerness to learn Bangla (5.8%) and English (13%) languages from the UDC. Some of them even want to become an entrepreneur (13%) mainly those who are students or unemployed youths. However, some are still not encouraged or indifferent to the UDC (44.8%), especially those who received only certificates from it.

The UDC could not be conspicuous about one of the important components of transparency, *the citizen charter.* Though in some cases there is a citizen charter hung inside/outside the UDC, for most cases it only includes the list of services without other essential information such as the price and time taken and the details of authority for complaint. While articulation of time in the citizen charter is not as important as most services are delivered instantly, the fixation of price against services is central since lack of it can contribute to the extra charges, particularly, in regard to certificates. Similarly, there is no mention of the grievance process in the citizen charter. Some

entrepreneurs admit to the researcher that lack of a price tag helps them earn extra from those who are affluent, since in Bangladesh people do not mind to pay a little extra if they are served well. It is also done to supplement free or minimum charge for some extreme poor or those who come up with *tadbir* (persuasion) from local representatives.

From the above discussion we can say that the UDC has some comparative advantages over alternatives. The extent to which it could not establish comparative advantage or ensure compatibility of innovation relates to 'complexity' of Diffusion of Innovation theory. It relates to those who find the use of a UDC difficult either from their illiteracy, poverty or weak communication on the part of managers that cause minimum or no use. Diffusion is a particular type of communication (Rogers 2003).

Communication of UDC

We know from the theory that communication happens through two channels: interpersonal communication and mass media (Rogers, 2003). According to A2I (2015), an estimated 2 million people visit UDCs each month. It can be learnt from how people first come across to the UDC (Appendix Table 2.5). Overall, recipients have become acquainted with the UDC by both means. Interpersonal communications such as from 'Neighbourhood/Public talk' (27.2%), 'Entrepreneur/UP representative' (21.2%), 'Incidental visit' (20.5%) combined account for the majority compared to mass media communication means such as 'media (Radio, TV, Newspaper) broadcast' (15.2%), 'Publicity by the UP' (14.6%). Only two people (1.4%) knew of the UDC from '*Wardshava* or other means'. We know that interpersonal channels are important for persuasion and final adoption which follow awareness generation by mass media. As the use of UDC is considered here as the final adoption we can usually notice more of its influence. Consistent with the theoretical assumptions, the propensity of interpersonal communication could have occurred presumably for certain common characteristics or homophiles among users, operators and local promoters such as Bangla language, education (more literate), beliefs, and socio-economic status (Compared to urban areas in Bangladesh, there is less unequal socio-economic status in rural areas). However, mass media, especially TV channels, which are more available than ever before in rural Bangladesh can also be an effective means of generating awareness among grassroots people.

Also, the awareness sources vary across categories of services. Shortage of government or commercial services is related to very low levels of awareness. For instance, 97% of those who become acquainted with it by their incidental visits to the UP are certificate recipients. Less frequent visits by people mean less income of entrepreneurs and thus fewer incentives for awareness building efforts. For other service categories interpersonal communications have an impact. 42% of those who received commercial services have become acquainted through the entrepreneurs or UP representatives. For use of government services: both media, neighbourhood

talk, publicity by the UP[49] and entrepreneur's efforts account for equal percentages (25% each). Interpersonal communication with a neighbour or public talk indicates how well ingrained the concept of UDC is among rural people. People who come across the UDC through their incidental visits are more from districts such as Bogra (33.2%) and Rajbari (29%), both of which lack in variety of services.

Another indicator of the extent of diffusion is the frequency of visits by users. Among users of the UDC: 33% are first time visitors; 35% are more frequent users such as weekly (15%) and monthly (20%) most of whom received computer training, electricity bill pay and Malaysia registration. On the other hand, the remaining less frequent visitors avail services either quarterly (13%) or half yearly (10%) who are mostly users of services such as land copy and other government services and commercial services. Among the least frequent users [more than half combining first time (35%) and once in a year (19%)], most are certificate recipients. We know that 33% have not taken any other services from the UDC previously. The remaining 67% users have taken services from the UDC either twice or more. For previously taken services from the UDC commercial type is the highest offered service (53%) followed by certificates (35%) and government information and services (12%). Though there is a sharp increase in the percentage of commercial information and services among the previous users again we notice a decline of government information and service users. The increase in commercial type is usual since those who received certificates during the survey mentioned about something else taken previously.

According to Rogers (2003) diffusion can lead to a wider socio-economic gap in its early stages but can be minimized by the adoption of greater awareness generation and more facilitation of information through interpersonal communication. This implies that a telecentre can have impacts for bridging digital divide through wider communication strategies.

The consequences of innovation– Impacts on bridging the digital divide

The UDC is a quick-win project to address the issues of digital divide. In chapter 4 we have seen that in spite of the progresses and achievements in online information and services, the vast majority of the population especially in rural areas have remained largely unaffected due to lack of simultaneous progress in telecommunication infrastructure and human capital. The majority of them do not have capacity to purchase ICT or use it. On the other hand, the availability of electronic information and services poses a potential danger of giving benefits to those who have or use ICTs and depriving others who do not(Islam, M Sirajul 2008; UN 2014). The UDC as a shared access point, thus, can be assumed to reach those who are otherwise unreached and help bridge the digital divide that runs through gender, age, levels of literacy, income and geographical

[49] It can be validated from interview findings that after introducing government services such as Malaysia registration, land copy and electricity bill pay there were considerable publicity from the entrepreneur/UP.

locations (UN 2012). The following discussion focuses on impacts of UDC on bridging the digital divide along these dimensions.

Benefits to Women

We have seen that women's participation for all types of services is about one third of total participation (Table 4). According to Bangladesh Bureau of Statistics (BBS 2014), among service recipients 24.27% women, 0.4% religious and ethnic minorities, 1.6% physically challenged and 6% older people (over 50 years). However, it is also evident that the participation varies along service types (Appendix table 2.6). Women's participation is least for government information and services (14%). In fact none of our women service recipients have received land copy, passport application, Malaysia registration[50] and government forms download. Among other government information and services their participation was for electricity bill pay, education and banking services. Nearly half of all women (49%) received certificates while the remaining 37% have received services of a commercial type. Compared to men, women's participation is impressive for certain services such as applying for job or job search (100%), skype conversation (67%), computer training (55%) and Telemedicine (50%). They have also participated considerably for Photoshoot (46%), Education information or services (40%), certificates (40%) and photocopying/compose/printing. The service recipient women mainly come for these information and services when their male counterparts remain busy with their day time works.

As UDCs are near to their house and there is a women entrepreneur from the community[51], who is known to them and whose activities are publicly visible, women can participate more comfortably. Moreover, the flexibility of UDC office hours, less time spent in queues, the friendly approach of entrepreneurs, and the opportunity to employ women's spared time can be attributed to overall women's participation. Also, some services such as telemedicine is beneficial for poor women as it is given with minimum charge as found from our FGD analysis. *Telemedicine* from the UDC gives them access to doctor's services which otherwise, if taken from alternative points in Upazila or district, need an appointment, incur a doctor's fee and travel costs. Besides, it saves them from hassles since to get a normal consultation sometimes they have to undergo a host of ancillary tests unnecessarily, the cost of which is unbearable and leads to some serious ailments not being reported. Some women, however, reported slow internet which interrupted their online consultation with doctors (FGD1 with women recipients, Durgapur UDC 2013). The researcher also met one woman who found a job after computer training from the UDC.

Age of the service recipients

The UDC has an appeal to people belonging to all ages ranging from 11 to 85. The age distribution is slightly negatively skewed that contributed to the mean age to 34.93 (N= 142) with a standard

[50] In Malaysia Registration, though was open for them, women did not participate as traditionally women are averse to overseas employment due to cultural and religious discouragement in the society (TIB 2012).
[51] In government workforce, women represents o*n*ly 8.5%(UNDP 2005) while 50% of UDC Entrepreneurs are women.

deviation of 14.73 (Median = 33 and Mode = 22). It is found that most internet based services (passport application, telemedicine, skype conversation, job application, Malaysia Registration and Computer Training, education information/service) are more availed by young people, as the group mean of age for them is found to be 26.75. It is usual that young people are best placed to take advantage of the benefits the internet and ICT can offer. Other traditional services are more taken by relatively aged people as the group mean age of those services is found to be 41.43. The latter kind of services such as land copy, electricity bill pay, government forms, mobile banking, certificates, photo shoot and photocopying/compose/printing/laminating/scanning are poplar to middle aged and old people. Receiving UDC services more by young people also has consequence for education of recipients as the younger generation is more likely to be literate and educated.

Education and occupations

One of UDC's goals is to benefit illiterate and educationally disadvantaged people. The frequency distribution of the highest level of education completed presented in the Table 4 shows that 52.3% (Cumulative Percent) of participants belong to the category Year 5 or below among them the majority (29.2%) did not even attend the school. As compared to total adult literacy rate (58%) (UNICEF 2013) of the country this is expected since a considerable percentage of people are still illiterate. It seems that the UDC is successful to provide services to a large percentage of uneducated people, but again the conclusion should be drawn upon what it provides to whom. Illiterate and less educated people mostly have received certificates (62% of all service recipients), electricity bill pay (75%), education information/services (60%), photocopying (55%), photoshoot (64%) and Malaysia registration (50%). Their representation is less for internet or ICT driven services such as land copy (28%) and mobile banking (25%). Although these people consist of half of our respondents none of them have received other internet based services such as government forms download, skype conversation, and online application for job or job search, e-mail or internet browsing and computer training. However, all recipients of passport application and telemedicine belong to these categories. It arises that the UDC favours educated people for ICT or internet driven information and services. This can be more obvious by having a look at the pattern of occupational groups of the service recipients (Table 4).

Students represent the highest number of service recipients (19.5%) followed by Household worker (15.6%), Small Tradesman (12.3%), Farmer (12.3%), Unemployed (6.5%), Day labourer (5.8%) and Industry worker (5.2%). Teacher, Government employee, Fisherman and Transport worker represent less than 5% of recipients each. The 'other' category (12.3%) consists of people from a number of occupations including Imam, Tailor, NGO worker, Retired person, Village police, Carpenter, UP member and Cook. The greater demand by students indicates the potential of UDC especially for education services, job search and computer training. Household workers are mostly women while its popularity to small tradesman indicates the possibility to promote business, though

e-commerce is yet to be offered. The occupation distribution is aligned with the type of services available in the UDC. It has also linkages to the income of service recipients.

Income dimension

Another group of people subject to digital divide is the poor and economically disadvantaged. The Median is = 5000 Taka equivalent to USD 63 (OANDA as on 16/12/2015) and the IQR is 7000. This suggests that among our sample respondents low income people or poor people's participation is considerable. This is also partially resulted from the reality that many of unemployed youths, students and household workers have reported no income [the mode = 0 (34)]. However, in terms of family income some of them certainly belong to high or middle income families, which could not be ascertained. Yet, the median value of $63, which is lower than monthly GDP per capita of $80 (Worldbank 2015), validates low income people's representation. In this regard a UP representative's interview opinion is worth to mention.

> "The more we can promote UDC the more we can go nearer to people with its fair system. People in administrative or political upper hierarchy always maintain a distance from rural masses who are less advantaged. Administrators work in air conditioned rooms suited and booted. In contrast, rural people always feel hesitated to approach them with their torn or messy dresses. Similarly, the upper political leadership wears gorgeous dresses and keeps themselves scented with perfumes but the sweltering masses can barely come near to them and express their wants and needs/grievances or dare to hug or handshake with them. There are sharp divisions and distances across social lines such as between poor and rich, powerful and weak, literates and illiterates, men and women. People of lesser social status are often neglected, harassed, bullied and physically insulted. This is one of the major sources of unrest within the society. The UDC has the prospective to break these social silos by treating people equally, giving info/services and empowering them" (UP Member Interviewee 3, Arabpur UP 2013).

While this statement implies that poor people can benefit more from government information and services our data suggests that they got more services of a commercial type (Median income of recipients= 3000; IQR= 10000) and certificates (Median = 5000; IQR = 7000) than government ones (Median = 6000; IQR = 7875). However, some of the commercial information and services are internet services meaning that it has improved their access.

Thus, there are some partial successes of UDC to bridge the digital divide along these dimensions. Assessing impacts on geographical locations is very important to understand its inclusive capability to reach all across the country.

Information/ Services across districts

Table 14 produces frequency of categories of information and services across four districts.

Table 14: Information/Service Categories across four Districts:

Categories of Information/Services	Name of the Districts				
	Comilla n(%)	Jessore n(%)	Bogra n(%)	Rajbari n(%)	Total N(%)
Government Information and Services	9(19)	27(56.3)	10(21)	2(4.2)	48(100)
Certificates	13(21)	5(7.9)	18(29)	27(42.9)	63(100)
Commercial information and Services	16(37)	12(27.9)	8(19)	7(16.3)	43(100)
Total N(%)	38(25)	44(28.6)	36(23)	36(23.4)	154(100)

The above table shows that Jessore has the greater portion of government information and services (56.3%). As Jessore[52] is being piloted with some e-initiatives it has introduced a number of government services with the help of A2I. None of the other three districts have all kinds of government information and services as is also indicated by lower row percentages of Comilla (19%), Bogra (21%), and Rajbari (4.2%). Though Bogra and Comilla have a few kinds of government services they are least in Rajbari (only two kinds such as Malaysia registration and passport application). Another important financial service that the rural people find useful and convenient, the mobile banking, is absent in all three districts. It could be known from the interview findings of management officials that the process of introducing mobile banking in these districts is under negotiations with relevant banks. Other two service categories are common across four districts.

Meanwhile, where government services are not available, UDCs mostly provide certificates and private commercial services for their sustenance. For instance, in *Rajbari* 75% of recipients received certificates. UDCs that have less to offer are also less frequently visited by people. Less frequent visitors consist of more than half of all recipients for Rajbari (65%) and Bogra (60%). Rajbari and Bogra also lag behind other two districts in terms of commercial information and services. It appears that the UDC lacks common branding of services in all regions of the country.

With geographical outreach of the UDC another question is relevant. The question is how widespread the impact is of the access across the entire area of the Union even though the UDC may have all types of information and services. For certificates, certainly, it is not an issue since people have no alternative point to take them and they come even from the furthest distance. However, for government information and services the average distance people travelled to a UDC was M= 1.3 kilometre with a standard deviation of 1.12 kilometre and for commercial information/services the Mean is = 0.95 and SD= 0.65 kilometre, whereas, for certificates the Mean

[52] It should be mentioned here that Jessore received the highest priority to be a pilot case as the then ICT minister Mostafa Faruk Mohammad and the A2I Project Director, Nazrul Islam Khan are from Jessore. Their ideas and initiatives were implemented by the capable leadership the district's Deputy Commissioner, Mostafizur Rahman who was a former official at the A2I.

distance = 2.3 and SD = 1.4 kilometre. Each UP has an area of 14.5 square kilometres on the average (Table 2). Thus, it can be said that for government and commercial service and information types the access is not widespread. For both types we can justify that not all UDCs provide them or people from the most distant area of the Union are not still aware of them.

Up to the present the impacts of digital inclusion along demographic and geographical lines has been discussed. We know from theory that digital divide along these lines is the result of existing broader socio-economic divides. Hence, 'Rural Livelihood Framework' was introduced to assess the impacts of ICT on rural livelihood.

Impacts on livelihood

We have assessed the livelihood issues in terms of three variables such as access to education, health and agricultural information and services because of their connections to poverty reductions and livelihood improvement (Bhatnagar 2004; Mitra & Gupta 2008). The recipients of these types of services are very few (Table 5) to assess any wider long term impacts. Hence, we attempt here to assess an overall perceived impact of UDC on those livelihood issues. The descriptive statistics suggest that the alternative system has greater means for education, health and agriculture information and services as presented in the Table 15.

Table 15 : Perceived livelihood impacts between Alternative and the UDC.

Variables	Mean (SD)		*P* values based on *t*
	Alternative	UDC	
Access to Education Information	4.45 (.597)	4.25 (.840)	.243
Access to Health Info	4.44 (.607)	3.83 (.845)	.003
Access to agricultural Info	4.37 (.808)	3.40 (.604)	.001
Access to Education Services	4.50 (.564)	4.26 (.790)	.211
Access to Health Services	4.44 (.840)	3.53 (.842)	.001
Access to Agricultural Services	4.52 (.700)	3.52 (.849)	.001

Note: 1= Strongly Disagree----6= Strongly Agree

The above table suggests that while some of the population mean differences are not statistically significant as for education, information and services, for other variables such as health and agriculture information and services the mean differences are significant ($\alpha = 0.05$) in favour of an alternative system. The difference for education might be for the reason that the UDC provides more of education related services such as admission, registration and result check, as we have seen earlier, compared to the other two categories. Yet, the UDC could not make any significant difference for education services. Presumably, they are mainly provided by the government offices especially from the Upazila. Similarly, for health and agriculture services the UDC could not make any significant differences which are still provided from the Upazila and district.

The question is why the UDC has not made any impact on these livelihood issues as it was meant to. The management official interviewees conjecture that education information and services are also available at the grass root level through various schools and colleges, now equipped with the

ICT. Connected PCs and mobile phones can also provide a bulk of them from anywhere. Moreover, there are no special services in the UDC for disadvantaged people such as distance education, or livelihood training (BCC 2014). Similarly, the agriculture information and services are also presented through 'Block Supervisors' who have worked at the Union level for a long time. Farmers traditionally maintain a liaison with those officials for their training or introduction of new inputs. Some of the Bangladeshi farmers are very innovative and have shared their ideas with fellow colleagues and become renowned for their success in boosting agriculture to supply the food for nearly 160 million people with very scarce land (BBS 2011). The health services are also offered at Union level through 'Community Clinics'. Though delivery system of these services suffers from inefficiency and inefficacy but they cannot be better served from the UDC due to their lack of readiness to be offered online through the UDC. Since UDCs are not yet equipped with these services it can now give on some informational services related on these issues from CDs, *e-tothyakosh* and other websites. Moreover, as these services are less likely to provide them with income, entrepreneurs also do not show much enthusiasm to deliver. According to the UDC guideline, the entrepreneur cannot charge for informational services (LGD 2010).

Not only is the UDC disconnected from the Upazila and district to provide various livelihood development information and services, it is also disengaged form the adjacent 7 localised departments hosted by the UP. According to the Local Government (Union Parishad) Act 2009, there are offices for local government engineering, agriculture, health, education, fisheries and livestock, social welfare and *Ansar* (auxiliary forces) and Village Defence Party (VDP) in the UP premise (LGD 2015b). Though many of these units exist only nominally, as they lack office set up with necessary staff and ICT infrastructure, yet the UDC remains stand alone to share information and services of any of these departments to the rural people. Noticeably, most of these localised services relate to people's livelihood issues.

Conclusion

Assessed against the attributes and components of *Diffusion of Innovation Theory* it appears that the UDC is now being used by innovators and early adopters. The socio economic profiles of users suggest that young, literate and more educated people are the majority of those early adopters. There are three categories of services from the UDC to ensure compatibility. Among them the most potential for opportunity costs is the government information and services that was further categorised as per the types in Stage Model of e-government. While some of them can be levelled as interactive and transactional, there are very few informational services. Also, from available services it cannot be said that they are consistent with the prioritised needs of rural people. Yet, we can say that the UDC has increased access to information and services as is supported by the test of our first hypothesis. The second hypothesis is partially supported as it has provided comparative advantages by reducing time, distance and cost of users and improvement in delivery governance

to some extent. Therefore, people value the UDC more compared to the alternative delivery points. The UDC follows both communication channels – mass media and interpersonal for wider diffusion. This has helped the UDC achieve some gains in bridging the digital divide in dimensions such as gender, education, occupations and income. However, ensuring the locational parity is still at bay since informational and internet based vital government services are not available across all districts. It is still to fulfil people's aspirations for livelihood information and services for longer term impacts. These shortcomings lead to the complexity among users leading to barriers in use or adoption. The necessity to overcome them heralds the need for an effective management strategy to which the discussion proceeds in the next chapter.

CHAPTER 6. STAKEHOLDERS INVOLVEMENT IN THE UDC

Introduction

This chapter aims to evaluate the management performance of Union Digital Centre (UDC) from the PPPP perspective to answer research question 5. Based on quantitative and qualitative inputs from the Entrepreneur Survey, analysis of field interviews and review of secondary literature this chapter identifies stakeholders, examines their roles and contributions to establish and operate the UDC, in four sections. The first section illustrates the external support from the government and the UP in terms of ICT infrastructure, services, training and performance management. Entrepreneurs' involvement in terms of their employment, demographics, computer competency, investment, income and satisfaction with the job is assessed in the second section. People's involvement as stakeholders will be examined in the third section. The final section assesses the dynamics of stakeholder supports in the last one year and the resultant progress in service provision and income. This section tests the 4th hypothesis using the SEM to ascertain the contributions from each stakeholder.

Stakeholders –identification and their roles

The stakeholders' involvement is discussed in terms of external support from the government and UP, the entrepreneurs' involvement and the people's participation as identified in the literature review in the light of Stakeholder Theory.

External support from government and UP

The UDC is established in a room of the UP building allocated for it. The initial equipment for introducing the business is purchased from government finance provided to the UP under LGSP and Annual Development Program (ADP). The government also supplied equipment, with the assistance from the United Nation's Development Program (UNDP), to some UDCs during piloting. As it is operated under PPP entrepreneurs and the UP add equipment and office furniture to the existing ones as the need arises. The operating and maintenance costs are required to be funded by the entrepreneur (LGD 2010). Nevertheless at times, in some places, the UP also supports these costs. The government also supports training, technical inputs, monitoring and evaluation.

Equipment and Facilities

The UDC has been provided with a number of equipment that is considered essential for running the business. The major equipment available in the UDC is presented in the Figure 5.

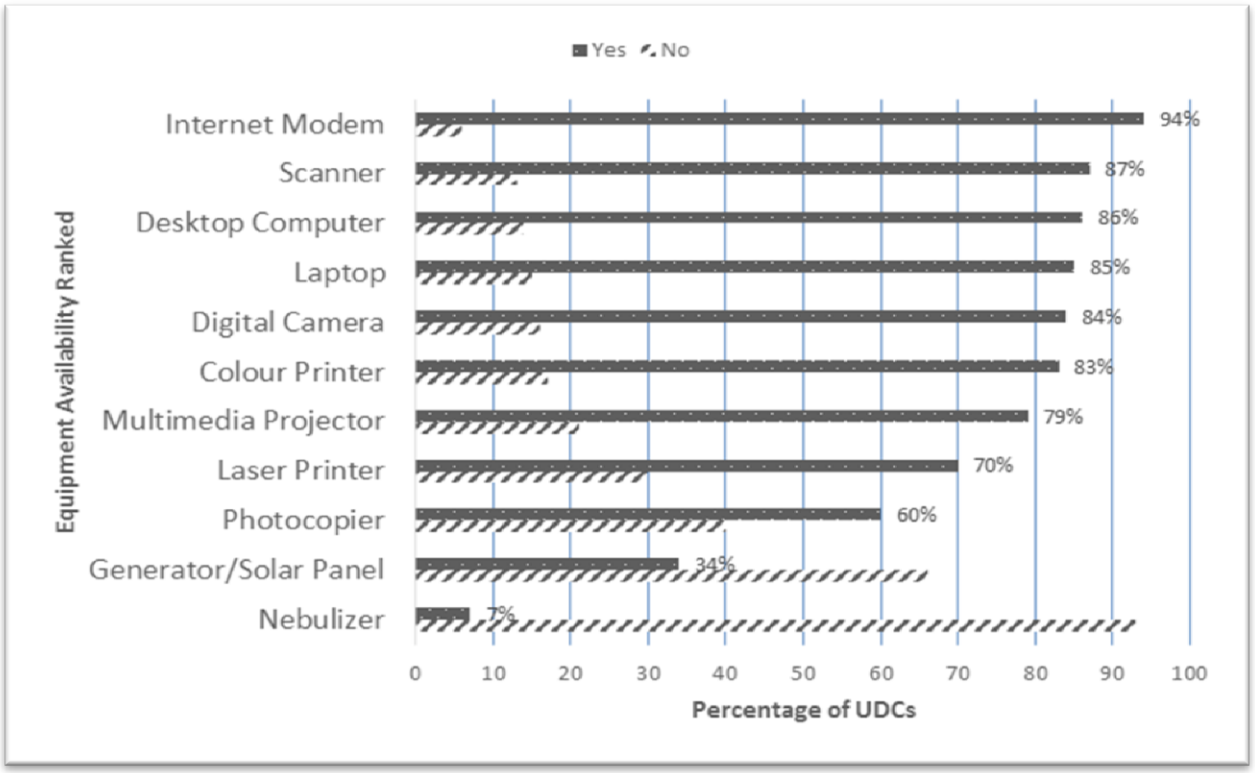

Figure 5: Percentage Distribution of Availability of Equipment in the UDC

The basic service equipment such as Internet modem, Scanner, Desktop Computer, Laptop, Digital Camera and Colour Printer are overwhelmingly available across all UDCs. Less than 17% of UDCs have reported an absence of any one of these items of basic service equipment (Figure 5). Laser printers are available in 70% of them. Additional equipment, which is costly, such as the Photocopier is lacking for 40% of UDCs. The presence of Multimedia Projector in 79% of them is considered impressive. Nebuliser (7%) was introduced in a few UDCs for health checks, but it is not mainstream service equipment. Absence of Generator/Solar Panel in 66% of UDCs hampers effective, fast service delivery since black outs in rural areas are frequent. (Sarker 2013). Additionally, it was confirmed from the researcher's field visit that most of these items of equipment are single in number. Only 6 UDCs among 16 were found to have more than one computer/laptop for training purposes. Mobile phones are available in all UDCs but not included in here since it is not an external support, rather invariably owned by entrepreneurs (BBS 2014).

Overall, in regard to ICT infrastructure, it appears that UDCs are well-equipped with the hardware. Then they suffer from the necessary software and services that can make the computer hardware put to best use. Only a few basic software such as MS Office, Adobe, Photoshop, and Antivirus are used by entrepreneurs while operating system is either Windows XP or Vista. The equipment infrastructure, in most cases, was bought from the LGSP which is sponsored by the government's finance taken from loan. Under the financial decentralisation concept the project provides autonomy to the UP to spend money for its prioritised development programmes including the UDC (LGD 2015b). The impetus for equipment purchase came fairly quickly from the central

administration directly when the Prime Minister declared a date to inaugurate 4501 UDCs in a day across the country on 11th November 2010 (A2I 2011c).

Over the period, due to operation or lack of it, many of the equipment items are due to be checked to make sure they are working properly since this affects the capacity of the UDC to generate income and make each person's use of the UDC worthwhile. Table 16 represents the working conditions for items of service equipment.

Table 16: Working conditions of Service Equipment.

Equipment	Good working condition n (%)	Moderate working condition n (%)	Out of Order n (%)	Being not used for UDC n (%)	Not Present in the UDC n (%)
Internet Modem	331 (61.5)	151 (28.1)	16 (3.0)	8 (1.5)	32 (5.9)
Scanner	417 (77.5)	32 (5.9)	17 (3.2)	4(0.7)	68 (12.6)
Desktop Computer	324 (60.2)	92 (17.1)	31 (5.8)	15 (2.8)	76 (14.1)
Laptop	344 (63.9)	60 (11.2)	35 (6.5)	20 (3.7)	79 (14.7)
Digital Camera	314 (58.4)	65 (12.1)	68 (12.6)	6 (1.1)	85 (15.8)
Colour Printer	262 (48.7)	102 (19.0)	79 (14.7)	2 (0.4)	93 (17.3)
Multimedia Projector	308 (57.2)	49 (9.1)	61 (11.3)	9 (1.7)	111 (20.6)
Laser Printer	218 (40.5)	48 (8.9)	108 (20.1)	2 (0.4)	162 (30.1)
Photocopier	193(35.9)	65(12.1)	63(11.7)	0 (0.0)	217(40.3)
Solar Panel	68 (12.6)	24 (4.5)	21 (3.9)	3 (0.6%)	422 (78.4)
Generator	65 (12.1)	19 (3.5)	23 (4.3)	4 (0.7)	427 (79.4)
Nebuliser	24(4.5)	8 (1.5)	5 (0.9)	0 (0.0)	501 (93.1)

In about 60% of UDCs the equipment such as internet modem, scanner, desktop computer, laptop, digital camera and multimedia projector are in 'Good working conditions' (Table 16). Combined with 'Moderate working condition', they represent around 70%. This indicates that service equipment are generally in good condition, which is to be expected since they were introduced only around 4 years ago. There are some instances of 'Out of Order' service equipment. Printers of both types are more prone to be out of order. Some percentages of 'Being Used not for UDC' are interesting to note. The highest percentage is for laptop (3.7%), followed by desktop computer (2.5%), Multimedia projector (1.7%), internet modem (1.5%), digital camera (1.1%) and others. From our field observation it was found that in a few cases laptops and internet modems are taken either by the Chairman or by the Secretary for their personal use and the desktops are being used by the secretary for UP office works. Other equipment items such as the Multimedia Projector and Solar panel digital camera are not given to the UDC on the pretext of security reasons, either of

damage or theft. Overall, the available service equipment are in a good condition to provide services. The availability and functioning status of equipment will be more particular if the category 'Not present in the UDC' is merged with the 'Being used not for UDC' both of which, in fact, represent the non-existence of equipment for the purpose of UDC. Hence, it is more appropriate to consider them as one category as 'Non-existing' and then recode the values[53].

Based on their availability and working condition, with the additional considerations of time , functions, income potential and prices introduced as described in some of the literature (Harris 2007; ICTA 2010; Jensen & Walker 2001; Shadrach & Sharma 2013) these equipment items are classified into three types:

(a) 'Basic Equipment' consists of Desktop Computer, Laptop, Laser Printer and Internet Modem. They are basic in the sense that they were introduced at the beginning, and hence, are common in all UDCs. Most telecentres around the world commonly hold at least this minimum equipment.

(b) 'Picture Equipment' comprises of Digital Camera, Colour Printer and Scanner since they all help with photo services either simple photoshoot or sending the picture/video through internet. Besides, they are brought together as they provide the potential of extra income without incurring significant investment, as per the interview suggests.

(c) 'Advanced Equipment' consists of Multimedia Projector, Nebuliser, Photocopier, Solar Panel and Generator. They are considered advanced due to their higher purchasing cost, facilitation of advanced operations and potential for greater income and number of people visiting. Considering their cost as well as lack of competency from operators, they are not widely available across UDCs as these were introduced later and are ongoing.

These classifications are important since they help with assessing how far the stakeholders are involved in ensuring varieties of equipment are available, which has connotations for financial and social sustainability (Jensen & Walker 2001; UNDP 2007). Accordingly, composite means from each of these constructs are used in later test statistics such as correlation and regression models.

It emerges that UDCs are provided with a number of equipment items. However, the same cannot be said regarding adequate office space and furniture for each facility. The lack of adequate office space and furniture as reported in 38% and 63% of UDCs respectively (available in the Appendix table 2.8) are major obstacles to give service recipients comfort and ease during waiting and queuing. These findings are consistent with our field observations on 16 UDCs. The UDC locates itself in a small room (approximately 150 square feet.) of the UP which is not enough to be a centre of a host of services. Though officially it was instructed to allocate two rooms, only one room is

[53] Values are now recoded as Non-existing = 0, Out of Order = 1, Moderate Working Condition= 2, Good Working Condition = 3.

spared for it by the UP, in a majority of cases. After housing the equipment, there is hardly any space to accommodate the inadequate amount of furniture, to provide comfort for service recipients while waiting for service delivery. While finding another room for the UDC is not a problem for UDCs in newer UP complex buildings, if the UP intends so, it is not possible for UPs that are not yet housed in the newer buildings. Among 16 UPs, visited by the researcher, 8 do not have their own offices with adequate space and furniture. These UPs are running their offices in either dilapidated or officially declared as abandoned small structures. Similarly, other customer amenities such as drinking water and toilet facilities are very poor in both old and new buildings.

Internet facility- the route to e-services

The service equipment that is most available (Figure 5) in the UDC is the internet modem (around 94%). This also indicates the type of internet connection that prevails in the UDC. The percentage distribution (Appendix table 2.13) of types of internet connection shows that only 10% of UDCs have broadband connection while 90% of them rely on dial-up (22%) and mobile internet (68%) connection both of which are very slow, intermittent and prone to frequent breakdown. The average speed of these connections is found to be around 10 kbps in the field observations. The broadband connection here is mostly related to mobile broadband connection, as is also supported by nonexistence of wired broadband in our field UDCs, which provides a relatively better speed. Yet, it is still weak for video streaming or data sharing. However slow the internet speed might be, connectivity cost is dearer in Bangladesh, presumably due to limited growth of the market (Hasan 2015). It should be mentioned here that most entrepreneurs use lower quality internet access due to the higher cost as well as the reality that they do not provide many internet based services. Due to this fragility in connection it is almost impossible to provide many e-services, which entrepreneurs consider to be the number one operational challenge for the UDC (elaborated in the next chapter). Though internet cost is mostly borne by entrepreneurs, the infrastructure development for connectivity is regarded as the external support from the government.

Availability of equipment and maintenance of their good working condition, along with internet access, is necessary to provide information and services. Besides partnering with other private agencies for services, the government also have supplied some of its own services. The UP joined the basket of services with its certificates and office works while the entrepreneurs are adding their own ones. As the levels and range of services have been discussed in the previous chapter, this section will analyse the levels of demand, availability and the percentage of income provided by various services from the entrepreneur's point of view. The frequency of demand for services also validates the appropriateness of types of equipment introduced and the extent of their utilisation (Hudson 2001). The list of information/services here is slightly different from the Table 5 presented in the previous chapter since it also represents users other than individuals such as the UP, the nearby educational institutions or government offices.

Frequently demanded services and their supply

The most frequently requested services/information, as considered by entrepreneurs, is presented (ranked as per very often) in the Table 17.

Table 17: Percentage Distribution of Frequently asked services from the UDC

Services/Information (ranked)	Very Often n (%)	Quite Often n (%)	Seldom n (%)	Never n (%)
Certificates (birth/death/inheritance/citizenship)	382(71.0)	106(19.7)	28 (5.2)	22 (4.1)
Computer Compose	358(66.5)	128(23.8)	26 (4.8)	26 (4.8)
Photocopying	291(54.1)	88(16.4)	41 (7.6)	118 (21.9)
Email/Internet browsing	274(50.9)	153(28.4)	87(16.2)	24 (4.5)
Photoshoot	272(50.6)	122(22.7)	89(16.5)	55 (10.2)
Education Services (admission/registration/result check)	200(37.2)	142(26.4)	145(27.0)	51 (9.5)
Computer Training	193(35.9)	142(26.4)	114(21.2)	89 (16.5)
Passport	155(28.8)	109(20.3)	185(34.4)	89 (16.5)
Job search/application	146(27.1)	118(21.9)	177(32.9)	97(18.0)
Mobile Banking	130(24.2)	75(13.9)	136(25.3)	197(36.6)
Copy of Land Records	130(24.2)	77 (14.3)	122(22.7)	209(38.8)
Other Commercial Services (phone call/projector rent/songl load)	120(22.3)	83(15.4)	182(33.8)	153(28.4)
Electricity Bill Pay	117(21.7)	43(8.0)	35(6.5)	343(63.8)
Others	116(21.6)	68(12.6)	72(13.4)	282(52.4)
Information on Education/health/agriculture	91(16.9)	90(16.7)	240(44.6)	117(21.7)
Telemedicine	22 (4.1)	19(3.5)	101(18.8)	396(73.6)

According to the percentage distribution for frequently demanded services/information presented in the table: ‘Certificates’ appear to be the most frequently requested as it represents 71% in terms of ‘Very Often’ asked services and 90.7% in combination with the ‘Quite often’ category. Combining both ‘Very Often’ and ‘Quite often’ categories: the next popular services are Compose (90.3%); Email/Internet browsing (79.3%); Photo shoot (73.3%); Photocopying (70.5%); Education services (63.6%) and Computer training (62.3%). Higher percentages for both of these ‘Often’ categories for these types of services mean that they are commonly being offered from UDCs across the country. Yet distressingly, none of them are government services, except some education services. These services are supplied by the UP or introduced by entrepreneurs themselves using the relevant equipment.

On the other hand, combining both ‘Seldom’ and ‘Never’ categories the higher percentages are mostly for services that are actually government ones such as: telemedicine (92.4%); electricity bill pay (70.5%); copy of land records (62%); information on education health and agriculture (66.3%); mobile banking (61.9%). Some services such as passport application (50.9%) and job search

(50.9%) can be considered available half way between. The 'Others' (24% combining both 'Very often' and 'Quite often') represent a bunch of services such as video conferencing, data entry, visa check, laminating, mobile service and flexi load, ticket booking for air, scanning, computer servicing and troubleshooting, stamp vendor, screen print and art, cards for community events, digital poster and banner as specified by entrepreneurs in the open ended option.

The lower counts of these services, however, do not necessarily mean that they are less popular services. In fact, they are absent in many UDCs across the country which is also supported by the User Survey data from four districts (Chapter 5). These latter kinds of services are catalysed by A2I forging partnership with respective provider agencies which are still in progress to be offered from all UDCs.

The limited availability of e-government services is further supported by the percentage distribution of income from services/information.

Income generating services

The income generation potential of services can be understood from the Table 18.

Table 18: Mean Percent[54] of Income from services delivered ranked (descended).

Services/Information	N	Mean (SD)	Min-Max
Certificates (birth/death/inheritance/citizenship)	336	29.3 (21.4)	0-100.0
Commercial Services (compose/print/photocopy/email/projector rent/skype)	337	19.9(15.8)	0-80.0
Education Services (admission/registration/result check)	336	9.1(6.9)	0-.60.0
Computer Training	337	9.0(12.3)	0-90.0
Data Entry	337	7.9 (10.0)	0-100.0
UP office works	337	7.1 (9.1)	0-40.0
Other Services (passport, flexi load, photoshoot, laminating, computer servicing, job search)	335	4.7(8.3)	0-50.0
Information on Education/health/agriculture	337	4.5(8.5)	0-90.0
Mobile Banking	336	3.8(6.4)	0-50.0
Copy of Land Records	335	3.3(7.1)	0-50.0
Electricity Bill Pay	335	1.0(3.6)	0-50.0
Telemedicine	336	0.3(1.9)	0-20.0

Significant income for UDCs is generated from Certificates and Commercial Services (Table 18). Approximately, 30% of income comes from Certificates and around 20% income from Commercial

[54] The question was asked as what following percent of your income comes from services like… Then descriptive statistics are calculated on these percentages.

services (compose, print, photocopy, email, projector rent, skype). Together they provide half of all a UDC's income. The next half generates from other 10 types of services, however, not contributing any of them more than 10% of income individually. The higher ones among them are Education Services (9.1%), Computer Training (9.0%), Data Entry (7.9%) and Union Parishad Works (7%). The higher values of range and standard deviation for certain services indicate their spread across percent categories. In contrast, with lower Range and Standard Deviation values Telemedicine, for instance, could earn 20% of income at most for some UDCs. Thus, the average percent income from services with low mean and standard deviation values such as for education, health and agriculture information, mobile banking, land copy, electricity bill pay indicate their limited availability across UDCs. The lack of variety of services results in the underutilisation of equipment. From the field visit, it was found that equipment such as photocopier, scanner, multimedia projector and solar panel largely remained underutilised.

Consistent with the previous classifications (Chapter 5) these services, based on their frequency of demands and availability, are categorised and validated from the Entrepreneur Survey data using the EFA (presented in the Appendix table 2.24). Again, classifications are done seemingly for their association with the extent of stakeholders' involvement and subsequent effects on financial and social targets (Chapter 2). From the 16 items of 'frequently asked services' (Table 17) the EFA extracted two factors subjected to Principal Axis Factoring (PAF) and Varimax with Kaiser Normalization rotation. The Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy was .924, exceeding the recommended value of .6 (Kaiser 1970, 1974 cited in Pallant 2012) and the Barlett's Test of Sphericity (Barlett 1954 cited in Pallant, 2012) reached statistical significance, supporting the factorability of correlation matrix. The first factor consists of services that are predominantly commercial and private type. On the other hand, the second factor consists of services that are primarily e-government services. While the first factor accounts for 37% variance, the 2nd factor accounts for only 9% of variance which might have resulted from the limited availability of these e-government services across UDCs. However, two factors suggested by EFA[55] are slightly reorganised and validated using the Cronbach's alpha, considering also their sources, to create three types as presented in the Table 19.

[55] The original Factor analysis table is presented in the Appendix table 2.24

Table 19 Factor Analysis on the frequently demanded services and their reliability

Factor	Factor Items	Factor loadings	Cronbach's Alpha
E-government Services	Electricity bill pay	.681	.764
	Copy of land records	.636	
	Telemedicine	.518	
	Mobile banking	.494	
	Passport	.418	
	Information on education, health and agriculture	.373	
Local Government Services	Computer Compose	.708	.553[56]
	Photocopying	.399	
	Certificates (birth/death/inheritance/citizenship)	.374	
Commercial Services	Email/Internet browsing	.710	.773
	Education services (admission/registration/result check)	.653	
	Photoshoot	.624	
	Job search/application	.569	
	Computer Training	.508	
	Phone call, projector rent, song load	.488	
	Others (flexi load, data entry, laminating, mobile servicing, laminating, video conference)	.312	

(a) 'E-government services' that consist of 'electricity bill pay', 'land copy', 'telemedicine', 'mobile banking[57]' belong to factor 2 and are also supplied by the government. 'Passport' and information on education, health and agriculture do not strictly belong to any factor but they are also government services and hence all of them are considered e-government services.

(b) 'Local government services' consist of certificates, computer compose and photocopying. Though certificates fall under factor 1, which is more of a commercial type, it can be considered as a factor on its own for not belonging to either factors with strong loading. Similarly, although compose and photocopying fall under commercial type, as they can be availed by any one, they are arguably treated as local government services since greater portions of these services are availed by the UP for its office works or are ancillary to its services such as certificates, development works, allowance applications, as the interview findings suggest.

(c) 'Commercial Services' consist of the remaining kinds belonging to factor 1 and also shown in the above table.

[56] [56] The internal consistency of three constructs is assessed through using the Cronbach's alpha. Though alpha value for 'Local government service' construct is below the minimum threshold (.7), perhaps for fewer items, mean inter-item correlations are found to be within the optimal threshold (.2 to .4) (Pallant 2012, p. 6) and all constructs are found to be acceptably fit in our later measurement model using the SEM.

[57] Though mobile banking is provided with the help of private banks and alternative private agents, traditionally, in rural areas the banking service is offered by the public banks. Moreover, the service is made available in the UDC by the effort from A2I. Hence, it is considered as e-government service.

The composite means from each of these concepts, as constructed above, are used in correlation and regression models later.

Service supply from the local administration

The dearth of government services in the UDC was partly the result of their inadequate supply from the nearest government service units, the district and Upazila administrations. As the transformation to e-delivery is slowly progressing in these points they are yet to provide a great number of e-services themselves. The introduction of DESC and subsequently the NESS has enabled them to receive online applications. However, due to factors such as the inadequate levels of internal automation, coupled with the reluctance of officials, there has been very minimum e-delivery. Besides, faster internet connectivity still remains a challenge for them. Computers are intranet connected within the office but not with other offices in the district. However, official communication with other offices for notices is possible through both e-mail and SMS. Under NESS only a handful of Upazila administrations have undergone electronic transformations like that of the district until now.

Though there are as many as 37 services on the list, none of them are currently ready to be offered online from the DESC/NESS. A few districts have introduced the land copy to be provided online without actually developing the digitized land records. Hence, upon receiving the request, the record room officials do it all manually and then scan it to preserve for future use. Interviews with officials in 4 districts reveal that this process takes more time than in the past. The problem becomes more complicated when volumes of applications are received from various UDCs for action/processing. In Jessore the problem has been addressed by deploying additional staff in the record room. As a result, it has reduced the time of delivery, and because of initial online management such as generation of a tracking number and notification of the outcome through SMS, the influence of intermediaries and scope of corruption have significantly reduced. Also, UDCs in Jessore are able to collect land copies by applying and paying online. The district has developed an online payment system from locally developed software[58].

In another district, the system of providing land copy from the UDC collapsed after the first few days, due to resistance from Record Room staff with the support of the management. It was done in the pretext that delivery under the new system took more time, which meant the UDC entrepreneurs could not provide the land copy to clients within the promised time. This was partly

58 In Jessore the payment system, found at www.loadbill.com, enables entrepreneurs with an ID to pay court fees for land copy as well as buy credits for flexi load services. Entrepreneurs have to buy credits from the district administration beforehand which is then deposited in their accounts in the 'loadbill'. Once they send a service request online or provide mobile phone refilling to clients the associated cost is deducted from their account. They can see the balance to refill it in time. There are reports that some other districts facilitate or are attempting to facilitate payments with mobile financial service providers such as BIKASH, Dutch-Bangla bank and Teletalk. Electricity bill posting is done in a similar way accessing the website developed by the Rural Electrification Board (REB). But there is no secure online payment system for that. In districts, where the service is available, the payment is made either manually after collecting the money from clients or through the available mobile provider. In Jessore the Deputy Commissioner takes the role of a guarantor on behalf of entrepreneurs in case of non-payment by any of them.

because, in the absence of an online payment system, the UDC entrepreneurs had to visit the Deputy Commissioner's office to submit paper documents for validating online applications and to affix court fees. Their roles, as it appears, have replaced the roles of traditional intermediaries. However, this new role enormously threatened the vested interest of local bureaucrats that age-old intermediaries had been serving. Consequently, non-cooperation from the local bureaucracy, by taking prolonged time in delivery to the UDC, resulted in people's lack of confidence on the new system and meant entrepreneurs were reluctant to offer this service. In two other districts, the system of offering land copy through UDCs has not been yet developed. However, all districts are undergoing record digitization to provide the service in the near future.

During the field visit a few Upazilas were trialling e-service centres which had been introduced since 2011. Among 8 Upazilas two such are Jessore Sadar and Bagarpara in Jessore district. Like DESC it is also a one-stop centre that accepts applications from citizens for various services from the UNO office. It is possible to apply from a UDC, as it is from anywhere, to receive services from the Upazila but no evidence was found (by checking the dashboard) that entrepreneurs did so. Even Upazila offices correspond with Unions through letter communication through postal/peon service without any email exchange. Importantly, the Upazila e-service system is not connected with the UDC intranet and there is no list of Upazila level government services available in the UDC. However, the name of officials, hierarchy, services of various offices can be known from Upazila portals developed under the national web portal accessing from the UDC.

Service supply from other partners

The A2I has partnered with other public and private agencies to provide additional services from the UDC (as also discussed in the chapter 4 and 5). Then again their engagement and supports have not been felt significantly in our field area as they are yet to cover all UDCs. This is also supported by our findings (Table 17) as we have seen that many UDCs suffer from a dearth of services. For instance, the government has forged partnership with five 5 banks to provide mobile financial services all across the country but up to now about 700 UDCs are able to provide the service. Similarly, the contract with the Technical Education Board (TEB) enables entrepreneurs to have computer trainees assessed by it and to provide government certificates to them but only a handful of UDCs (about 500) are affiliated with it. Some UDCs (about 400) are affiliated with Jibam Bima Corporation (Life Insurance Company of Bangladesh Government) for opening an account and then depositing the premium from the Union. 727 of them provide electricity bill facilitated by REB(Prothom_Alo 2014).

There are approximately 700 UDCs that provide sim card selling and mobile refill in partnership with *Robi* and *Banglalink*. Only a few entrepreneurs provide a data entry service in partnership with Bangladesh Statistical Bureau (usually for census and different surveys). Apparently, this service not only boosts earning for the entrepreneur, it also helps him/her to be acquainted with the

customer base. Telemedicine was piloted in about 30 UDCs in partnership with the Director General of Health Services (DGHS). Though the government has forged partnership with the Ministry of Agriculture to provide consultation services from agriculture officials, very few UDCs are actually offering the service on the ground. Similarly, the partnership with the British Council to spread English Literacy has very minimum users across the country. A partnership contract with the UNESCO is underway to introduce non-formal education from the UDC. It appears that though the government could identify some of the important stakeholders from external service providers it is still struggling to engage them in full swing.

Training and technical support

The A2I, the BCC, the LGD, the District and the Upazila administrations provide training and technical supports. Currently, though A2I provides some direct training for supervisory officials on providing backend support to the UDC, for entrepreneur's training it relies on the BCC, the district and Upazila administrations. All of the entrepreneurs in this study have received at least basic computer training for 10 days conducted by the BCC Assistant Programmer and the District Administration, along with their attendance in other orientations and workshops. Some have received additional trainings for shorter periods that covered basic computer skill, online freelancing work, service related trainings such as how to open a life insurance policy, or apply for overseas jobs, or for online passport application. The specialised trainings are provided with the help of respective agencies or outsourced to a body engaged by the A2I.[59] Sometime the UNO arranges some short time training on computer operation and UDC management.

Entrepreneurs found these training courses to be effective and some, such as the course on earning online through freelancing, led to an increase in income. However, most of these trainings are taking place at the district level. Thus, in districts with greater number of UDCs, entrepreneurs tend to have limited access to training courses since they have to compete with other entrepreneurs in the same district for places. During its 'Basic Office Management' training NILG acquaints UP secretaries with how to coordinate with entrepreneurs and the mission of 'Digital Bangladesh'. It also arranges a training/workshop/orientation programme for UP representatives and secretaries together on UDC matters. These agencies also arrange motivational workshops for people's representatives, government officials and social and political elites. All of the UP Chairmen in this study and some members have attended such orientations. But, there is no training for the broader population.

Although the government has made a contract with the TEB for technical and troubleshooting support, entrepreneurs do not usually go there due to the distance and their perceptions that service will be slow as it is a government agency. Entrepreneurs prefer repair works done at their

59 For instance, the Pally Biddut Samity (Rural Electrification Board) acquainted them with their software to provide electricity bills. Dutch-Bangla Bank provided training on how to do mobile banking in the rural area. Jiban Bima (Life Insurance Company) trained them how to open life insurance policy from the UDC . UDCs in 29 districts have arrangements for giving services of Jiban Bima facilitated and trained by A2I with a scope for further expansion.

own expense from nearby private maintenance shops. In some cases they get financial help from the UP. Assistant Programmers of BCC from the DC Office also provide help such as in troubleshooting, software maintenance and installation, password reset, internet use, daily report upload, access to blog, USB port installation or how to install CD ROM. They can also provide instructions on how to use e-mail, skype, data sheet and presentation of slides (BCC 2014).

Performance monitoring and evaluation

To monitor the progress of UDC operations across the country an online monitoring tool, known as UAMS, has been created by the A2I (http.//www.e.service.gov.bd/uams/). Entrepreneurs are required to upload the report on the daily income from services/information delivery and the number of people that have visited them. It is an accounting and management tool for the entrepreneur, as he/she does not need to write the accounts of everyday transactions manually. UDCs across the country can be monitored by looking at the synchronised uploaded reports generated from the system. The A2I, the Cabinet Division, the LGD and the Deputy Commissioner (DC) in the district have access to synchronised reports to see the progress. Best performers in the field are awarded annually in national and district levels on categories such as management officials, local representatives and entrepreneurs.

Another important online platform to assess the performance is the UDC blog participated in by as many as 14000 members including entrepreneurs, management officials, secretaries and ministers. The blog serves three vital causes: (a) interrelationships and interactions with fellow entrepreneurs, (b) exchange with administration and (c) sharing problems and innovative ideas. Nearly 70% of technical problems are solved through the blog along with troubleshooting and administrative problems. Solutions come from fellow colleagues and monitoring officials. Meeting on UDC matters, Digital fair or other promotion campaigns are also called through the blog[60] (Interview with A2I official, 2013). Entrepreneurs report their monthly income against number of people they served to the UNO. Field visits and inspections by local administration are also in vogue.

Cooperation from the UP

For most of the UDCs the UP provides office space and the utility bills. Only two UDCs are placed outside the UP premise in shops rented by entrepreneurs. In some cases the UP provides the internet connection fees as well as repair or replacement of equipment. Two UPs also pay some money for keeping the entrepreneurs in the job because their earnings are very low to sustain. UP assistance is heavier where the UDC earning is weaker. Although, the contract allows UP to claim

[60] The blog has now become one of the strong mediums of online performance management. The blog shows the top 5 income earner UDCs in each division every day, top 20 countrywide, in terms of income and number of requests delivered last day, last week and last month. The blog also guides as how to upload report, get troubleshooting assistance, access to information hub, get training materials and seek consultations. Links to other government service websites, mobile numbers of Upazila health complex doctors and all government forms facilitate quick access to information and services.

25% of UDC income after initial 3 years, if it thinks appropriate, not one UP in the field indicated they intended to do this. Despite such levels of assistance, there are reported hostilities between the UP chairman and or secretary and the entrepreneur. The conflict arises between them because neither party are aware of each other's charter of duties and responsibilities. One management official (Interviewee no. 23, 2013) describes the problem:

> "The problem is income of entrepreneurs. When the entrepreneur did not have adequate income the UP supported him/her with the payment of the internet connection fee, the electricity bill, even his daily earnings, and above all purchased major equipment of the UDC. Now the income has increased in many UDCs, but still some entrepreneurs are reluctant to bear these costs or invest further. Alongside, some UP chairman and Secretaries also consider that they should have a portion of the increased income".

Besides, as major UP office works are done through the UDC, entrepreneurs usually claim payment for that. Some UPs do not want to pay since they consider that the entrepreneur is earning using the UP equipment. So he/she must compensate – one way of that is doing UP works for free. Consequently, there are tensions around the environment. Similarly, the secretaries have long been enjoying the single authority of a government official in the UP. However, now some of their work jurisdictions are intruded by the entrepreneur and hence the potential source of extra income and power has been dwindled. Moreover, as entrepreneurs enjoy prominent attention of the government and a proximity to the local administration, secretaries are finding their long held dominance being diminished. At this stage because of support from the administration to the entrepreneurs as well as for the early enthusiasm surrounding the project they can manage it to survive. Similarly, there are reports that some UP representatives do not understand the model. A few UP representatives captured the equipment, especially the laptop, for their personal use as discussed earlier. Since in most cases the appointment of entrepreneurs is made based on the personal choice of the Chairman, their position is at stake when the chairman's tenure is over. Also, there evolve personal and political enmities over time. These problems are often resolved through initiatives from the District and Upazila administrations. This arbitration along with oversight and mass mobilisation could have come from the UDC management committees, but these did not exist in any UPs. The entrepreneurs, however, sometimes remain present in the UP monthly meeting and report about their progress and problems.

In the field UDCs, representatives of the UP, in most cases, have taken the UDC concept somewhat positively and are willing to cooperate. Especially, their roles for mass mobilisation are significant. They remain present or deliver motivational speeches during an entrepreneur's video display at various locations of the UP on UDC services. However, many entrepreneurs do not take this display initiative and hence miss out the advantage of interface with people. Low income entrepreneurs have a sense of being subordinate to the UP secretary and or Chairman. Some members also take the advantage of an entrepreneur's weak position and force them to work free for their relatives or friends. In some cases there is frustration and low motivation of entrepreneurs

where the animosity is high and their position is at stake. The relationship is further elaborated as a challenge in the next chapter.

Regardless of personal or political confrontations, entrepreneurs have to rely on the UP for logistic, service and security purposes. The UDC is guarded at night by the village police of the UP who also help with queuing and guiding people to sitting, waiting, drinking water or finding the toilet. At times, they are paid tips for their service by the entrepreneur. All of the UP representatives studied consider the UDC is very good for its potential to provide local and accessible services. Some UP chairman perceive UDCs' good performance as a matter of reputation and prestige for them. If people have to go another Union for services this will surely affect their image and credibility.

> "Initially, we decided to employ some competent entrepreneurs but the UP Chairmen did not agree. When their selected entrepreneurs could not help people with 'the Malaysian registration', for example, they had to embrace public criticisms. People in some areas had to go adjacent Unions to complete their online registration. Now some of these chairmen realise that the competency of entrepreneurs has a value to keep their own reputation and popularity unaffected." (Management Official Interviewee no 22, 2013)

However, currently there are no clear guidelines as to how to handle the performance appraisal of UP representatives. The existing guidelines outline some of the duties of UP representatives but do not outline what to do if these guidelines are not followed. And importantly, these guidelines are not incorporated to the 'UP Operational Manual', the main policy guidebook for its activities. The manual only mentions about the options for spending for the UDC, without any issues of performance appraisal or awarding the good performer or punishing the bad ones.

In this section we have identified the external support from government and the UP. We have seen supports from these partners are vital for UDC survival and growth in terms of equipment and services, visits by people, income and entrepreneur's longer stay which have been further elaborated in the discussion of other stakeholder's involvement.

Entrepreneur's involvement

Entrepreneur's involvement is discussed in terms of his/her gender and education, computer competency, recruitment, contract, investment, income and satisfaction.

Entrepreneur's gender and education

Ideally, there should be both a female and a male entrepreneur in each UDC. Among 538 participants surveyed online 90.4% are male while only 9.6% are female entrepreneurs. This low level of participation by females is consistent with their unavailability as found during visits to 16 UDCs. There are no female entrepreneurs in 6 of them and in other 10 UDCs they are part-time and therefore not prominent or regular in the office. The interview with management officials and UP representatives suggests that, in general, computer trained and willing-to-serve entrepreneurs are hard to be found for employment in rural areas. Even when recruited, females quit the job

quicker than their male counterparts do, due to being less skilled in computer work, lack of income, getting married and better job opportunity.

Within each of 7 administrative divisions, compared to male counterparts, female representation is higher for *Barishal* (21.6%) and *Rajshahi* (15.7%) and no more than two have participated from Khulna Division. Across divisions their participation is the highest for Dhaka division (28.3%) and lowest for Sylhet Division (6.4%). In between them are Chittagong (19.1%), Rangpur (15%), Rajshahi (13.3%), Khulna (10.9%) and Barishal (6.9%). However, for both genders, entrepreneurs participation is approximately proportionate to the number of districts and hence the number of UDCs each administrative division represents. Dhaka Division has the highest number of districts (17) followed by Chittagong (11), Khulna (10), Rajshahi (8), Rangpur (8), Barishal (6) and Sylhet divisions (4) (BBS 2014).

Interviews with female entrepreneurs suggest that they feel discouraged when they perceive that there is no permanency and they have to share income with their male counterparts often disproportionately if they are less skilled or for other reasons. The UDC has not created any friendly office environments for them yet. Also, the cultural practice such as the *pardah* (veil) system discourages females to work in customer service in a rural setting. Yet, one thing that is encouraging is that the female entrepreneurs have to deal with women users whose participation has increased recently due to the UDC (Chapter 5).

All entrepreneurs interviewed (N = 19) in the field area belong to the age range of 21 to 40 and 10 of them are in age group of 21-25 which means that the UDC has created a job opportunity for potentially young people. Four (4) have an education level of Secondary School Certificate (SSC) and 11 have passed Higher Secondary Certificate (HSC) and 4 have been awarded with graduate certificates. Regarding their past occupations 2 were part time teachers, 1 small businessman, 5 had the experience of working as computer operator/ entrepreneur, 1 NGO worker, 1 voluntary social worker and 9 started fresh employment, among whom 8 students who were continuing their study alongside UDC business. It appears that the UDC has employed people who were previously mostly unemployed or partially employed.

Computer competency

The entrepreneur's computer competency is presented in the Table 20.

Table 20: Highest Computer Competency

Computer Competency	Male n(%)	Female n(%)	Total n(%)
No formal training	29(6.5)	5(9.8)	34(6.8)
Less than 3 months training	40(8.9)	10(19.6)	50(10.0)
Less than 6 months training	64(14.3)	10(19.6)	74(14.8)
6 months and above training	257(57.2)	26(51.0)	283(56.6)
Diploma	39(8.7)	0(0.0)	39(7.8)
Bachelor	20(4.5)	0(0.0)	20(4.0)

It is worthwhile to note that nearly half of the female entrepreneurs (49%) have computer training of less than 6 months. The remaining 51% have training of 6 months and above. Remarkably, no female has higher level qualifications such as Diploma or Bachelor in computer studies. Females' low levels of computer competency have implications for their low income as the interviews suggest. For both genders, the majority of entrepreneurs (56.6%) have trainings such as of 6 months and above. Only a few have higher level trainings such as Diploma (7.8%) and Bachelor (4%). 6.8% are running the UDC without any formal training. In the open ended option of the Entrepreneur survey questionnaire some of them have responded that they have become acquainted with the computer after their employment in the UDC. Some also mention that they have received training from the local administration in addition to previous trainings and their job in the UDC is improving their computer skills. Female entrepreneurs who are less efficient in computer operations can get training from their male colleagues.

The question is whether the proportion of entrepreneurs having computer competencies differs significantly across gender distribution for the entire population of entrepreneurs. This is determined through using test statistic, the Chi-Square Test of Independence (not shown here) after dichotomising the variable computer competency into 'Less than 6 months' and '6 months and above'[61]. The χ^2 value 7.97 is significant beyond p=0.05 level. The relevant effect size 'Cramer's V' is found to be .126, which is a small effect. The gender effects will be discussed further in other components of entrepreneurship.

Recruitment

Although there are guidelines for recruiting entrepreneurs (outlined in the 4th chapter) for most cases these were not followed. Entrepreneurs are mostly recruited by the proposal from the UP chairman, often in consultation with the UP secretary, by the UNO. Interviews with management officials suggest that there are a number of reasons for that:

1. First, rigorous recruitment policy is relaxed since skilled candidates are not sufficiently available in rural areas. Even if available they are not attracted to the position as it lacks

[61] The variable computer competency is dichotomised since there are no counts for women for levels such as Diploma and Bachelor and duration of these courses are also 6 months and above.

adequate guarantee of job and pay. The resignation of a few qualified youths who obtained better jobs after the employment in a field UDC also defends this statement. Hence, a preference is given to those who are willing to serve and have eagerness to earn from their own work. Since the target is to develop entrepreneurship, candidates who are less competent are also welcome since they can grow their skills over time using the facility at the UDC.

2. Second, this recruitment has to be done impartially by the UNO by selecting candidates based on their skills and competency. However, this is often compromised due to persuasion from the Chairman who wants his chosen person to be employed. If the UNO enforces their decision, the recruit may have to face adversarial circumstances in the UDC.
3. Finally, the permanency of the job or the long term contract is avoided as stated by the ICT Division secretary (2013):

> "We do not provide any permanent appointment since under the terms and conditions of appointment it is hard to fire any person on grounds of corruption, inefficiency, misconduct, negligence or any other reasons. The person can use the existing legal loopholes to stay in the job without performance. There are problems and we solve them through reconciliatory process by local UNO, ADC and DC and our officials from the project".

Contract

One of the primary causes of drop out is the conflict with the UP chairman and secretary as indicated in the interviews and review of the UDC blog posts. Many entrepreneurs also consider it as one of the main threats to the sustainability of the UDC. The sources of conflict range from entrepreneur's income sharing with UP chairman and secretary to doing UP works without remuneration along with other enmities, as discussed earlier. The problem gets compounded by lack of understanding of the roles and responsibilities of each party. To address such problems the LGD has issued a circular to the UP to execute a contract that enforces the specific duties of both parties and a short term permanency of entrepreneurs for 3 years, during which they cannot be removed without mediation from the local administration (LGD 2010). This is considered to be an important initiative as it will be legally binding and not only safeguard the interests of both parties but also serve as the basis of the partnership. It outlines, for example, areas of cooperation from the UP as well as the entrepreneur's involvement in terms of investment and operations. However, a large percentage of entrepreneurs (42.9%) are yet to have any contract, among them 56.9% are female. Again females lag behind in enforcing a contract as the frequency distribution between gender and contract (not shown here) suggests the gender difference is significantly associated[62] with contract with the UP.

[62] The Chi-square Test of Independence between gender and contract with the UP calculated are found to be $\chi^2 = 4.47$ (Pearson Chi-Square); $p<0.05$ (asymptotic), Cramer's V=0.09; a small effect.

Investment

While the government and the UP have invested, as we have seen, in the availability of basic equipment across UDCs, the supply of services and the training they provide, the private investment from entrepreneurs appears to be in short supply. However, this investment excludes the day to day operational cost and includes business investment such as for equipment purchase or maintenance. Figure 6 depicts the levels of investment by entrepreneurs.

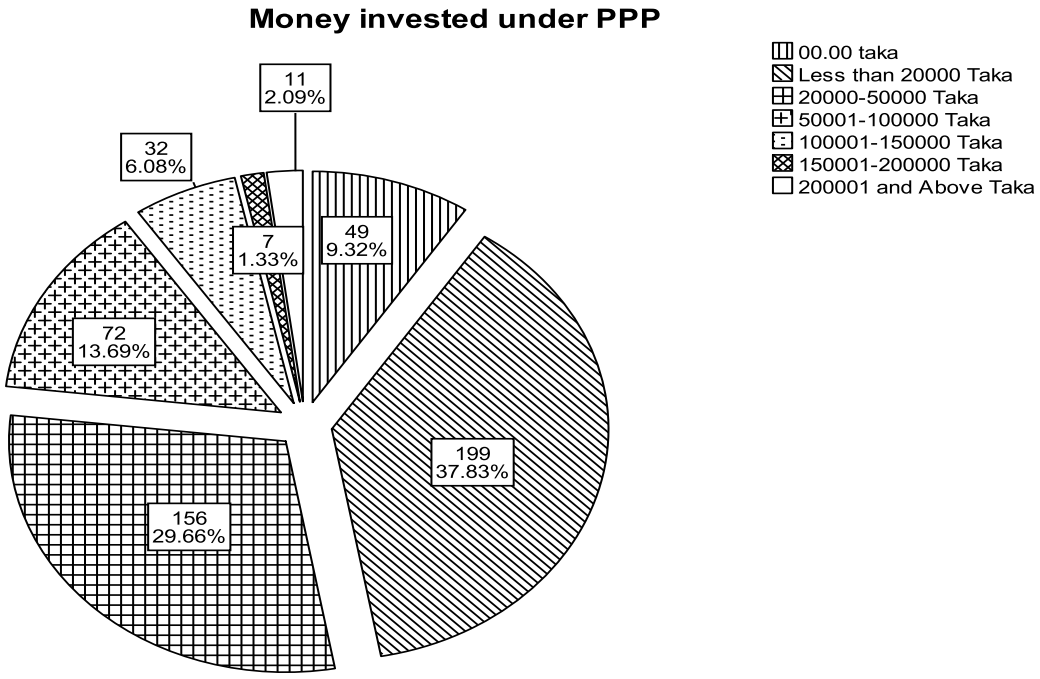

Figure 6: Percentage of Entrepreneurs invested money under PPP in Taka

9.3% entrepreneurs have invested nothing in the UDC (Figure 6). Although the UDC have then been operating for about 4 years, more than one third of them (37.8%) contributed to only an investment less than 20000 Bangladeshi Taka (BDT). 29.7% have invested 20000-50000. With investment categories increasing, the percentages of entrepreneurs are dropping as can be seen from category 50001-100000 (13.7%) and onward. When cumulated, 90.5% could not make any investment beyond the last limit of this category, 100,000 BDT. Only 9.5% have made an investment beyond that category onward that is 100001 to 150000 (6.1%), 150001 to 200000 (1.3%) and 2.1% for the investment category of 200001 and above. 77% could not reach the minimum threshold of investment, 50000 (USD 650) BDT set by the contract requirement. We have observed that entrepreneurs who invest a higher amount of money expanded equipment, rented separate shops to provide trainings, and purchased high quality internets. A number of

variables described earlier are associated with the investment. Computer competency is correlated with it which is expressed as Spearman rho[63]= .141; p<.05. Female entrepreneurs tend to invest less as the frequency distribution gender versus investment (not shown here) suggests and the gender difference is significantly associated[64] with amount of investment. Also, there is a significant association[65] between contract with the UP and entrepreneurial investment. Investment is primarily targeted to increase income.

Monthly income

An entrepreneurs' monthly income is a crucial determinant of financial sustainability. The percentage distribution of average monthly income of entrepreneurs is presented through the Figure 7.

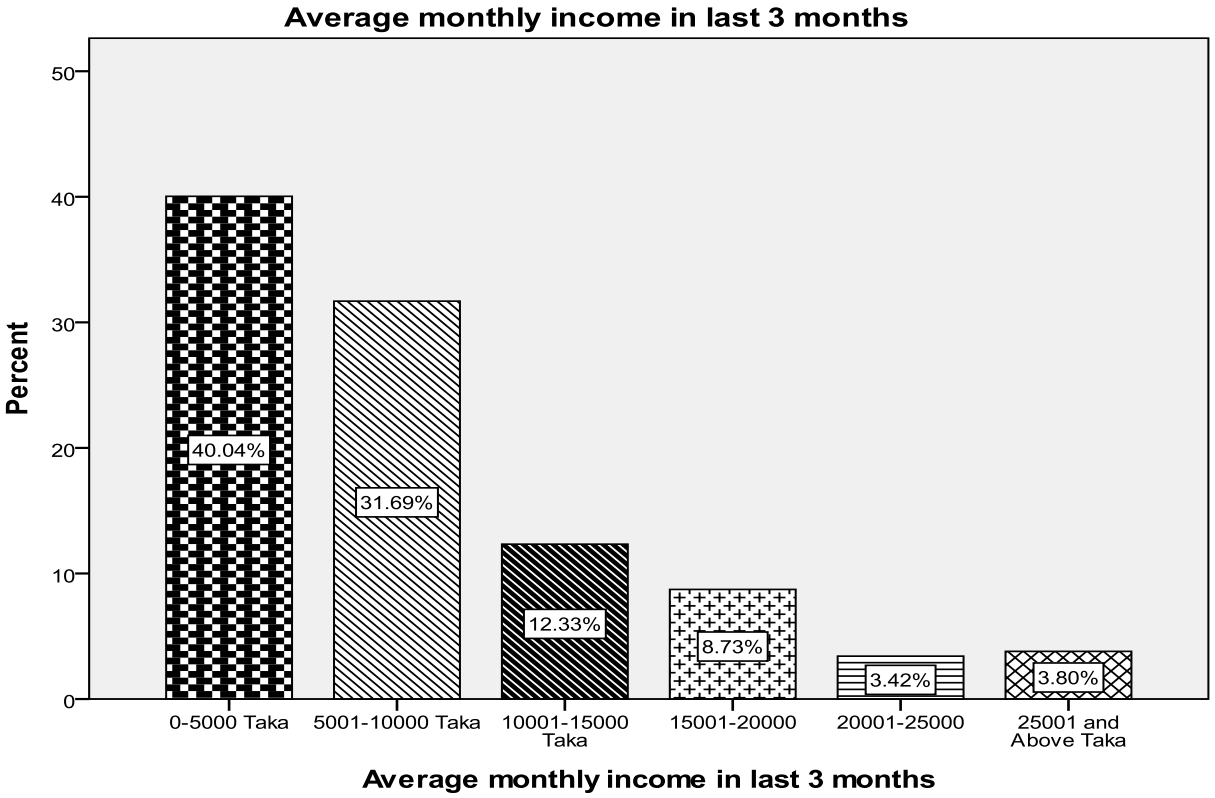

Figure 7: Percentage Distribution of Average Monthly income in Taka.

The percentage distribution shows that 40% of entrepreneurs have a monthly income of 5000 or less BDT (equivalent to 65 USD or less) after incurring operating costs[66]. Compared to the monthly

[63] Considering both Computer competency and money invested under PPP as continuous variables since in both cases the value increasing mean the consistent lift toward higher categories Testing the normality assumptions of both variables it was found that in both cases data are not quite normal and hence it is decided to use the rank correlation or Spearman's rho. Other assumptions of Spearman's rho are checked and found correct.

[64] The Chi-square Test of Independence between gender and money invested under PPP is calculated and found to be χ^2 = 15.49 (Fisher's Exact test); p<0.05, Cramer's V=0.173; a small effect.

[65] The Chi-square Test of Independence between contract with UP and money invested under PPP calculated is found to be χ^2 = 15.25 (Fisher's Exact test); p<0.05, Cramer's V=0.172; a small effect.

[66]From our interview with entrepreneurs it was found that internet connection fee accounts for the highest amount of operating cost (M = 525 BDT; N = 16), followed by costs for paper and printing, equipment maintenance electricity bill

salary of UP Secretaries[67], ranging from 5200 to 11235 BDT (LGD 2014), this income is lower. However, nearly one third of them (32%) can really race with the UP Secretary with an income that ranges from 5001 to 10000 while 28% combined actually surpass that upper limit of the category by having an income of 10001 to 25000 and above where 3.80% have a substantial income of 25001 and above. The chart demonstrates that even with a rising income category, the proportion of entrepreneurs is in fact decreasing. This implies that higher income remains a challenge. Low income is one of the prominent reasons of low retention of operators and will be discussed in the next chapter in more detail. A review of the consolidated monthly report of *Comilla* district for 3 months (January to March 2013) shows that for 184 UDCs, on average each of them earns around 11000 BDT per month which has to be shared between two entrepreneurs, if both are working (Monthly UDC Report, Comilla, 2013).

The UDC has a contribution of direct employment creation and gives rural youths an avenue for entrepreneurship development. The difference in monthly income of entrepreneurs (13 male and 10 female) in 16 UDCs before and after the UDC supports this assumption. For 13 males before joining the UDC, the range of income was 0-20000 BDT and the *Mode* = 0 since 6 did not have any income beforehand and the median = 2000. However, after joining the UDC their income rose to a median of 10000 in a range of income from 3000 to 60000. Two of them earn as much as 30000 while one of them has an income of 60000 each month. The median difference between before joining the UDC and after it is 8000. For 10 female before joining the UDC the modal income was 0 as only two of them used to earn 1500 and 5000 BDT respectively. Yet after joining the UDC their median income increased to 3000. One woman has a significant income of 30000. According to the project officials the monthly income range of 1000 to 1200 UDCs is between 10000 to 60000 BDT. Collectively, all entrepreneurs earn a total income of 5.5 crore BDT a month.

Compared to their male counterparts, female's income is lower. The problem is more keenly felt in UDCs that have an overall low income. When one entrepreneur's work is enough to serve the customers, the woman entrepreneur frequently becomes either a part-time or ad hoc worker so as to give space to her male counterpart who usually possesses more accomplished computer skills. Moreover, there are problems of female's dealings with males, lower education, cultural constraints and marriage issues. In Bangladesh, once they are married women in many cases move in with their husbands and are encouraged to stay home and sacrifice their own jobs and careers. As a result, the level of females dropping out of the UDC tends to be higher.

This 'income' is associated with a number of other variables we have discussed earlier such as types of equipment, internet connection type, services, contract and investment, which is presented beneath.

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pay in some cases, and miscellaneous expenses. Though in some cases the UP assists for operating costs, in most cases it is borne by entrepreneurs.

[67] UP secretaries are permanent government employees who enjoy salaries according to National Pay Scale.

The equipment categories, as established earlier, are correlated with the monthly income as presented in the Figure 8.

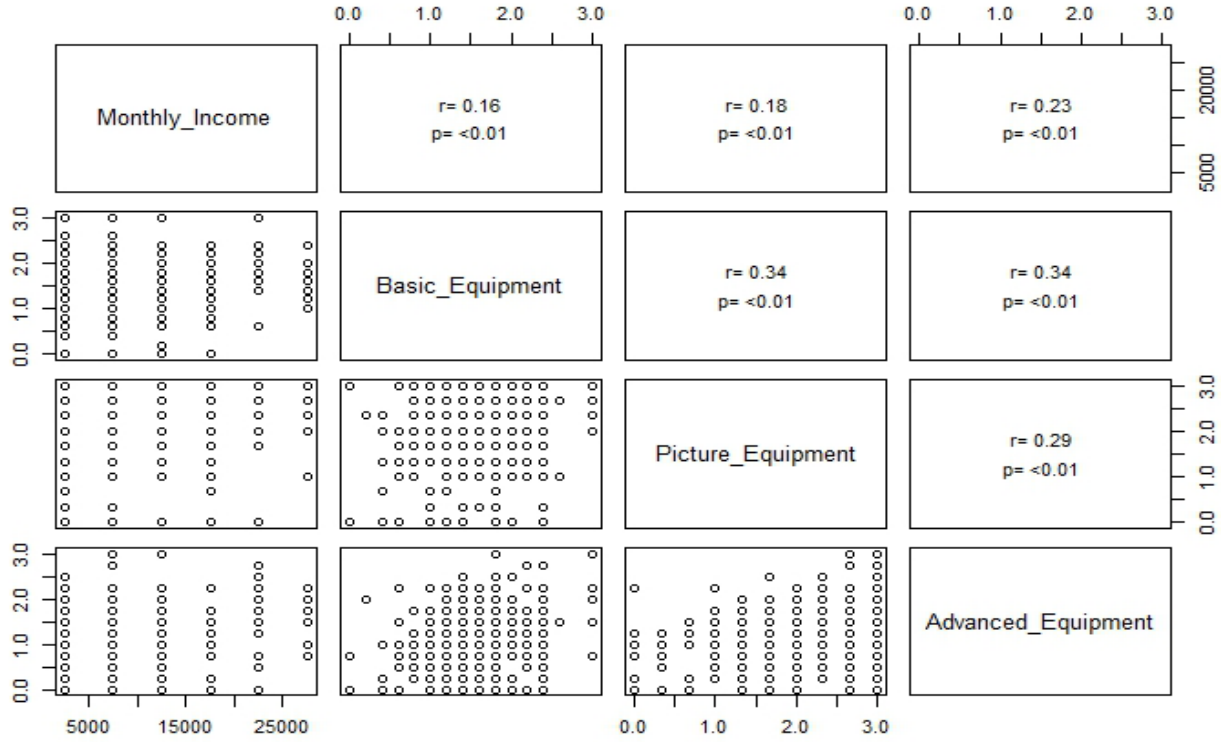


Figure 8: Correlation coefficients[68] with scatterplots between categories of equipment and monthly income.

It is evident from the above figure that the picture equipment is correlated with income with higher effects followed by advanced equipment and basic ones.

The literature suggests that broadband has an impact on the quicker delivery and thus earning capacity of the operators (UN 2012). Whether or not this happens with the entrepreneurs studied was explored. Cross tabbed with the monthly average income the resulting frequency distribution of internet connection type is presented in the Table 21.

[68] The correlation coefficient Pearson '*r*' is used to see the strength of the relationship. Categorical variables such as income, investment and people's participation along with the composite variables are treated as continuous (as discussed in the Methodology) and midpoints of categories are used to calculate the correlation. Other assumptions of Pearson *r* are checked and found to be correct (Gray & Kinnear 2012).

Table 21: Cross tabulation of Internet Connection Type with Monthly average income.

Average monthly income (in BDT)	Internet Connection Type		
	Dial-up or Mobile n(%)	Broadband n(%)	P Value based on Chi-square
0-5000	175 (41.6)	12 (25.5)	$\chi^2 = 10.80$; $p<0.05$ (Fisher's Exact Test); Cramer's V = .165
5001-10000	128 (30.4)	18 (38.3)	
10001-15000	53 (12.6)	6 (12.8)	
15001-20000	35 (8.3)	4 (8.5)	
20001-25000	16 (3.8)	1 (2.1)	
25001 and Above	14 (3.3)	6 (12.8)	
Total	421 (100.0)	47 (100.0)	

It can be observed from the Table 21 that percentages are higher for broadband as the income categories progress. The question is whether or not these proportions of broadband users are independent of income categories or if they have an association with them. The Chi-Square Test of Independence calculated and is found to be significant (Table 21). The effect size, 'Cramer's V' = .165, a smaller than typical effect.

Usually, entrepreneurs with high incomes provide a greater number of services by demonstrating entrepreneurial skills in bringing services from outside such as nearby schools or other private bodies. They also negotiate with the local administration for additional services from public and private institutions. There is a correlation found between categories of services (Table 19) with monthly income as presented in the Figure 9.

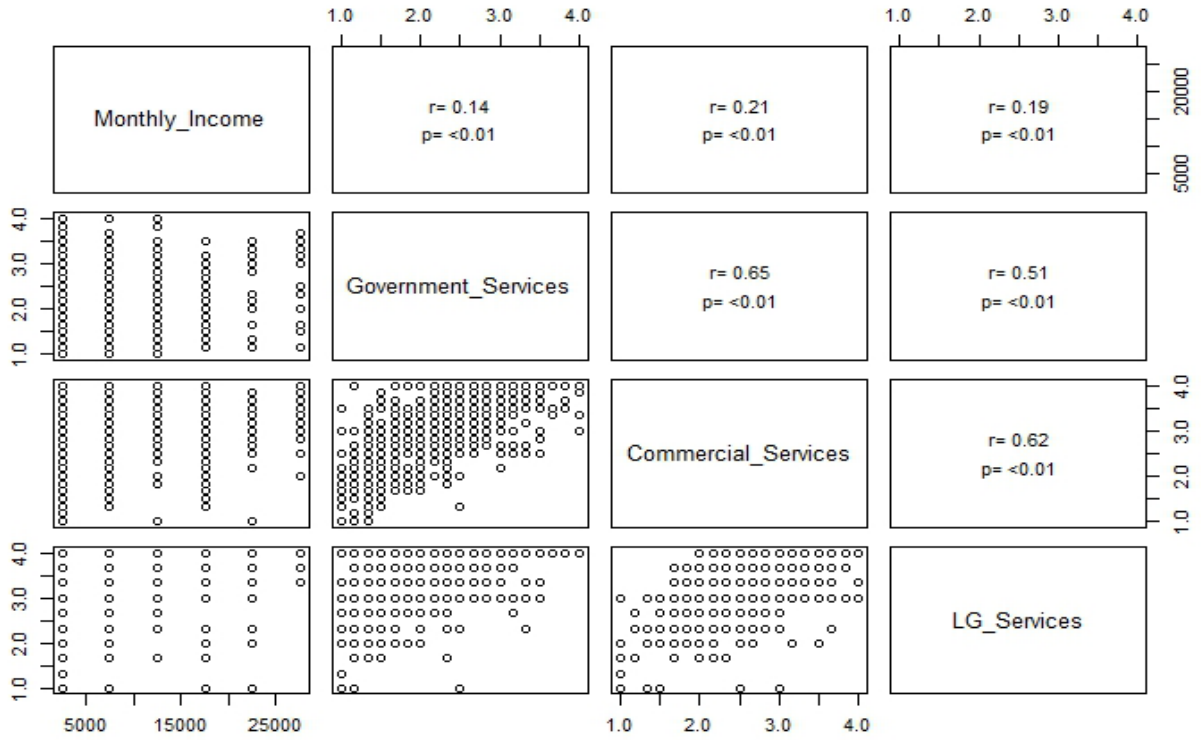


Figure 9: Correlation coefficients with scatterplots between categories of services with monthly income.

Local government services appear to be correlated with entrepreneur's monthly income with higher effect followed by commercial and government services.

The percentage distribution (not shown here) demonstrates that monthly income is higher for entrepreneurs having a contract with the UP. To examine the difference for population proportion the Chi-Square Test of Independence is calculated and found to be 11.406 which is significant: $\chi^2 = 11.41$; $p<0.05$, Cramer's V=0.148; a small effect. Thus, there is a significant association between the execution of a contract with the UP and the increase in an entrepreneur's income.

This income, which is so vital for the sustenance of UDCs and it growth, is also correlated with the money investment by the entrepreneurs and people's participation (discussed later). The nature and strength of relationship between them by using the correlation coefficient is presented in the Figure 10.

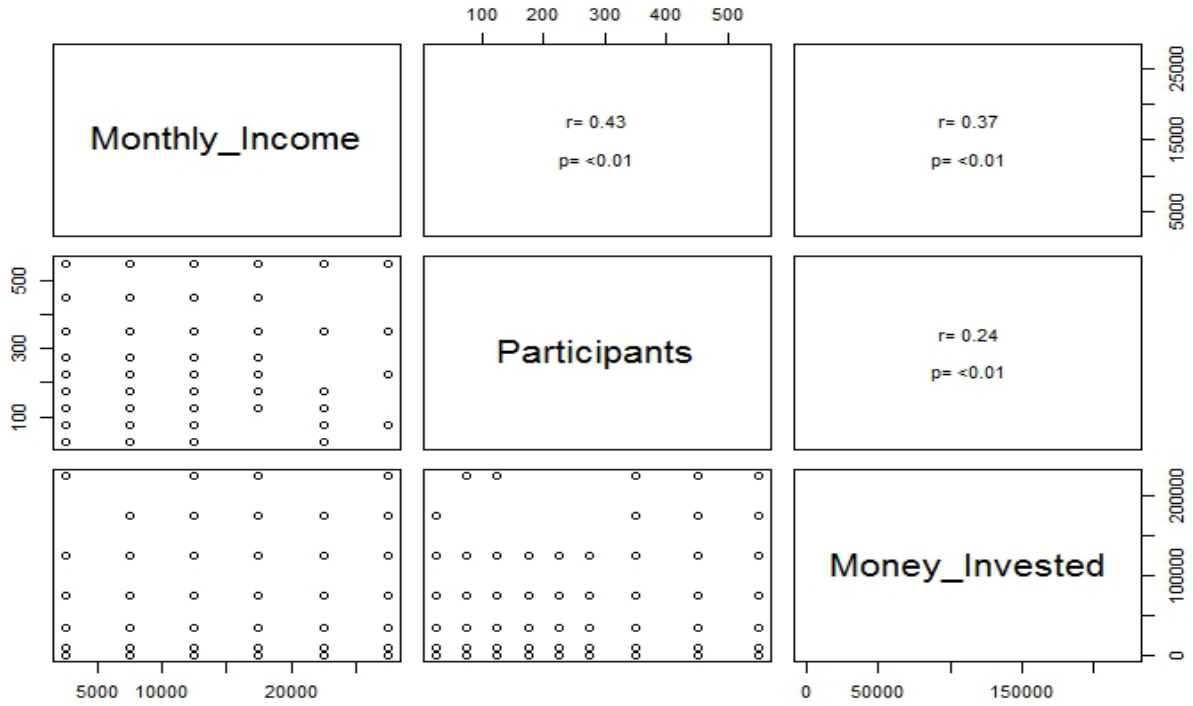


Figure 10: Correlation coefficients with scatterplots between monthly income, people's participation and investment.

The correlation between income and investment is found to be positive expressed as r = .37; p < .01; a medium effect. However, this correlation is moderated by another variable, the internet connection type. The association is examined between these two variables after splitting the data by internet connection type. For Dial-up or Mobile internet: r (417)= .326; p < .01; a medium effect. For Broadband: r (47) = .618; p < .01; a large effect. It is evident that that when moderated by broadband the correlation between these two variables is higher. This association can be interpreted in a way that those who have greater investment tend to earn more from the UDC. Those with broadband internet connection tend to have more earnings associated with greater investment.

Entrepreneur's satisfaction

Entrepreneur's satisfaction is a very important element to keep him/her in the business. Entrepreneur's satisfaction on certain issues such as income, people's participation, cooperation from UP and Local administration is asked in a rating scale of 5. The descriptive is presented in the Table 22.

Table 22: Percentage Distribution and Descriptive of Entrepreneur's Satisfaction

Variables	Highly Dissatisfied n(%)	Dissatisfied n(%)	Neither dissatisfied or satisfied n(%)	Satisfied n(%)	Highly satisfied n(%)	Mean (SD)
People's participation	21(8.9)	18 (7.6)	16 (6.8)	93(39.2)	89(37.6)	3.89(1.24)
Reduced time and cost in delivery	19(10.4)	37(20.2)	39(21.3)	50(27.3)	38(20.8)	3.28(1.29)
Income	31 (11.0)	73 (25.8)	59 (20.8)	95(33.6)	25 (8.8)	3.04(1.18)
Training and other technical support of local administration	30(16.7)	36(20.0)	43(23.9)	50(27.8)	21(11.7)	2.98(1.27)
Online service support from the local administration	38(22.0)	41(23.7)	44(25.4)	26(15.0)	24(13.9)	2.75(1.33)
Cooperation from the Union Parishad	74(27.5)	79(29.4)	60(22.3)	34(12.6)	22(8.2)	2.45(1.24)

Note: 1= Highly dissatisfied--------- 5= Highly Satisfied.

From the percentage distribution and the sorted mean (descended) presented in the above table it appears that entrepreneurs are satisfied most in people's participation followed by reduced time and cost in service delivery and their income from the UDC. Typically, they are less satisfied on training and other technical support and online service support from the local administration. They are least satisfied on the Cooperation from the UP, which is noteworthy since it supports UDCs for office, equipment, operations, security and mass mobilisation. For sustenance of UDC there is no alternative for improving this relationship. Overall composite mean from these variables is used as a predictor in in the 2nd model (Chapter 7) to see how the satisfaction of the entrepreneur explains his/her sustained income.

Thus far, the involvement of two stakeholders has been discussed: public and private. Now, an assessment of the role of the third and most crucial stakeholder, the people, will be embarked on.

People as the partner

The UDC has innovated a new concept which is termed as Public-Private-People's Partnership in which it also considers people as partners or stakeholders (A2I 2015). Though there is no contract executed with the people, the UDC model takes into consideration: (1) increased demand for services from the population density especially from a large portion of people who are young; (2) mass people's involvement in the UDC management committee and (3) involvement of the UP which is a people's representative body (A2I 2015).

People's participation by choosing UDC as the focal point for services and information delivery is vital for a UDC as discussed earlier and will be expanded on here and in subsequent chapters. People's participation is assessed here in terms of people's direct participation as service

recipients, members of a UDC management committee and as volunteers and their indirect involvement through their representative body, the UP. Though people usually take certificates from the UP, for commercial and government services the UDC is the closest point to them for most cases. Hence, on its own, the UDC carries potential for people's visits for its opportunity costs.

Consistent with the entrepreneur's increased level of satisfaction with people's participation (Table 22): these findings also suggest that some UDCs are well attended by people visiting for services per month while others fall short. Figure 11 presents the picture of monthly average number of service recipients based on the last three months.

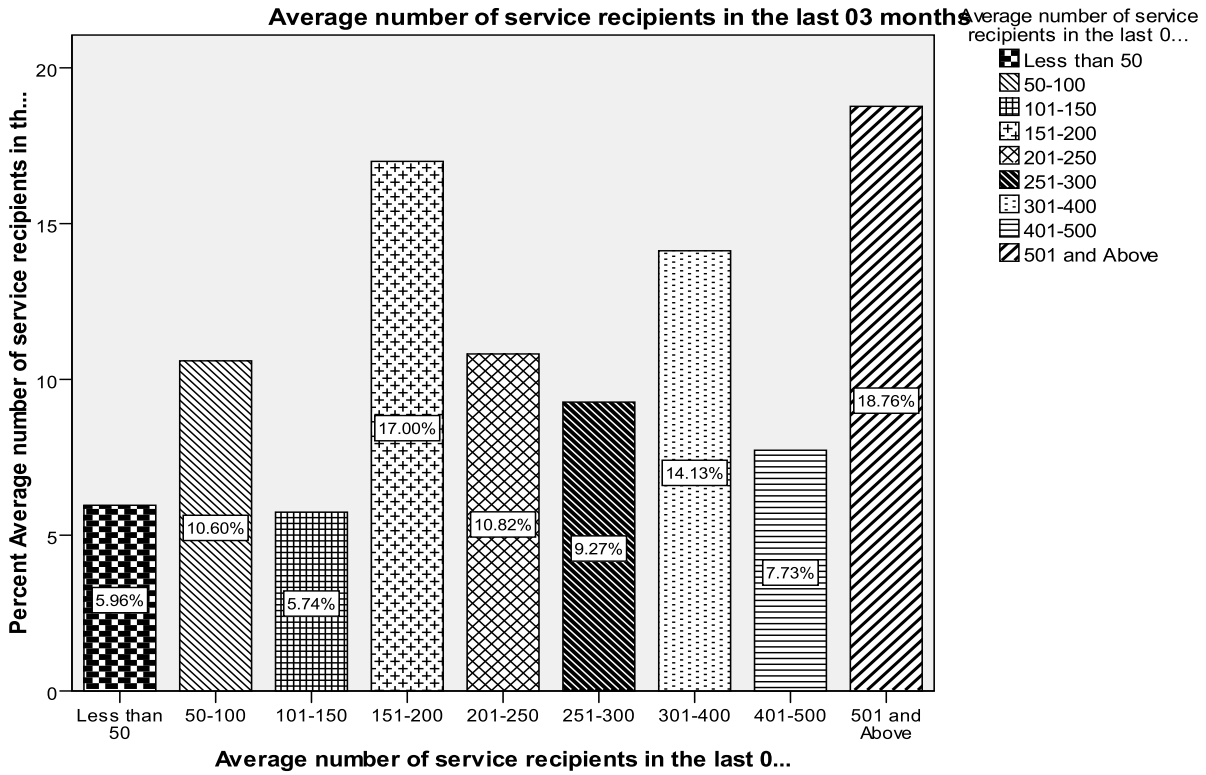


Figure 11: Percentage distribution of average number of service recipients in a month.

It can be seen from the above bar chart that jointly half of all UDCs have visits by more than 250 service recipients. Among them 31% are attended by 251-500 people and the remaining 19% could provide 501 or more people services or information. In contrast, the rest half have visitors of 250 or less. It is worth a mention that tiny portions (6%) have less than 50 people visiting them each month. Examining the consolidated monthly report of *Comilla* district for 3 months it was

found the on the average each UDC serves 285 (n= 184) people in a month. The grand mean[69] for all administrative divisions is found to be 285.5; 95% CI[70] (267, 304).

People's participation is widespread all over the country. Apparently, across 7 administrative divisions the averages of people's participation differ from each other as is depicted in the Figure 12.

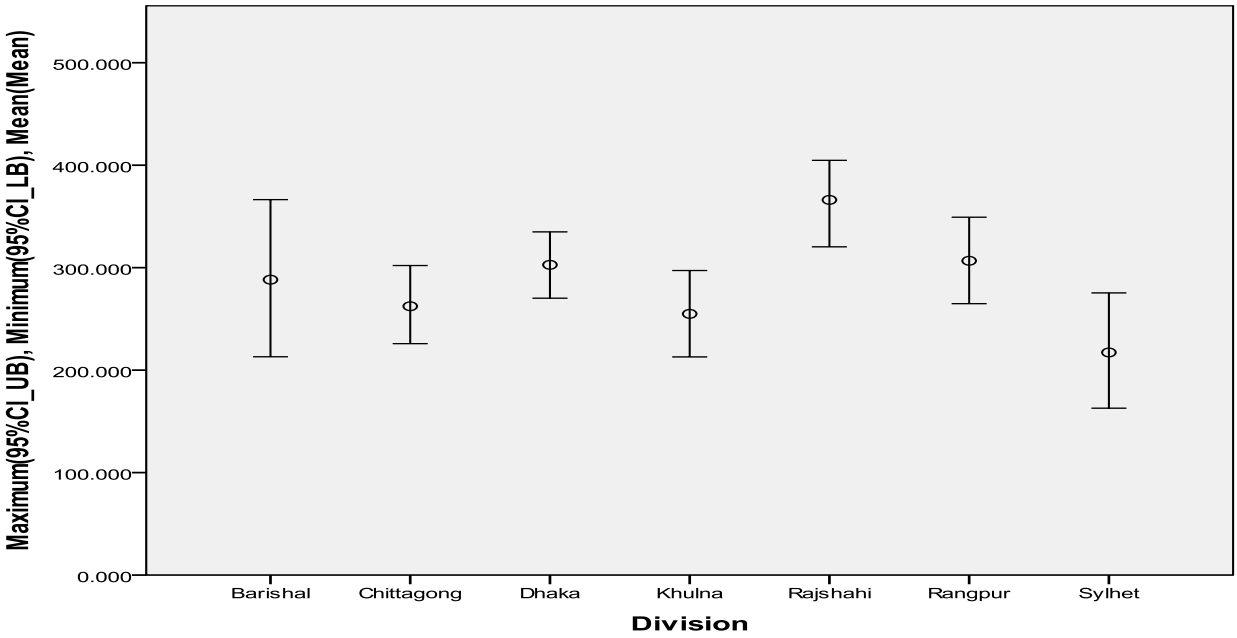


Figure 12: Mean plot with confidence interval for people's monthly participation across 7 Administrative Divisions.

It can be observed from the above figure that *Rajshahi* division has the highest level of people's participation (M= 366, 95% CI 321,411) followed by *Rangpur* (M = 307, 95% CI 263, 350), *Dhaka* (M = 303, 95% CI 271,334), *Barishal* (M =288, 95% CI 225, 351), *Chittagong* (M =262, 95% CI 223, 301), *Khulna* (M =255, 95% CI 205, 305) and *Sylhet* (M =217, 95% CI, 151, 283) being the lowest. The difference between these averages of participation is found to be statistically significant using the one-way ANOVA. When calculated (not shown here) the value of *F* is found to be significant beyond .01 level: F (6, 443) = 3.43; p<.005. Eta η is .21, a small effect. Despite there is an overall significant difference across divisions for people's participation looking at bootstrap multiple comparisons following the *Tukey* adjustment (Field 2013) it is found that the *Rajshai* division significantly differs from all other administrative divisions except for *Barishal* and *Rangpur.* Sylhet also differs significantly from *Rajshahi, Rangpur* and *Dhaka.* Other divisions do not differ much with each other.

[69] Means are calculated from the median points of respective categories.
[70] The 95% Confidence Interval (CI), subsequent ANOVA and multiple comparisons are based on bootstrap results from 1000 samples since checking the normality tests and plots it is found that that there are some deviations from the normality assumptions.

The visits by service recipients can have a significant bearing for the financial sustainability of the UDC. When calculated, (Figure 10) a significant correlation is found between monthly income and the number of service recipients. This is written as: r = .43; $p < .01$, a medium effect. More people visiting for services are associated with more income meaning the UDC is engaged in a retail business. It is also correlated with a number of other variables such as 'money investment' (r = .24), $p < .01$ (Figure 10) and availability of different categories of equipment and services (Appendix table 2.25).

Similar to the findings of the User Survey, there is some success of the UDC in bridging the digital divide along demographic lines. A significant portion of the people accessing the services are disadvantaged in terms of demographics and marginalised from other forms of service delivery, according to entrepreneurs. This again validates the UDC's ability to bridge the digital divide.

Involvement of the Disadvantaged

Entrepreneurs were asked what approximate percentages of service recipients are women, poor (both women and men) and illiterate (both women and men). Their answers using the percentage distribution are presented in the Table 23.

Table 23: Percentages of Disadvantaged People receiving services from the UDC.

Percentage of Disadvantaged	Women		Poor (men and women)		Illiterate (men and women)	
	N	%	N	%	N	%
10	61	13.5	20	4.5	67	15.2
20	85	18.8	62	13.9	92	20.8
30	125	27.7	66	14.8	109	24.7
40	97	21.5	80	17.9	65	14.7
50	36	8.0	88	19.7	48	10.9
60	30	6.7	58	13.0	23	5.2
70	12	2.7	42	9.4	12	2.7
80	5	1.1	31	6.9	26	5.9

When cumulated about 90 percent of entrepreneurs[71] consider that their women service recipients range from 10% to 50%. Among them greater percentages (49.2%) consider that they have a women participation rate of 30%-40% and 32.3% perceive that women represent 10% to 20% of the total service recipients. This participation by women is considerably higher than their participation in conventional service delivery since women constitute a tiny portion of service recipients from government offices (TIB 2012). This is consistent with 30% overall women participation as found from the scrutiny of the uploaded reports by entrepreneurs for *Bogra* district for 9 consecutive days (UDC Dashboard Report, Bogra. 2013) as well as the findings of User

[71] It should be mentioned here that Column N% and Cumulative percent in the table represent the percentage of entrepreneurs.

survey (Table 4: Percentage Distribution of Users by Gender, Education, Occupation, Age and Income).

Poor people (both women and men) are also being benefited. About 71% (Cumulative Percent) entrepreneurs consider that among all their service recipients 10%-50% are poor among which, 37.6% combined consider that they have 40%-50% poor recipients. Jointly, 28.7% consider that they have the poor people's participation by 20%-30%. Only 4.5% consider that they deal with 10% poor people. This is consistent with the rate of poor people living in rural areas in Bangladesh which is 36% (IFAD 2014). There is a significant correlation between increase in poor people's participation and increase in women's participation in the last one year: rho (428) = .624; p< .01; a large effect.

Illiterate people are the third kind of disadvantaged people who, according to entrepreneurs, participate heavily in the service delivery provision of UDCs. A great majority of 86.2% (cumulative percent) consider that they have the illiterate people participating in their service delivery that ranges from 10% -50% among which 10.9% considers it is half of their total service recipients while 14.7% find it as 40%. In the lower ends 15.2% consider that only 10% of their service recipients are illiterate, when 5.9% in upper end mark that they have illiterate people's participation by 80%. From the qualitative findings it was determined that illiterate people find UDC convenient since it does not require much paper work and assistance is available from the entrepreneur, if required to request a service.

Thus, again we can say that these disadvantaged people have better representations in the UDC service provisions compared to alternatives. This means that it is able to provide digital services to those who are digital have-nots as well marginalised from traditional service delivery due to their underprivileged socio-economic standings. These people obtain benefits, because sometimes to write a simple petition they have to take help from intermediaries or lower staffs who charge them. To know the address or contact number of a doctor or a vet they have to travel a long way and incur significant costs.

The increase in people's participation is also supported from the statement of one UP Chairman:

> "The UDC has turned the UP more crowded like a market. People are visiting in an ever more scale because of new ideas and services ushered to the scene with the existing services. The UP was not providing the kind of services now it provides. Mass awareness has increased because we did multimedia assisted display at night in various locations of the Union followed by miking and leafleting. In my opinion, about 70% of inhabitants now are aware of it who believe that using ICT better services can be offered. People are getting services at their doorsteps" (UP Representative Interviewee no 41, 2013).

From a qualitative point, a number of factors can be identified for high potential demands from people, such as: densely concentrated low-income people with limited access to ICT and internet; very high unemployment rate among rural youths (for computer training or overseas job

application); compulsion for obtaining certificates (birth/death/inheritance) from the UP and the presence of certain easy to access services such as land copy, electricity bill pay and mobile banking in the UDC. Considering the catchment area each UDC serves this level of people's participation is expected. On average each UDC serves approximately 30,000 people (Table 2) living in an overall country density of 1081 people per square kilometre (World Bank 2014). Compared to telecentres in other developing countries, this coverage of people gives the UDC a larger potential client base for selling its products.

Along with their participation for services, it was also noticed that people volunteered in their UDC for serving customers or assisting the entrepreneur in a few cases. The roles of alternative entrepreneurs in this perspective are worth specific mention, who serves in the centre to get them skilled as well as serve the people. The voluntary assistance of UP representatives along with the overall support from the UP was also noticed during the research. However, there was no UDC management committee involving social and political elites, which could have given this model more inclusive character to consider people as partner. Hence, service recipients are considered as proxy to people's participation in this research. This is also for the proposition that people's participation as service recipients including disadvantaged sections and support from other stakeholders such as UP and Administration are vital for progress of the UDC, as perceived by entrepreneurs.

Until now, the roles of different stakeholders under PPPP have been identified and discussed. It has been shown how support from government, UP and other stakeholders engaged by the government have helped UDCs to be established and come into operation. Entrepreneurs have also started to contribute to the model and there is a considerable participation of people. Since much of the supports from external partners came at the beginning of the project it is important to know how they are being offered now. This is because the literature review has shown that a telecentre needs ongoing backend support until self-sustainability. Initial establishment of a telecentre with full scale external support but subsequent lack of continuity or termination has led to the closure of many telecentres. Similarly, ascertaining the contribution of grooming entrepreneurs is essential to understand the pathway to entrepreneurship development. The dynamics of current support also reflects the commitment of the stakeholders to the project (Kuriyan & Ray 2009; Liyanage 2009; Proenza 2001; Shadrach 2012).

Dynamics of stakeholder's involvement in the last one year (July 2012-June2013)

Entrepreneurs were asked what changes they noticed in the current month (July 2013, survey period) compared to the same month in the previous year in different arenas of various stakeholders' involvement and changes in service and income. Entrepreneur's responses are presented using both percentage distribution and descriptive statistics in the Table 24.

Table 24. Percentage Distribution and Descriptive of Public Partners' support and People's participation

Variables	Significantly Decreased n(%)	Decreased n(%)	Same as Before n(%)	Increased n(%)	Significantly Increased n(%)	Mean (SD)
Mass Awareness	6(1.4)	9(2.1)	51(12.1)	242(57.3)	114(27.0)	4.06(.776)
Number of Service Recipients	6(1.4)	30(6.8)	66(15.0)	271(61.7)	66(15.0)	3.82(.817)
Participation by poor	8(1.8)	17(3.9)	100(22.8)	245(55.9)	68(15.5)	3.79(.814)
Participation by women	5(1.2)	18(4.1)	106(24.4)	256(59.0)	49(11.3)	3.75(.752)
Monthly income	19(4.2)	33(7.3)	77(17.1)	264(58.7)	57(12.7)	3.68(.934)
Service Request	12(2.8)	34(7.8)	95(21.8)	239(54.9)	55(12.6)	3.67(.893)
Number of services	10(2.4)	22(5.2)	106(25.2)	243(57.9)	39(9.3)	3.66(.811)
Service supply from government	23(5.4)	44(10.4)	159(37.6)	159(37.6)	38(9.0)	3.34(.970)
Technical and Training assistance from Local admin	47(11.4)	55(13.3)	168(40.7)	122(29.5)	21(5.1)	3.04(1.04)
Cooperation from UP	74(16.7)	94(21.2)	144 (32.5)	106(23.9)	25(5.6)	2.81(1.15)

Note: 1= Significantly decreased---------5=Significantly increased.

The above table indicate that the UDC has noticed an average increase in all of these variables except 'Cooperation from the UP'. Most remarkable increases over the last one year have occurred in areas such as mass awareness[72], number of service recipients, participation by poor women followed by monthly income, service requests and number of services delivered. In contrast, on the lower ebb of increase are support from the government, Technical and Training Assistance from Local Administration and Cooperation from the UP with relatively lower means and higher standard deviations. Similar to their low satisfaction with UP support, it is noteworthy that cooperation from the UP has decreased, though slightly, on the average here too. However, the UDC relies on it for some vital supports such as new equipment acquisition, maintenance of existing ones, security of them and mass mobilisation. The number of service request is asked separately beside recipients since there are some service requests from institutions such as the UP, nearby schools, government offices which are not always placed by physical visits. Using these variables three latent concepts are developed to understand the dimensionality with the help of Exploratory Factor Analysis as presented in the Table 25.

[72] Mass awareness is considered as people's participation in general.

Table 25: Factor Analysis of variables of perceived changes in 1 year.

Factors	Factor Items	Factor Loadings	Cronbach's alpha
3. Public Partners' support	Service supply from the Government	.821	.734
	Technical and Training assistance from the local administration	.750	
	Cooperation from the Union Parishad	.538	
2. People's participation	Participation by poor	.746	.880
	Participation by women	.723	
	Mass Awareness	.398	
1. Progress in service and income	Monthly income from the UDC	.748	.794
	Service requests (per month)	.718	
	Number of service recipients (per month)	.660	
	Number of Services delivered	.588	

As can be seen from the table that for 10 items of perceived change on a 5 point scale of significantly decreased to significantly increased during the last one year (Table 24) the PAF produces 3 factors[73]. The first three variables connote the external support from the government and the UP; the second three are related to people's participation while the last four is about 'service and financial component' which, in other words, is relevant to the perceived overall progress in the last one year.

How can these changes in the income and service component which are key targets of UDC be explained. As PPPP model three management stakeholders are involved here: government, the private entrepreneur and the people. Thus, the explanatory factors must include the contributions of all three players to explain the progress[74] in one year, as is assumed in our 4th hypothesis. The investment is considered as the sole indicator of entrepreneur's involvement since the entrepreneur's decision to invest comes when he/she is confident of his/her other qualities such as computer and marketing skills, understanding of the business model and plan to stay long by having a contract (Liyanage 2009). It is also related to the length of progress as in most cases entrepreneur's investment came from accumulated savings after a few years of operations in the UDC, as confirmed by the interview. The 4th hypothesis test is presented through the use of Structural Equation Model (SEM).

[73] The PAF with Direct Oblimin with Kaiser Normalization rotation produces 2 factors based on Eigenvalues> 1. However, after examining the scree plot (the number of data points above the break) it was decided to ask for 3 fixed factors. The three factors extracted appeared to be with clear factor structure- no factor with less than 3 items, item loading above .30 with fewer cross loading (Costello and Osborne, 2005; Suhr, 2006). The KMO value is .896; the Bartlett's Test of Sphericity also reached statistical significance. The three component solution explains variance of 50%, 13% and 8% respectively for first, second and third factors (produced reverse in the Table 25).

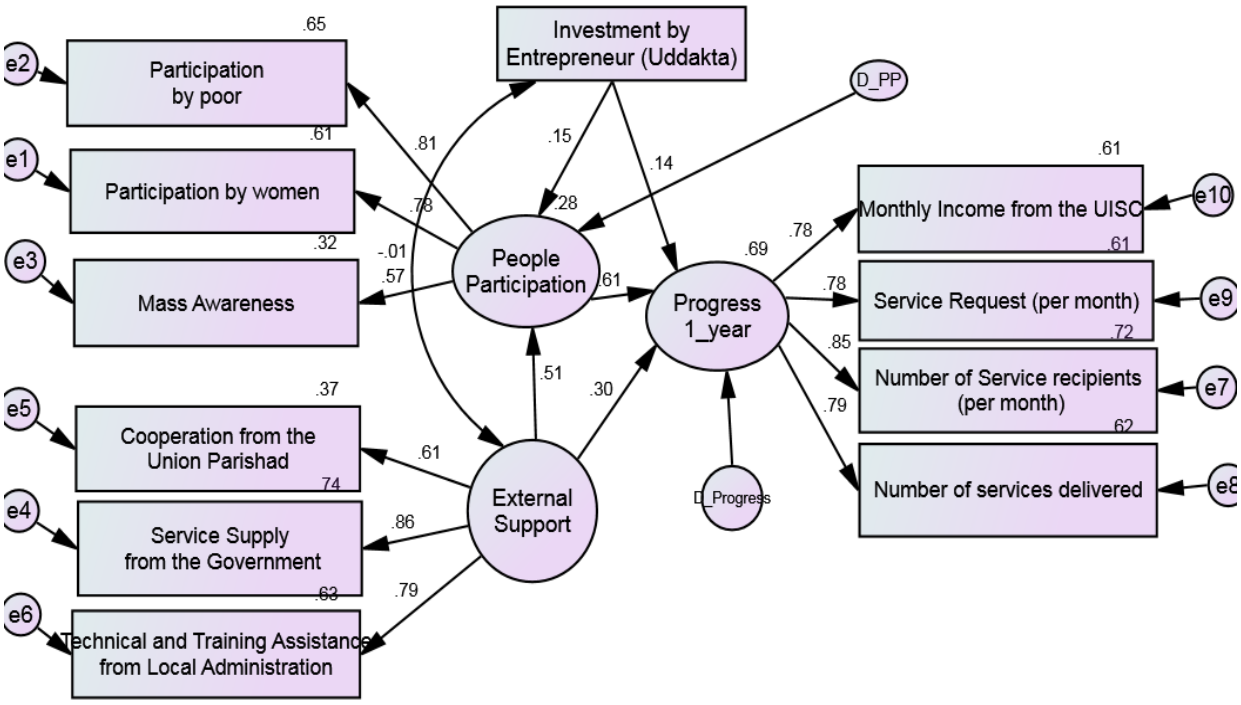
[74] Because of no previous baseline data the progress is measured here as perceived progress.

Modelling stakeholders' involvement to explain progress in last one year.

The 'external support', 'people's participation' and 'entrepreneur's investment' are placed as independent factors to explain the progress during the last one year and presented through the SEM in Model 1.

Model 1: Structural Equation Model[75] of UDC Progress in the last one year from stakeholders' involvement.

(Standardised Solution; N = 538)



It can be seen from the above model[76] that changes in 'People's participation', 'External support from the UP and the local administration' and investment by the entrepreneur account for 69% variances in the 'progress in one year'. The 'people's participation' is the most dominant among all factors with a regression coefficient value of α= 0.61 followed by external support from the government and the UP with a moderate contribution (α= 0.30). 'Investment by the entrepreneur' has the least contribution (α= 0.14). We can reject the null hypothesis since all regression paths in the model (Appendix table 2.26) are statistically significant (α= 0.01). Thus, our hypothesis that *the UDC's current progress hinges more on external support (government and UP) and people's*

[75] χ^2 (41) = 102, *p*<.000 (given large sample size) but CMIN/DF = 2.48; NFI = .95 ; CFI = .97 ; TLI= .95; RFI= .92; RMSEA = .05

[76] The missing values prohibit to conduct bootstrapping in AMOS. Despite the large sample size and the use of Full Information Maximum Likelihood (FIML) in AMOS, that deals with missing values with the estimate means and intercepts, in orders to allow bootstrapping on 500 sample a separate analysis was undertaken with the data set imputed to start with by Expectation Maximization (EM). The result shows no considerable difference from the solution based on original data in terms of regression weights, standard error and significance level. However, the solutions are based on original data (Buhi et al 2007; Schreiber et al 2006).

participation than on entrepreneurial investment from the private partner, is supported. The interpretation for a single predictor is, for instance, when people's participation goes up by 1 standard deviation the progress goes up 0.61 standard deviations. The external support and the entrepreneur's investment have indirect effects too on people's participation, the former with a regression coefficient value of α= 0.51 and the latter with α =0.15. The indirect effect from people's participation is thus 0.31 (0.51 x 0.61) and the total effect is 0.61 (0.31+0.30). On the other hand, the total effect from the entrepreneur is 0.23 (0.09+0.14). Similar to the hypothesis for progress it can be seen again that people's participation is more accounted by external supports than entrepreneur's investment. Excluding people, only one-third of the progress can be attributed to entrepreneur's investment while the rest two-third comes from public partners. Thus, despite dwindle in support continuity the UDC is still more reliant on government and UP than on entrepreneur.

Conclusion

This chapter has identified the UDC management model under PPPP and described roles of the stakeholders involved for its establishment and carrying out operations. The external supports from the government and the UP to provide these centres with equipment, services, enabling entrepreneurs through training, networking and monitoring are enthusiastic. The UDC services are enabled by ICT equipment which appears to be adequate at its basic level but disparaged by inadequate office space and furniture, power breakdown and slow internet connection. Though not widely established, multiplicity of services can be considered as its strength. With the time advancing, the formidable challenge would be maintenance and replacement of the equipment which are meant to be shouldered by private partners. Yet, the amount of investment until now by the majority of entrepreneurs is inadequate. Notwithstanding, the UDC is increasingly becoming attractive to people, a significant portion of whom are disadvantaged. Increase in disadvantaged and mass people's participation along with support from UP and administration can largely explain the extent of progress that has taken place over the last one year compared to the contribution from the entrepreneur, as is supported by the hypothesis test. This overdependence on external support implies challenges for entrepreneurship development which will be discussed in the next chapter.

CHAPTER 7. UDC ECOSYSTEM- ISSUES OF SUSTAINABILITY

Introduction

Drawing from both qualitative and quantitative sources, this chapter identifies and analyses the major challenges for Union Digital Centre (UDC) evolving from their current partnership arrangements into operating as an enterprise. It also suggests ways to address the challenges through strengthening the ecosystem for sustainability of the UDC. This chapter is split in three sections to answer research questions 6-8. Section one illustrates the challenges for developing entrepreneurship, emanated from the imbalance in the stakeholders' involvement identified in the previous chapter, that has links to operational and management problems. To address them and ensure sustainability, it is assumed that the strengths and opportunities emerging from the partnership ecosystem of the project will come forward. Hence, in section two all the sustainability factors and outcomes in the light of the sustainability framework developed in the literature review are identified. This is done to test the hypotheses that inputs from the partnership ecosystem such as equipment and internet, services, support continuity and entrepreneurship can ensure the UDC's financial and social sustainability. In the final section, lessons from a detailed comparison of two UDC cases are used to corroborate the sustainability model with qualitative findings.

Major Constraints and Challenges

The discussion starts with entrepreneurship challenges followed by operational and management hurdles. The problems of the UDC, being the first type of model of its kind in the community, are traced and these problems are linked to a lack of engagement of stakeholders in the operations and management of the project. This approach helps us to explain stakeholder behaviour and stakeholder management in terms of whether stakeholders are informed, consulted or given partnership or control. How concessions or bargaining power are given is also discussed (Figure 2). The aim of such discussion is to ascertain future pathways as to how they should work for the sustainability by engaging all stakeholders effectively (Bailur 2007; Freeman 1984).

Drop outs and lack of entrepreneurship

We have seen weaknesses in entrepreneur's engagement as evident from lack of investment (Model 1) and subsequent drop outs. The aim of UDC to bridge the digital divide by employing equal number of female entrepreneurs is still unmet from their unavailability or lack of regular engagement. Within a short period of about 4 years, 9 UDCs have replaced their entrepreneurs either for a second or third time. The problem related to their engagement started from the identification process. They were identified by the UP chairman and confirmed by the local administration. In the identification process the recruitment prerequisites related to minimum qualification, investment capacity and contract enforcement were not followed as strictly as

outlined in the guideline document - the LGD circular 2010. Though their action was justified that computer skilled, willing-to-serve with investment capacity entrepreneurs were rare for employment in rural areas, all options were not adequately explored. Consequently, most entrepreneurs come from rural unemployed youths such as largely from students who do not have access to funds or loans to invest for expansion of the business. Some entrepreneurs are only employed part-time. Even, some only join the UDC to learn computer operations. These less committed entrepreneurs quit the job when and how it works for them without bothering about acquiring the entrepreneurial skills expected from them. Females quit quicker than their male counterparts from their lack of computer skill or when getting married, giving space to their male counterpart to increase their income. Male drop-outs are mainly the result of the low income, conflict with the UP or mobility for better jobs. Quicker replacement with alternative entrepreneurs is not the practice in most cases. With the departure of an entrepreneur, for any reasons, the service capability of the UDC is affected and, not to mention, incurs wastage of development money.

In terms of stakeholders' management they are not well informed or consulted adequately about modus operandi or nature of partnership as many aspire to be permanent like the UP secretary, where the concept is of basically a public-private partnership.

> The main tendency of people in our country is to be permanent and entrepreneurs do not believe exception to that. People are not widely used to earn on their own and there is a set mind of doing permanent jobs (Management Official Interviewee 29, 2013).

The desire to do a permanent job is so intense that it was found that 3 good earning entrepreneurs later joined as *Upazila Technician* under info-sarker project of the government with lower pay compared to their previous earnings from the UDC. When asked for suggestions to improve in the open ended option of the questionnaire, the majority mentioned to make them permanent employees. The weak consultation is also reflected in the level of training they have undergone which was limited to some basic computer operations, let alone any marketing or managerial skills. Entrepreneurs who joined in later batches have not been given even the basic training (Prothom_Alo 2015).

Although entrepreneurs are considered as the ambassador of the UDC project, the UP or the administration has given less control even to the competent entrepreneurs. The UP treats them as part time employees, who can be dismissed at any time, and places them under the control and supervision of UP secretary.

> "The problem occurs when we train up one person to provide services. With changes in power in the UP, the Chairman removes the entrepreneur especially in cases where there is no contract executed. Sometimes, we are not informed by the UP to make requests for speedy replacements. Approximately, 70% of first entrepreneurs are no longer working in the UDC" (Management Official Interviewee 23, 2013).

The above statement reflects the fragility in the terms and conditions of the entrepreneur's job. We have seen that entrepreneurs are least satisfied with their relationships with the UP (Table 22).

Entrepreneur's reliance on UP for financial assistance or works and his or her lack of commitment help perpetuate this weakening position.

The UP doesn't always dismiss entrepreneurs out of its parochial interest, but they are forced to do so from the misconduct of entrepreneurs. In Jessore district some entrepreneurs from one Upazila entrusted with the responsibility of collecting electricity bills have been found to be involved in embezzlement of funds. It was reported that entrepreneurs collected bills and money from customers to transfer it electronically to the local Rural Electrification Board (REB) account. Instead, after amassing money for a few months, some of them disappeared from the locality with the collected money and others claimed, when traced out, that they tried to do posting but the online system did not work. An estimated 2 million Taka became outstanding for which many customers received non-payment notices from REB. Criminal cases were filed against some entrepreneurs and others were enforced from the UP to reimburse the money. This incident has had a huge detrimental effect on the image of UDC with the dismissal of some entrepreneurs (Interview with Management official 23, 2014).

This instance also suggests the instability of UDC as an institution especially in cases where there is no contract with the entrepreneur. It also raises questions about the delivery of public services by a private person without the correct authority. This is why the contract is so important before giving entrepreneurs any control. It is also important for ensuring both the accountability of entrepreneurs to provide public services, as well as for security of equipment handed over to them. Moreover, because of their short term take on office and uncertainty over relations with the UP, some entrepreneurs are still not investing their own funds significantly even after a few years of employment.

Similarly, their relationship with the government officials is subdued as they are viewed merely as trainees and even lower to the level of the UP secretary. The entrepreneurs are not in a position to facilitate accountability and transparency of government officials or local government institutions to the people they serve. Entrepreneurial attributes such as investment, contract with the UP and efforts to raise awareness are found to be associated with the financial success and improve the situation somewhat better. Especially, it can help with building good relations with the UP and administration and avoid conflict with the UP Chairman and Secretary. Careful recruitment process and ongoing training, facilitating entrepreneur's access to loan with good tracking records by the government are fundamental in building entrepreneurship (Jensen 2007; Shadrach & Sharma 2013). Currently, though it is argued that it is difficult to find competent entrepreneurs in the rural area, it was observed that robust processes such as extensive advertisement with criteria set out and then sufficient background checks or skill assessment of inbound entrepreneurs were not followed. There are places where the employment of entrepreneurs happened to be based on politics or patronage. In those areas the lack of competency precipitates the rate of drop outs.

Lack of entrepreneurship and subsequent dropouts are threatening to the existence of UDC. According to the dashboard picture of A2I, each day on the average 600 to 1000 centres remain closed due to absence of entrepreneurs. On the 4th December 2014 at 11 am the number was 663 and for the immediate previous day it was 860. The number of closed UDCs is gradually decreasing (Prothom_Alo 2014). Entrepreneur's competency makes a big difference in the business as is supported by the interview with district officials. According to them, overall 10-15% existing entrepreneurs are efficient in marketing and computer skills while 40% of them moderate and the rest have very poor skills to run the centre.

The challenge in entrepreneurship development is facilitated by a number of operational problems that evolve from the weak engagement of stakeholders.

The operational challenges

The operational challenges are ranked by entrepreneurs as from most to least as presented in the Table 26.

Table 26: Percentage distribution and Descriptive of problems prioritised by entrepreneurs

Problems ranked	1 n(%)	2 n(%)	3 n(%)	4 n(%)	5 n(%)	6 n(%)	7 n(%)	Mean(SD)
Internet breakdown Or slow speed	141(35)	124(31)	54(13)	27(7)	21(5)	22(6)	12(3)	2.44(1.63)
Power breakdown	136(34)	92(23)	40(10)	40(10)	34(9)	30(7)	27(7)	2.85(1.94)
Computer or other equipment problems	36(9)	68(17)	118(29)	62(16)	25(13)	43(10)	22(6)	3.61(1.64)
Low income from low turn-out of people	30(7)	44(11)	62(16)	130(33)	65(16)	42(10)	27(7)	3.97(1.57)
Lack of service supply from the government	32(8)	28(7)	64(16)	43(11)	53(13)	51(13)	130(32)	4.82(2.01)
Lack of publicity and awareness	18(5)	30(8)	37(9)	58(14)	58(15)	160(40)	40(10)	4.87(1.64)
Lack of training of entrepreneurs	8(2)	15(4)	26(6)	41(10)	118(30)	53(13)	140(35)	5.41(1.55)

Note: 1= Most important problem------ 7 = Least important problem

From the sorted (Ascending) means presented in the table it appears that internet is the most important bottleneck and lack of training as the least one, which are elaborated beneath with some suggestions to improve.

Internet connection breakdown/slow speed

We have seen that 90% of UDCs use either mobile internet or dial-up connection which is very slow and prone to intermittent breakdown. The problem is less severe for those who have broadband connection as determined from descriptive and test statistics presented in the Table 27.

Table 27: Connection breakdown/Slow speed problem and Internet Connection Type.

Ranking of the internet connection Problem	Internet Connection Type		
	Dial-up or Mobile n(%)	Broadband n(%)	P Value based on Chi-square
1	118(36.2)	10(27.0)	
2	101(31.0)	7(18.9)	$\chi^2 = 11.90$; $p<0.05$ (Fisher's Exact Test)
3	45(13.8)	5(13.5)	
4	21(6.4)	5(13.5)	
5	15(4.6)	5(13.5)	
6	17(5.2)	2(5.4)	
7	9(2.8)	3(8.1)	

Note: 1= Most important problem------ 7 = Least important problem

The Table 27 demonstrates that the connection breakdown/slow speed is more prioritised as an important problem by entrepreneurs with dial-up or mobile connection compared to those who have broadband connection. With the magnitude of problem being an important one to have decreased, the proportion of broadband users is being increased. The difference for population proportions between these two categorical variables is found to be statistically significant using the Chi-square Test of Independence (Table 27). The relevant effect size Cramer's V = .185, a smaller than typical effect. Thus, the broadband appears to be a solution to curb down the problems of internet breakdown/slow speed along with its association for increased income (Table 21).

To address the fragility in connection, a World Bank funded project has connected fibre optic broadband line in 100 UDCs. Though the *BanglaGovNet Project* undertaken by the government is working on nationwide network infrastructure, its lowest unit of reach is the Upazila meaning the UDC is yet to be considered (BCC 2014). In Bangladesh, with the existing predominant mobile wireless broadband connection, the connectivity is better yet with incidences of breakdown or slow speed as is indicated in the above findings (Table 27). More recently, the situation in wireless broadband connectivity is slightly improved with the penetration of 3G connections in urban and semi-urban locations (BTRC 2015). However, most UDCs in rural and remote areas are outside the 3G coverage.

Though fibre optic lines of many different government agencies are available across many parts of the country they are unable to be used as internet traffic because of disjoint connectivity. For instance, there are 14776 kilometres of fibre optic lines owned by public organisations such as the Power Grid Company of Bangladesh, Bangladesh Railway and Bangladesh Telephone and Telegraph Board (BTTB) who try to establish separate connections with their central headquarters. The coverage of fibre optics exists in approximately 59 districts and 296 Upazilas. However, to

utilise these lines as internet traffic for data transmission are yet to happen. At present, those who own them cannot ensure their optimum utilization while those who need them most do not have access to them. As these lines are underutilised and fragmented from each other to form a unified channel of data network, a committee, called 'National Network Development Committee' is working to establish an integrated network development to provide bandwidth to citizens and private businesses. Also, the next generation network policy adopted by the government is aimed at unifying voice and data network (Bhuiyan, MSH 2012; Joy 2010).

The connectivity problem denies two basic purposes of telecentres such as generic access to the internet and subsequently demands for e-services (Hanna 2010). Without internet link it has to rely on stand-alone computer based services limiting its income potential (Jensen & Walker 2001). Ensuring connectivity is not enough for telecentres for poor people unless it is associated with affordable cost. For internet cost minimisation some countries have implemented discounts for providers by introducing tariff policies (ICTA 2010). Bangladesh is yet to take any similar attempt. We have discussed in the previous chapter that because of the high costs, most entrepreneurs use low speed internet.

Power breakdown

The problems of power breakdown are very widespread and frequent in rural areas. Power breakdowns happen typically 3 or 4 times during working hours causing blackouts for approximately 3 to 4 hours in a day, disrupting service provision and causing a dent in income. An increase in the time for delivery of certificates was noticed (Table 9), the power blackout being one of the major causes. It is also menacing for equipment since uneven transmission and has already caused damage in some cases. The use of stabiliser or UPS has been found in a very few cases. One alternative solution might be the use of battery powered laptop, while others can be generator/ solar panel. In that end the government have supplied at least one laptop in all UDCs and solar panels in 1013 of them where there is no electricity. A project financed by the *Climate Change Trust Fund* under the Ministry of Environment is almost completed to equip another 3208 UDCs with solar panels. The challenge still remains from low power capacity (approximately 100 watt) of solar panels as well as their installation and proper maintenance. There are also security concerns from the theft in the rural areas, which has led to some UPs keeping solar panels shelved in the lockers. There are anecdotal reports of a UDC's solar panel being used for lighting the Chairman's personal house. Likewise, the generator is an expensive item for average or low income entrepreneurs with its regular fuel costs.

Equipment problems

We have noticed that the UDC is relatively better equipped with the ICT (Figure 5), though with limited office space and furniture. Nonetheless, almost all types of equipment are single in number. Any equipment not working means a total collapse of service by it and the concomitant income.

Though instances of out of order equipment are not alarming at this stage (Table 16), this is expected to rise in the future. Instead of equipment being purchased through a centralised tender process, equipment was mostly purchased at a local level from the UNO office, often at different points of time. There was no guarantee obtained for replacement or repair or any contract signed with a separate agency to provide service support. Entrepreneurs were not provided with relevant training on hardware or software issues of computer or maintenance of other equipment. Though, the district polytechnic institute under TEB is given the responsibility to provide repair support, entrepreneurs usually do not consult them because of the distance, the expected delays or they were unaware of this arrangement. The AP in the DC office does provide some technical support but does not extend to hardware or software repair assistance. Hence, for repair or replacement, entrepreneurs invariably count on their own finance or the UP's support. Increase in cooperation from the UP is found to be associated[77] with fewer problems with equipment. From a qualitative point of view this relationship is also significant since computers and other equipment are initially provided from the UP fund. The UP also considers them as its property. On the other hand, entrepreneurs are temporary and many of them have not invested much in the UDC or are not earning much from it. So, they have to rely on the UP cooperation for maintenance of equipment. Thus, it appears that where the extent of cooperation, especially concerning the financial assistance for repairing equipment is healthy, there are fewer problems with inoperative equipment.

Not only did the local purchase fail to obtain the maintenance guarantee, it also could not ensure uniformity in quality of the equipment. In some places there were allegations of corruption and the purchase of lower quality equipment that went out of work within a short period of time. Partly, because of this local purchase we also notice asymmetry in the types of equipment across UDCs: some are equipped with only basic equipment while others with advanced ones operate alongside (Figure 5). Since there was no need-assessment carried out beforehand, some equipment appears to not be cost- effective. For instance, spending approximately 70,000-100,000 Taka behind a multimedia projector, which remain mostly underutilised, could have been more prudently used for buying another 3 or 4 computers or other cost effective equipment. It was found that lack of an adequate number of computers was obstructing some of the fundamental purposes of UDC: giving services, access to internet and computer training. While the central purchase can be effective, maintenance centrally seems to be equally inefficient (Hudson 2001). The solar panel, for example, was purchased centrally but because of lack of local arrangement, maintenance takes a prolonged time resulting in some of them still uninstalled.

[77] When reduced the 5 scale of the variable into two scale as 'Decreased' and 'Same as before' versus 'Increased' and applied the Chi-square test (Pearson Chi-Square) the result finds a significant relationship between the ranking of the problem as being number one and the changes in cooperation from the UDC beyond the level .05. This is written as: $\chi^2 = 14.03$; $p<0.05$, Cramer's V = .190, a smaller than typical effect.

Low income (from low turnout of people)

As we have seen that nearly 60% of entrepreneurs are enjoying an income which is equal to or greater than a UP secretary's income, this was not rated highly as a problem. Apparently, this problem is more severe for entrepreneurs with actual low income as there is a significant correlation of it with average monthly income: rho (396) = .212; $p < .01$. In fact, both income and turnout of people are themselves associated as presented earlier (Figure 10). For low income entrepreneurs, the extra income comes on different occasions when more people visit their UDC. For instance, during Malaysia registration, DV lottery, exam results or registration and admission to school they earn more. This means that supply of services make people visit the UDC which in turn can give them more earning, which the quantitative findings also have established already.

Still 40% of entrepreneurs earn Taka 5000 or less among whom dropout rate is very high which challenges the UDC in particular. Low income entrepreneurs usually receive very low turnout of people and there is a correlation between scale of the problem and the number of people visiting in a month: rho (393) = .163; p< .01, meaning that entrepreneurs with high turnout of people find it a lesser problem. Our model later in this chapter will explain the factors that can address this low turnout and supply better income together for ensuring both financial and social sustainability. A number of other variables such as 'investment' categories of 'equipment' and 'services' are correlated with both income and number of people (Figure 10 & Appendix table 2.25). Unlike that of income, the number of people, however, is not associated with contract and internet connection type, again implying the shortage of internet services. The computer competency has implications for a greater number of people and income as the qualitative findings suggest.

Lack of e-government services

Lack of supply in online services from higher government offices stands out to be the 5th ranked problem. In fact UDCs suffer from dearth of e-government services as was discussed (Table 17). A large number of UDCs are yet to offe`r any e-government services. Still entrepreneurs typically consider it a lesser problem since they can swap their earnings to some extent from certificates and commercial services. From the people's perspective, the UDC is yet to meet their needs of government services, the delivery system of which is beleaguered with age old problems (Table 7). Similarly, entrepreneurs also put greater importance for government services as when asked about future services from the UDC. Their importance for future services is presented in the Table 28.

Table 28: Entrepreneur's Perceived Importance of the Future services from the UDC

Name of Information or Services	N	Mean	SD
Online passport	440	4.63	.846
Distribution of allowances for aged/widow/disabled using mobile banking	436	4.60	.913
Land certificate/Land tax	438	4.56	.839
Special services for poor/women/illiterates	430	4.53	.818
Consultation with doctors at Upazila or District	434	4.43	.925
GD/Complaint to police	436	4.40	.936
Awareness on right to information	437	4.39	.916
Local news	427	4.33	.890
Agriculture information or services from Upazila or district	439	4.32	.976
Matrimonial information	434	4.26	.979

Note: 1= Least important------ 5= Very Important

It can be seen from the sorted (descended) mean of the table that although the sequences of services slightly differ from that of service order made by users presented in chapter 5 (Table 7), both entrepreneurs and users rate them quite similarly. Since the user survey used a 6 point scale, in contrast to the entrepreneur survey that used a 5 scale, the mean values for user's ratings hover around 5. The slight difference in orders of both types of stakeholders can, probably, be explained to have been driven by their respective interests. Entrepreneurs' interests might be influenced by the income potential while the users' interests possibly reflect their real needs. The bottom line is that they both put first order of importance to the government information or services that are now being delivered from the conventional delivery points located at Upazila or district.

However, the UDC has no connection with government conventional delivery points to provide these services. Even, as noted earlier, the UDC is disconnected to neighbouring government offices located at the UP premise that provide some livelihood services. Neither are these services ready to be offered online from the original points. It has been noticed that DESC/ NESS have transformed the front end of the delivery in the DC office to some extent, but it is not well supported by reengineered backend processes and operations. For instance, other than the land copy the DC office cannot provide other services, even if that is not completely online. The *Info-sarker Project* taken by the government is now working on the transformation of manual services of these points into e-services and setting information and data sharing across offices including the UDC (BCC 2014). There is no legal obligation to bolster the effort and to engage the government departments actively to offer all of their services electronically within a certain timeframe. Such an obligation is imposed in India with the enactment of Electronic Service Delivery (EDS) in 2011 and the Public Services Guarantee Acts (PSGAs). These laws extend opportunities to CSCs to be equipped with services from the government to offer at the grassroots (Shadrach & Sharma 2013).

In the absence of fully-fledged online services from these points, ad hoc measures to provide online support to the UDC is facing challenges as well as raising legitimate questions. For

instance, the land copy delivery through the current scanning system takes more time and the staffs are also not motivated to do more work when they may lose the benefits that they used to receive. Moreover, as there is no online central payment system, the isolated local payment arrangement proves to be unreliable and in contravention to the existing rules set by the central bank of the country, the Bangladesh Bank.

Not only is the quantity of government services limited, but the quality of delivery is questionable, even though the UDC system has earned some respect in the eyes of recipients. It has been noted that the UDC does not follow any citizen charter, neither has it given any receipt of payment. At present, for few available government services, there is no price limits determined by the provider agencies. It all depends on the entrepreneur how much he/she would charge. With an increasing number of government services being channelled through UDCs, it is important to ensure the public service standard driven by three 'C' approach (customer-driven service standards; communication and control) (Shadrach & Sharma 2013).

Lack of awareness among people

Lack of publicity and awareness among citizens is considered by entrepreneurs to be a lower ranked problem holding 6th position, which is also supported by the qualitative findings. The UDC benefits from various publicity campaigns especially for overseas employment registration. An entrepreneur's own drive, as well as UP representatives' publicity and people's incidental visits for various traditional local government certificates and services could trigger some awareness among rural inhabitants. However, it is a formidable challenge especially in places where the UDC has not much to offer. Chapter 5 has noted that for government and commercial services most UDC service recipients live very close to the UDC, meaning that people who live further away are still not aware of what their nearest UDC offers. Also, overcharging for certificates is affecting the image which can potentially discourage people from using other services on offer. For broader awareness generation, the formation of UDC management committees comprising people from different layers of the society along with UP representatives is yet to be implemented. Alarmingly, most UPs are not aware of this obligation.

Various efforts from the government publicity through media channels such as radio, television and newspaper advertisements have been noticed. However, after conversation with local people and other stakeholders it is understood that unless the UDC ensures the economies of scale, that is providing affordable access to a greater variety of services, the level of awareness will remain low. For certificates, for instance, a visit to the UDC can happen once or twice by a person in his/her life time. Similarly, for commercial services people would not prefer a UDC to their nearby computer and internet shops which are burgeoning. However, for government and financial services it would certainly be people's first preference since most government delivery points are still distant to rural

people. Making the UDC as the forefront of delivery by various government agencies is more likely to attract people.

We have seen that UP representatives can play a role to promote awareness on UDC. Some entrepreneurs involved them in awareness campaigns in public places such as in the market, mosque and educational institutions. Almost all UDCs are equipped with multimedia projector which can be used smartly for this purpose displaying the entertainment as well as the UDC products. Before such an arrangement, the UDC needs to have something in its showcase in the first place. With limited services, its attempt to create demands, necessary for financial success or sustainability, went in vein. It was observed in the field study that, despite having newly built offices of UP, some UDCs were not attractive to people due to the absence of a variety of services. It was found that among 8 well-constructed UDCs, 4 were not regularly frequented by people. In those centres, the service equipment is not used to its full capacity. In contrast, among 8 not well placed UDCs, 6 were very successful in delivering various services.

Also the level of demand varies, depending on the characteristics of the locality or month of the year. In places, especially in semi-urban areas, where the land transfer is frequent, it can expect a bigger demand for land copy. On the other hand, places with fewer numbers of educational institutions cannot expect much demand for educational information and services and computer trainings. Similarly, there is a greater demand for certificates during the month of December-January for admission in schools. Hence, assessing demands and then curtailing services as per needs are crucial for financial viability. In Nenasala Project, operators were engaged to create local contents often in local languages to serve local demands (Shadrach 2012).

Lack of adequate training

Similar to awareness, the training of entrepreneurs is regarded as the least felt problem. From quantitative analysis no significant relations was found of length of computer training on any of the issues such as income from the UDC, number of people visited or number of services delivered. This means that for offering the current types of service delivery the shortage of computer training is not a major problem. Perhaps, with the introduction of more complex services, lack of adequate training will be a considerable issue. For instance, there is a significant correlation between the highest computer competency and the frequency of services such as computer training: rho (501) = .160, $p < .01$. It is found that entrepreneurs have been only given some short term training on basics of operations. They need training on marketing, personnel management, cost benefit analysis, entrepreneurial skill and investment strategy. In Sri Lanka and India there are separate agencies to provide these special trainings. In Sri Lanka a plan is under consideration to introduce Telecentre Academy to provide degrees on telecentre courses (Shadrach 2012; Shadrach & Sharma 2013).

Clearly, these operational challenges have evolved from the roles of key management stakeholders to which we proceed in our next discussion.

Management challenges

There are challenges of management that range from model choice and stakeholder's involvement implementation practices, monitoring and evaluation to networking and funding.

Model choice and stakeholder's involvement

The UDC is established on a single model which is PPPP and hosted by the UP. In Sri Lanka many different models work for the Nenasala such as private entrepreneurial, religious institution, NGO led, depending on their availability, suitability and advantageous position in remote areas. Similarly, in India there are multifarious models in different states taking into consideration their relative advantages and disadvantages (ICTA 2010; Shadrach 2012). By contrast, the only choice of home grown entrepreneurs in Bangladesh as private partner with little experience and investment capacity is posing some serious challenges for entrepreneurship development. Other competent private or institutional stakeholders have not been tried out. Even the skill training package is not comprehensive enough to have quick impacts for entrepreneurship generation to own this project.

The engagement of UP for hosting certainly gives UDCs some advantages in terms of office, equipment, services, liaison with social leaders and awareness generation, rent and utility subsidies. Nevertheless, given the building infrastructure fragility in half of the cases and lack of adequate space in the UP, the more expensive ICT equipment poses a security risk. We will present, later in this chapter, a case where the equipment was stolen. Moreover, some UP premises are far away from nearby traditional people's hubs/markets limiting increased turnout.

We have seen in the previous chapter that entrepreneurs' satisfaction is the lowest in regard to cooperation from the UP (Table 22). Over the last one year period it has also increased the least (Table 24). Although the UP took the responsibility during the initial purchase of equipment and continued subsequent partial support, it considers, as also the contract requires, that the entrepreneur would increasingly take over the responsibility for the equipment ownership and operations. This stance is well justified since there is no binding policy directives from the government to spend for UDC. Yet, some entrepreneurs who consider the job as temporary, or are uncertain to invest, or lack the capacity to understand the business, expect the UP support to be continued as before. However, the UP is increasingly finding it hard to continue charity funding since it has to allocate funds for other development programmes. Besides, there are problems of prioritising spending in dubious programmes which can facilitate corruption, prevailing in the local government units (Hulme & Siddiquee 1999).

Nearly, half of all entrepreneurs are still without contract with the UP due to negligence/awareness on their part or of the UP. Some entrepreneurs consider that the UP does not execute the contract so that it can expel them at any point of time. Sometimes, the vested interest of the UP authority to grab money discourages the development of a contract preventing any firm footing of the entrepreneur in the UDC. Likewise, some entrepreneurs are not interested to sign a contract if they consider it a short-term platform to move elsewhere for a better job.

It has also been noticed that many UP representatives are not aware of the objectives of the UDC. Some coerce the entrepreneur to work free for their near ones or voters. Encouraged by such trends some people as well consider that services from the UDC are public goods for free riding. For traditional involvement of UPs in distributing some free public goods such expectations are not unrealistic. Hence, the entrepreneur has to explain the mode of operation frequently, though the citizen charter could have been displayed in these circumstances more aptly. However, free riding for disadvantaged sections can be allowed to some extent by giving them subsidised cards by the government for using the UDC for computer and other skill training, which is not in practice.

We have seen that a major portion of UDC's income comes from certificates (Table 18). Previously, UP secretaries used to have discretion to provide this service. Now as the entrepreneurs are in charge of the digital system they took over the responsibility in most cases. Hence, there is a mood among UP secretaries that they would only bear with that if are compensated through income sharing or the entrepreneur demonstrating some obedience to them by providing services to them for free or at minimal cost. However, some UP secretaries with poor computer skills rely on skilled entrepreneurs and this gives the entrepreneur a feeling of superiority. Entrepreneurs who have limited income because of lack of variety of services have no choice but to place the UP secretary's needs over clients. In a few cases the UP secretaries did not hand over the discretion of certificate delivery to the UDC. In places where the income is really substantial the chairman does not want to forsake his desire for cash appropriation. Likewise, the newly elected chairman may find the existing entrepreneur different to his personal and/or political choice. These issues serve as a recipe for conflict, especially, where the entrepreneur attempts to run the business independently. When overt conflict arises usually, other UP representatives remain on side of the secretary/chairman while at times the mediation from the local administration ends up with a peaceful resolution. Hence, there is a growing demand from entrepreneurs, with similar experience, to be permanent and independent.

> The secretary earns extra from the stipulated expenses allocated to do UP office works by having the job done by entrepreneurs for free. High income entrepreneurs usually find this deprivation negligible. Low income entrepreneurs discover their very existence threatened. Nothing in the UP can happen without the consent of Chairman. This relation of financial matter shapes all other kinds of relationships between them. This is a violation of the policy that says that the entrepreneur needs to be paid in market price for UP office works. It is justified by considering as a return for investment in equipment. However, some secretaries hold a positive attitude to the UDC to promote its causes (Management Official Interviewee no 21, 2013).

These issues underscore the importance of establishment of the UDC as an institution. Although the current directives, discussed in chapter 4, outline the roles and responsibilities of both parties, they are not strictly observed. Framing a comprehensive policy on UDC is only at the consultation stage with different stakeholders (A2I 2015).

In the context of exercise of exclusive control of the project by the government and the UP, the UDC also has given rise to questions of transparency and accountability of these stakeholders. The UDC is not merely a delivery point, it is also supposed to do electronic transformations in the units of government and local government to ensure better transparency and accountability of relevant stakeholders (Figure 1) (A2I 2011c).

The UDC owns some of the services from the ministry/division and the government office at the district level (Chapter 5). Delivering services of these providers enables it to reduce the time, cost and distance for recipients (Table 9). The recipients also perceive that the UDC has better governance of delivery in terms of less corruption and hassle free elements (Table 13). Certainly, those who receive services from it do not have to encounter the government officials for them which reduces the chances of corruption or hassle. Nevertheless, such government information or services from the UDC are just a few compared to their volumes in the original sources. There is no intranet connection between the UDC and other government units to provide seamless services. Neither are government officials too willing to relinquish their discretion over the delivery in favour of the UDC as we have seen in the case of one district (Chapter 6). More evidently, the A2I has arranged the provision of land copy through the UDC from almost all DC offices but we have seen that the service is available only in 38% UDCs (Table 17). Overall, the impact of UDC for transparency and accountability of the government service units can be said to be minimum.

Similarly, the UDC does not provide UP services except certificates and some clerical assistance. UP development activities that are related to the financial expenditure are outside the purview of it. We have already noticed the subordinate position of the entrepreneur in relation to the UP chairman and secretary, thus, it is unlikely that he/she will dare to make information of development activities available to the people. In our field no entrepreneurs have eagerness to facilitate this kind of information to the people. The UP representatives consider that information related to them go to the public through other channels such as their Annual budget meeting, *Uthan Baithak* (yard meeting) in Wards of the Union. However, people's widespread participation in these forums is dubious. Yet, the UDC can provide some information by accessing the websites of these bodies which relate to organisational structure, name of services they offer, links to other governmental websites and sometimes the contact phone number of providers. The government officials too consider that the task of UDC is not to hold them or the UP accountable. In the UP, the entrepreneur has to work with the UP secretaries more closely than anyone else, but they have not

been partnered with or consulted enough. Still, they can exercise enormous control indirectly through the chairman to affect the entrepreneur's tenure and operations.

Performance management

The A2I is the principal agency that implements the tasks of monitoring and evaluation for which it relies on district administration to do on its behalf. However, field officials responsible for UDC matters have the accountability chain to the Cabinet Division and the Ministry of Public Administration. Hence, the A2I can only advise the field official but cannot hold them responsible for failure and poor performance. BCC is better placed in this regard since it has its own officials in the district levels such as the Assistant Programmers. Then it is only able to provide technical assistance and is unsuitable to collaborate with partners like local government bodies, government officials and private entrepreneurs.

Similarly, entrepreneurs work under the supervision of UP which is accountable to the LGD. Because of UP's involvement for hosting, funding and appointing entrepreneurs, along with the supervisory role, the A2I wanted to shift the UDC management responsibility to the LGD, but it did not agree to take over. According to management officials, had the LGD been involved in the process they could monitor the performance more effectively. LGD could use its existing channel of seeking reports on UDC operations, as it does for all other UP activities, via its designated senior official at the DC office, the Deputy Director of Local Government (DDLG). Upon evaluation it can align funding with performance and also take actions against poor performers. Currently, the LDG's involvement is limited to only issuing some circulars and guidelines on UDC and UP relations and activities. It is in no way involved in performance monitoring and appraisal.

The UDC is just one among multiple quick-win projects the A2I has undertaken. Hence, this can disadvantage the UDC project which receives inadequate attention from an overburdened management involved in a growing number of projects. In Sri Lanka and in most states of India such management responsibility is stewarded by the ICT ministry/ or agency because of expertise and management capacity. Though in West Bengal this responsibility is given to the Department of Panchayat raj (Local Government) it finds it challenging to integrate and coordinate effectively across departments because of the absence of appropriate managerial leadership (ICTA 2010); Shadrach 2012; Shadrach & Sharma 2013).

In Bangladesh the A2I, under the banner of the Prime Minister's Office, can play a somewhat effective role in coordination across government departments and forging partnership with private agencies. However, the UDC cell in A2I is too under resourced in terms of staff, resources and capacity (Interview with A2I Officials, 2013). Hence, it needs to be considered whether the ICT ministry can play a more effective role in this regard for its specialisation and mandate. At this stage the ICT ministry's attached department, the BCC through its field APs, provides only some technical and training assistance to the UDC. The AP's office is also under resourced in terms of

personnel and logistics for which he/she can offer assistance through mobile phones and can hardly pay any physical visits to see the problems on the ground. More recently, the appointment of *Technicians* under info-sarker project of BCC at Upazila level has added somewhat to the strength of technical support to the UDC (BCC 2015).

Countered by such management shortcomings the A2I relies heavily on the district and Upazila administration for establishment, supervision and monitoring and performance management of UDCs. Though these units are well placed geographically to oversee UDCs in the field they are overburdened with the responsibility of everything the government have to offer at those levels. Officials of these units struggle to allocate sufficient time for the UDC. Of course, the initial enthusiasm and directives from the PMO and the Cabinet Division motivated them to quickly establish UDCs. Continuity of similar efforts for performance management is now a challenge. As the executives in the district and Upazila administrations are from the generalist core of the bureaucracy, their understanding of the model as well as their commitment to supervision vary widely. Moreover, their short term tenure in the field affects the supervision. We could notice passions of some administrators coupled with the assistance from the A2I in some districts awarded UDCs with a greater level of equipment and services, better training of entrepreneurs and more effective monitoring. For instance, in Jessore district the Deputy Commissioner became the grantor of non-payment of Electricity bills to REB by entrepreneurs, which awarded UDCs in the district with the service fairly quickly. With the transfer of committed officials some UDCs experienced shortfalls in the levels of support. The laxity in recruitment, training, supervision, monitoring of entrepreneurs can be partly attributed to differences in levels of commitment and capacity of these management officials.

> "The difference in UDC performance is largely dependent on the performance of the Upazila Nirbahi Officers (UNO). Where the UNO is active in supervision and oversight or has some sort of IT background or interest in it, the situation is better. If UNO says that he/she is having a look at monitoring tools as what the performance of entrepreneurs is, the situation gets improved quickly"(Management Official Interviewee no 22)

Even some management stakeholders feel that with the transfer of some architect officers at the A2I cell, the project may suffer. Similarly, there is a feeling among entrepreneurs that the entire project may be doomed with the change in government because the UDC is the extension of the current government's 'Digital Bangladesh' agenda.

Like the accountability chain, the monthly reporting on the UDC operation follows the same route from UDC to UNO office to DC office and then to the Divisional Commissioner's office to be eventually shelved in the Cabinet Division, but the reporting is not considered as part of the A2I. The consolidated facts from these reports are presented in the monthly or quarterly meetings in some of these layers of administration, especially in the DC office, for discussion and subsequent administrative directions from higher to lower officials. In many cases such reports are inflated/deflated, not reflecting the true reality or routine works. Interviews with all district officials

suggest that roughly 40% of UDCs are running well with good income and regular reporting. Despite questions of accuracy and with no other means of validation, these reports form the major basis of performance reward not just for entrepreneurs but also for other management stakeholders such as people's representatives and management officials. Though there are provisions for physical visits or inspections by the local administration such checks are infrequent and recommendations made are normally not implemented.

These limitations of physical monitoring and evaluation can be addressed somewhat through the online monitoring tool, the UAMS. But, as not all entrepreneurs regularly upload reports in the UAMS, they are untraceable on their progress. In Bogra district, for instance, only 30 UDCs out of 109 uploaded reports daily and 14 other reported irregularly while the remaining 65 did not report at all during a 7 day period between 19 - 25 May, 2013 (UDC Dashboard Report, Bogra, 2013). Though the UAMS enables the monitoring of open UDCs in terms of the number of people visiting and income of entrepreneurs by producing consolidated reports accessible at different layers of administration, such reports are often fabricated, like the paper based ones. Entrepreneurs admit the deviance by justifying that they remain under pressure from higher administration to exhibit good performance. However, there are opposite reasons to suppress facts for some high income entrepreneurs who prefer not to reveal their true income to avert attention to themselves or for income tax purposes. Perhaps, many entrepreneurs are reluctant to upload reports regularly due to evasion, apathy, lack of ICT ability, or lack of awareness. As not all entrepreneurs upload an activities report regularly the UAMS represents a partial picture of performance. Notwithstanding, the consolidated information on a few uploaded reports serves as the basis of further instructions from the higher management officials and the A2I. Even after approximately 5 years of operation the A2I is yet to undertake any evaluation exercise and produce a report on the project (A2I 2015).

Networking and funding

The networking opportunity among entrepreneurs is created through the UDC blog as discussed earlier. Like report uploading in the UAMS it is also partially used by entrepreneurs. Only 3000 entrepreneurs are frequent users the UDC blog to share innovative ideas or seek technical solutions (Interview with A2I official, 2013). Entrepreneurs who are not members or active on the blog miss out on the opportunity to solve problems or the exchange learning. It also underscores the need to establish telecentre networks for wider learning sharing of ideas, problems and innovation.

Superseding all of these challenges, perhaps, the immediate biggest challenge is continuity of funding for replacement and repair of equipment, especially for low income UDCs. Until now there is no common fund developed to support UDC for a reasonable period of time with equipment and training, as is the practice in many developing countries under a Universal Service Obligation (USO) fund collected from telecom providers (ICTA 2010; Shadrach & Sharma 2013). In the

absence of a common fund source, the project has to look for funds from so many charitable sources such as from the UNDP, the A2I, the BCC, the LGD, even the ministry of Environment. Though funding from these sources has helped UDCs to a large extent to establish more quickly it cannot be enforced by any rule to be continued. We have seen that UPs are no longer as generous as they were since it is not mandatory for them to continue funding. On the other hand, lack of entrepreneurship and investment from the entrepreneur pose a formidable challenge for future financial sustainability. Contrary to the notion of public-private partnership, many entrepreneurs, even some chairmen as well, are of the opinion that their service needs to be permanent like that of a government official. Still there are entrepreneurs who do not want be permanent as they have the capacity to earn more than the equivalent government official, even the UP secretary. The management officials believe that if the entrepreneur's income can be increased there will be less insistence on permanency and the model will survive. In the next section we attempt to find a solution to financial and social sustainability. Yet again, there is no quick fix from a single partner but has to be addressed through partnership ecosystem as the challenges are numerous and complex.

Sustainability of the UDC

In the literature review we identified the attributes that come from different stakeholders in a partnership telecentre which is also referred to as the ecosystem. This ecosystem enables processes and systems to overcome challenges and prompt sustainability in different dimensions such as policy, operational, organisational, financial and social (Shadrach 2012). Hence, it is imperative to understand the strengths and opportunities of the model emanating from the partnership ecosystem that determine its sustainability.

Strengths and opportunities of the model - sustainability factors

ICT enabled centre

The UDC is an ICT enabled centre which is the first of its kind in the rural area. In the UP previously most jobs were done manually handwritten and sometimes with the help of nearby computer shops. We have seen that the UDC is adequately equipped at least in terms of 'Basic ICT equipment' that made the UP office work more efficiently. In poverty tormented country where multifarious heads of expenditure have to vie with each other over the allocation of resources, such levels of ICT resources at UDCs is certainly substantial. This is also significant since most government offices in the country are still to be given the level of ICT structure the UDC now enjoys (Jabbar 2009; Sarker 2013).

The ICT equipment is also playing a role to provide citizens enhanced access to services or information which is error free and consistent. It treats people in an impartial way coupled with providing benefits of least cost and time. As some UDCs are provided with other two types of equipment such as the Picture Equipment and Advanced Equipment (Table 16) they can go extra

miles to provide wider benefits. For instance, those who have a number of computers can provide computer training to more rural youths. Currently, though the nearby computer shops have equipment but they fall below the scale and variety of equipment the UDC has. So people can use the UDC for a variety of services and this increases its income.

> "Although there are other shops around they do not have the number of equipment we do to facilitate varieties of services. When someone comes for a certificate, for instance, he/she can also photocopy or email it" (Interview with entrepreneur, Arulia, Bogra 2013).

Using the internet from the centre people can talk with their relatives abroad or email them, apply for admission, pay utility bills, apply for passport, do financial transactions. It only adds to their convenience.

One stop centre for digital services

The UDC is a one-stop centre for providing a bundle of government and private information and services unparalleled to any other delivery points in the country. It provides the combination of government, local government and private services (Table 19). Government services are traditionally provided from alternative points which are often distant to rural people and are associated with non-transparency, corruption and reign of intermediaries. By bringing them merely closer to rural people the UDC can make a huge difference in benefiting people and improving governance of delivery. For instance, the online admission facilitated by the UDC has impacts as described by a management official:

> "Online admission from the UDC has reduced interventions from inside and outside in some colleges. Even the most powerful political leader or the college principal becomes helpless to manipulate with the digital system. Candidates are selected based on their previous academic records retrieved from the respective educational boards on transparent and impartial basis. Even the waiting list is published online. There is no scope of bargaining or the extra charge as the payment is online and definitive. This has drastically reduced the scope of corruption or tadbir (persuasion) from influential corners, chaos and brawls surrounding the process" (Management Official Interviewee no. 22, 2013).

Similarly, for land copy from DC office at the district level, the application can be launched and tracked from the UDC. People can know the progress of their application, the concerned person dealing with it and the expected date of delivery (Table 7 and Table 28). The UDC also enjoys monopoly for delivering some government services such as overseas job registration and data entry of statistical bureau. In Natore district, for instance, the DESC stopped delivery of land copies to force people to visit UDCs (Interview with A2I Official 2013).

The online provision of certificates, which were previously given manually, has reduced error, forgery and corruption in the delivery system. While the supply of other services varies across UDCs, the delivery of certificates is almost fixed and currently it provides the highest percentage of income. Given the monopoly of the UDC to provide certificates, not only it provides an edge in greater income but also helps entrepreneurs, who cannot provide other types of services, to survive. The demands for certificates for various purposes such as school admission, passport and

licenses should also potentially be huge from densely populated rural communities living in a critical mass within 3 or 4 square kilometres (Table 2). It also provides opportunity to marketing other products of the UDC.

Though the third type of services, the commercial ones, can be received from anywhere, still the UDC is the closer and cheaper point to rural people considering the growth of these services consistent with overall development of the country (Sarker 2013). Moreover, since it is a one-stop centre, people coming for a single type of service can easily place requests for other kinds. In addition, it is the first time some of the internet based services have been provided in rural areas, adding to the potential of UDC to harness the untapped market. According to the A2I, entrepreneurs had earned about 1.38 billion BDT by providing as many 50 kinds of services over the last two years (A2I 2015).

Blessed with the government's continuous support

Despite the declining trend, there has been continuity in the support from the government and the UP in a one year period (Table 24). From our interview with entrepreneurs it is revealed that many entrepreneurs consider government's support as a blessing for them.

> "If I were to open a similar centre I have to spend a lot of money behind it. This is the difference of UDC with other ventures; I do not have to pay rent and electricity bill or I can pay them through my work of UP. There is a great opportunity to earn money without much investment (Entrepreneur, Arulia, Bogra 2013).

Until entrepreneurship development and ownership by the private entrepreneur this continuity of support is very essential for the survival of the UDC. Many UDCs struggle to have equipment and service varieties mainly from lack of support from public partners. Data shows that service supply and technical and training assistance from the government have increased moderately on the average, after the initial set up. Cooperation from the UP has remained typically near to the same as before (Table 24). Initial enthusiasm powered by the slogan of 'Digital Bangladesh' and compelled by the stronger directions from LGD and PMO motivated the UPs to purchase the basic ICT equipment. It is reasonable that the initial full scale support has dropped over time because of resource limits as well as the growing expectation that the UDC can run on its own earning. It is disagreeable to some entrepreneurs especially who are dependent more on external support. We have seen in our Progress Model in the previous chapter (Model 1) how external support largely shaped both increase in people's participation and progress in one year. Changes in these variables were used to create three composite variables such as 'Public Partner's support', 'People's participation' and 'Progress in service and income' (Table 25). While the first one connotes policy, organisational and operational supports the latter two are about financial and social outcomes. The latent constructs comprising these three components, are thus, used in our sustainability model later.

Public-Private Partnership (PPP)

Support from the government is not only targeted to provide people services and bridge the digital divide, it also has as a remit to trigger entrepreneurship in the rural area, especially, among rural youths engaged through PPP (A2I 2011c). Contrary to engage full grown private entrepreneurs with investment and efficiency, the government has partnered with home grown local youth who are mostly weak on both fronts. After their recruitment they have not undergone adequate training on computer and marketing skill development. Nearly half of them are still to sign any contract with the UP to make their extended stay reliable. Given these circumstances, the entrepreneur's investment (Figure 6) is considered as the principal indicator of his/her engagement in the UDC. We have seen from the field observation that all high income entrepreneurs have invested their earnings from the UDC since they do not have access to loans or government assistance in this regard. Initially, many were not even sure about the prospect of the business and hence were hesitant to put money behind it or to show vigour in entrepreneurship. This is also largely for that many did not have a previous source of income to invest. Then entrepreneurs' income has increased steadily over time, as has the amount of investment (Figure 10) for the maintenance of and proliferation of the business. The presence of ICT equipment at the rural level has not only empowered the community, but has also had a substantial impact on the unemployed youth's skill development and their earnings.

> "In remote villages the laptop was unknown to the people. Even among the entrepreneurs majority had never used laptops before. We are giving training and books on basic computer operations to entrepreneurs who are, in turn, training others. Because of their age these young entrepreneurs have better receptive quality to train themselves and acquire new skills" (Management Official, Interviewee no 25).

As the UDC contributes to their skills, some entrepreneurs are training others such as less efficient fellow entrepreneur, alternative entrepreneurs and unemployed youths. The PPP is forged on the belief that when there is more than one player there is less likelihood of failure (Interview with A2I Official, 2013).

Another quality often desired under PPP is the efficiency gain from private partners (Flynn 2007; Webb & Pulle 2002). Hence, it is important for entrepreneurs to be efficient in both the time it takes for delivery and the reduction of costs to thrive in the competitive market. As far as reduced time and cost is concerned, (Table 22) 31% entrepreneurs are dissatisfied while 21% and are neither dissatisfied nor satisfied. Dissatisfaction with reduction in time and costs partly comes from slow internet and electricity blackouts which take an unusually long time leading to extra charges to maintain earnings. On the other hand, 48% are satisfied and highly satisfied resulting in an overall average of satisfaction M= 3.28, SD= 1.29. Efficiency in time and cost has implications for both income and client's turn out. The association among these constructs is shown in the sustainability model later.

Sustainability outcomes - financial, entrepreneurial and social

The sustainability outcome is presented here in terms of financial, entrepreneurial and social outcomes as determined in the literature review.

Financial

It has been seen that entrepreneurs have the least contribution in the UDC in terms of their investment (Model 1). From our qualitative interviews, it is learnt that most entrepreneurs come from rural unemployed youths in low income families. A number of entrepreneurs who have previous economic capability are unwilling to invest given the uncertainty of the job and the market. Those who have invested admit that the major portion of their investment comes from savings from the income from the UDC. We have also seen that a large number of low income entrepreneurs, especially females, tend to leave their jobs. Hence, it has become imperative to predict what factors contribute to income sustainability in order to ensure that entrepreneurs come forward to invest and the financial sustainability of the UDC is guaranteed. In this next subsection we will attempt to predict the sustained income by putting our fifth hypothesis to the test.

We will attempt to identify the major enablers of the sustained level of income and the interrelationship between them. Using the binary logistic regression model, we test the fifth hypothesis that partnership components such as infrastructure inputs and services from public partners, private partner's entrepreneurial capacity along with people's participation, play an important part in explaining the entrepreneur's monthly sustained income necessary for financial sustainability. Monthly income is considered as the crucial determinant of financial sustainability because it excludes the operating costs from recurring expenses such as internet, utility bills, paper, printing cartridges, and equipment maintenance and repairs. The reported income adjusts the fluctuation as it is an average from 3 months. BDT 5001 and above as the sustainable level of income for reasons stated beneath.

We know that the UP secretaries are permanent government employees and their salary starts above 5000 BDT a month. Considering this, as well as the prevailing unemployment rate and low paid jobs in the country, BDT 5001 and above is regarded here as a sustainable income for entrepreneurs. This level of income is also sustainable since the UDC equipment is purchased by the government and some of its recurrent expenses are subsidised by the UP. Entrepreneurs are not asked to pay anything to the UP, at least for the initial three years, as per the contract (LGD 2010). Whereas in other telecentre models financial sustainability means the recovery of cost of infrastructure as well as operational costs (Shadrach & Sharma 2013), in Bangladesh the entrepreneurs are not encumbered with a similar responsibility to reach break-even point since the government and the local government are partners with continued support. Yet, the orthodox financial sustainability is desirable as external funding cannot be taken for granted indefinitely and the target is to develop entrepreneurship. Given the current context, there is widespread conviction

among entrepreneurs that a starting salary of at least 5001 BDT would help them survive, as well as give them a chance to expand the business with subsequent investments over time (LGD 2010; Interview with A2I Official, 2013).

More than one third (40%) of entrepreneurs are earning less than this threshold (Figure 7). The level of satisfaction among them is very low (Table 22). In addition, the dropout rate among them is very high as the qualitative interview suggests. Our model using the binary logistic regression presented below explains the factors that contribute to this sustainable income level. The variable 'Average Monthly Income' is dichotomised into binary of these two categories (Up to 5000 and 5001 and above) for reasons mentioned above as well as for somewhat skewed nature of the variable (Gray & Kinnear 2012).

Modelling income sustainability

The sustainability of income of the entrepreneurs is presented through the Model 2.

Model 2: Logistic regression on the sustainability of entrepreneur's income from inputs of stakeholders

Model A

Variables	*Odds ratio*	*95% CI*	*P values*
Computer Competency			
< 6 months	Reference		
>= 6 months	.776	.455 & 1.32	.349
Contract			
No	Reference		
Yes	1.35	.826 & 2.22	.229
Internet Connection Type			
Dial-up or mobile	Reference		
Broadband	1.94	.799 & 4.69	.144
Investment by entrepreneur			
No investment	Reference		
<20000 BDT	.798	.326 &1.95	.621
20000-50000	1.59	.627 & 4.02	.330
50001-100000	2.64	.914 & 7.60	.073
>100000	4.02	1.17 & 13.80	.027
Picture Equipment	2.08	1.50 & 2.87	.000
E-government Services	1.26	.894 &1.79	.186
Entrepreneur's Satisfaction	2.13	1.47 & 3.10	.000

Model B

Variables	*Odds ratio*	*95% CI*	*P values*
Computer Competency			
< 6 months	Reference		
>= 6 months	.794	.452 & 1.40	.425
Contract			
No	Reference		
Yes	1.58	.931 & 2.68	.090
Internet Connection Type			
Dial-up or mobile	Reference		
Broadband	1.71	.679 & 4.28	.256
Investment by entrepreneur			
No investment	Reference		
<20000	.691	.262 &1.82	.456
20000-50000	1.50	.554 & 4.07	.424
50001-100000	2.16	.691 & 6.81	.185
>100000	3.07	.806 & 11.72	.100
Picture Equipment	2.22	1.56 & 3.16	.000
E-government Services	1.15	.791 &1.66	.468
Entrepreneur's Satisfaction	1.80	1.22 & 2.67	.003
Monthly service recipients			
<=100	Reference		
101-200	2.55	1.13 & 5.76	.024
201-300	3.47	1.51 & 7.96	.003
301-400	6.64	2.52 & 17.51	.000
401-500	7.47	2.54 & 22.10	.000
>=501	8.90	3.34 & 23.70	.000

Logistic regression was conducted to assess the impact of a number of factors on the likelihood that entrepreneurs would report that they had an income of 5001 and above BDT (Sustainability level). There are 8 (eight) variables in the model ('computer competency', 'contract with the UP', 'internet connection type', 'money invested by the entrepreneur', ' average monthly service recipients in the last 3 months' are categorical variables; 'picture equipment'[78] 'e-government services'[79] and 'entrepreneur's satisfactions'[80] are continuous variables with composite means). The full model containing all predictors was statistically significant, $\chi 2$ (14, N= 342) = 103.95, p<.01, indicating that the model was able to distinguish between entrepreneurs who have Taka 5001 and above and those who have Taka 5000 or less from the UDC.

The model as a whole explained between 26.2% (Cox & Snell R square) and 35.3% (Nagelkerke R square) of the variance in income status, and correctly classified 75.4% of cases, an improvement upon the baseline, intercept only rate of 58.8%. As shown in the above table (model B) that three of the independent variables made a unique statistically significant contribution to the model (average monthly service recipients, picture equipment and entrepreneur's satisfaction). 'Money invested by the entrepreneur' was significant in the model A; became not significant when included with the 'monthly service recipients' in the model B. The strongest predictor of having an income of Taka 5001 and above is the average number of service recipients in a month with the overall Wald value of 27.44 . The odds ratios for categorical variables > 1 indicate that moving from reference categories entrepreneurs are more likely to report to have an income >=5001. For instance, entrepreneurs who have invested >100000 are 4.02 times (model A) more likely to have a sustained income compared to those who have invested nothing in the UDC. Entrepreneurs who are visited by >= 500 service recipient are 8.90 times more likely to report to earn the sustained income compared to those who serve <= 100 people a month. Similarly, odds ratio for all significant continuous independent variables are > 1 indicating that for every additional increase in units of each of them, entrepreneurs are more likely to report to have an income of 5001 and above BDT, controlling for every other factors in the model (Pallant, 2011; Gray and Kinnear, 2012). Four other independent variables are not found to be statistically significant at p<.05. Thus, our fifth hypothesis that partnership involvement under PPPP in terms of infrastructure inputs (equipment, services, internet connection), entrepreneurship (computer competency, contract, investment, satisfaction) and people's participation contribute to the entrepreneur's income sustainability is partially supported.

From a quantitative point of view we know that correlated independent variables cancel each other in the regression model. It has been noticed that most of these independent variables are

[78] Picture equipment is a mean from availability and working conditions of scanner, digital camera and colour printer.
[79] Government Service is a composite mean of land copy, electricity bill pay, passport and mobile banking and information on education, health and agriculture (Table 19).
[80] Entrepreneur satisfaction denotes a composite mean of satisfaction on issues such as income from the UDC, reduced time and cost in delivery, cooperation from the UP, training and technical support from admin, online service support from government and people's participation (Table 22).

correlated with each other and there are moderation effects too (Gray & Kinnear 2012). From a qualitative point of view we can also justify this reason. At this stage, the 'computer competency' does not have any independent influence on the sustainable income. It might be because UDCs do not provide many services that require higher-level computer skills. For instance, the UDC provides very few internet based e-services. Moreover, for any external e-services introduced in the UDC the entrepreneurs are given training on relevant operations by the local administration beforehand. However, with the introduction of more internet based services, the higher-level computer skill might be a significant factor for sustained income.

Likewise, having a contract with the UP does not play a significant role in explaining the dependent variable, perhaps, because it is not enforced in its strictest sense that fulfils the requirement for investment and parties' other responsibilities.. Similarly, internet connection does not have any significant impact on sustainable income which might explain why Bangladeshi broadband is also slow. Broadband's Bangladeshi standard of minimum 128 kbps is not consistent with the ITU determined bandwidth of at least 1mbps. As per ITU standard this bandwidth can at best be termed as narrowband. Besides, the few available broadband connections that do exist are mostly mobile, and not connected with fibre optics for establishing faster speed (Faroqi 2015b; Prothom_Alo 2013). Similarly, government services are not widely available in UDCs.

Although financial sustainability would help UDCs avert a shutdown, it is a narrow form of sustainability as we have learnt from literature review. There are other forms of sustainability outcomes such as entrepreneurial and social which are interlinked as we already have noticed challenges along these lines. Because of links of income to other sustainability outcomes it is again incorporated as part of our broader sustainability framework presented later using the SEM.

Entrepreneurial

We have seen that many entrepreneurs have moved away from low satisfaction levels with their income and, hence, it is considered an important indicator for sustainability. The percentage distribution (Table 22) shows that 11% entrepreneurs are highly dissatisfied, 26% dissatisfied, 21% uncertain while 33% are satisfied and the remaining 9% are highly satisfied. The average value for the scale is 3.04 with the SD= 1.18. The monthly income is also correlated with the satisfaction on income with medium effects i.e rho (297) = .330; $p < .01$, meaning that high income entrepreneurs tend to be more satisfied. We have seen that the UDC has employed mostly people who were previously unemployed; it has given them an avenue to develop their skill and augment their earning capability. Successful entrepreneurs have employed additional people to run separate computer shops or support the UDC operations. According to the management authority in Comilla district, for example, there are as many as 50 entrepreneurs out of 184 who have employed an extra two or three people. This elevates their status as an employer as well as a social leader. Some entrepreneurs view that the UDC also has increased their social prestige by giving them an

opportunity to make contact with administration and work as an agent of government with the people. Collectively, these issues serve as sources of satisfaction that link back to the income.

Social

The UDC's target is to connect rural masses and bridge the digital divide and, therefore, the number of people visiting it is considered as the key indicator of social sustainability. We have shown that the composition of the recipients comprises significant portion of disadvantaged people including women, poor and illiterate (Table 23). The reported number of service recipients adjusts the fluctuation as it is an average from three months. People's participation is found to be the biggest contributor for the income sustainability (Model 2). Though people usually take certificates from the UP, for commercial and government services the UDC is the only close point to them for most cases leasing to benefits and opportunity costs. Hence, on its own the UDC carries potential for people's participation from a massive cliental base living in one of the most densely populated countries, as discussed earlier. Our quantitative findings have already suggested that some UDCs are doing well in terms of number of people visiting for services per month (Figure 11). It is widespread too across all administrative divisions (Figure 12). As the UDC advances in time so is people's visit and consequent income as is shown in our progress model (Model 1). This variable is correlated with both monthly income and investment (Figure 10) and satisfaction on income[81] with medium effects.

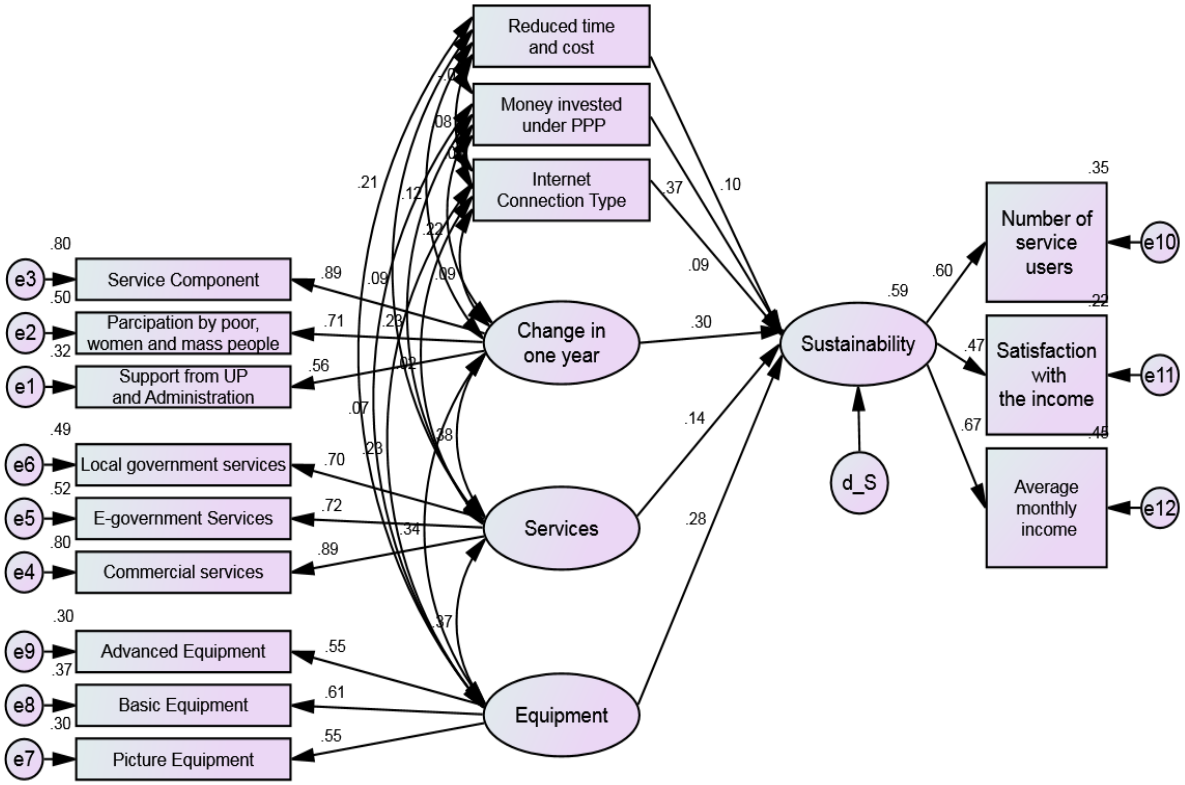
These sustainability outcomes are predicted from factors discussed earlier in this section using the SEM and presented in the Model 3.

81 People's participation is correlated with satisfaction on income (rho = .30; p<01)

Sustainability model

Model 3: Structural Equation Model of Sustainability Dimensions

(Standardised solution; N = 538).



The above model[82] demonstrates that equipment, services, support continuity in one year, internet, and entrepreneurship contribute to the sustainability (financial, entrepreneurial and social) by explaining 59% of total variance of it. Since these factors are components of partnership our hypotheses (6-9) that inputs from partnership ecosystem lead to UDC's sustainability are partially supported; the null hypothesis is rejected as all regression paths except that of 'reduced time and cost' and 'internet connection type' are statistically significant at p< .05 (Appendix table 2.27)[83].

In terms of unique contribution, though the entrepreneur's investment is the biggest (α= .37) we have to accept that all other explanatory factors are contributions from public partners and people on the major. Also, in the previous model (Model 2) people's participation was the predicting

[82] The model fits are: χ^2 (72) = 150.68, *p*<.000 (given large sample size) but CMIN/DF = 2.09; NFI = .91; CFI = .95; TLI= .92; RMSEA = .045.

[83] The missing values prohibit to conduct bootstrapping in AMOS. Despite the large sample size and the use of FIML in AMOS, that deals with missing values with the estimate means and intercepts, in orders to allow bootstrapping on 500 sample a separate analysis was undertaken with the data set imputed to start with by Expectation Maximization (EM). The result shows no considerable difference from the solution based on original data in terms of regression weights, standard error and significance level. However, the solutions are based on original data (Buhi, Goodson & Neilands 2007; Schreiber et al. 2006)

variable and here it is the outcome variable. The other significant contributors are ‘change in inputs and outcome’ in one year (α= .30), equipment (α=.28), services (α= .14). Despite not statistically significant (p<.05), ‘the reduced time and cost’ has a regression coefficient value α= .10 and the internet with α=.09. Thus, the interpretation for a single predictor is, for instance, when money investment goes up by 1 standard deviation the sustainability goes up 0.37 standard deviations.

Though services are not contributing in an expected magnitude but it is correlated (p< .05) with ‘equipment’ and ‘change’ with medium effects (correlation values in the above Model 3). Similarly, equipment is associated with change with medium effects. We know that a multiplicity of equipment can facilitate a variety of services, both of which are being increased over time supported by partners. The entrepreneur’s investment is also correlated with change and services with small effects implying that he/she is increasingly joining the UDC’s advancement by introducing new services and/or mobilising awareness. There are also significant correlation between equipment with internet connection type and reduced time and cost. Faster internet allows various equipment be used efficiently and serve quickly and thus transact in greater volumes, which in turn help to reduce cost.

The regression pathways that are not statistically significant to predict sustainability imply challenges and validate our previous discussion of them. The internet connection can be considered to be marginally significant (p<.08) to impact sustainability. This is because country’s overall fragile internet is unable to give any faster connectivity to the UDC as we discussed earlier (UN 2014). The lower magnitude of effects from services can be explained in a way that except certificates, other services are not common across centres. In fact, many suffer from a dearth of government and commercial services. The government’s support with its services is taking time from resistance from bureaucracy, resource and capacity constraints. Similarly, a lack of skills and commitment on the part of entrepreneurs and slower internet speeds are denying the introduction of some commercial and internet based services as can be seen from the small correlation between investment and services as well as from insignificant correlation between internet and services.

Entrepreneurs appear to play a significant part but it is very inadequate compared to expectations of both efficiency and investment for future ownership of the project (A2I 2015). We have not found any significant correlation between investment and reduced time and cost, the indicator for efficiency. Neither the investment is significantly associated with the equipment which might have been for entrepreneurs could not make any considerable addition to the equipment bundle initially provided by the public partners. Lack of efficiency and investment capacity are triggering dropouts frustrating the mission of the project. This is partly because not adequate considerations are given to recruitment, training, monitoring and evaluation and enabling them with loans assessing good tracking records. Yet, efficient entrepreneurs are earning good and investing in turn. Despite such

limitations the UDC is increasingly becoming popular because of dense population with service demands at the bottom of the pyramid. We have seen that the most noticeable upsurge happened during the last year in the arena of mass people's participation. However, service supply, technical and training assistance and cooperation from UP did not match with similar rise. With external support being weakened it is important that entrepreneurs take over the responsibility of ownership and operation for survival of the project. Our sustainability model (Model 3) shows the pathways to ensure sustainability of all UDCs.

In the light of these key determinants of sustainability and their outcomes, two cases of UDC are presented here to support the discussion from a qualitative perspective.

Case Studies

These two cases have been chosen to demonstrate how partnership components in terms of external support from the government and the UP have synergised with the entrepreneur's own initiative to contribute to the development of entrepreneurship and sustainability and show how weaknesses in the ecosystem can result in failure on both fronts. The cases are drawn from Arabpur UDC from Jessore and Naruamala UDC from Bogra districts.

Arabpur UDC, Jessore

Arabpur union has an area of 25.97 square kilometre spread across 16 villages inhabited by 41361 people with a literacy rate of 84% located at the outskirt of *Jessore* district town. The UDC hosts itself outside of the UP office in a nearby rented shop. The internet users in *Jessore* district consist of only 1% of the total population; the women's share among them being remarkably low to only 13.7%. (BBS 2011). In such a low level of people's access to digital contents, the UDC started its journey in September, 2010. After six months of inception, the first entrepreneurs were replaced with the current husband and wife entrepreneurs with a graduate level education. The husband has a six-month in computer office application.

Like that of other UDCs the government, from its LGSP fund, provided the equipment such as a laptop, a desktop computer, a camera, a multimedia projector, a photocopier and a printer. The district administration[84] has introduced a number of services from the UDC such as land copy, electricity bill pay, mobile banking, and passport application with the help of A2I. It has also developed a local software to facilitate e-payment of some services from the UDC while others can be paid through the mobile provider, the *Teletalk*. The A2I and the district administration have engaged Bangladesh Technical Education Board to give all kind of technical service support and troubleshooting assistance from its local polytechnic institutions and to award certificates to computer trainees form UDCs.

[84]In fact, *Jessore* was the first to pilot District e-service centre (DESC) and subsequently the National E-service system (NESS) to replace the former in a more robust manner to incorporate other offices in the district and Upazila (A2I 2014).

The district administration also made advertisements in newspapers and in local TV networks to showcase the services of the UDC. The entrepreneurs consider this as a profound endorsement by the government. It carries out training and oversight of entrepreneurs as supported by the A2I and Bangladesh Computer Council (BCC). Both A2I and the district administration monitor the progress of daily income and number of people visiting these centres through UAMS and facilitate peer learning and communication though their UDC blog. The entrepreneur is awarded as the best performer by both the district administration for district level and by the A2I in the country level.

He is clear about objectives and the potentials of the UDC as he says:

> "The UDC gave me a platform to serve rural people which I had long cherished. We have the objective of easily available, least costly and hassle free service and information delivery to the rural people. Common people suffer heavily from lack of these when they visit government or private offices" (Entrepreneur, Arabpur, 2013).

The entrepreneur added five more computers two internet modems, three printers and five mobile phones. He rents two separate premises adjacent to the UP, one for service delivery and the other for computer training. He has invested 600,000 Taka (mostly from his savings) in order to buy additional equipment and provide office set-ups which have subsequently boosted his income. He also pays the electricity and internet bills and recurring costs of the centre. He has employed two alternative entrepreneurs and one additional person to help with volumes of activities in both centres. Additionally, he has had to pay a security people to prevent numerous attempts at theft. For this additional workforce he has to pay around 15,000 Taka a month. After incurring all these costs, the UDC's net income is 90,000 Taka a month which is his family income. An estimated 100 people visit his centre each day.

He has adopted some strategies to tackle some of the challenges discussed earlier.

First, he has reduced dependency on providing UP certificates which is now provided by the UP secretary there.

> "At the beginning we used to provide certificates from the UDC, but it created problems. It is a problem all over the country especially for those entrepreneurs who are dependent on the income from certificates only. The income from certificates was previously enjoyed by the secretary and the chairman. Now it goes to entrepreneurs who, in many areas, deny to share with them that prompts conflict. I do UP office works without bargaining on payment since I use some of their equipment" (Entrepreneur, Arabpur 2013).

This UDC can easily forsake reliance on certificates since it could diversify its service collection. Not giving UP services, the entrepreneur recognises, has a downside too from missing out customers of other services. However, the UP helps with fostering mass mobilisation and awareness building.

Secondly, because of frequent internet breakdown or slow broadband speed, entrepreneurs find it increasingly difficult to serve people quickly. Therefore, entrepreneurs use mobile broadband which

is more costly and slow (average 25-35 kbps). This fragile connection hampers the provision of in-demand e-services such as downloadable forms, telemedicine and Skype conversations.. The power breakdown still remains unaddressed since it is relatively less frequent in this UDC. Though there are some other technical problems in the centre such as hardware and software problems they are manageable by the entrepreneur.

Thirdly, the entrepreneur does all his marketing campaigns elegantly by inviting social elites such as the local Member of Parliament (MP), (who, for instance, inaugurated the mobile banking system), the UP Chairman or the local administrators to demonstrate a showdown and to build trust and confidence in the system. Since Arabpur is one of the successful UDCs it is also showcased to present high officials and dignitaries from home and abroad by the government in the best possible light.

Finally, the entrepreneur is planning to build more services into his repertoire such as e-commerce by arranging online sale of the famous local product the *Nakshikhatha* (the embroidered wrap), for instance. He dreams of a UDC complex with multiple facilities such as a cyber café, a computer training section and a service desk for which he is hoping to buy a land with the help of district administration. He also contemplates to purchase of better internet connectivity from a local ISP that will give him a speed of 512 kbps at a cost of 5000 Taka a month.

Eventually, both entrepreneurs come up with a number of suggestions to make the UDC services more useful and beneficial to the rural people that include intranet connection with government offices to provide seamless services, robust e-payment system and their entrepreneurial training. Overall, both of them are highly satisfied.

> "It has not only increased our income but also honour and social esteem for attachment with the administration and the people'' (Female Entrepreneur, Arabpur 2013).

Naruamala UDC, Bogra

Naruamala Union has an area of 30.5 square kilometre inhabited by 30288 people across 19 villages with a literacy rate of 49% located around 5 kilometre away from the Upazila headquarter of *Gabtoli Sadar* of Bogra district. The Union Parishad Complex building hosts the UDC in one of its rooms. Only 0.5% of the district population use internet (women consists of 26% of total users) to access online information and services (BBS 2011). The UDC started in November 2010 with a view to improve people's access through a shared point.

> "In the beginning, it was running good benefitting people from providing certificates, computer compose, printing, photocopy and computer training. Suddenly, an accident has halted its progress" (UP Chairman, Naruamala, 2013)

The required equipment was purchased by the UP, but within 9 months the UDC had experienced a theft. Equipment including a projector, laptop, desktop computer, digital camera, web cam, and

laminating machine with an estimated value of 243,000 Taka were stolen during the night[85]. Fortunately, the photocopier and the printer and two other computers remained untouched as they were in a separate room under the custody of the woman entrepreneur. A criminal case was then filed against the male entrepreneur and he was arrested immediately and replaced by the current male entrepreneur.

> "Narumala UDC was the first in terms of activities such as computer training, and services and it had the highest number of equipment and facilities. After theft it became one of the poor performing UDCs in the Upazila" (UNO, Gabtoli, Bogra 2013).

Later, one laptop was purchased but it was kept under the custody of the UP Chairman under the pretext of security. Both entrepreneurs are part-time as both are students. The male entrepreneur has a diploma certificate in computer education but cannot offer computer training due to unavailability of computers. The centre mostly relies on providing certificates and some computer work including composition, data entry and photocopying that generate an income of approximately 3000 Taka each month for each entrepreneur. The UP works have to be done for free but this assists in meeting the utility bills. Unlike Arabpur, it is not equipped with external services such as land copy, electricity bill pay and mobile banking since these are not available anywhere in the district. The problems of power breakdown and slow internet connectivity are similar to other UDCs across the country For their low income and lack of access to loans entrepreneurs do not invest much in the UDC, which is only around 5000 Taka. The maximum amount of investment is around 5000 Taka. They are not clear about the mode of partnership and desire to be permanent like a government employee in future. Approximately 10 people visit the centre typically in a working day.

These two cases provide us lessons that the UDC has the ability to develop entrepreneurship among operators and ensure its own sustainability given the presence of effective interaction of partners engaged under PPP. These entrepreneurs, in turn, can empower people they serve by giving them access to digital technology, information and services as well as training them on ICT promoting social sustainability. Entrepreneurs who are better equipped with capacities such as computer skill, greater investment, good rapport with UP and administration, awareness generation and marketing tend to earn more from the UDC. The involvement of government and UPs such as in the supply of external services, adequate equipment assistance and cooperation and promotional campaign have effects on boosting the income of the entrepreneur and giving him opportunity to expand his ventures by furthering investment risks and responsibility. Entrepreneurs who are financially successful also engage others in a way that can catalyse entrepreneurship in the rural area as we have seen more profoundly in the case of Arabpur. External support and entrepreneurial involvement are key strategies for the UDC in the fight against digital divide and

85 The village police who were in charge of night security was also alleged to be involved in the matter and then a charge was also brought against him.

work as a social enterprise. Weaknesses in any of them can affect the other and, thus, potentially the mission of the UDC as is the case of Naruamala.

Conclusion

In this chapter we have identified and discussed the UDC's key challenges and suggested ways to address them based on the existing strengths and opportunities of the model. The challenges are categorised into three types which are interlinked with each other. First was the lack of entrepreneurship which leads to dropouts of operators and subsequent closure of UDCs jeopardising its objectives. This challenge is linked to the second types which are operational challenges, ranked by entrepreneurs, from internet connection being the topmost followed by power breakdown, equipment problem, low income from low turnout, lack of e-government services, lack of mass awareness and training of entrepreneurs. These problems clearly stem from weaknesses in the management of the project related to policy and implementation strategies by involving all stakeholders. Collectively, these challenges are posing sustainability concerns of the project in all dimensions including financial, entrepreneurial and social. Hence, we tried to find ways to make UDCs sustainable. Since all of these challenges are related to the partnership ecosystem of the project, therefore, opportunities in there are considered as strengths of the project. Strengths identified in equipment and service varieties, internet connection, development progress over the course of a year and entrepreneurship are considered as independent factors to predict the financial and social sustainability. We have seen that low income has a detrimental effect on entrepreneurship which causes the most important threats to the UDC, the drop outs. Female entrepreneurs are at a greater disadvantage in this regard. Our second model using the binary logistic regression predicted the sustained level of income from a number of partnership components generated from engaged stakeholders. If taken care of, increasing units of these factors should lead to sustained income and help entrepreneurs cling to the business. For overall sustainability including also entrepreneurial and social aspects hypotheses 6-9 have also been tested using SEM which are found to be partially supported. The non-significant factors are still considered as challenges. To see how partnership ecosystem work in practice for ensuring sustainability we presented two UDC cases. Both of them demonstrate that strengths in partnership ecosystem, or the lack of it, can promote sustainability or failure. In the next chapter, concluding comments will be made and recommendations presented based on this extensive study of the UDC.

CHAPTER 8. CONCLUSION AND POLICY RECOMMENDATIONS

Introduction

This chapter aims to identify what lessons can be learnt based on empirical findings and the experiences of similar projects in other developing countries. This chapter is organised into four sections. The first section presents a summary of findings based on the key issues identified and discussed in previous chapters. The second section delineates the methodological and theoretical implications of the study. The third section puts forward some recommendations based on learnings and experiences of similar projects in other countries. The final section provides concluding remarks and offers directions for future research.

Summary of Findings

In terms of infrastructure and management hurdles to establishing wider connectivity, the government of Bangladesh has introduced the Union Digital Centre (UDC) as the shared access point. The objectives are to provide rural people with easy access to information and services that will contribute to savings in money and time, reduce hassle and bridge the digital divide, as well as establish entrepreneurship. However, given the lack of preparation in backend electronic contents and management and challenges involving disadvantaged sections of the population, this initiative has led to questions concerning its ability to reach all. The question of whether the UDC can contribute to entrepreneurial development has emerged as many of the private partners began to abandon the project, leading to the closure of many centres. Moreover, the involvement of various stakeholders, without an adequate management approach, raises issues of sustainability. However, it is argued that the project has significant potential to contribute to development and transform public governance. Hence, there are three key domains of analysis: impacts on users, management and sustainability. In the following sub-sections, a summary of findings on these issues is presented.

Impacts on users

Based on the user survey and FGD data analysis, it is found that the UDC has enhanced people's access to information and services. It has introduced, to some extent, the compatible contents that are consistent with the needs of rural people. The UDC has also established a one-stop access point as opposed to the various types of information/services of multiple providers usually located at distant places. Some services are entirely new in rural settings, such as computer training, video conferencing or emailing. Financial transaction through mobile banking has the potential to foster business and entrepreneurship. These make the UDC an innovation.

The reach of UDC is currently limited, serving a very tiny portion of the rural population. To explain in terms of Diffusion Theory it appears that the project is only at the beginning phase of *S* curve of

diffusion. According to the theory, diffusion of innovation is most likely to happen speedily when there are more attributes, such as compatibility, relative advantages and less complexity. While some of the contents can be considered as compatible, they are not generally provided by all UDCs. Even with their availability they fall short of fulfilling the demands placed by local people with a list of future services. For this, a need assessment has not been carried out. The compatible contents also have implications for relative advantages.

With the presence of a few compatible contents, the UDC has established modest relative advantages. It has provided the nearest access point in the lowest decentralised local government unit, the UP, which covers the entirety of the rural area. There are partial benefits of reduced time and distance, and hassle free service delivery. Through effective use of ICT equipment, the UDC has improved the governance of service delivery in terms of speed, freedom from error and corruption, transparency and a demonstrated capacity to exercise empathy to recipients. Since entrepreneurs have an eagerness to earn from customers, they are motivated to keep the office open at flexible times and be friendly with service seekers.

The potential benefits of delivery of government services from the UDC perhaps make it superior to any other type of delivery since it can free people from the reins of corrupt government officials as well as intermediaries associated with excessive cost, unnecessary delay and hassle. However, the range of government services from UDCs is limited and not widespread. Most UDCs provide electronic birth registration, improving quality of delivery and reducing forgery and corruption. Nevertheless, this does not represent a great advantage since it is provided from the same place and the new delivery system has contributed to an increase in cost and time. It also has the risk of turning the UDC into a mere delivery point, as opposed to an innovative centre with services that have comparative greater range of advantages. This has led to complexity, detracting from the system for both current users and potential new users. While compatibility and relative advantages affects diffusion positively, complexity has the opposite effect.

The UDC uses two communication channels to advertise its presence: interpersonal communication and mass media. An initial mass media campaign by the government and the UP has facilitated some awareness among the rural people. Interpersonal communication (or ‘word of mouth’) is an ongoing process facilitated by peer users, entrepreneurs, volunteers and UP representatives. The UDC has a potential customer base which is grossly homophilous, with entrepreneurs and local patrons in terms of language use, cultural values and beliefs, though not in terms of economic status. This may assist with spread of communication. Compatibility and relative advantages, along with effectiveness of communication are necessary for bridging the digital divide.

The UDC’s record in bridging the digital divide is equivocal. It has some success in reaching over socio-economic barriers, travelling across gender, age, education, occupation, income, and

geographic divides. Women are more likely to visit a UDC than a government office. Because of the type of services the UDC provides, it is accessed more by young, literate and educated people, which is consistent with the characteristics of early use according to diffusion theory. Despite data demonstrating that low income people participate more in UDC service provision, it is not possible to consider all of them as poor because some of them are currently underemployed or unemployed, but belong to well-off families. Also, under the current circumstances, people living in extreme poverty are less likely to visit the UDC because there are no special services for them. More alarming is the lack of parity in the distribution of the few compatible contents across the geographical regions. This indicates that there is a room for introducing customised services for the disadvantaged.

The literature points to the fact that the digital divide evolves from existing socio-economic divide. Telecentre has a role to promote livelihood information to improve socio-economic conditions. Using telecentre, rural people can make informed decisions and facilitate their exit from the vicious cycle of poverty. The UDC has a few instances of providing information and services, catering for some needs in education, health and financial services. There is some anecdotal evidence of success with new skill acquisition, but these could not be definitively established as the impacts are not significant. This service delivery role of the UDC has remained limited, largely because they are yet to be connected to back end government agencies that would supply livelihood content. These potentials and shortcomings in impacts have presumably emerged from the engagement of relevant stakeholders in project operations and management.

Operations and management

The stakeholders' involvement is assessed in line with the PPPP approach adopted by the UDC. Key issues identified in stakeholder theory and subsequent contextualisation based on telecentre research form the basis of discussion. These are identification of key stakeholders, behaviour explanation, management and finally coalition analysis. We have introduced the policy background of involvement of such stakeholders. The UDC has joined the country's overall e-government journey in recent times. The institutional players in charge of the overall development of e-government in the country, and the promotion of UDCs in particular, have backed the process. Their policy roles and responsibilities are assessed against the empirical findings. Despite having identified management players and their policy roles, the UDC lacks any coherent policies to run its functions effectively. There is no strategic guideline to the functional modalities, resource mobilisation, development of human resources, or participation of rural population detailed in the existing policies.

The UDC has conducted the initial identification process in the stakeholder management. Before launching the project at full scale, stakeholders such as government officials and UP chairmen were consulted by the A2I, which did not occur during the subsequent rollout. However, no

interviewing or mapping was done to involve people or even other local government representatives such as UP members. After launching the project, the private partners (entrepreneurs) were identified, though not directly by the A2I, but by the UP chairman. During the identification process of entrepreneurs, the recruitment prerequisites such as minimum qualifications, investment capacity and contract enforcement were not strictly followed. Similarly, although involvement of people was underscored in the policy directives to create a 'UDC Management Committee', these were never formed, nor were local people consulted or engaged in the process of establishing UDCs. However, during the reiteration process some new stakeholders such as banks, civil societies and government agencies were identified for additional service supply, but their involvement is still relatively minor. Likewise, the project authority has failed to identify more competent and efficient stakeholders to be involved in franchising and investment, training of entrepreneurs, service and infrastructure development, and monitoring and evaluation, as has happened in India and Sri Lanka.

In the current context, the key stakeholders in management and operations are the government and the A2I, the district and Upazila administration, the UP, and the entrepreneur. The government, with support from the UP, has established UDCs and provided equipment and services, recruited entrepreneurs and conducted monitoring and supervision. The government also trains entrepreneurs and engages other stakeholders to supply services to the UDC. The aim behind such support is to trigger entrepreneurship development among operators who can later take ownership responsibility.

The involvement of stakeholders varies across UDCs in terms of the inputs they provide. There is a difference in the scale of equipment as not all UDCs are provided with the same number and types of equipment. Also they vary in terms of office space and furniture and internet connection type. However, the levels of equipment and internet are related to the number of services and subsequent number of recipients and income they provide.

As is the case with equipment, service supply from stakeholders varies across the board. While some UDCs are supplied with government services and thus have a wider clientele base, others are restricted to providing certificate delivery and a few commercial services. Despite having ICT hardware, some UDCs suffer from the supply of various services to optimise the use of equipment. Meanwhile, the government's efforts to provide its own services or forge partnerships with other service suppliers are slow. Therefore, the majority of UDCs have become reliant on the UP service, the certificates, its office works and its financial aid. Disparities in levels of training, monitoring and supervision by the government are also apparent. Because of such variations we also notice differences in income and people's visits, key indicators of sustainability. However, such variability in external inputs is not the only factor responsible. The private entrepreneur's extent of involvement also plays a large part in service and income.

Many UDCs are without full time entrepreneurs, especially females. Some entrepreneurs lack engagement in terms of their computer skills, contract enforcement, and investment capacity. The amount of investment by most falls short of the minimum requirement. Some could not take the opportunity of earning from already equipped centres because of their lack of entrepreneurial skills which has roots in their recruitment and skill training. As their earnings are low, and savings being the major source of finance, they cannot invest further to expand the business. The extent of cooperation from the UP for further investment is also low since the UP prioritises other development activities with the limited resources allocated to it. Low incomes, along with unfavourable relations with other stakeholders, are behind the most important threats to the UDC, the drop outs.

Despite such limitations, the UDC is making the most of access to a huge clientele base. A large portion of these people are disadvantaged. Still some UDCs are missing out on this opportunity because of weak stakeholder engagement. An increase in participation of the both the general public and disadvantaged people, along with support from UP and administration, can largely explain the extent of current progress. This, however, supports the claim of weakness in engagement by private entrepreneurs and raises concerns for sustainability.

Sustainability

The overdependence on external support and lack of entrepreneurship pose challenges for the sustainability of the UDC. Because of problems in identification, many of the entrepreneurs recruited are less committed to the UDC and treat it as short-term employment or a stepping stone to a higher position. Their commitment is further weakened by inadequate support from other management stakeholders which subsequently limits visits by people and results in insufficient income for the entrepreneur. Limited income, compounded by other problems, causes entrepreneurs to abandon the scheme and puts the goals of UDC out of reach.

This situation could have been improved through other steps in stakeholder management by the government. However, weaknesses in the rules of engagement are evident on a number of fronts, from operational problems to flaws in management practices. The government is yet to develop faster internet infrastructure to connect rural masses to the information superhighways. Neither is the available internet cost reasonable enough for extensive purposes. Despite power issues being somewhat addressed through the supply of solar panels, they are yet to offer full benefits. An imminent challenge is the maintenance and replacement of equipment, particularly for low income entrepreneurs. Dependence on UP's financial support in this regard has proven to be increasingly unreliable. These issues pose challenges for people to even visit UDCs which makes reaching financial targets impossible. This is because people would prefer that there are services that can benefit them. However, the supply of e-services that can ensure optimum benefits is incomplete. Neither are entrepreneurs engaged in developing local content. The lack of visits is also related to

the level of awareness building undertaken by stakeholders, which is still to cover the entire base of the UDC. Training in business and managerial skills are not given to entrepreneurs, which further weakens their capacity to run the UDC as an enterprise. All of these challenges affect income, people's use and entrepreneur's development.

These challenges are linked to managerial practices of government stakeholders in terms of model choice, financing, collaboration with other partners, and undertaking coalition analysis. It appears that the government have not followed the best practices by learning from similar interventions in neighbouring developing countries. For wider acceptance by people, such models in those countries involve multifarious stakeholders such as the private sector, civil society, local government, religious and educational institutions. In Bangladesh, partnering with the local government unit is still loose in terms of legal and policy obligations.

Without forging any strict partnership with clear specification of power and responsibilities, it appears that the UP has been given some control over recruitment, operation and monitoring. Because of this mismatch between power and responsibility, some problems between the entrepreneur and the UP are evident. It also appears that the government has not explored alternative options in partnership to assist in the recruiting and training of entrepreneurs, monitoring or evaluation of performance. Current reliance on local administration for these issues without adequate accountability mechanisms or binding legally means that UDC performance management varies depending on the commitment of local officials. In the context described above it is questionable how effective it would be to make the vital components of UDCs, such as entrepreneur recruitment, service supply and equipment purchase, entirely dependent on these public partners. There have been incidences of corruption in the purchase of equipment, nepotism in entrepreneur recruitment, inadequate training, resistance to supply services and sham monitoring and evaluation. Similarly, partnering with private operators, without developing a robust package to develop entrepreneurship among them, is negatively affecting the capacity to harness efficiency and the investment necessary for sustainability. Lack of full scale entrepreneurship also suggests that operators are not consulted sufficiently or given adequate control.

Despite some years of operation, no rigorous evaluation exercise has been undertaken by the government to facilitate coalition analysis to show pathways for stakeholders to work together for improvement. Whilst other stakeholders have been informed, the local people have not been informed, consulted or provided with any opportunity to be involved in their local UDCs. Yet they are named as partners under PPPP. These issues collectively pose challenges to the sustainability on three dimensions: financial; entrepreneurial; and social.

There are some strengths of the project that have been identified within the current practices, but these have not been universally well disseminated. These strengths, from inputs of stakeholders, lie in the variety of equipment and internet, multiplicity of services, continuity of supports, and

entrepreneurial engagement in terms of investment and skill demonstration. These factors are associated with the financial, entrepreneurial and social outcomes of the project.

Entrepreneurial development is central to the issue of financial sustainability. The key indicator for involvement is the amount of investment. As no loans are currently sanctioned by the government, the entrepreneur's income serves as a major source of investment. However, a significant proportion of entrepreneurs earn less than the threshold that would enable them to invest after their operational costs are considered. Hence, the income sustainability model (Model 2) has predicted the factors that can support the sustained level of income. It finds that partnership components such as infrastructure and service inputs, entrepreneurial capacity along with people's participation all have a significant part. The predictors that could not explain the sustainable income validate challenges in the stakeholders' involvement. However, as financial sustainability only serves the survival the long term sustainability is predicted.

The sustainability model (Model 3) shows that the majority of inputs from relevant stakeholders significantly explain the sustainability that has three dimensions such as financial, social and entrepreneurial. Again stakeholders' involvement in terms of investment, equipment and internet, services and support dynamics enables financial, entrepreneurial and social outcomes. Though some factors are still to have any significant impact, they may do so if appropriate measures are taken. Two case studies presented reinforce the claim that stakeholders' effective involvement can make a difference to the sustainability.

Methodological and Theoretical Implications

As the literatures have suggested that the topic of the research is more closely related to Information System (IS) and Management disciplines a pluralistic approach with a mixed method combining both qualitative and quantitative techniques, conventional to these disciplines, is adopted. Representative samples were drawn from respective stakeholders to understand benefits to users, involvement of management stakeholders and inputs for sustainability. The sample respondents were surveyed, interviewed and engaged in FGD. The findings from qualitative techniques are mainly used for corroborating the survey findings. In order to understand the impacts on service recipients, statistics for difference questions are used based on the data collected through using dependent samples. This can serve as a direction for future research to use the perception of users to compare two systems of delivery and ascertain whether any difference is caused. Alternatively, independent samples can be used by collecting information from two sets of respondents from two different systems, given time and cost permit. In that case the larger sample would be needed for alternative system to screen out those who only match with UDC users in terms of demographic characteristics.

To understand the stakeholders' perspectives and sustainability mostly associational measures are used which again are substantiated through the qualitative techniques. This is because the target here was to ascertain the association between inputs from partners or stakeholder and the performance in terms of financial and social outcomes of the project. Consistent with the norms that prevail in IS and management literature constructs for predicting progress and sustainability have been developed using reflective measures. Given the lack of previous theoretical direction to determine the validity for constructs the factorial validity could help establish the constructs that can lead to theory build up. Given our SEM model on sustainability (Model 3) could explain 59% of total variance more variables can be added in the future to increase the explanatory power. This is also applicable for stakeholders' involvement model (Model 1) and income sustainability model (Model 2).

The use of Diffusion of Innovation theory and its contextualization for telecentre research is a unique contribution of this research. This research has also shown how three pertinent points of Diffusion theory such as 'perceived attributes', 'communication process' and 'consequences of innovation' works for a telecentre project. Alignment of diffusion processes to the UDC usage can validate the predictive potential of the theory which can further be confirmed by subsequent studies as the project progresses. Since the UDC is still in its early stage of implementation all facets of the theory could not assessed against the project. Similarly, though the use of stakeholder theory has been in use for identification of stakeholders and understanding of their behaviours for some telecentre projects, the theory has not been applied in a telecentre project which is based on public-private-peoples partnership approach. Identification and understanding of stakeholders' behaviour in such a context and making their contribution ascertained through empirical approach is a new contribution by this study. The theory also can serve as guide and best-practice template to improve stakeholders' involvement processes: identification; behaviour analysis; management-informing, consulting and giving control and coalition analysis. We have seen that although the UDC has followed some of the steps in stakeholders' involvement, others are still to be implemented. Hence this research could not produce greater details and in-depth analysis about those issues.

Likewise, various studies have suggested different factors for sustainability but these factors and outcomes are not linearly placed in one place in a framework to test their validity. Ascertaining different forms of sustainability and their interrelation through data driven approach are likely to add rigour to the theoretical foundation. This models produced in this can serve as foundation for theory build up in stakeholders involvement and sustainability dimensions and their interrelationships in the future.

In the light of the findings, as above, the following recommendations are made.

Policy Recommendations

Recommendations are made related to three key domains of the research: impacts on users, operations and management and sustainability.

1. The UDC needs to offer more compatible and cost-effective information and services to satisfy the demands of the rural population. Although some of these are available now, they need to be disseminated across the country. For wider impact, a comprehensive demand assessment should be carried out by the government. The demand assessment can look at, for example, existing socio-economic profiles of the users, geographical characteristics, urbanisation, density, connectivity status, and distance from similar providers. Based on the assessment, both a comprehensive package of common branded products and some special contents can be introduced. It is necessary to establish a symmetry between information and services by delivering more information-related content. Furthermore, entrepreneurs can be engaged to create local content in local languages. Depending on its capacity, the UDC may provide other additional service facilities such as for the support of seminars, training, workshops, libraries, video conference and distance education. It can also be used as a community access point for database, notification for disaster alerts and government notices (Jensen & Walker 2001). Various types of services, in turn, assist with increased demand generation as well as value addition to the strategy for poverty reduction and broader development goals. In other words, the UDC needs to be transformed into a Multipurpose Community Telecentre (MCT) to expedite the diffusion.

2. Information and services that are less accessible to rural people have more potential for providing expected benefits. It should aim to provide both economic and non-economic benefits. These include speed of delivery and less cost; consistent and errors free results; no corruption; improved transparency; and an empathetic approach to service delivery. UDCs should also adopt a citizen charter and guarantee service standards. In this respect, guidance can be found in the standards outlined in the Secretariat Instruction 2008 for Citizen Charter. Qualities defined here include (1) specified standard within stipulated time, (2) detailed identity of providers (3) relevant expense (4) opportunity to choose (5) good manner of providers in prioritising the service on first come first served principle (6) offering regret in case of mistake or incapability (7) provision for raising allegations, and (8) ensuring equality in treatment and value for money (GOB 2008). For empowering people's access to information, entrepreneurs can be given the responsibility to work as the Information Officer under the Right to Information Act 2009. Both compatibility and relative advantages have to be accompanied by better communication to optimise diffusion.

3. Current mass media campaigns to create awareness of UDC needs to be intensified by the government involving national and local media organisations and maintaining uniformity in

communication. The government and the UP should persuade and assist the entrepreneur to advertise and promote UDC products in every part of the Union. However, for persuasion and final adoption, interpersonal communication can be attained by involving all stakeholders, in particular entrepreneurs, volunteers and UP representatives, and by the formation of the UDC Management Committee. Widespread communication will help with the goal of bridging the digital divide.

4. Digital inclusion connotes more than facilitating access to livelihood contents for socio-economic development. It may include education and skill development, vocational training, telemedicine, veterinary assistance, e-commerce for local business, market information and financial inclusion services. The UDC has to ensure that certain services are available everywhere in the country, not merely in a few districts. Lessons from pioneering districts, such as Jessore, can be transmitted more speedily to other parts of the country. Also, every UDC must include some customised services, simpler applications, and a friendlier environment to avoid complexity, particularly that faced by disadvantaged people. Subsidised schemes adopted by the government for disadvantaged groups such as women, illiterate, poor, disabled and the aged can ensure the representation of these groups as well as income guarantee for the entrepreneur. A voucher system for poor students and unemployed people for computer training and information services could be introduced. In order to deliver on its mission there is no doubt that the key is the management of the stakeholder group, of which people form an important part.

5. It is essential that entrepreneurs are recruited using certain standard practices in terms of wider advertisement with the eligibility criteria set out, comprehensive scrutiny of background checks and assessment of investment capacity. The current level of training provided by the local administration, which is both rare and very inadequate in length, must be scaled up to improve the computer skills, marketing skills and enterprise management of entrepreneurs. Acquiring a combination of skills, entrepreneurs can play the role of a ‘jack of all trades’ and become a resource for technical leadership in the community. Support for the government can be obtained from international organisations such as ITU, UNESCO and other professional bodies in this regard. Moreover, establishing a network of UDCs can provide a common platform for training and shared learning. To facilitate the investment, entrepreneurs can be granted loans by the government after assessment their track records.

6. The UP needs to be engaged more constructively because of its part in the management. This can be done by the parent ministry (the LGD) taking ownership and responsibility for management of the project. The UP could replace dilapidated holdings with newly built offices and allocate at least two rooms for the UDC, actions which could address the issue

of appropriate office space. The minimum requirement of land (1214 square meter) for a new UP premise can be relaxed to expedite construction by the government. The government must consult UP secretaries to promote the objectives of the UDC. The UP's role in recruitment and control of entrepreneurs by the local administration can be reviewed by coalition analysis and the process can be reiterated for adopting better practices. For instance, the partnership contract between government, entrepreneurs and the UPs has to be enforced appropriately. Similarly, more control should be given entrepreneurs to promote business management and independence in decision making and to bring a balance in the power relations particularly with the UP.

7. The government has to complete the identification process of stakeholders. This can be done by introducing interviews, dialogue and mapping of previously unidentified stakeholders such as the beneficiaries, identical providers, UP members and alternative entrepreneurs, technical and virtual organisations related to the ICT, civil society and international donors. Once identified, they can be involved through management approaches such as through consultation, partnership and control. For instance, other community information providers, such as D.Net, Grameenphone and Care Bangladesh, can be identified and consulted for exchange of knowledge and information sharing.

8. The government has a role to continue to equip UDC centres and provide maintenance support until the entrepreneurship is developed. The UP can be partnered more effectively in this regard through enabling legal provision for spending on UDC. Spending funds from LGSP or ADP can be ascertained by adopting legal obligations in the UP manual which could reduce the reluctance of UPs to make finances available. Similarly, the government can finance the cost temporarily from the Social Obligation Fund (SOF) being collected at 1% of gross revenue of existing telecom providers since 2011 by BTRC. This is the kind of fund mentioned earlier as USO. Currently, because of the absence of appropriate rules and guidelines for usage, this fund (approximately 6.3 million USD at the end of 2014) remains unutilised (Hasan 2014; Shawki 2014). Taking the opportunity to forge partnerships with ICT companies such as Microsoft, or donor agencies such as UNDP, World Bank, ITU for funding and technical and management assistance can be another option.

9. With regard to purchase of equipment, central purchase either from the A2I or from the DC office following guidelines of public procurement as well as obtaining a warranty period is necessary. Some equipment can be purchased in greater quantity such as computers to serve and train people. There could be a less costly multi-computer environment backed by network capability, private clouding or LAN. However, computers need to be accompanied by compatible software to meet the local demand. Equipment that does not appear cost effective should not be acquired. The right mix of equipment is crucial for financial and

social sustainability (Model 3). As picture equipment such as camera, printer and scanner tend to provide better earning, the government have to ensure that they are available in every UDC at least for the survival of the project. Greater earning can lead to the acquisition of advanced equipment such as photocopiers. Adequate consideration of 'users' needs', 'income generation potential', 'recurrent and upgrading costs' 'compatibility' 'possible redeployment at other locations', and 'maintenance and repairs' is necessary before introducing any technology (Jensen & Walker 2001, p. 223). The government has to find more competent local maintenance bodies, perhaps at Upazila level. Alternatively, maintenance responsibility can be transferred to the AP's office thereby strengthening it both financially and technically. Similarly, finding used but compatible technology from local and international markets can save cost and ensure environmental sustainability. The equipment has to be adequately supported by power and internet connectivity.

10. It is necessary to ensure that solar panels are installed properly and kept well maintained with arrangement at the local level. For speeding up the connectivity there is no alternative to stretching the broadband coverage to the rural area and implementation of BanglaGovNet project for intranet connection. The existing fibre optic lines of different agencies (4th chapter) can be integrated by the BTRC to be used for unified broadband connectivity. The current bandwidth surplus can be utilised using the UDC as a point of 'last mile connectivity' for creating a thriving demand base for broadband. For this, UDCs have to be connected in the first place through fibre optics or wireless broadband, followed by free internet for a few years. Until cable connectivity is established, the existing 3G connection needs be stretched to cover all areas of the country to benefit UDCs with lower incidence of breakdown and better speed. Again, SOF can be utilised for this purpose by the government. With improved connectivity the UDC can even be the supplier of leased internet within its locality to bodies such as schools, clubs and clinics, via LAN or wireless to create and fulfil internet based service demands. Both equipment and connectivity, however, could remain underutilised if not accompanied by adequate use for services.

11. The combination of services contributes to sustainability (Model 3). While certificates and, to some extent, commercial services are common, the government needs to supply its own services from UDCs everywhere. In this regard the implementation of *the Inforsarker Project* must be expedited to enable back-end service support from government delivery points, such as Upazila, district and the ministry, to the UDC. This can be facilitated by mandatory legal measures enacted by the government to force agencies to find ways to deliver their information and services online from the grass-root level through the UDC. The Bangladesh e-Governance Interoperability Framework (BD-eGIF)'s effective engagement can expedite the process to integrate all client-centric information and provide an interconnected approach. It is important that the Bangladesh Bank widens its National

Payment System (NPS) across the country quickly to ensure a secure online payment system. Many UDCs cannot facilitate transactional services, internet banking or shopping and e-commerce simply because of the absence of a reliable e-payment system. Similarly, improved efficiency of Controller of Certifying Authority (CCA) for introducing digital signatures will extend the transactional and integrated services of the UDC.

12. It is not enough that external public sector organisations such as the local administration and the UP have established these centres with equipment and services once. Their continued support is an important contribution to sustainability (Model 3). There must be continuous support from the political end for establishing Digital Bangladesh. Similarly, trends in the number of visits, as well as composition of users over time, also need to be taken into consideration. Benefitting one group at the cost of others tends to culminate in cultural or social sustainability failure (Best & Kumar 2008).

13. To achieve all these targets and connect rural masses to the information superhighway a reformative approach can be considered by the government in the long run. This includes engaging other stakeholders in the model choice and implementation. For instance, the NGO led model has the potential to thrive as Bangladesh is home to the largest number of NGOs of any country in the world. They have outlets and branches even in the remotest and least accessible parts of the country. Alternatively, religious institutions such as mosques and temples and educational bodies or private entrepreneur's shops can be considered by giving private ownership to the model. Other possible hosts include the Post Office, Bangladesh Scouts Office and Public Library. To improve the implementation practices, it is more reasonable to give the responsibility to the ICT ministry which can better handle the situation with its field wings. The appointment of chief information officer can be considered. It is also important to establish some accountability chain of existing management officials to the ministry. In addition, the government can engage specialised private or public agencies or NGOs in investment, entrepreneur recruitment, training, monitoring and evaluation of performance. To train the entrepreneurs, a training academy with appropriate courses could be launched with its field wings in administrative divisions.

14. The existing rules outlined in different circulars and official letters are not adequate enough to enforce implementation or monitor performance. The government needs to complete the current consultation for framing a consolidated single policy that will also identify the stakeholders, their behaviour patterns, their management, expected targets, implementation strategies, performance and reward management.

Final Remarks

Although the UDC's record in government service provision is not as impressive as with certificates and commercial services, as a new and innovative initiative, it holds enormous promise to redefine the nature of service delivery and broaden the access of ordinary citizens to information and services. One of the contributions of the present study is that it has considered the UDC as an innovation showing how the attributes of innovation can help it for wider diffusion and to fulfil the project's objectives. The model needs to endure and sustain for greater diffusion. Given the lack of previous studies, this study has first developed a model of contribution from each stakeholder under PPPP in a telecentre project of a developing country, where the private sector is fragile in terms of efficiency and investment. Then, the models of 'sustained income' and 'sustainability' shed light on the pathway to the adoption of a survival strategy and the attainment of the financial, social and entrepreneurial targets of the project. Both models have demonstrated how collaborative efforts from stakeholders in the ecosystem can support weak private partners and generate entrepreneurship among them. Once entrepreneurship is established among rural youths, they can serve people more effectively and fulfil the objectives of the UDC. However, future research is required to validate the hypotheses or come up with new hypotheses regarding impacts on the people, management and sustainability. Since this study has found many effect sizes related to impacts as small future research can assess any changes to them. It is important to study the project longitudinally to examine how variables change over time to understand whether the diffusion process continues as predicted and whether it is able to produce long term impacts related to developmental outcomes. It is also necessary to identify any changes in stakeholders' involvement and their roles and subsequent changes in sustainability inputs and outcomes.

APPENDICES

Appendix 1

APPENDIX 1.

Ethics Approval

Tue, Mar 19, 2013 at 10:36 AM
10:36 AM
Message starred
FROM Human Research Ethics TO You + 3 More
5975 SBREC - Final approval notice (18 March 2013)
Hide Details
From
- Human Research Ethics

To
- faroqi76@yahoo.com
- Alam Siddiquee
- Craig Matheson
- 1 More...

Dear Md. Gofran,

The Chair of the Social and Behavioural Research Ethics Committee (SBREC) at Flinders University considered your response to conditional approval out of session and your project has now been granted final ethics approval. Your ethics final approval notice can be found below.

FINAL APPROVAL NOTICE

Project No.:	**5975**
Project Title:	Connecting Rural Masses to the Information Superhighways: An Assessment of Union Information and Services Centres (UISC) in Bangladesh
Principal Researcher:	Mr Md Gofran Faroqi
Email:	faroqi76@yahoo.com
Address:	5/5 Comaum Street St Marys SA 5042

Approval Date:	18 March 2013	Ethics Approval Expiry Date:	**1 September 2015**

The above proposed project has been **approved** on the basis of the information contained in the application, its attachments and the information subsequently provided with the addition of the following comment:

Additional information required following commencement of research:

1

1. Please ensure that copies of the correspondence requesting and granting permission for senior level officials to be interviewed at the Ministry of Local Government in Bangladesh are submitted to the Committee *on receipt.* Please ensure that the SBREC project number is included in the subject line of any permission emails forwarded to the Committee. Please note that data collection should not commence until the researcher has received the relevant permissions (item D8 and Conditional approval response – number 3).

RESPONSIBILITIES OF RESEARCHERS AND SUPERVISORS

1. Participant Documentation

Please note that it is the responsibility of researchers and supervisors, in the case of student projects, to ensure that:

☐ all participant documents are checked for spelling, grammatical, numbering and formatting errors. The Committee does not accept any responsibility for the above mentioned errors.

☐ the Flinders University logo is included on all participant documentation (e.g., letters of Introduction, information Sheets, consent forms, debriefing information and questionnaires – with the exception of purchased research tools) and the current Flinders University letterhead is included in the header of all letters of introduction. The Flinders University international logo/letterhead should be used and documentation should contain international dialling codes for all telephone and fax numbers listed for all research to be conducted overseas.

☐ the SBREC contact details, listed below, are included in the footer of all letters of introduction and information sheets.

This research project has been approved by the Flinders University Social and Behavioural Research Ethics Committee (Project Number 'INSERT PROJECT No. here following approval'). For more information regarding ethical approval of the project the Executive Officer of the Committee can be contacted by telephone on 8201 3116, by fax on 8201 2035 or by email human.researchethics@flinders.edu.au.

2. Annual Progress / Final Reports

In order to comply with the monitoring requirements of the *National Statement on Ethical Conduct in Human Research (March 2007)* an annual progress report must be submitted each year on the **18 March** (approval anniversary date) for the duration of the ethics approval using the annual progress / final report pro forma. *Please retain this notice for reference when completing annual progress or final reports.*

If the project is completed *before* ethics approval has expired please ensure a final report is submitted immediately. If ethics approval for your project expires please submit either (1) a final report; or (2) an extension of time request and an annual report.

Your first report is due on **18 March 2014** or on completion of the project, whichever is the earliest.

3. Modifications to Project

Modifications to the project must not proceed until approval has been obtained from the Ethics Committee. Such matters include:

☐ proposed changes to the research protocol;
☐ proposed changes to participant recruitment methods;
☐ amendments to participant documentation and/or research tools;
☐ extension of ethics approval expiry date; and
☐ changes to the research team (addition, removals, supervisor changes).

To notify the Committee of any proposed modifications to the project please submit a Modification Request Form to the Executive Officer. Please note that extension of time requests should be submitted prior to the Ethics Approval Expiry Date listed on this notice.

Change of Contact Details

Please ensure that you notify the Committee if either your mailing or email address changes to ensure that correspondence relating to this project can be sent to you. A modification request is not required to change your contact details.

4. Adverse Events and/or Complaints

Researchers should advise the Executive Officer of the Ethics Committee on 08 8201-3116 or human.researchethics@flinders.edu.au immediately if:

- any complaints regarding the research are received;
- a serious or unexpected adverse event occurs that effects participants;
- an unforseen event occurs that may affect the ethical acceptability of the project.

Andrea Fiegert
Executive Officer
Social and Behavioural Research Ethics Committee

c.c Dr Noore Alam Siddiquee
A/Prof Craig Matheson
A/Prof Janet McIntyre-Mills

Andrea Fiegert
Executive Officer, Social and Behavioural Research Ethics Committee
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P: +61 8 8201-3116 | F: +61 8 8201-2035 |Web: Social and Behavioural Research Ethics Committee

Operationalisation of concepts for using in instruments

Access to Information and Services: the frequency of people taking delivery of information and services from the UDC; the types of online information whether that addresses the needs of people; number of requests placed in a certain period and the compatibility with their socio-economic profile.

Relative advantage means the economic gains in terms of cost and time savings, the distance reduction, people's perception on ease in receiving the service, how quickly their grievances are addressed, whether it is hassle and intermediary free and convenient.

Impact on governance refers to people's perceptions on transparency, responsiveness and empathy to the recipients and non-corruptiveness.

Digital divide means people's unequal access to information and services along their lines of gender, age, income, education and geographical locations. It is also related to *Access to livelihood information* i.e. perception of the UDC improving their access to education, health, agriculture information or services.

Stakeholders mean related partners such as Government, the UP, the entrepreneurs and people and any other unidentified ones.

Public-Private People's Partnership (PPPP) means how stakeholders are engaged in partnership and their involvement in terms of investment and supports to the UDC.

Infrastructure inputs mean equipment such the number of computers, printers, scanners, photocopiers in the UDC, the type and speed of internet.

Back-end support means the preparation of online services by the government, the supply of services from the UP and the technical and training assistance to the UDC.

Entrepreneurship means the extent of engagement by the private operator in terms of his/her computer competency, training and commitment, and the amount of investment.

Participation *of people* means how frequently they visit the UDC for services, the total turn out in a certain period of time relative to the total number of people living in the *Union Parishad* area and their involvement in the management or volunteering.

Disadvantaged people means those who are poor (based on the daily income for instance less than one dollar a day or landless but does not have other means of livelihood), woman (socially disadvantaged),and illiterate (those who did not attend school).

Inclusiveness of disadvantaged people means how frequently these types of people can enjoy the access to the service and information, identification of special arrangement for them such as sections for poor in the online provision, employment information for them, and information on their welfare issues.

Community Ownership means people's feeling about the operation and sustainability of the UDC, efforts of the local representatives to create awareness among people about the UDC, financial and other support to the UDC by the *Union Parishad*, steps taken to involve people in the UDC, future plan with the UDC (Hudson, 2001;).

Sustainability means the ability of UDC to survive even when the government support is withdrawn by attaining financial, entrepreneurial and social targets. Financial sustainability means the amount of income after incurring the operating costs; the entrepreneurial sustainability means the extent of satisfaction by the entrepreneurs to stay at the UDC while the social outcome means the number of people visiting including the disadvantaged.

Interview instrument for *Uddaktas* (entrepreneurs)
Date and time:
Place:
(i) Uddakta's Profile
(1) Name:
(2) Sex:
(3) Age:
(4) Education level:
(5) Past Occupation:
(6) Earnings in TK (monthly):
(7) Computer skill/ Training undertaken:
(8) Economic status:

Income sources	Income (per year)		Difference (if any)	What caused the difference?
	Before Joining UISC	Now		
1				
2				
3				

ii) Union Information and Service Centres (UISC)
9. Name of the UISC:
10. Location of the UISC: ☐ Union Parishad Complex ☐Outside
11. Commencement Date:
12. Days and Times UISC opens in a week:
13. Number of Villages the UISC covers:
14. Number of rooms available for the UISC:
15. Objectives of the UISC:
16. Infrastructure Status of the UISC:

Name of the inputs	Number	Date Received or Purchased	Working condition or Not Y/N	Being Utilised or Not Y/N	Not Available (N/A)
Computer					
Internet Modem					
Printer					
Scanner					
Digital Camera					
Photocopier					
USB Device					
Mobile phone					
Others (please specify)					

17. Type of Network Connection: ☐Broadband ☐Dial –up ☐Mobile Internet ☐Others (specify).
18 Nature of Public-private partnership:

Name of the asset	Provided by Government/Union Parishad/ Uddakta himself G/UP/U	Amount of Capital Investment by the Uddakta in TK	Source of Fund by Uddakta Loan/self-finance/aid
Land			
Office			
Shop			
Rent			
Office Furniture			
Internet			

Connection Fee			
Operating cost			
Manpower (If applicable)			
Telephone			
Power Supply			
Others (Please Specify)			

19. Problems encountered by the entrepreneurs related to UISC operations and time taken to recover.

Type of Problem	Frequency of Occurrence					
	Latest 7 days		Latest 30 working days		Latest Quarter	
	No	Recovery time	No	Recovery time	No	Recovery time
Power Breakdown						
Internet Connectivity Breakdown						
Slow internet speed						
Computer Hardware problem						
Computer Software problem						
Other equipment dysfunctional						
Others (Please specify)						

20. What other problems you encounter in UISC operations?

List of the Problem	Details of the Problem	Remarks as to why such happens
Low turn out		
Busy with other works		
No cooperation from the Local governance		
Lack of support from the Local Administration		
Others (please specify)		

iii. UISC interface with government offices and private providers.

21. How would you describe the intranet linkages between UISC and other government offices? Yes=Y, No= N.

Name of the government Office	Intranet/Internet connectivity with the UISC established Y/N	Online Information/Services can be accessed Y/N	Fees/charges can be paid online Y/N	Provider can be contacted online Y/N
Ministry level offices				
Division/District Level Offices				
Upazila Level Offices				

iv. Services to the Citizens

22. During working hours which is the most popular time of visit by citizens?

☐ Morning (up to 12) ☐ Afternoon (12-2) ☐ Early evening (2-4) ☐ Evening

23. Amenities provided for citizens at the UISC (Please Tick in the appropriate box)

☐ Waiting room with sitting arrangement	☐ Toilet Gents
☐ Drinking Water	☐ Toilet Ladies
☐ Citizen Charter	☐ Others (please specify)

24. Information/ Services Offered by the UISC

Service	**Charge in TK (per service)**	**Average Time Taken (per service)**	**Number of requests**			
1. Government Information/Services			**One week**	**One month**	**One Qtr**	**Last one year**
i)						
ii)						
iii)						
Total						
Commercial Information/ services						
i)						
ii)						
iii)						
Other Information/ services (please specify)						
Total Number of Users						

25. Total Earnings by the UISC in the last one year

Name of services	**Number of Users**	**Earnings**			
		Last one month	**Last quarter**	**Last one year**	**Remarks**

26. What other services you think should be included in the UISC and Why?

Name of Service	Reasons for inclusion

27. What are your suggestions to make UISC services more useful/beneficial to the rural people?

vii UISC and other local bodies/ management

28. What kind of support you get from the host organisation, the Union Parishad?

Name of the Support	**Provided**	**Not provided**	**If yes, support details**
Rooming Facility			
Furniture			
Logistics			
Financial			
Mass mobilisation			
Awareness Building			
No support at all			

Your Computer Training			

29. How would you describe the relationship between the UISC and the Union Parishad?
,.....

30. From the Upazila and District administration and the Project Management what are the supports and helps offered to the UISC? Y/N

Name of the Support	**Upazila Administration**	**District Administration**	**Central Project Management**	**If yes, support details**
Policy Guidelines				
Grievance Redressal				
Requested Service delivery				
Financial Assistance				
Mass mobilisation				
Awareness Building				
Logistic Support				
Computer Training				
Technical support				
Others (Please Specify)				

31. In your opinion what else support should be given from the Project Management/ Local Administration and Local Governance.

Name of the Support	Project Management/ Local administration	Local Government	The reasons for the support

32. Overall what is your level of satisfaction for being an Uddakta?
1☐ Highly satisfying 2. ☐ Satisfying 3. ☐ Not satisfying 4. ☐Very disappointing

Thank You very much

Interview schedule for Government Officials
Date and time:
Place:

i. Profile of the Officer
(1) Gender:
(2) Age: (3) Designation:
(4) Office Name
(5) ICT orientation/training (If any)
ii. IT infrastructure in the office and back end support to the UISC.
6. Number of computers
7. Are the computers networked through internet connection? Yes ☐ No ☐

8. If yes, then what is the type of Internet Connection?
9. Number of Officers IT trained for providing back –end support to the Union Information and Service Centres (UISC).
10. Does the Office have intranet connection with the UISC? Yes ☐ No ☐
11. If yes , what types of services are given from your office to the UISC?
12. Is there any problem providing back –end support to the UISC from your office? Yes No. Please explain ……
13. If no connection is established with the UISC, then what could be the causes of no connection with the UISC?

a) No connection is set up with the UISC
b) Government services are not put online in Upazila or District level.
c) UISC functions do not cover online transactions.
d) UISC provides only few basic services only.
e) In future online services would be available in the UISC.
f) Citizen's lack of participation.
g) Others (please specify)

……
……

14. Service Delivery Mode to the Public and UISC in Deputy Commissioner's Office

Service name	Automation *(Backend=1, Online=2, Plan=3, Manual=4)*	Receipt/ Delivery Mode *Paper Based=1, email= 2, Verbal=3*				Connectivity with other offices in the district (Yes/No and remarks)
		Requests Directly from Pubic (last one week)		Requests From UISC (last one week)		
		Receipt	Delivery	Receipt	Delivery	

15. Service Delivery Mode to the Public and UISC in the Office of the Upazila Nirbahi Officer

Service name	Automation *(Backend=1, Online=2, Plan=3, Manual=4)*	Receipt & Delivery Mode *Paper Based=1, email= 2, Verbal=3*		Connectivity with other offices in the Upazila (Y/N and remarks)
		Requests Directly from Pubic (last one week)	From UISC (last one week)	

		Receipt	Delivery	Receipt	Delivery	

16. In your opinion what are that problems hindering the effective operations of UISC?

List of the Problem (put a tick)	Details of the Problem	Remarks as to why such happens	Government steps to address them
Power Breakdown			
Internet Connectivity Breakdown/ Slowness			
Computer related problems			
Other equipment dysfunctional			
Lack of office space and furniture			
Inadequate Furniture			
Low turn out from unawareness of people			
Uddakta's Lack of incentives from low income			
Lack of Uddakta's skill and motivation			
No cooperation from the Union Parishad			
Lack of back end supply of online services from higher government offices			
Others (please specify)			

17. In your assessment what has been the impact of UISC on the following areas? Please express them in terms of the following points.

1. Very high 2. High 3. Moderate 4. Low 5. Very Low

Category	Point	Remarks	Category	Point	Remarks
Easy Access to government and commercial Information and Services			Spread of computer literacy		
Reduced Time and Cost in service delivery			Promotion of Education and Literacy		
Enhanced access of disadvantaged people such as poor, women and illiterate to information and services.			Awareness among population about disaster management		
Increased health information and services			Increased Agricultural information and services		
Hassle free and corruption free services			Transparency and accountability of local bureaucracy		
Transparency and accountability of Union Parishad			Increase in employment of rural youths.		
Alleviation of poverty			**Others (please specify)**		

Others (Please specify)					

18. What other services do you think should be included in the UISC and Why?

Name of Service	Reasons for inclusion

iv) Support and Monitoring of the UISC.

19. From the Upazila/District administration/Project Management what are the supports offered to the UISC? Please tick in the relevant boxes.

Name of the Support	**Upazila Administration**	**District Administration**	**Central Project Management**	**If provided, support details**
Policy Guidelines				
Quick Grievance Redressal from citizens				
Requested Service delivery				
Financial Assistance				
Mass mobilisation				
Awareness Building				
Logistic Support				
Computer Training of Uddaktas				
Others (Please Specify)				

20. What type of monitoring and evaluation mechanisms are in place to ensure the progress of UISC?

a. Monitoring Tools.....

b. Evaluation Tools.....

21. What suggestions do you have to make UISC services more useful/beneficial to the rural people?

For the Project Management (Additional)

Can you please describe about the introduction of UISC, its functions and roles and its potential to provide online information and services to the citizens?

Background of the Introduction of UISC

UISC Functions, services and benefits

Its role in providing government and commercial information and services

Its operation modes i. e. public-private partnership

Its roles in development and governance improvement

Its impact on livelihood issues and accountability and Transparency of local government and government offices

Its management

Involvement of local government and local bureaucracy

People's participation.

Improvement of the causes of the disadvantaged people such as poor, women, illiterate people.

What are the significant barriers to the Implementation of the UISC?

What are the current strategies for the overcoming infrastructural barriers, mobilisation of human and financial resources, involvement of local population and sustainability of the project?

Has any of the following actions been taken by the national government to promote increased citizen's involvement in UISC?

a. Increased funding to Union Parishad
b. Public Training programmes hosted by the government.

c. Public Information Campaigns by the national government.
d. Others (Please specify) ----------

What are the monitoring and evaluation mechanisms in place to ensure the progress of UISC ? Special institution/commission/department/agencies/ taskforce/ombudsman/non-government organisations, etc.

What mechanisms are developed for reducing digital divide?
Special programme for disadvantaged/ media awareness programme/ awareness building through educational institution/ financial assistance to Local Government, etc.

Please list your suggestions to make the UISC more popular/ beneficial to the rural people.

Thank you very much.

Interview Schedule for People's Representative
Date and Time:
Place Taken:

(1) Gender:
(2) Age: (3) Designation:
(4) Your ICT orientations (If any):
(5) Can you please describe about the introduction of UISC, its functions and roles and its potential to provide online information and services to the citizens?
.....

(6) As a host organisation what roles are being played by the Union Parishad to promote UISCs
(7) How would you evaluate the benefits and impact of UISC in the following areas
Benefits of time, cost and distance reduction
Improvement of livelihood such as income generation, agriculture, health, Education
Employment Creation
Good Governance such as Responsiveness, Accountability, Transparency of local government and local bureaucracy Participation of rural people
Others
(8) What are the current problems of UISC in terms of
Infrastructural,
Management
Mass mobilisation (Unawareness)
Type of Services Given
Uddaktas,
Support from Government Officials,
Support from Local government
Financial Problems
Others (Please Specify)

(9) What steps are taken from Local Government to assist overcome any of the problems?
Perceived Service Quality evaluation of Pre and Post UISC scenarios in the Union Parishad
(10) How would you evaluate the service quality in the context of pre and post UISC scenarios in the Union Parishad? Please express them as follows:

1. *Most 2. Somewhat more 3. Same as before 4. Somewhat reduced 5. Significantly reduced.*

Services from UP	Before UISC			After UISC			Reasons Explained
	Time Taken	Cost	Citizen's satisfaction	Time Taken	Cost	Citizen's satisfaction	

(11) What suggestions do you have to make the UISC services more beneficial to the rural people in terms of
Greater involvement of People
Financial Sustainability
Management
Services demanded
Transparency and accountability
Others
Thank you very much.

Instrument for Focus Group Discussion

Focus Group No. Date and Time:
Number of Participants : Male: Female : Total:
Place Taken:

Introduction:
Brief introduction of all, purpose of the research , projected time, familiarity with the recording system, discussion guidelines, importance of everyone's participation, break time (if required), issue of confidentiality, rewards for completion, etc.

Topic Generation

1. Do you visit the UISC to gain information and services? Yes ☐ No ☐
If yes, how frequently you go and what services you avail from the UISC? Please explain your experiences .If no, then why?
2. Do you think that the UISC has helped to reduce the cost, time of service delivery and increased access to the government information and services?
Yes: No: Please give details of your answers.
3. Do you feel that the UISC has increased your access to information and services on livelihood areas such as agriculture, education, health, employment and income?
Yes: No:
Please explain your answer
4. What are the problems you encounter on service taking from the UISC?
5. Do you think that the UISC has any relevance to the poor, women and illiterate people?
Please explain your answer How/Why.
6. How the services of UISC can be made popular? What additional steps can be taken at that end?

Closure

Closing remarks
Thanks the participants
Issue their reward or compensation

Questionnaire for UISC user group

1. What is your gender?

◯ Male ◯ Female

2. What is your age?

Age in Years

3. What is the highest level of education you have completed?

◯ Did not attend school ◯ year 6 to below SSC ◯ HSC

◯ Year 5 or below ◯ SSC ◯ Bachelor and Above

4. Which of the following best describes your current occupation?

◯ Farmer ◯ Government Employee ◯ student

◯ Day labourer ◯ Fisherman ◯ Small Tradesman

◯ Teacher ◯ Transport worker ◯ Household work

◯ Industry worker ◯ Unemployed ◯ Other

Other (please specify)

5. What is your approximate monthly income?

Approximate monthly income in Taka

6. Can you please name the UISC from which you have taken the information/services?

◯ Durgapur UISC (Comilla Adarsha Sadar)

◯ Kalirbazar UISC (Comilla Adarsha Sadar)

◯ Ghagutia UISC (Homna, Comilla)

◯ Mathavanga UISC (Homna, Comilla)

◯ Arabpur UISC (Jessore Sadar)

◯ Fatehpur UISC (Jessore Sadar)

◯ Basuary UISC (Bagharpara Jessore)

◯ Dohakula UISC (Bagarpara Jessore)

◯ Arulia UISC (Bogra Sadar)

◯ Namuza UISC (Bogra Sadar)

◯ Gabtoli Sadar UISC (Gabtoli, Bogra)

◯ Naruamala UISC (Gabtoli, Bogra)

◯ Alipur UISC (Rajbari Sadar)

◯ Khankhanapur UISC (Rajbari Sadar)

◯ Kalukhali Ratandia UISC (Kalukhali, Rajbari)

◯ Kalikapur UISC (Kalukhali Rajbari)

Questionnaire for UISC user group

7. What information or services you have taken from the UISC at the latest?

- ◯ Land certificate copy
- ◯ Electricity bill payment
- ◯ Applying for passport
- ◯ Telemedicine
- ◯ Applying for overseas job (Malaysia or other countries)
- ◯ Government forms dowloading
- ◯ Education information or services (registration/admission)
- ◯ Certificate (birth/death/inheritance/citizenship)
- ◯ Mobile banking
- ◯ photocopying/ compose/ printing/laminiting/scanning, etc.
- ◯ skype conversation
- ◯ applying for job or Job search
- ◯ photo shoot
- ◯ E-mail or Internet browsing
- ◯ Computer Training
- ◯ Others

8. Have you taken previously the same information/services from alternative delivery points?

- ◯ Yes
- ◯ No

9. Without UISC which of the following alternative delivery points did you take or possibly could have taken the same information/services from?

- ◯ Ministry/Division
- ◯ Government offices (District)
- ◯ Government offices (Upazila)
- ◯ Educational Institutions (Board/School/College/Universities)
- ◯ Local government offices (Union Parishad)
- ◯ Banks
- ◯ Private individual/shops/organisation
- ◯ Others

Questionnaire for UISC user group

Experiences of Service Takings from Alternative Delivery Agencies

10. How much time or trips were spent/could have approximately been spent per requested delivery from the above mentioned delivery point? (Not applicable for Computer Training and Malaysia Registration)

Number of days	
Number of Trips	
Travel and Waiting Time (Minutes)	
Distance from the House/place travelling from (meter)	

11. How much cost in Taka was spent/could have approximately been spent in the transaction in receiving the service (alternative delivery point)?

Service Charge and Bribe (if any) in Taka	
Other costs (such as travel, food or wage loss) in Taka	
Total cost in Taka	

12. Was/could be it Hassle free(alternative delivery point)?

◯ Yes ◯ No

13. How have/could you taken it through (alternative delivery point)?

◯ Directly by yourself or near ones ◯ Through Intermediaries

Questionnaire for UISC user group

Perceived impact of the Alternative Delivery Point on Easy Access, Livelihood and Governance Issues

14. How would you express your level of satisfaction on the following issues of alternative delivery system? (for government services only)

	Very Poor	Poor	Just Satisfactory	Good	Very Good
Easy Access	◯	◯	◯	◯	◯
Corruption Free	◯	◯	◯	◯	◯
Error free and consistent Information	◯	◯	◯	◯	◯
Transparency of Information and Decision	◯	◯	◯	◯	◯
Empathy (responsive and helpful to clients needs)	◯	◯	◯	◯	◯

15. To what extent you agree or disagree with the following statements related to alternative delivery system (for government services only)?

	Strongly Disagree	Disagree	Slightly Disagree	Slightly Agree	Agree	Strongly Agree
The alternative point ensures easy access to the government information	◯	◯	◯	◯	◯	◯
The alternative point fulfils my needs for education information	◯	◯	◯	◯	◯	◯
The alternative point fulfils my needs for health information	◯	◯	◯	◯	◯	◯
The alternative point fulfils my needs for Agriculture information.	◯	◯	◯	◯	◯	◯
The alternative point ensures easy access to the government service delivery	◯	◯	◯	◯	◯	◯
The alternative point fulfils my needs for education services.	◯	◯	◯	◯	◯	◯
The alternative point fulfils my needs for health services.	◯	◯	◯	◯	◯	◯
The alternative point fulfils my needs for Agriculture services.	◯	◯	◯	◯	◯	◯
My grievances are adequately addressed under the alternative point.	◯	◯	◯	◯	◯	◯
I can participate in the service provision of the alternative point	◯	◯	◯	◯	◯	◯

Questionnaire for UISC user group

Experiences with Union Information and Service Centres (UISC)

16. How have you first come across the UISC?

- ◯ Mass media (Newspaper/radio/television)
- ◯ Neighbour/Public talk
- ◯ By visiting the Union Parishad
- ◯ Publicity by the Union Parishad (leaflet/miking/exhibition)
- ◯ Union Parishad Representative or Uddakta
- ◯ Warshava/public or budget meeting in the Union Parishad
- ◯ Others

Other (please specify)

17. During the working hours (9 AM to 5 PM) is the UISC open whenever you want to visit?

- ◯ Always
- ◯ Most of the time
- ◯ Sometimes
- ◯ Never

18. How frequently do you visit the UISC for services?

- ◯ First Time
- ◯ Weekly
- ◯ Monthly
- ◯ Quaterly
- ◯ Half Yearly
- ◯ Once in a year or more

19. What elese information or services you have availed from the UISC?

- ☐ Nothing
- ☐ Land certificate copy
- ☐ Electricity bill payment
- ☐ Applying for passport
- ☐ Telemedicine
- ☐ Applying for overseas job (Malaysia or other countries)
- ☐ Government forms dowloading
- ☐ Education information or services (registration/admission)
- ☐ Certificate (birth/death/inheritance/citizenship)
- ☐ Mobile banking
- ☐ photocopying/ compose/ printing/laminiting/scanning, etc.
- ☐ skype conversation
- ☐ applying for job or Job search
- ☐ photo shoot
- ☐ E-mail or Internet browsing
- ☐ Computer Training
- ☐ Others

20. How much trips or time were spent per request regarding the latest service/information received from UISC? (Not applicable for computer training or malaysia registration)

Number of days	
Number of Trips	
Travel and Waiting Time Taken (Minutes)	
Distance from the House/place travelling from (meter)	

Questionnaire for UISC user group

21. How much cost in Taka was involved in the transaction (per request) UISC

Service Charge and Bribe (if any)	
Other costs (such as travel, food or wage loss)	
Total cost	

22. Was it Hassle free? (UISC)

◯ Yes ◯ No

23. How have you taken it through ? (UISC)

◯ Directly by yourself or near ones ◯ Through Intermediaries

24. Do you feel interested to visiting the UISC again?

◯ Not Applicable ◯ No

◯ Yes

Please explain your answer

25. From your contact with the UISC, do you feel encouraged to

	Yes	No
Read or write Bangla	◯	◯
Read or write English	◯	◯
Learn Computers	◯	◯
Use internet and e-mail	◯	◯
want to become Uddakta (Entrepreneur)	◯	◯
Not Applicable	◯	◯

Questionnaire for UISC user group

Perceived Impact of UISC on Access, Livelihood and Governance Issues

26. How would you express your level of satisfaction on the following issues from the UISC delivery system?

	Very Poor	Poor	Just Satisfactory	Good	Very Good
Easy Access	◯	◯	◯	◯	◯
Corruption Free	◯	◯	◯	◯	◯
Error free and consistent Information	◯	◯	◯	◯	◯
Transparency of Information and Decision	◯	◯	◯	◯	◯
Empathy (responsive and helpful to clients' needs)	◯	◯	◯	◯	◯

27. To what extent do you agree (after seeing the UISC in operation) that Information Technology/computerisation can be used to give better citizen services or Information?

	Strongly Disagree	Disagree	Slightly Disagree	Slightly Agree	Agree	Strongly Agree
Information Technology/computerisation can be used to give better citizen service.	◯	◯	◯	◯	◯	◯

28. Over all, compared to alternative delivery points how would you assess the benefits from the UISC?

◯ Worse ◯ Same ◯ Better

29. To what extent you agree or disagree with the following statements?

	Strongly Disagree	Disagree	Slightly Disagree	Slightly Agree	Agree	Strongly Agree
The introduction of UISC has made easy access to the government information	◯	◯	◯	◯	◯	◯
The UISC provides my required information on education.	◯	◯	◯	◯	◯	◯
The UISC ensures my needful information on health.	◯	◯	◯	◯	◯	◯
The UISC provides my required information on agriculture	◯	◯	◯	◯	◯	◯
The Introduction of UISC has made easy access to the government service delivery	◯	◯	◯	◯	◯	◯
The UISC provides my required services on education	◯	◯	◯	◯	◯	◯
The UISC ensures my needful services on health.	◯	◯	◯	◯	◯	◯
The UISC provides my required services on agriculture	◯	◯	◯	◯	◯	◯
The UISC adequately addresses my grievances, if any.	◯	◯	◯	◯	◯	◯
I can participate in service provision of the government through UISC.	◯	◯	◯	◯	◯	◯

Questionnaire for UISC user group

30. How important it is to you to receive any of the following services from the UISC in future in order to save your time and money?

	Not important at all	Less important	Slightly less important	Slightly important	Important	Very important
Land certificates/Land Tax	◯	◯	◯	◯	◯	◯
General Diary/Case filing with Thana	◯	◯	◯	◯	◯	◯
Health Consutation with doctors at Upazila or district	◯	◯	◯	◯	◯	◯
Agriculture information or services from Upazila or district	◯	◯	◯	◯	◯	◯
Court Related Information	◯	◯	◯	◯	◯	◯
Matrimonial Information	◯	◯	◯	◯	◯	◯
Local news	◯	◯	◯	◯	◯	◯
Online passport/VISA	◯	◯	◯	◯	◯	◯
Welfare allowance distribution for aged/widow/disabled using mobile banking	◯	◯	◯	◯	◯	◯
Right to information on Union Parishad activities or other government departments	◯	◯	◯	◯	◯	◯

31. Do you think that the UISC will sustain in future?

◯ Yes ◯ No

Please explain your answer

32. What are your suggestions to make UISC more popular?

1

2

3

Questionnaire for Entrepreneur's Survey

UISC Uddakta

Union Information and Service Centres in Bangladesh

This survey requires your spontaneous responses

1. What is your gender?

- ◯ Male
- ◯ Female

2. Which of the following divisions does your UISC belong?

- ◯ Dhaka
- ◯ Barishal
- ◯ Chittagong
- ◯ Sylhet
- ◯ Rajshahi
- ◯ Rangpur
- ◯ Khulna

3. What is the highest level of computer education you have completed?

- ◯ No formal traning
- ◯ Diploma
- ◯ Less than 03 months training
- ◯ Bachelor
- ◯ less than six months training
- ◯ Other
- ◯ Six months and above training

In case of Other (please specify)

4. Has the Union Parishad made a contract with you on Establishment and Operation of the UISC?

- ◯ Yes
- ◯ No

Union Information and Service Centres in Bangladesh

This survey requires your spontaneous answers

UISC Uddakta

5. Are the following service equipment/ facilities avaiable in the UISC?

	Yes	No
Computer (Desktop)	◯	◯
Laptop	◯	◯
Internet Modem	◯	◯
Laser Printer	◯	◯
Colour Printer	◯	◯
Scanner	◯	◯
Digital Camera	◯	◯
Photocopier	◯	◯
Generator/Solar Panel	◯	◯
Multimedia Projector	◯	◯
Nebuliser	◯	◯
Enough Office space	◯	◯
Enough furniture	◯	◯

6. How would you describe the working conditions of the following service equipments?

	Good working condition	Moderate working conditions	Out of Order	Being Used not for UISC	Not Present in the UISC
Computer (Desktop)	◯	◯	◯	◯	◯
Laptop	◯	◯	◯	◯	◯
Internet Modem	◯	◯	◯	◯	◯
Laser Printer	◯	◯	◯	◯	◯
Colour Printer	◯	◯	◯	◯	◯
Scanner	◯	◯	◯	◯	◯
Digital Camera	◯	◯	◯	◯	◯
Photocopier	◯	◯	◯	◯	◯
Generator	◯	◯	◯	◯	◯
Multimedia Projector	◯	◯	◯	◯	◯
Nebuliser	◯	◯	◯	◯	◯
Solar Panel	◯	◯	◯	◯	◯

If you wish you can expand your answer.

7. What type of internet connection is currently available in the UISC?

◯ Dial-up Connection ◯ Broadband Internet Connection

◯ Mobile Internet connection ◯ Other

In case of Other (please specify)

UISC Uddakta

8. What types of Information/services are often demanded by the people?

	Very Often	Quite Often	Seldom	Never
Certificates (Birth/Death/Inheritance/Citizenship,etc.)	◯	◯	◯	◯
Information on education, health and agriculture	◯	◯	◯	◯
Education services (admission/registration/result check, etc.)	◯	◯	◯	◯
E-mail or internet services	◯	◯	◯	◯
Telemedicine	◯	◯	◯	◯
Mobile Banking	◯	◯	◯	◯
Passport and Visa Information/services	◯	◯	◯	◯
Photocopying	◯	◯	◯	◯
Compose and Printing	◯	◯	◯	◯
Photoshoot	◯	◯	◯	◯
Other Comercial services (mobile phone call, Projector rent, Song upload, etc.)	◯	◯	◯	◯
Computer Training	◯	◯	◯	◯
Job search and application	◯	◯	◯	◯
Utility (Electricity/Gas) bills payment	◯	◯	◯	◯
Land copy	◯	◯	◯	◯
Others	◯	◯	◯	◯

You can list other very often demanded services, if not already mentioned

9. Excluding operational costs what is your monthly average income from the UISC in the last 03 months?

- ◯ 0-5000 Taka
- ◯ 5001-10000 Taka
- ◯ 10001-15000 Taka
- ◯ 15001-20000 Taka
- ◯ 20001-25000 Taka
- ◯ 25000 and above Taka

UISC Uddakta

10. How much money you have invested in the UISC up to now (without operational costs such as for equipment purchase and maintenance)?

- ◯ No investment
- ◯ Less then 20000 Taka
- ◯ 20000-50000 Taka
- ◯ 50001-100000 Taka
- ◯ 100001-150000 Taka
- ◯ 150001-200000 Taka
- ◯ 200001 and above Taka

11. What percentage of your income in a month comes from the following listed services? (please put 0% for the services you are not obtaining income from and make sure that your responses add to 100%)

	Income Generating Services
Certificates (Birth/Death/Inheritance/Citizenship)	
Information on education, health and agriculture	
Education Services (admission/registration/result check, etc.)	
Telemedicine	
Mobile Banking	
Union Parishad Works	
Commercial Services (composing, printing, photocopying, email/internet,Projector rent, skype conversation, photoshoot, etc.)	
Computer Training	
Data entry	
Utility (Electricity/Gas) bill payment	
Land copy application	
Others	

You can mention any other income generating services, if not already mentioned.

UISC Uddakta

12. On average how many people have availed services per month from the UISC in the last three month

◯ less than 50	◯ 151-200	◯ 301-400
◯ 50-100	◯ 201-250	◯ 401-500
◯ 101-150	◯ 251-300	◯ 500 and above

13. What are the approximate percentages of women, poor and illiterate among all service recipients from the UISC?

	Percentages
Women	
Poor (Women & Men)	
Illiterate (Women & Men)	

14. Compared to last year what changes have you noticed in the following areas?

	Significantly Decreased	Decreased	Same as before	Increased	Significantly Increased
Your Income from the UISC (per month)	◯	◯	◯	◯	◯
Number of service requests (per month)	◯	◯	◯	◯	◯
Number of People visiting the UISC (per month)	◯	◯	◯	◯	◯
Number of services ready to deliver	◯	◯	◯	◯	◯
Participation by poor people	◯	◯	◯	◯	◯
Participation by women	◯	◯	◯	◯	◯
Cooperation from the Union Parishad	◯	◯	◯	◯	◯
Online service support from the local administration	◯	◯	◯	◯	◯
Technical and Training support from the local administration	◯	◯	◯	◯	◯
People's Awareness	◯	◯	◯	◯	◯

You can mention any other important changes you have noticed during this time

UISC Uddakta

15. In future, how importatnt is it to you deliver the following services from the UISC?

	Not important at all	Less Important	Neither Important nor Unimportant	Important	Very Important
Land certificate/Land Tax	◯	◯	◯	◯	◯
Complaint/GD to Local Police Station	◯	◯	◯	◯	◯
Passport	◯	◯	◯	◯	◯
Consultation with doctors at Upazila/District Level	◯	◯	◯	◯	◯
Online information/services from Upazila Agriculture Office	◯	◯	◯	◯	◯
Matrimonial Information	◯	◯	◯	◯	◯
local news	◯	◯	◯	◯	◯
Aged/widow/disabled allowance payment through Mobile banking	◯	◯	◯	◯	◯
Awareness building on the Right to Information on UP or Government Office activities	◯	◯	◯	◯	◯
Special Services for poor, women and illiterates	◯	◯	◯	◯	◯

You can add other important services for the UISC and can tell as to why, if you wish

Union Information and Service Centres in Bangladesh

Questionnaire for Uddaktas (Entrepreneurs)

16. From 1 to 7 (1 being the most important to 7 being the least important) how would you rank the problems you face when operating the UISC?

☐	Power Breakdown
☐	Internet Connectivity Breakdown/Slow speed
☐	Computer/ other equipment not working
☐	Low income from low turn out people
☐	Lack of your training
☐	Lack of Publicity and Awareness
☐	Lack of back end online services from higher government offices

UISC Uddakta

17. How much satisfied you are on the following issues?

	Very Dissatisfied	Dissatisfied	Neither Satisfied nor Dissatisfied	Satisfied	Very Satisfied
Your personal income from the UISC	◯	◯	◯	◯	◯
Reduced Time and Cost of service delivery	◯	◯	◯	◯	◯
Cooperation from the Union Parishad	◯	◯	◯	◯	◯
Training and other technical support from the local administration	◯	◯	◯	◯	◯
Online service support from the local administration	◯	◯	◯	◯	◯
People's participation in the UISC	◯	◯	◯	◯	◯

Other (please specify)

Union Information and Service Centres in Bangladesh

This survey requires your spontaneous responses

18. Can you please describe your experiences with the UISC? (You can tell the problems, potentials and any of your suggestions that may help the UISC work well)

Problems	
Potentials	
Suggestions to improve	

Appendix- 2

User Survey

Missing value Analysis

Questions 1, 3 and 4 have very few missing values which is less than 3% and they are kept as they are. Questions 2 and 5 have missing values of 8.4%. These missing values are generated as some people could not tell their actual age or income or others were not intending to speak about that. So they are kept as they are

Question 6, 7 and 8 have missing values less than 4%, hence, they are kept as they are.

Questions 9 and 10 have missing values of 49 for the most which accounts for about 32% of the responses. This is resulted from two factors such as (1) some people did not have the experience of previous service takings from alternative delivery points other than UDC or could not anticipate the time and cost of service delivery from those points and on other issues related thereto. (2) Some parts of the questions such as days, minutes, trips other costs were not applicable for those who took Computer Training and Malaysia Registration (10+11)= 21 since both of these services required a long time accompanied by a number of visits along with several time other costs . So these missing values are kept as they are.

Question 10 has a missing value of 20 which is resulted from those who did not have the experience of previous service takings from alternative delivery points other than UISC or could not anticipate the cost of service related thereto.

Questions 12 and 13 have 20 missing values each for similar reasons of not having experiences of alternative points

Items for questions 14 and 15 have missing values ranging from 86-115 since it was asked mainly to recipients of government services such as land copy, passport application, government forms and education services which accounts for 39 to 68 respondents for different variables. Moreover, those who do not have experience with alternative points did not participate in these questions.

Questions 16, 17 and 18 have very few missing values accounting to less than 3% of total responses.

Question 19 has missing values ranging from 60-100% since it contains the names of additional service takings from the UDC which many respondents did not have the experience.

Items for questions 20 and 21 have missing values that range from 2- 15%. Like question 9 and 10 Malaysian registration holders and computer trainees did not answer for questions such as number of days. trips, minutes other costs. Hence, the greater missing values are for that reason.

Questions 22 and 23 have missing values of less than 3%.

Question 24 has 9.1% missing values since these respondents kept silent when the question was asked rather than answering no.

Similarly items in question 25 have missing values that range from 55 to 94% since respondent did not say specifically no, rather they kept silent.

Like questions 14 and 15, items of questions 26 and 29 have missing values that range from 47% to 72% since they were asked for only for government services as well many people considered too early to comment about the impacts of UDC on livelihood information and services.

Question 27 and 28 have missing values around 32% as these respondents were not aware of this impact of the UDC or unwilling to proceed with the questions onward out of their time limitations.

Similarly, items for questions 30 and 31 have missing values that range from 64% to 78%. Since these people have either come to the UISC for the first time or are not aware of its impact in other arenas as sought to know in the question. Some people did not want to proceed with the question that is asked at the end of the questionnaire. And not everyone answered all the questions for which the range of missing value is resulted. The missing values of all questions are kept as they are.

Ancillary tables from data analysis of User survey

Table 2.1: Wilcoxon Signed Rank Test for days, trips, time and distance between Alternative and UDC system

Ranks

		N	Mean Rank	Sum of Ranks
Days taken with alternative points - Days taken with UISC	Negative Ranks	25[a]	15.80	395.00
	Positive Ranks	11[b]	24.64	271.00
	Ties	70[c]		
	Total	106		
Trips taken with alternative points - Trips taken with UISC	Negative Ranks	24[d]	18.71	449.00
	Positive Ranks	13[e]	19.54	254.00
	Ties	69[f]		
	Total	106		
Minutes taken with alternative points - Minutes taken with UISC	Negative Ranks	32[g]	43.11	1379.50
	Positive Ranks	63[h]	50.48	3180.50
	Ties	11[i]		
	Total	106		
Distance in meters alternative points - Distance in meters to UISC	Negative Ranks	7[j]	23.43	164.00
	Positive Ranks	70[k]	40.56	2839.00
	Ties	50[l]		
	Total	127		

a. Days taken with alternative points < Days taken with UISC

b. Days taken with alternative points > Days taken with UISC

c. Days taken with alternative points = Days taken with UISC

d. Trips taken with alternative points < Trips taken with UISC

e. Trips taken with alternative points > Trips taken with UISC

f. Trips taken with alternative points = Trips taken with UISC

g. Minutes taken with alternative points < Minutes taken with UISC

h. Minutes taken with alternative points > Minutes taken with UISC

i. Minutes taken with alternative points = Minutes taken with UISC

j. Distance in meters alternative points < Distance in meters to UISC

k. Distance in meters alternative points > Distance in meters to UISC

l. Distance in meters alternative points = Distance in meters to UISC

Table 2.2: Wilcoxon Signed Rank Test for costs between Alternative and UDC system as per service categories

Ranks

Categories of Information and Services			N	Mean Rank	Sum of Ranks
Government Information and Services	Service charge and bribe (if any) in Taka with alternative points - Service cost with UDC	Negative Ranks	20[a]	10.70	214.00
		Positive Ranks	20[b]	30.30	606.00
		Ties	7[c]		
		Total	47		
	Other costs (travel, food and wage loss)in Taka with alternative - Other costs with UDC	Negative Ranks	0[d]	.00	.00
		Positive Ranks	32[e]	16.50	528.00
		Ties	5[f]		
		Total	37		
	Total costs with alternative points - Total cost with UDC	Negative Ranks	2[g]	3.25	6.50
		Positive Ranks	38[h]	21.41	813.50
		Ties	4[i]		
		Total	44		
Certificates (birth/death/inheritance/character)	Service charge and bribe (if any) in Taka with alternative points - Service cost with UDC	Negative Ranks	27[a]	17.22	465.00
		Positive Ranks	5[b]	12.60	63.00
		Ties	2[c]		
		Total	34		
	Other costs (travel, food and wage loss)in Taka with alternative - Other costs with UDC	Negative Ranks	25[d]	17.08	427.00
		Positive Ranks	7[e]	14.43	101.00
		Ties	4[f]		
		Total	36		
	Total costs with alternative points - Total cost with UDC	Negative Ranks	26[g]	18.17	472.50
		Positive Ranks	6[h]	9.25	55.50
		Ties	1[i]		
		Total	33		
Commercial information and services	Service charge and bribe (if any) in Taka with alternative points - Service cost with UDC	Negative Ranks	7[a]	5.50	38.50
		Positive Ranks	14[b]	13.75	192.50
		Ties	22[c]		
		Total	43		
	Other costs (travel, food and wage loss)in Taka with alternative - Other costs with UDC	Negative Ranks	2[d]	4.00	8.00
		Positive Ranks	25[e]	14.80	370.00
		Ties	5[f]		
		Total	32		
	Total costs with alternative points - Total cost with UDC	Negative Ranks	5[g]	5.70	28.50
		Positive Ranks	32[h]	21.08	674.50
		Ties	6[i]		
		Total	43		

a. Service charge and bribe (if any) in Taka with alternative points < Service cost with UDC

b. Service charge and bribe (if any) in Taka with alternative points > Service cost with UDC

c. Service charge and bribe (if any) in Taka with alternative points = Service cost with UDC

d. Other costs (travel, food and wage loss)in Taka with alternative < Other costs with UDC

e. Other costs (travel, food and wage loss)in Taka with alternative > Other costs with UDC

f. Other costs (travel, food and wage loss)in Taka with alternative = Other costs with UDC

g. Total costs with alternative points < Total cost with UDC

h. Total costs with alternative points > Total cost with UDC

i. Total costs with alternative points = Total cost with UDC

Table 2.3: Hypothesis test Summary on the perceived impact on UDC on easy access to government information and services.

Test Statistics[a]

	Z	Asymp. Sig. (2-tailed)
Access to government information (alternative) - Access to government information (UDC)	-2.825[b]	.005
Access to government services (alternative) - Access to government services (UDC)	-1.391[c]	.164

a. Wilcoxon Signed Ranks Test

b. Based on positive ranks.

c. Based on negative ranks.

Ranks

		N	Mean Rank	Sum of Ranks
Access to government information (alternative) - Access to government information (UDC)	Negative Ranks	19[a]	11.87	225.50
	Positive Ranks	4[b]	12.63	50.50
	Ties	17[c]		
	Total	40		
Access to government services (alternative) - Access to government services (UDC)	Negative Ranks	8[d]	10.81	86.50
	Positive Ranks	14[e]	11.89	166.50
	Ties	14[f]		
	Total	36		

a. Access to government information (alternative) < Access to government information (UDC)

b. Access to government information (alternative) > Access to government information (UDC)

c. Access to government information (alternative) = Access to government information (UDC)

d. Access to government services (alternative) < Access to government services (UDC)

e. Access to government services (alternative) > Access to government services (UDC)

f. Access to government services (alternative) = Access to government services (UDC)

Table 2.4: Hypothesis test summary on participatory and grievance redress provisions

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	Impact on participation (alternative) - Impact on participation (UDC)	-.531	1.436	.254	-1.049	-.013	-2.092	31	.045
Pair 2	Impact on grievance redressed (alternative) - Impact on grievance redressed (UDC)	-.143	1.325	.250	-.657	.371	-.570	27	.573

Table 2.5: Percentage distribution of sources of Awareness as per service categories.

		Categories of Information and Services										
		Government Information and Services			Certificates (birth/death/inheritance/charecter)			Commercial information and services			Total	
		Count	Column N %	Row N %	Count	Column N %	Row N %	Count	Column N %	Row N %	Count	Column N %
First acquaintance with the UDC	Mass media (news paper/radio/TV)	12	25.5%	52.2%	6	9.8%	26.1%	5	11.6%	21.7%	23	15.2%
	Neighbour/public talk	12	25.5%	29.3%	18	29.5%	43.9%	11	25.6%	26.8%	41	27.2%
	By visiting the UP	**0**	**0.0%**	**0.0%**	**30**	**49.2%**	**96.8%**	**1**	**2.3%**	**3.2%**	31	20.5%
	Publicity by the UP (leaflet/miking/exhibition)	12	25.5%	54.5%	4	6.6%	18.2%	6	14.0%	27.3%	22	14.6%
	Entrepreneur/ UP representative	11	23.4%	34.4%	3	4.9%	9.4%	18	41.9%	56.3%	32	21.2%
	Wardshava/budget meeting	0	0.0%	0.0%	0	0.0%	0.0%	1	2.3%	100%	1	0.7%
	Others	0	0.0%	0.0%	0	0.0%	0.0%	1	2.3%	100%	1	0.7%
	Total	47	100.0%	31.1%	61	100.0%	40.4%	43	100.0%	28.5%	151	100.0%

Table 2.6: Percentage distribution of Services received from UDC as per gender

		Gender of the Participant					
		Male			Female		
		Count	Column N %	Row N %	Count	Column N %	Row N %
Name of information or services taken from UDC at the latest?	Land certificate copy	7	6.8%	100.0%	0	0.0%	0.0%
	Electricity bill payment	13	12.6%	81.3%	3	5.9%	18.8%
	Applying for passport	2	1.9%	100.0%	0	0.0%	0.0%
	Telemedicine	1	1.0%	50.0%	1	2.0%	50.0%
	Applying for overseas job (Malaysia)	10	9.7%	100.0%	0	0.0%	0.0%
	Government forms downloading	2	1.9%	100.0%	0	0.0%	0.0%
	Education information or services (registration/admission/result check)	3	2.9%	60.0%	2	3.9%	40.0%
	Certificates (birth/death/inheritance/citizenship)	38	36.9%	60.3%	25	49.0%	39.7%
	Mobile banking	3	2.9%	75.0%	1	2.0%	25.0%
	Photocopying/compose/printing/laminating/scanning, etc.	9	8.7%	69.2%	4	7.8%	30.8%
	Skype conversation	1	1.0%	33.3%	2	3.9%	66.7%
	applying for job or job search	0	0.0%	0.0%	2	3.9%	100.0%
	Photoshoot	6	5.8%	54.5%	5	9.8%	45.5%
	E-mail or internet browsing	3	2.9%	100.0%	0	0.0%	0.0%
	Computer Training	5	4.9%	45.5%	6	11.8%	54.5%
	Others	0	0.0%	0.0%	0	0.0%	0.0%
	Total	103	100.0%	66.9%	51	100.0%	33.1%

Entrepreneur Survey

Missing value analysis, coding and data organization

Question 1 and 2 that are regarding Gender of the Uddakta and the name of the administrative divisions have missing values of 3 and 4 respectively which the researcher does not have any option to do anything with and they are not big either. Similarly, 20 missing cases with question no 3 on computer competency and 6 cases with question no. 4 are not so large; so they are kept as they were. Question 3 has the 'Other' category which is answered by 34 respondents and coded as 7 in SPSS. Exploring the open ended answers for this response category it was found that 17 respondents did not mention anything about their competency, hence they are treated as missing and recoded with 9. 12 respondents mentioned that they have long time experience with multiple training and thus they can logically be treated as having training 06 months and above computer competency and are coded with 4 for the response category. 2 have mentioned about having Diploma degree and hence are coded with 5 for the category. 2 have mentioned of having no formal training, therefore, they are coded with 1 for the category. 1 has mentioned about having training of 15 days and hence he is coded with 2 for the response category 'Less than 3 months training'.

Question 5 required Yes or No answer regarding service equipment in the UDC. The missing Value analysis of the question in SPSS demonstrates that there are quite a number of missing values on a number of items as presented in the following table 2.7.

Table 2.7: Missing value summary of the question 5 on Service Equipment.

Variable Summary[a,b]

	Missing		
	N	Percent	Valid N
Nebuliser	193	35.9%	345
Generator	120	22.3%	418
Photocopier	71	13.2%	467
Laser Printer	65	12.1%	473
Adequate Furniture in the UISC	61	11.3%	477

a. Maximum number of variables shown: 25
b. Minimum percentage of missing values for variable to be included: 10.0%

From our Field survey on 16 UDCs we find that these items listed in the table are not available across all UDCs specially the number of UDCs with Nebuliser or Generator is quite a handful. Also, the interview findings with management officials suggest that these items were not initially brought

by the local administration to equip the UDCs; they were added later in some UDCs either from the Project Management or from local arrangement. Same kind of unavailability can be assumed for other items i.e. Photocopier, Laser Printer, Adequate Furniture in the UDC since the respondents have only two options to answer, either Yes or No. Thus, there are strong reasons to believe that these missing values are reflections of not having those equipment in the UDC. Based on such logical conjectures these missing values are recoded with 2, the value attributed for the answer 'No'. The resulting frequency distribution is presented in the table 2.8.

Table 2.8: Frequency distribution on Availability of service equipment after recoding the question no 5.

	Yes		No		Total	
	Count	Row N %	Count	Row N %	Count	Row N %
Desktop Computer	452	84.0%	86	16.0%	538	100.0%
Laptop	452	84.0%	86	16.0%	538	100.0%
Internet Modem	521	96.8%	17	3.2%	538	100.0%
Laser Printer	364	67.7%	174	32.3%	538	100.0%
Colour Printer	424	78.8%	114	21.2%	538	100.0%
Scanner	481	89.4%	57	10.6%	538	100.0%
Digital_Camera	451	83.8%	87	16.2%	538	100.0%
Photocopier	318	59.1%	220	40.9%	538	100.0%
Generator/Solar Panel	183	34.0%	355	66.0%	538	100.0%
Multimedia Projector	430	79.9%	108	20.1%	538	100.0%
Nebuliser	30	5.6%	508	94.4%	538	100.0%
Enough Space in the UISC	332	61.7%	206	38.3%	538	100.0%
Adequate Furniture in the UISC	199	37.0%	339	63.0%	538	100.0%

For Question 6 the missing value summary is presented in the table 2.9.

Table 2.9: Missing value summary of the question 06 on working conditions of Service Equipment

Variable Summary[a,b]

	Missing		
	N	Percent	Valid N
Nebuliser	257	47.8%	281
Generator	218	40.5%	320
Solar Panel	205	38.1%	333
Photocopier	109	20.3%	429
Laser Printer	88	16.4%	450
Multimedial Projector	58	10.8%	480

a. Maximum number of variables shown: 25
b. Minimum percentage of missing values for variable to be included: 10.0%

To make decisions about these missing values we need to produce the frequency distribution of question 06 and make a comparison of it with the recoded frequency distribution of question no. 5 presented in table 2.10.

The Frequency Distribution of Q 6 with missing values is presented in the table beneath:

Table 2.10: Frequency Distribution on Working Conditions of Service Equipment of question 6.

	Good Working Condition	Moderate Working Condition	Out of Order	Being Used Not for UISC	Not Present in the UISC	Missing	Total
	Count	Count	Count	Count	Count	Count	Count
Desktop computer	324	92	31	15	29	47	538
Laptop	344	60	35	20	36	43	538
Internet Modem	331	151	16	8	6	26	538
Laser Printer	218	48	108	2	74	88	538
Colour Printer	262	102	79	2	45	48	538
Scanner	417	32	17	4	22	46	538
Digital Camera	314	65	68	6	42	43	538
Photocopier	193	65	63	0	108	109	538
Generator	65	19	23	4	209	218	538
Multimedial Projector	308	49	61	9	53	58	538
Nebuliser	24	8	5	0	244	257	538
Solar Panel	68	24	21	3	217	205	538

For nebuliser we can see that the response for ‘Not Present in the UDC’ plus missing is 244 + 257 = 501 in the above table while the total number not having it is 508 in Table 3.2. So the missing values of 257 for Nebuliser can reasonably be fitted with the level ‘Not Present in the UDC’. The same can be told for equipment such as Photocopier and Multimedia Projector with numbers such as 220 and 108 in Table 3.2 for not having it for fitting missing values of 109 and 58 for them added with existing values 108 and 53 of ‘Not Present in UDC’ respectively in the Table 5.4 (109 + 108 = 217 and 58 + 53 = 111)). Use of Generator and Solar Panel was jointly asked in Q5 and have a number 355 for ‘Not Present in the UDC’. When they are asked separately in Q6 both received higher numbers of combined values from levels ‘Not Present in the UDC’ and ‘Missing’ i.e. 427 for generator and 422 for solar panel which can be assumed logical. So, it can be assumed that those who answered ‘NO’ for these items in question no. 05 opted for either answering ‘Not Present in the UDC’ or not answering the item at all. The same conclusion can be deducted for other equipment types having missing values of less than 10%. In the event of such circumstances the missing values for all types of equipment in question 6 are recoded with 5, the value for ‘Not Present in the UDC’.

For question 7 the missing value summary is presented in the table 2.11 as beneath.

Table 2.11: Missing value summary on Internet Connection Type in question 7.

Variable Summary

	Missing		
	N	Percent	Valid N
Broadband	491	91.3%	47
Others	456	84.8%	82
Dial_up	430	79.9%	108
Mobile Internet	282	52.4%	256

These large number of missing values are resulted from system generation as the most UDCs have either one connection but the question type was Multiple Choice that allows multiple answers. The missing numbers can be interpreted as not having any other connection type since most UDCs have either one of these connections type listed in the table, as is also validated from the findings of our field interview. The Frequency Distribution of the Internet Connection Types can make the issue more clear as presented in the Table 2.12.

Table 2.12: Frequency Distribution of Internet Connection Types in question 7.

		Count	Column N %
Dial_up	Dial-Up	108	20.1%
	Missing	430	79.9%
	Total	538	100.0%
Mobile Internet	Mobile Internet	256	47.6%
	Missing	282	52.4%
	Total	538	100.0%
Broadband	BroadBand	47	8.7%
	Missing	491	91.3%
	Total	538	100.0%
Others	Other Connection	82	15.2%
	Missing	456	84.8%
	Total	538	100.0%

Exploring the open-ended responses for 82 ‘Other’ type as presented in the above table it was found that participants mentioned modems and names of companies that provide the mobile internet modems which in other words the mobile internet itself. This may happen due to lack of understanding about the type of mobile internet. Thus, this variable with value 4 is recoded as

Mobile internet variable with value 2. Since most UDCs exclusively use either of these connections, as found from the examination of the data and distinct value is allocated for each type i.e. dial –up connection = 1, Mobile internet = 2, Broadband = 3, they are restructured under one variable naming ‘Internet Connection Type’ by going manually every case in the data file. 7 cases, where the answers were multiple including the ‘Broadband’ type, are coded as broadband= 3 since it is the best connection type. In terms of connection speed and breakdown incidents there is not much difference between dial-up and mobile internet connection. So for 5 cases, where the answer is both dial up and mobile internet connection, 3 are coded with value 2 = mobile internet and remaining 2 are coded with value 1 = dial up connection, consistent with their frequency values. The newly constructed variable ‘Internet Connection Type’ thus replaces the names of previous variables yet with their values in three types as presented in the table 2.13 beneath.

Table 2.13: Frequency Distribution of Internet Connection Type in the UDCs

Internet Connection Type

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**Dial-up**	104	19.3	**21.9**	21.9
	Mobile internet	324	60.2	**68.2**	90.1
	Broadband	47	8.7	**9.9**	100.0
	Total	475	88.3	100.0	
Missing	**Missing**	63	11.7		
Total		538	100.0		

63 missing values in the question are kept as they are.

For question 8 the missing value summary is produced in the table 2.14.

Table 2.14: Missing value summary on Services demanded in question 8.

Variable Summary[a,b]

	Missing		
	N	Percent	Valid N
Others	240	44.6%	298
Telemedicine	141	26.2%	397
Electricity Bill Pay	131	24.3%	407
Copy of Land Records	94	17.5%	444
Mobile Banking	88	16.4%	450
Other Commercial services (phone call/projector rent/song load,etc.)	69	12.8%	469
Photocopying	68	12.6%	470
Information on education,health and agriculture	59	11.0%	479
Job Search and application	57	10.6%	481

a. Maximum number of variables shown: 25

b. Minimum percentage of missing values for variable to be included: 10.0%

The missing values for other categories can perhaps be interpreted as not having those services and thus they are never asked by the people. It is can also be supported from our field survey where we found that not all services are equally available in every UDCs. The presence of services was largely determined by the supply from the local arrangement. Since almost all services provided from the UDC are mentioned in nearly an exclusive list so the 'Others' category remains least answered. Since Telemedicine Electricity Bill Pay, Copy of Land Records, Mobile Banking are only introduced in few UDCs so the respondents from UDCs not having those have probably bothered least about answering them. These assumptions can be supported from the analysis of the Frequency Distribution on Question 8 as presented in the following table 2.15.

Table 2.15: Frequency Distribution of Service demanded by people in question 8.

	Very Often	Quite Often	Seldom	Never	Missing	Total
	Count	Count	Count	Count	Count	Count
Others	116	68	72	42	240	538
Telemedicine	22	19	101	255	141	538
Electricity Bill Pay	117	43	35	212	131	538
Copy of Land Records	130	77	122	115	94	538
Mobile Banking	130	75	136	109	88	538
Other Commercial services (phone call/projector rent/song load,etc.)	120	83	182	84	69	538
Photocopying	291	88	41	50	68	538
Information on education,health and agriculture	91	90	240	58	59	538
Job Search and application	146	118	177	40	57	538
Passport	155	109	185	43	46	538
Computer Training	193	142	114	46	43	538
Education Services (admission/registration/result check,etc.)	200	142	145	13	38	538
Photoshoot	272	122	89	28	27	538
Compose	358	128	26	3	23	538
Email/Internet browing	274	153	87	6	18	538
Certificates (birth/death/inheritance/citizen, etc.)	382	106	28	7	15	538

From the sorted (Descending) values of missing category in the above table it can be seen that missing values are higher for service types that have lower values in answer categories such as ‘Very Often’ and ‘Quite Often’ indicating the limited availability of those services across UDCs. Thus, these missing values can logically be merged with the answer category ‘Never’ and are accordingly recoded with 4, the value for answer category ‘Never’. Since values are inversely allocated in the scale for ‘Very often’ = 1, ‘Quite often’ = 2, ‘Seldom’ = 3 and ‘Never’ = 4, they are recoded reversely i.e. ‘Very often’ = 4, ‘Quite often’ = 3, ‘Seldom’ = 2 and ‘Never’ = 1 for making analysis easier by pairing with other variables that have the latter order progressively increasing.

For question no 9 and 10 the missing values are 11 and 12 respectively that constitute around 2% of the total respondents which is negligible and it is also difficult to guess about their source since there are as many as 06 response categories with question no 9 and 7 response categories with question 10. So they are kept as they are.

For question 11 the missing value summary is produced in the table 2.16.

Table 2.16: Missing value summary on income from services in a month in question 11

Variable Summary

	Missing		
	N	Percent	Valid N
Others	198	36.8%	340
Electricity bill payment	164	30.5%	374
Telemedicine	156	29.0%	382
Copy of land land records	151	28.1%	387
Mobile Banking	128	23.8%	410
Data Entry	121	22.5%	417
Education Health and Agriculture Information	119	22.1%	419
Computer Training	116	21.6%	422
Commercial services (compose/print/photocopy/e-mail/projector rent/skype,etc.)	112	20.8%	426
Union Parishad Works	112	20.8%	426
Education Services (admission/registration/result check,etc.)	109	20.3%	429
Certificates (birth/death/inheritance/citizen)	87	16.2%	451

As 70 respondents did not progress with the question 11 and onward in online page 3 and 4, but are added to this large value of missing they can logically be deducted from each type of services. After subtraction the service category wise missing value for the question 11 would appear much similar to the question 8 missing values pattern presented in the table 3.9 connoting for similar reasons. The possibility is that because of absence of these categories of services in many UDCs, the income from them is 0%. Thus, these remainder missing values for these service categories have been coded with 11, the value for 0% income.

Another important decision has to be taken since browsing of the responses has revealed that the answer categories for the question from 0% - 100% do not add up to 100 (which is a question requirement) for 186 cases (for 27 cases it is less than 100 and for 159 cases more than 100). When categorised in four sub-groups they fall under interval groups such as 10-50%, 60-90%, 110-150%, 160% and above. For 10-50% and 160% and above subgroups there are 8 and 125 respondents respectively and we have decided to treat their answers as missing values by coding them with 99 since it would be misleading to rescale them as values are extremely low or high and are very spread across levels of answers. For remaining 19 respondents' values belonging to 60-90% groups and 34 respondent's values belonging to 110-150% group have been decided to be rescaled proportionate to their existing levels of answers, i.e. increasing or decreasing values of their answered levels proportionately to add up to 100. So the number of missing values for question 11 totals [70 (those who did not answer page 3 onward) + 8 +125] = 203 and kept as they are. Since the values are inversely allocated in the scale for '100%' = 1, '90%' = 2 ----- up to 10%

= 10 and 0.00% = 11 they are recoded reversely i.e. 0.00% = 0, 10% = 1 ------ up to 90% = 9 and 100% =10 for making analysis easier by pairing with other variable that have the latter order i.e. progressively increasing.

Table 2.17: Categorised Percent of Income distribution from services delivered[86].

	80-100%		50-70%		20-40%		10%		0.00%	
	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %
Certificates (birth/death/inheritance/citizen)	11	3.3%	63	19%	167	50%	57	17%	38	11.3%
Education Health and Agriculture Information	1	0.3%	1	0.3%	12	3.6%	108	32%	215	63.8%
Education Services (admission/registration/result check,etc.)	0	0.0%	1	0.3%	37	11%	220	65%	78	23.2%
Telemedicine	0	0.0%	0	0.0%	1	0.3%	8	2.4%	327	97.3%
Mobile Banking	0	0.0%	1	0.3%	14	4.2%	92	27%	229	68.2%
Union Parishad Works	0	0.0%	0	0.0%	59	18%	101	30%	177	52.5%
Commercial services (compose/print/photocopy/e-mail/projector rent/skype,etc.)	1	0.3%	27	8.0%	167	50%	96	28%	46	13.6%
Computer Training	3	0.9%	4	1.2%	50	15%	136	40%	144	42.7%
Data Entry	1	0.3%	3	0.9%	40	12%	149	44%	144	42.7%
Electricity bill payment	0	0.0%	0	0.0%	2	0.6%	26	7.8%	307	91.6%
Copy of land land records	0	0.0%	2	0.6%	15	4.5%	66	20%	252	75.2%
Others	0	0.0%	1	0.3%	33	9.9%	110	33%	191	57.0%

For question 12 the missing value summary is produced in the table 2.18

Table 2.18: Missing value summary on Average service recipients in the last 3 months in question 12

Univariate Statistics

	N	Mean	Std. Deviation	Missing Count	Missing Percent
Q12_Averagerecipientsinthelast03months	453	5.52	2.532	85	15.8

[86] Due to space limit the 'Total' category is not presented in the table, but percentages each row add up to 100%.

Given that 70 out of 538 did not proceed with question 12 that belongs to page 3 of the online survey the actual missing value would be 15 which is relatively low and we can not know the exactly the reason of missing since the answer could be opted through multiple levels.

Question 13 have produced a missing value in the following table 2.19.

Table 2.19: Missing value summary on percentage of disadvantaged people attending the UDC in question 13.

Variable Summary

	Missing		
	N	Percent	Valid N
Illiterate (men and women)	96	17.8%	442
Poor (men and women)	91	16.9%	447
Women	87	16.2%	451

Like that of the question 12 the actual missing values of these categories, when 70 cases, who did not participate in page 3 of the online survey, are deducted it would be 26, 21 and 17 subsequently which are also missing perhaps the respondents opted not to answer. Any plausible guess is also impossible since recognising any close one among 8 response levels would be misleading. So these missing values are kept as they are.

Excluding those 70 cases who did not proceed with the question 14 in page 3 the missing values are presented in the following table 2.20.

Table 2.20: Missing value summary on Changes due to UDC in the last year in Question 14

Variable Summary

	Missing				
	N	Percent	Valid N	Mean	Std. Deviation
Technical and Training Assistance from Local Administration	55	10.2%	413	3.04	1.043
Number of services delivered	48	8.9%	420	3.66	.811
Mass Awareness	46	8.5%	422	4.06	.776
Online Service Supply from the local administration	45	8.3%	423	3.34	.970
Participation by women	34	6.3%	434	3.75	.752
Service Request (per month)	33	6.1%	435	3.67	.893
Participation by poor	30	5.6%	438	3.79	.814
Number of Service recipients (per month)	29	5.4%	439	3.82	.817
Cooperation from the Union Parishad	25	4.6%	443	2.81	1.145
Monthly Income from the UISC	18	3.3%	450	3.68	.934

It can be observed that only one category has received a missing category of around 10%. However it is not recognisable why these missing cases are and they cannot be in fitted in any rating of a 5 scale in a credible way. Thus, they are kept as they are.

Similarly, in question 15 the missing values are found across categories of different levels. Excluding those 70 cases (who did not participate on page 3 of online survey) the missing values account for less than 10% of total responses for each category in the question as can be observed in the following table 2.21.

Table 2.21: Missing value summary of Future Services from the UDC

Variable Summary

	Missing		
	N	Percent	Valid N
Local News	111	20.6%	427
specilal services for poor/women/illiterates	108	20.1%	430
Matrimonial Information	104	19.3%	434
Consultation with upazila or district doctors	104	19.3%	434
Paying aged/widow/disabled allowances through mobile banking	102	19.0%	436
GD/Complaint to Police	102	19.0%	436
Awareness on Right to Information	101	18.8%	437
Land Certificate/Land Tax	100	18.6%	438
Online Information/services from Upazila or District Agriculture Office	99	18.4%	439
Online Passport	98	18.2%	440

Since the question has a 5 scale ratings they cannot be fitted in any of them simply for inability to guess in a conceivable way. Thus, they are kept as not recoded.

Question 16 belongs to page 4 of the online survey which remain unanswered by (70+49=119) people since these participants did not progress with Page 3 and 4 respectively. So, when the value 119 is deduced, the actual missing values appear very small as can be seen in the table 2.22.

Table 2.22: Missing value on Problems of UDC in question 16

Variable Summary

	Missing		
	N	Percent	Valid N
Power Breakdown	139	25.8%	399
Low income from low turn out of people	138	25.7%	400
Lack of online service supply from higher government offices	137	25.5%	401
Lack of publicity and awarness	137	25.5%	401
Lack of training of the uddakta	137	25.5%	401
Computer/other equipment not working	137	25.5%	401
Internet connection breakdown/slowspeed	137	25.5%	401

By deducting 119 from each of the above variables the missing values become very small. So the missing values are kept as they are.

Missing values for question 17 are produced in the table 2.23.

Table 2.23: Missing value on Uddakta's satisfaction with UDC in question 17

Variable Summary

	Missing		
	N	Percent	Valid N
Online service support from the local administration	365	67.8%	173
Training and Other Technical Support from the local administraion	358	66.5%	180
Reduced time and cost in service delivery	355	66.0%	183
People's participation in the UISC	301	55.9%	237
Cooperation from the Union Parishad	269	50.0%	269
Income from the UISC	255	47.4%	283

Despite deducting the number 119 as we did with Question 16 the missing values are still large which is probably a reflection of non-response at the end of the survey since it was the last closed ended question in the questionnaire. So these missing values are kept as they are.

Question 18 is an open ended question.

Table 2.24: Exploratory Factor analysis of frequently asked services from the UDC

Rotated Factor Matrix[a]

	Factor	
	1	2
Email/Internet browing	**.710**	
Compose	**.708**	
Education Services (admission/registration/result check,etc.)	**.653**	
Photoshoot	**.624**	
Job Search and application	**.569**	
Computer Training	**.508**	.366
Other Commercial services (phone call/projector rent/song load,etc.)	**.488**	.381
Passport	.463	.418
Information on education,health and agriculture	.431	.373
Photocopying	.399	.317
Certificates (birth/death/inheritance/citizen,etc.)	.374	
Others		
Electricity Bill Pay		**.681**
Copy of Land Records		**.636**
Telemedicine		**.518**
Mobile Banking	.316	**.494**

Extraction Method: Principal Axis Factoring.
Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 3 iterations.

Table 2.25: Correlation between people's participation and other variables

Correlations

	Spearman's rho		
	Average number of service recipients in the last 3 months		
	Correlation Coefficient	Sig. (2-tailed)	N
Average monthly income in last 3 months	.442**	.000	449
Money invested under PPP	.211**	.000	446
Basic Equipment	.170**	.000	453
Picture Equipment	.096*	.041	453
Advanced Equipment	.147**	.002	453
Government Services	.165**	.000	453
Commercial services	.277**	.000	453
Certificates	.283**	.000	453

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Table 2.26: Hypothesis Testing: Regression Weights and Critical Ratios within factors in the Progress model

			Estimate	S.E.	C.R.	P	Label
Progress_1_year	<---	People_Participation	.702	.069	10.226	***	
Progress_1_year	<---	External_Support	.253	.043	5.909	***	
Progress_1_year	<---	Money_invested	.086	.020	4.345	***	
Q14_Participation_women	<---	People_Participation	1.000				
Q14_Participation_poor	<---	People_Participation	1.105	.074	15.014	***	
Q14_Mass_awareness	<---	People_Participation	.735	.068	10.784	***	
Q14_Government_S_supply	<---	External_Support	1.000				
Q14_Cooperation_UP	<---	External_Support	.829	.068	12.190	***	
Q14_Tech_Train_asst	<---	External_Support	.984	.065	15.187	***	
Q14_S_R_number	<---	Progress_1_year	1.000				
Q14_Service_number	<---	Progress_1_year	.919	.050	18.516	***	
Q14_Service_request	<---	Progress_1_year	1.004	.055	18.348	***	
Q14_Change_c_l_y	<---	Progress_1_year	1.058	.057	18.601	***	

Table 2.27: Hypothesis Testing: Regression Weights and Critical Ratios within factors in the Sustainability model

Regression Weights: (Group number 1 - Default model)

		Estimate	S.E.	C.R.	P	Label
Sustainability	<--- Q17_Reduced_time	.113	.095	1.186	.235	par_24
Sustainability	<--- Q10_Money_invested	.449	.069	6.467	***	par_25
Sustainability	<--- Internet_connection_recoded	.465	.273	1.704	.088	par_26
Sustainability	<--- CIOY	.668	.155	4.317	***	par_27
Sustainability	<--- Services	.311	.145	2.145	.032	par_28
Sustainability	<--- Equipment	1.156	.347	3.328	***	par_29
Mean_Support	<--- CIOY	.735	.069	10.695	***	par_1
Mean_participants	<--- CIOY	.678	.053	12.738	***	par_2
Mean_service_component	<--- CIOY	1.000				
Mean_Commercial_service1	<--- Services	1.000				
Mean_egovernment_services	<--- Services	.795	.049	16.107	***	par_3
Mean_LG_services2	<--- Services	.720	.046	15.605	***	par_4
Mean_picture_equipment	<--- Equipment	1.231	.161	7.660	***	par_5
Mean_Basic_equipment	<--- Equipment	1.000				
Mean_advanced_equipment	<--- Equipment	.939	.122	7.688	***	par_6
Q12_Averagerecipientsinthelast03months	<--- Sustainability	1.000				
Q17_Uddakta_satisfaction	<--- Sustainability	.366	.058	6.323	***	par_7
Q9_Monthly_income	<--- Sustainability	.593	.064	9.276	***	par_8

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