Union Digital Centers (UDCs), Bangladesh:
An Assessment of the UDCs' Effectiveness

Tanzina Akhter

The Graduate School

Yonsei University

Department of Public Policy and Management

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This certifies that the master's thesis of Tanzina Akhter is approved.

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Thesis Supervisor: Prof. Jung Wook Lee

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Thesis Committee Member #1: Prof. Young Jun Choi

_____

Thesis Committee Member #2: Prof. Hyun Hoe Bae

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Abreviations

PPP   Public-Private-Partnership

GoB   Government of Bangladesh

UP   Union Parishadh

A2i   Aspire to Innovate

UNO   Upazila Nirbahi Officer

UDC   Union Digital Center

SPSS   Statistical Package for Social Sciences

OECD   Organisation for Economic Co-operation and Development

ICT   Information and Communication Technology

UISC   Union Information and Service Center

TIB   Transparency International Bangladesh

DC   Deputy Commissioner

Abstract

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Tanzina Akhter
Global Master of e-Government and Public Management
Department of Public Policy and Management
The Graduate School
Yonsei University

Though embracing the information and communication technology in providing governmental services becomes the demand of time, sometimes the government of developing countries face various challenges for lack of assets to bring holistic change. The government of Bangladesh finds the solution in utilizing the finance and expertise of private sectors which is also a common trend all over the world. The government has established Union Digital Centers (UDCs) throughout the country nearby the local government offices to provide online-based public services to the doorsteps under public-private-partnership model. Individual private entrepreneurs work there to deliver online-based government services. This study aims to find out the influential factors affect the effectiveness of UDCs in delivering those services.

The primary data has been collected from Jashore district (by using survey questionnaire) and a2i (monthly report collected from each UDC), as the monitoring authority

under Prime Minister Office regarding the online-based government services. The sources of secondary data cover books, journal articles, academic paper, reports, etc. This study follows mixed method as it has been gone through content analysis for qualitative data and statistical analysis for quantitative data. The quantitative data has been analysed under regression model with the software: SPSS. Among analysed fifteen factors which might have influence on UDCs' effectiveness only three factors have been found out with positive relations or impacts. These are service delivery capacity, role of Aspire to innovate (a2i), and network within the UDCs. From the non-supported variables this study has explained the challenges facing by the UDCs, for example; less supervision from local government bodies, having no required qualification for being and selecting entrepreneurs, not having any policy, and so on. To overcome these kinds of problem this study includes suggestions to establish a separate wing under the ICT Division to monitor UDCs properly.

As thes UDCs become mandatory establishments in the locality to assist the citizens to avail online-based public services, the government should take more serious measure to facilitate those centers.

Key Words: Public-Private-Partnership, Union Digital Center, Online-based Government Service Delivery, Effectiveness, Influential Factors

Chapter 1: Introduction

The nature of the changes of world governance system has not curtail the government functions rather its embracing different kind of transformation. The era of industrialization or the induction of modernization in the developing countries has not limited the scope of government rather the citizens are demanding for security of life, work and freedom. The spread of technologies and the use of internet make the citizens smarter to demand for quick and easier services. On the other hand, in the developing countries there re digital gap between the rural and urban citizens. Generally, urban citizens are more educated or the educated people tend to live in the urban areas. Thus, the demand of educated people to bring transformation in the governance system becomes a new way of living for the marginalized rural or uneducated people. In this ground, the role and responsibilities of the government increases to ensure education and basic digital knowledge for all. The role of non-governmental organizations can be found in educational sector, nevertheless it is the government to introduce and familiarize any new digital system related to the public service to the citizens. This vast work, sometimes, cannot be covered by the government itself. Sometimes, government takes help from private sector under financial issue or for expert human resources.

Public-Private Partnership (PPP) becomes a common way of accomplishing big projects in both developed and developing countries. Utilizing the benefits of PPP in carrying out big projects is getting a new ground of work in the digital transformation of the government. Bangladesh has introduced PPP in the local level for making and ensuring the accessibility of marginal people to the online based government services what is being common in developing countries. It established digital centers in the lowest tier of local government where citizens can find various services, such as; information, computer-based services, banking services, etc. besides the public office related online services, against a minimal cost. The commission for getting assistance from the service providers of those centers is the income for those private

individual persons who work under the contract signed with the respective local government. These digital centers have passed ten years of the journey in providing services to the doorstep. The vision of the government to transform the public services or offices paper-less and online-based can be accomplished with the functions of these centers, otherwise, the target group of public services like the marginal people cannot avail online services easily. Here, to measure the effectiveness of these centers is the demand of time.

Thus, this study focuses on the effectiveness of the digital centers working at the Union level. Particularly, it takes the online-based government services (among different types of services) under the consideration. This is mainly a quantitative study which gathers primary information through questionnaire survey from the service providers. The collected data is analyzed by multiple linear regression model in SPSS software. The findings are discussed with both content analysis and multivariate analysis including descriptive statistics.

1.1 Rationale of the Study

The recent development of the governance system throughout the world evidences the journey towards digital transformation. All the developed countries have already implemented e-government to make the public offices paperless and, provide the citizens quick services. Meanwhile, developing countries are also trying to follow the trend. Generally, they are lying in different stages of implementing e-government. The spread of internet facilities or the use of internet-based communication is also influencing the citizens to demand for online-based government services. In the time of pandemic this demand became obvious and vibrant. Though the use of ICT can help the government to simplify the work process, bring transparency, reduce corruption, and ensure citizens' engagement, it is not easy to upgrade all the traditional procedures to digital processes within few years. Because, the governments of developing countries are providing vast range of public services. To incorporate digital systems in all over the public sectors needs big amount of money and suitable workforce. Readiness of

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the citizens to enjoy e-government is also another important issue which is related with the digital literacy rate of the country. Sometimes, government lacks in finance and expertise to reach the marginal community or to cover all the locality. In this ground, it finds the solutions in getting assistance from non-governmental organizations or, in building partnership with private sectors.

For bringing development in different sectors, different countries had utilized the expertise under Public-Private Partnership (PPP) since 1990s to carry out big projects, mostly infrastructural works. Nowadays, it's being introduced to bring ICT development in the country as well. Many developing countries embrace PPP model for ensuring digital services to the citizens. Bangladesh is also going through constructions of various project in the field of IT, Education, Health, Transport, Accommodation, Economic Zone, Industry, Tourism, Energy, Shipping, etc. under PPP model. Considering the majority of the population, who are living in the rural areas, rate of literacy and availability of resources are low. Employment in small and medium size informal sectors is common. And, another common scenario is less utilization of information and communication technologies (Rahman, 2016). Thus, to provide digital services to the grass-root level or to help the local people to avail different or newly introduced online services, the Government of Bangladesh (GoB) has established digital centers following PPP model.

On the other hand, the GoB has been working to transform the country to a digital one through providing online services to the citizens. In UN E-Government Development Index 2022, the country gets the rank at 111th position among 193 countries. It is moving forward in digitalization as the position has moved 8 steps upward within last two years (119th in 2020). The Vision 2041 of the government includes four priorities, such as; developing human resources, connecting citizens in an effective way, ensuring the services to the doorsteps, and, patronizing the private sectors and market system with the use of digital technologies towards

more production and competition (GED, 2020). As 68.49% (Population Census, 2022) of total population of the country are staying in the rural area, the country cannot achieve the desired goal of development either in economic sectors or in social components without incorporating the rural people in this journey. Providing better government services to the grass-root people is one of the goals of the government, where availability of online-based public or government services can serve the purpose better. In this ground, the GoB has taken the initiative to establish digital service centers in the Unions (lowest tier of the local government), municipals and city-corporations under the PPP model. The initial idea was to make those as a one-stop shop in the locality. However, the nature of PPP in this regard is a little bit different than general understanding of PPP. The private part of the partnership is individual persons rather than any private company. The private individuals come under a contract or an agreement with the Union Parishads (UPs); the rural council consisting of peoples' representatives. As the UP chairman is politically elected person thus the contract gets a new nature than other projects of the country. Nevertheless, the Upazila Nirbahi Officer (UNO), the head of the lowest administrative tier, is another responsible person to provide suggestions for the better performance and sustainability of UDCs. As the ultimate monitoring authority Aspire to Innovate (a2i) program under the Prime Minister office convey and implement government's decisions, provide training and other technical supports to the entrepreneurs (service providing private individuals). This nature of the contract or dimensional level of correlation diversify the necessary factors of UDCs' effectiveness in providing the desired services.

At the time of first initiative (November, 2009), the UDCs were working in a pilot basis which becomes a mandatory establishment in all the unions from 2013. The government has targeted to establish one UDC within every 4 km of each diameter of the locality. These centers provide different types of services, such as; government services, non- government services, commercial services, information services, technological training services and so on. There are

two entrepreneurs, by post, in each center to provide services to the citizens who are mostly less-educated to do technological work by their own or unfamiliar with new technologies. Here, the government only provides the accommodation (a place for the center, furniture, etc.) and technologies (computer, printer, etc.). The entrepreneurs are responsible to generate the income, pay utility bills, and, buy and repair logistics. Form the service receivers' site, getting services from the digital centers is reducing their time, cost and visit while taking services from any public office. It also has reduced the scope of corruption by reducing the practice of face-to-face interaction with public service providers (TIB, 2017).

Thus, the effectiveness of the government in providing online services is being accelerated by the work of UDCs. Likewise, the effectiveness of UDCs is depending on various factors which affects the nature of service providing, for example; the numbers and quality of entrepreneurs, electricity and internet connection, and so on. Though the government provided similar support to all the centers, there are differences in facilities provided by the local government. Again, there are differences in the qualification of entrepreneurs who are working under contract. Overall, the performances of UDCs are varying from each other which has been monitoring by a2i. It also provides awards to the best performing entrepreneurs. Knowing the factors which are necessary to ensure the effectiveness can help both the authority and service providers to facilitate weak centers towards betterment. Here the perceived effectiveness takes task accomplishment, after what the employees get reward or punishment, under consideration. These also depend on determining the resources, knowing the availability and getting feedback (Sbea & Guzzo, 1987). Again, this effectiveness consists the successful implementation of major policies and value for money (Andrews et al., 2017). Likewise, here to define or measure effectiveness, the monthly income of the service providers or the private individuals and the number of service recipients are taking under consideration. Overall, the objective of this study

is to assess the factors affecting the effectiveness of Union Digital Centers (UDCs) in delivering online government services to the grass-root people of Bangladesh.

1.2 Research Question

The primary objective of this study is searching out the factors affecting the effectiveness of Union Digital Centers (UDCs) in providing online government services. It focuses on the centers of Jashore district of Bangladesh which represents the service delivery relation between the government and grass-root people. The factors cover both internal and external dimensions. Thus, the questions and sub-question of the study are:

Main Question: What are the factors affecting the effectiveness of Union Digital Centers (UDCs) in providing online government services to the grass-root people of Bangladesh?

Sub-question 1: What are the internal factors (management, work environment, etc.) affecting the effectiveness of UDCs?

Sub-question 2: What are the external factors (governance, networking, etc.) affecting the effectiveness of UDCs?

1.3 Scope of the Study

For searching the factors necessary to provide effective online-based government services to the rural-local people, this study focuses on the UDCs under the Jashore district. Bangladesh is primarily divided into 8 Divisions, 64 Districts, 492 Upazilas and 4554 Unions (Bangladesh National Portal, 2022). The district Jashore is under the Khulna Division which is the third largest city of the country after Dhaka, capital, and the Chattogram, second financial and economic hub of the country. Among all 8 districts under the Khulna Division Jashore is a progressive area. The reason to choose this district because it is the first announced 'Digital District' of the country which has been announced on 20 December 2012 (Prothom Alo, 28

July 2013). Under the district, there are 93 Unions and 08 Municipalities. This study collects data from 93 unions where there are 96 digital centers as the GoB planned to establish a center within each 4-kilometer circumference.

There are 10 types of services provided by the centers, i.e.; government, non-government, financial, e-commerce, education and training, information, job, post and courier, health and other services. The listed services under each category are not commonly available in each and every center. For example, every center cannot provide enough facility to the citizen to use internet or computer by their own, all entrepreneurs are not qualified enough to provide training to other people, etc. Sometimes, entrepreneurs also introduce new commercial services in the center, for example; agent banking. Thus, there are differences from one center to another. However, this study only focuses on the government services which go under the government to business, and government to citizens networks. And, for those a governmental body monitors the activities of UDCs. It can be assumed that, in terms of online government services there should be similarities in all centers. But then again, different centers are performing differently. Thus, this study is an endeavor to discover the factors those affects the performance of those centers while providing government services to the respective local people.

1.4 Research Design

The following figure is showing the brief research design or the steps that was used to conduct the study:

Figure 1

Research Design of the Study

Research Area	
Problem Statement	

⇩

Hypothesis Development	
Literature Review	

⇩

Research Method	
Quantitative	Qualitative

⇩

Data Collection	
Primary: Questionnaire Survey	Secondary: Published Documents

⇩

Timeline	
Four Months (September-December, 2022)	

⇩

Data Analysis	
Multiple Linear Regression	

⇩

Discussion	
Discriptive Statistic	

⇩

Implecations	
Academic	Policy
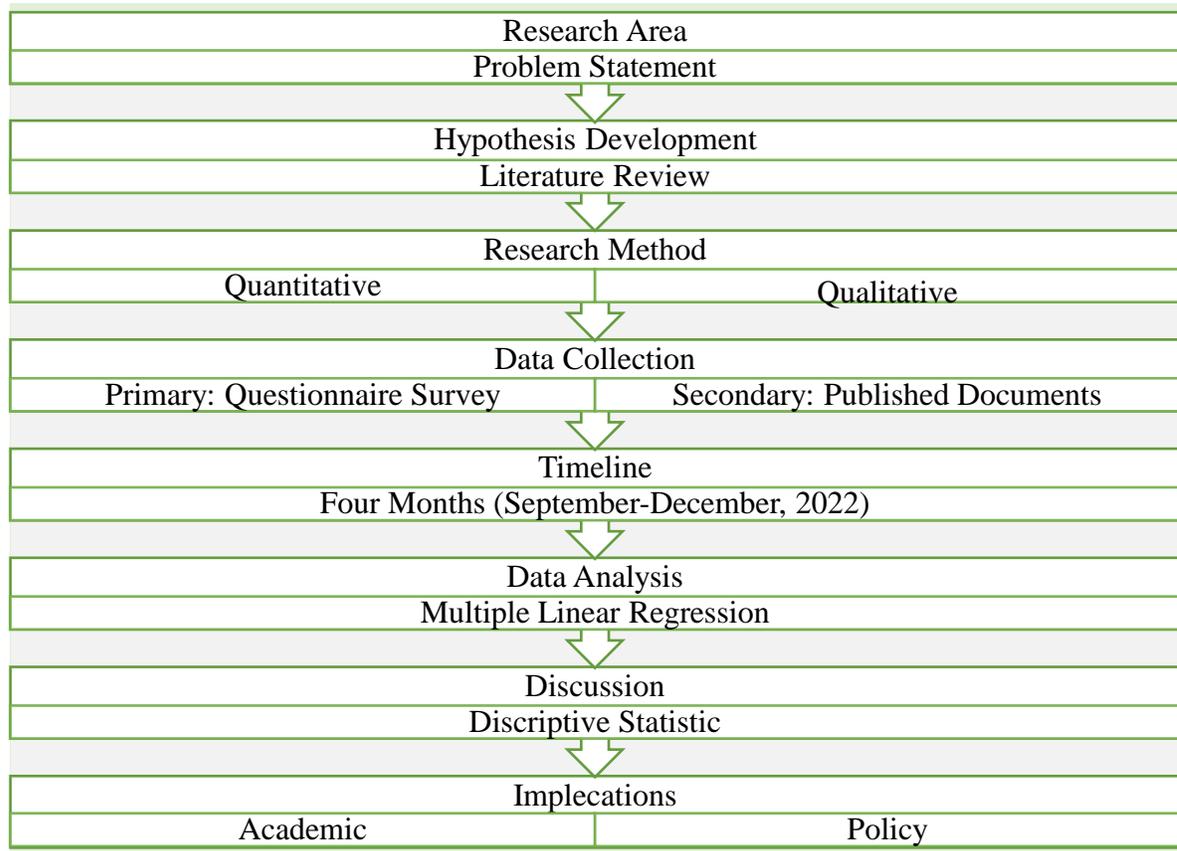
By following the research design, there were few particular functions for collecting two kinds of data; primary and secondary. To elaborate and to run the data collection work, another plan was prepared.

Table 1

Data Collection Plan

Evaluation Question	Data Type & Sources	Data Collection Instrument	Sampling Notes	Data Collection Timeline	Person Responsible
The nature and role of UDCs	Qualitative, Secondary	Analyzing Literatures	Available & Relevant Literatures	September-October, 2022	The Researcher
Factors affecting the effectiveness of UDCs	Quantitative, Primary	Questionnaire Survey	UDCs under Jashore District	October-November, 2022	Entrepreneurs & the Researcher

1.4.1 Data Collection Method

To serve the research objective of this study, data is collected from 96 centers of Jashore district. As per the organizational structure there should be two entrepreneurs in each center, one male and another female. For ignoring the duplication of data or different responses for same centers, one response has been taken under the consideration of playing main role and work experience with the UDCs.

A survey questionnaire has been prepared with Likert scale in Google form. There are 5 points under the scale. Most of the responses get the level of strongly agree to strongly disagree. The link of the Google form has been distributed among the entrepreneurs through their email addresses. Finally, the collective data has been taken from the Google form. And, another set of data has been gathered from the a2i, monitoring authority to know about the monthly income

(commission) of entrepreneurs after providing online based government services and number of service recipients visit UDCs monthly.

1.4.2 Data Analysis Procedure

The data has been discussed under different concept, like; PPP, online public-services, effectiveness in service providing, etc. Theoretical model has been used to analyze the data and the correlation between dependent and independent variable. There are two types of independent variables; internal and external; in the model which can positively affect the dependent variable; effectiveness in service delivery.

To find out the relationship between variables and the most necessary factors to ensure effectiveness, multiple linear regression model has been used. For that reason, a computer software; IMB SPSS Statistics 26, has been used to run the analysis.

1.5 Significance of the Study

The unit of analysis of this study, UDC, is itself is an important establishment in rural area. Though, the UDC is common in all unions of the country, the level of their performance in service delivery is not similar. Thus, it is important to find out which factors essentially ensure effective service delivery from the UDCs.

This study is significant in both academic and operational ground. The finding of the study will enrich the literature as there is no previous work with Jashore district. As the government considers this region as digitally advanced, the findings can be valuable for developing the less-performing UDCs. On the other hand, the findings can also help the policy makers to learn the service delivery status from the service providers' site, to know which factors are most influential in the service delivery practice, and finally, can take required initiatives while providing supports to the center. Though there are some literatures presenting essential factors

that can ensure the effective service delivery of UDCs, the regression analysis enables this study to present the level of significance of the effective factors on service delivery. This helps to understand the priorities. In that ground, this study is unique in existing literature and carrying valuable information for the policy makers.

1.6 Structure of the Paper

The research paper is divided into five segments, these are;

Chapter 1: Introduction

The beginning chapter introduces the research topic and area, discuss about the rationale, and scope of the study, significance of the study, etc. It also presents research question, research design and the structure for this full paper presentation.

Chapter 2: Literature Review

This chapter includes the discussion on thematic analysis, previous research work, journal articles, etc. From that discussion, hypotheses have been developed accordingly. Fifteen different hypotheses show the relationship between variables and impact of independent variables on dependent variable which goes under the same interest. Those positive relation also have been presented in the form of theoretical framework.

Chapter 3: Methodology

This chapter clarify the research method and data collection method. Definitions of variables are also included in this part of the paper.

Chapter 4: Findings and Discussion

This portion of the paper presents the findings of the research. The statistical result from the multiple linear regression analysis has been interpreted and discussed here.

Chapter 5: Conclusion

The final section of this paper presents the recommendation by the researcher. Firstly, the limitation of the study is being presented thus the readers of this paper can know and understand the limitations before going through the recommendation part. This chapter also includes a brief summary of the findings and conclusion of this work.

Chapter 2: Literature Review

The developed countries of the world have already transformed their governance system to electronic service delivery management system to introduce paperless public offices and, for ensuring easy, quick and effective services to the citizens. By following that path, developing countries are also playing new types of roles to bring changes in sector by sector. The journey of Bangladesh towards a digital country has started with the availability of public services in the online platform. However, involving citizens in enjoying online services is a different sector to be developed because it relates with the education level of the citizens, the technological knowledge, or digital readiness, etc. Thus, to help the local people the GoB decided to establish digital centers in each locality of the rural areas to help the citizens to avail the online government services. On the contrary, government does not have the resources (human & financial) to run those centers. For that reason, the government follows PPP model as a solution. Therefore, this chapter presents theoretical literature to explain general understanding of PPP, important factors for running effective PPP model, the nature of PPP in UDC, functions of UDC, etc. After that, this section describes the development of hypotheses and the conceptual framework.

2.1: Theoretical Literature

This part of the paper describes the definitions and explanations of few concepts which have been, generally, considering to develop its conceptual framework and hypotheses.

2.1.1 Definitions / Explanations

Defining PPP

Seeking help from the private entities to deliver public services is not a new trend in governance. Previously, the practice was to privatize the state-owned companies, contract out the services, and, sometimes to use the private finance to develop social infrastructure. In

developing countries, most of the time, the collaboration occurs to build and operate big-size infrastructure (Li & Akintoye, 2008). However, generally, PPP offers long-term and sustainable relations to bring desired changes within the system and the country (Wang et al., 2018).

Thus, public-private partnership (PPP) is an arrangement under which public (government) and private (profit making) entities come under an agreement to provide services to the citizens that was delivered by the public sector before. The private sector has to work with certain terms and conditions for ensuring the well-being of the public. It takes some accountability of public sectors and shares risks. This relation helps the government to curtail the expense on foreign expertise. In opposite, it enables the private sector to increase their quality by being involved in large-scale work. This can be beneficial for the country as without the advancement of both public and private sectors there cannot be any development (Narasimhan & Aundhe, 2016). The OECD (2008) defines PPP as 'an agreement between government and one or more private partners which may include the operators and the financers'. It also elaborates that while providing services, the private sector may focus on its profit objectives aligning with sufficient acceptance of risks. Hodge & Greve (2017) explain PPP more broadly as a 'cooperation between public-private actors in which they jointly develop products and services and share risks, costs and resources which are connected with these products and services' (Hodge & Greve, 2017). An easier definition presents by Garvin and Bosso (2008) as PPP is 'a long-term contractual arrangement between the public and private sectors where mutual benefits are sought and where ultimately (a) the private sector provides management and operating services and/or (b) puts private finance at risk.' This definition shows the relevance with the nature of UDC; the unit of analysis of this study.

Different frameworks under PPP

Throughout the world different types of PPP can be found. Wang et al. (2018) state five types of possible partnership under the levels of (i) cooperation for joint production and risk sharing, (ii) long-term contract to build infrastructure, (iii) public policy network, (iv) civil society and community development, and (v) economic development of urban and rural areas.

To define the relationship between partners, there are several models. Generally, the nature of the tasks, responsibilities and risks decide the nature of the relationship. There are few well-known models which are also commonly used in fields of e-government fields, these are:

- Build, Own and Operate (BOO),
- Build, Operate and Transfer (BOT), &
- Build, Own, Operate and Transfer (BOOT). (Sharma, 2017)

For the first dimension (BOO), public sector sells the right and responsibility to build a project under defined design to the private entity. There could be a specific timeframe for the private entity to operate the project. In the latter two categories (BOT & BOOT) the private entity will transfer the project after a certain period of time to the public organization. Another dimension of the forms is Design, Build, Operate & Transfer (DBOT) where the private sector would get the responsibility of designing the project as well. Under Build, Lease and Transfer (BLT), the model in-between time of building and transfer is mentioned as lease for the private sector. The Build, Lease, Operate and Transfer (BLOT) model generally defines that the private entity will build the project on leased public land. Under the Lease, Develop and Operate (LDO) system the public sector gets the financial payback for giving lease to private. There can be other models as well for ensuring the convenience and factors related to the project.

Besides building projects or infrastructural development, the private sector can be involved in different scopes under e-government. Different kinds of involvement by private sectors occurs in advertising and sponsoring for public activity, fee-based funding, sharing cost and revenue,

full service delivery, etc. To enjoy the expertise of the private companies, the government can find assistants in financial investment, IT related procurement, project management, risk transformation, entrepreneurship and innovation, and so on (Sharma, 2017).

Factors ensuring successful PPP

Besides explaining the factors affecting the success of PPP there are also few factors important to evaluate the performance of the PPP projects. In this complicated process many actors are involved in the agreement where each actor has a particular task to accomplish as well as indicators to measure the achievement. Wang et al. (2018) describe the performance of PPP under 'narrow' and 'broad' concepts. Under the 'narrow' understanding the performance is measured by the achievement of the targets stated under the contract. Financially, the return on investment is being measured. Again, it can be judged by the accomplishment of project phases in the described timeframe. On the other hand, the 'broad' concept of PPP performance, including the narrow measurements, emphasizes on the wider benefits or the impact on the stakeholders or beneficiaries. Thus, 'value for money' is the important matter here. They also describe two dimensions to measure the performance of PPP from the consideration of the network, these are: focusing on the content outcomes or final result, and another is focusing on the process outcomes or quality of the decision-making processes.

Therefore, a large number of factors can be necessary for a successful PPP as stated by Wang et. al. (2018). They have found out the most important ones as contract management, process management, management strategies, organizational forms and political support. However, some scholars of the Netherlands present two theoretical perspectives of the success, such as; organizational forms, stems from resource dependency theory and contract theory, and, management strategies, stems from governance network theory (wang et al., 2018). A study in Malaysian finds out that there are five factors necessary for ensuring successful PPP implementation. Among eighteen variables, political support became the least important one.

Likewise, risk allocation, technical feasibility, transparency in procurement process, and so on got less importance as well. On the contrary, the five important factors or critical success factors (CSFs) discovered from the study includes: the presence of good governance, state of commitment from the both party (public & private), supporting legal framework, stable economic policy, and having a financial market (Ismail, 2013). Tang et al. (2013) focused on Australian infrastructural projects and found out four main influential factors. Those factors cover procurement, stakeholder, risk and finance related issues of a projects. They described adequate time and controlling the process of procurement are needed. There should be an open environment to promote effective communication with the stakeholders. The project should have the ability to identify potential risk and the possible way to transfer risk. Finally, under financial issues the proper explanation of contract, budgetary issues and payment mechanism should be presented and maintained.

Except these, a broader study conducted by Hai et al., 2021 including forty-two CSFs (under six categories) of PPP, focusing on the implementation process of infrastructural projects. That study has found out private sector related factors as the most important one. This bunch is consisting of the components regarding the capability of the private sector, such as; financial and human resource competency, project management, analytical ability, etc. It also mentioned that the government of developing countries assist the local companies to flourish thus they can take part in PPP projects. The second important thing is the information related to the projects. There should be the availability of the information about the project scale, objectives, plan, location, probability, benefits for the communities, etc. Thirdly, the study mentioned about the risk management separately. This includes not only the cost-benefit issues but also feasibility studies covering social, political and environmental issues. It should also be known about the level of risk allocation among public and private sectors. After these categories the study has found the influence of issues related procurement, public sector's ability, and external

factors respectively. In the last group it keeps the factors where the human beings have less control, i.e.: geographical, weather, geographical and environmental issues.

Defining PPP in e-Governance

Electronic Government brings a new face for the traditional nature of government. Expected outcomes of this is to enable the citizens to interact with the government at all levels, and enable the government to communicate with other governments around the world (Morgeson III & Mithas, 2009). The field of e-government is stated by The World Bank (2022) including the use of information technology by government agencies that may transform the traditional way of communication between and among government, business and citizens. With an improved network the government may deliver better services with a better management capacity, and through this process the citizens will be empowered. The expected result of utilizing technology may be visible in reducing corruption, increasing transparency, better financial management, and so on. Normally, governments spend or invest large amount of money for ensuring public service delivery and implementing e-government that brings focus on determining the effectiveness of the whole activities. Sometimes, this initiatives towards the development of e-government lags behind from the private sector in delivering high quality services (Reddick & Turner, 2011, Morgeson III & Mithas, 2009). Public organizations lag in adopting and implementing new technologies, and, do not concentrate much on performing well as the citizens do not have choice here like a role of customer (Morgeson III & Mithas, 2009). Moreover, implementing e-government can discover another problem like the ration of women and older people show less access to government websites (Reddick & Turner, 2011).

Thus, the definition provided by OECD describes where there are needs of utilizing PPP. To ensure effective implementation of e-government projects, PPP can be the most suitable arrangement for developing countries. It can help to minimize the gaps within the quality, time

and efficiency in public service delivery because, generally, the government chooses the suitable expertise of respective field. Thus, PPP can assist the public sectors broadly under three needs, i.e.; lack of financial resources, required soft skills, and practice of awarding the good performers (Sharma, 2007).

Public Service Delivery and PPP (examples from developing countries)
Ensuring the quality of public service becomes a concern for both the policy makers and the citizens because there is demand for high-quality services with the rising living standards. On the contrary, there is inefficiency of public sector at regional level which can be categorized under three characteristics, there are: i) lack of best practices, ii) less quality of service delivery system (lack of management quality and information, technical inefficiency, etc.), and, iii) experience of allocation of budget or problem in reallocating of expenditures (Zhu & Peyrache, 2017). This circumstance shows there is an importance of implementing any project under PPP in local level as it facilitates the public sector to use the resources of private sectors in delivering services by which local government can save budget. It is because, PPP models concentrated on value for money, and, its managerial flexibility may improve efficiency or bring cost-effectiveness. And, again, efficiency becomes a perceived outcome of PPP model because firstly, private organizations work within an economic environment, and secondly, they have less bureaucratic culture which ensure the managerial flexibility (Andrews & Entwistle, 2010). Likewise, the utilization of PPP in the ICT sector is being famous in developing countries. The government of India is running locality-based PPP projects involving native entrepreneurs at several states. Egyptian government embraces PPP for the development of villages as well. Estonia goes under the partnership because it ensures broadband connection in remote areas (Rahman, 2016). Particularly, effective cases are found in India and Vietnam. India is maintaining various projects under PPP. As per Sharma (2007), there are two cases that are performing very well. For example; 'Bhoomi' is the system to provide land titles online to the

rural farmers of Karnataka. The computer-based land records system ensures better planning and, availability of land records in public domain. The system has reduced the time of service delivery from months to days. Another one is 'e-Procurement' project in Andhra Pradesh. Here, the private partner takes the financial responsibilities, like; the complete initial investment, maintenance of all hardware and software, etc. The private entity charges the stakeholders for each transaction to recover its investment. This project gets huge political support as they have made e-procurement as a compulsory step for all vendors who want to supply goods for the government activities.

On the other hand, Vietnam focuses on the tele-communication services. It continues same partnership project in two rural areas. The partnership has been created between three partners, i.e.; the telecommunication fund of the Ministry of Post and Telecom, Vietnam Data Communities Company, and Intel. From the outside of the partnership, USAID facilitates this working network. Firstly, the project was started in Lao Chi, an agricultural village, and after its success the government has introduced that in Sapa, a rural-mountainous area. The objective of this project is to foster economic development by providing cost-effective WiMAX broadband facilities, including voice over internet protocol services, to the rural people who are living in remote areas (Fife & Hosman, 2007).

Defining Effectiveness

The Oxford Learner's Dictionaries define the word 'effectiveness' as "the fact of producing the result that is wanted or intended; or, the fact of producing a successful result". The Merriam-Webster Dictionary provides three explanations of this word, these are: "1. the capacity to persuade, 2. the power to produce a desired result, and, 3. the quality of an utterance that provokes interest and produces an effect." The second meaning shows the relations to productiveness which also included the capability and strength. The meaning of effectiveness

in this study is being meant with this expression. Moreover, it incorporates the word as being successful in fulfilling targeted results.

Sbea & Guzzo (1987) define the effectiveness under the circumstance of group activity that can be any performance-based organization. Here, task interdependence (TI), outcome interdependence (OI), and potency are important to ensure effectiveness. These variables are also can be affected or influenced by the members or supervisor of the group. TI shows the degree of interaction among the task-based group members who work in parallel posts. Without knowing each other they complete their assigned work, i.e., research or development groups, while supervisor may combine their works. Another situation explains that group members can work in a sequence, one after another, to complete a full task. Here, they may have frequent interaction, i.e., groups within large organizations. OI emphasizes on the outcome of task accomplishment, such as, the senior manager or the supervisor can provide some rewards like, additional pay or recognition, or can provide punishment. Lastly, potency indicates the faith of group members regarding the group effectiveness and has strong influence on the performance. It is all about to know the necessities to be succeeded, for example, skills, financial resource, training, networking, feedback from monitoring entity, etc. TI and potency have positive inter-connection as more task interdependency enables the members to oversee and evaluate each-others' performances. Under the material context three things are also needed, such as; i) having defined goal of the organization, and clear chart of key task, ii) determining required resources and availability, getting feedback against performance, and, iii) deciding the type and nature of the group by defining the job distribution and the way of collaboration. Finally, the role of supervisor is important to focus on group opinion, guide and direct the group, and above all to monitor the performance.

Effectiveness in Public Service Delivery

Generally, organizations take different implementation strategies to fulfill different goals, such as; conflicting to each other, to bring efficiency in service delivery, etc. In public organizations, newly introduced strategy becomes 'taken for granted' in the routine job. Thus, measuring the performance of public sector is multidimensional and complex (Andrews et al., 2017). The prime responsibility of a government as the state's guardian is to provide various services to the citizens. Public services can include both goods and services targeted to ensure quality of life. Public service does not focus on per capita income or market benefits. Thus, government ensures the services by using taxes or subsidies. There are two dimensions of the benefits citizens can get from these services, such as; externalities (prevention of epidemics), and, equities (ensuring basic needs for everyone). In considering the effectiveness in public service delivery these few things are important to measure; reaching to the target groups or beneficiaries, getting desired impact, and having expected citizens' response. There also should be an active nexus among politicians, service providers and beneficiaries (Besley & Ghatak, 2005).

Figure 2

Public Service Delivery Nexus
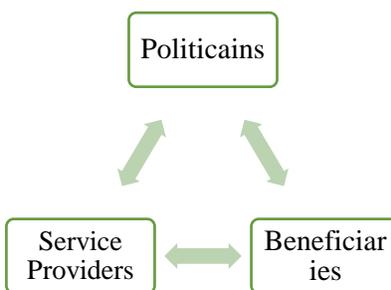
Hence, the effectiveness of public service delivery system can be considered as the successful implementation of major policies, or particularly for local government, how extent it can achieve the objectives stated by the central. Again, efficiency will be measured with how well it can manage the resources, ensure value for money and bring fair distribution or equity. Here, the policy makers should encourage the local government to incremental implementation of strategies to improve effectiveness, efficiency and equity (Andrews et al., 2017). Rahman (2016) mentions, the effectiveness and sustainability of that necessarily the UDCs depend on the support and direction from the respective representatives of local government bodies and, from the central government while needed.

Effectiveness in Online Public Service Delivery

Providing online public or government services is basic initiative of digitalization. Again, a holistic digitalization can promote e-government. e-Government indicates the all-over transformation of the public sector for ensuring effective, efficient and citizen-centric public service delivery. This transformation, certainly, needs well use of Information and Communication Technology (ICT). Through the use of ICT or particularly online platforms, the government has to be connected among all of its activities and services. The performance or process of service delivery is the main understanding of e-governance. Again, the use of ICT should ensure the interaction between and among citizens, state and private sectors which is needed for an integral framework of e-governance (Qian, 2010). The UN e-Government Survey 2022 presents, as the after effect of Covid-19, 90% of its member states developed online platforms to management public services related to the pandemic. Specially, the populous cities improve their local online services by appointing skilled workforce and employing more public budget.

Pawlewicz (2021) incorporates few features of online government services, these are; filling out and submitting online applications, making payments, giving e-signature options to

residents and staff, managing and storing confidential information. Beforehand, online services should be accessible for 24/7, these will take less time, will cost lower than before, and from the service providers' side, these should be handled with less effort. Moreover, online services must cover all the citizens of the country. In this ground, Qian (2010) mentions the high-income countries are in better situation while bringing transformation to the all over the country. For the countries with less-favorable situation, public-private-people partnership (PPPP) can be a better solution to introduce online services in a country. Additionally, the government has to provide continuous emphasize on capacity building through education and training. Because, effective governance and government demands citizens as co-creators and co-owners of public service rather being simple recipients.

A study presents different means to ensure effective public service delivery in Bangladesh, for example, ensuring the availability of information regarding service process and outcome, developing database of citizens' information, utilizing the benefits of PPP in citizens' engagement, introducing one-stop service centers with electronic queue management system, customer feedback mechanism, mechanism for monitoring and reviewing public service delivery, and so on (Hassan, 2015). The GoB has introduced digital centers in the local level as a representation of one-stop service center under the PPP model.

2.1.2 Union Digital Centers (UDCs), Bangladesh

Establishment and Management of UDCs

In Bangladesh, 70 percent of rural residents had faced problems to get public services from the district or sub-district levels of government offices. Though those offices provide wide range of services, the public services were time consuming and labor intensive both for service seekers and providers. Typically, district and sub-district offices are on average 35km and 20km respectively far from rural residents. Moreover, lack of proper information regarding the

processes, and sometimes, lang delays leaded to additional costs for the citizens, like; spending for transportation, accommodation and food. To reduce these kinds of considerable hassle, and to promote public services to the door-steps of unserved citizens, the then Access to Information (a2i, presently known as Aspire to Innovate) Programme of the Prime Minister Office established the then Union Information and Service Centers, USIC (presently named as the Union Digital Centers, UDCs) as the one-stop information and service delivery outlet (a2i, 2018). How the ninth parliament of Bangladesh (2009-2013) set 'Vision 2021' to develop the country digitally, and emphasized on the development of marginal citizens who are least served or enjoy less access to public services by themselves, also found out the solution in establishing digital centers. In the establishment of those centers the government got the technical assistance from the UNDP and USAID. These centers have been established about 4km from average rural citizens' resident thus all citizens including women, elderly persons, people with disabilities, regardless their literacy and ICT knowledge, can access to information and services. These information and services not only cover the public or government ones (such as; birth certificate, land-record, passport application, etc.) but also various private services (such as; mobile financial services, doctor's appointment, agent banking, computer training, etc.).

These one-stop service centers, in organizational format, are like micro-enterprises that are running by two citizen entrepreneurs; one male and one female. They go under a contract with elected local government representatives (a2i, 2018) which goes under the characteristic of PPP model. The contract has been signed for 5 years with the provision that the service providers can be changed if they have any problem as per the recommendation of Union Parishad's Chairman. For an entrepreneur, sometimes, next contract becomes uncertain or a matter of preference of next elected Chairman (Mamun, 2018). This nature makes the public-private-partnership (PPP) model of UDC as the foremost innovative initiative of the

government to bring public sector's infrastructure, and private sector's entrepreneurial efficiency together (a2i, 2018). Though the contracts are signed for medium term, decided by the two parties, here both parties seek their mutual benefits, and, private part maintains the operations as Garvin and Bosso (2008) mentioned for PPP.

Government provides one percent of its Annual Development Programme's budget to fulfill the mandate of digitalization by motivating and assisting local entrepreneurial capability. Operational expenditures (such as; utility charge, internet bills, computer maintenance cost, etc.) are borne by the private service providers or entrepreneurs as they are generating income by selling public and private services (a2i, 2018). The GoB has fixed the price rate for each service as well. For getting public services, the lowest price start from BDT 5 ($ 0.049) for mobile banking, the higher range is BDT 100 ($0.98) and the highest one for submitting online tender, EGP is BDT 2000 ($ 19.59). On the other hand, for getting private services like e-ticketing for bus and train, computer compose and data entry the price is BDT 20 ($0.20). To get computer printout, scan or photocopy is half or one-third of the previous price. In this level, the higher one is getting e-ticketing for plane, and that is BDT 250 ($0.45). the highest rate for private service is for the computer training, and the price is BDT 1000 ($ 9.79).

Work & Service Environment of UDCs

Since 2013, UDCs become mandatory establishment in each and every union under the PPP model. As per the government circular, 2013 the Union Parishadh (UP) is responsible to provide a room or space for establishing UDC in the premises of UP complex without any rent. That means, these centers are usually hosted in the local government institutions (a2i, 2018). Though, it is expected that UP would have own premises, there are few UPs without their own premise. In those cases, UDCs had to be established in another place. On the other hand, sometimes, UP could not provide enough space to run the activities of UDC. Besides that, there

are few problems for lack of investment, slow internet speed and network disruption, load shedding and inadequate alternative power supply, etc. Particularly, computers, printer, photocopy machine, etc. are essential to provide online services to the citizens. The research had found considerable number of UDCs were suffering for non-functional equipment. And, entrepreneurs were not willing to invest for the equipment as they were having shorter tenure of agreement (TIB, 2017). However, nowadays Union Parishadh spends for the new equipment, if needed, from their welfare fund.

UDCs are remaining functional for more than normal office hour and also in the time of weekends or holidays to run the business. Thus, working men and women can visit the center after their scheduled work or on their day offs (a2i, 2018). Though, there are provision of running the center by both male and female entrepreneurs, the presence of male entrepreneurs is higher than the female counterparts. There are some social barriers for females as their families do not want them to work with any unknown male person. Sometimes, females cannot continue entrepreneurship after getting married, and migrating to another place with husband (TIB, 2017).

Digital (online) Service Capacity of UDCs

The Transparency International Bangladesh (TIB), 2017 mentioned that UDCs are providing ICT based government, commercial and social services (providing information regarding agriculture, health, education, etc.) to the rural people, and these centers make delivery of e-services and dissemination of information easy and harassment free. They are reducing people's time, cost and visit for receiving services which actually include getting services from public offices. A nearby UDC also reduces the hassle to get computer (like; printing, composing, photocopy, etc.) related services from different shops. However, among different services receiving government services are most common where online birth registration is the most frequent one. UP provides different types of certificates to the citizens. Composing and

printing those certificates are also done by the UDC. If the citizens pay to the UP, in that case, UP will pay for the service of composing and printing to the UDC. Common private services are to take print out, take pictures, photocopy and laminating, etc.

However, providing quality services also depend on the quality of the workforce. As per the government circular (circulated in January 2013, from the UP Section of Local Government Division), there is no requirement of educational qualification or technical knowledge. The UDC Management Committee, which is comprised of UP Chairman, secretary of UP, and some other honorable persons from the concerned locality, has the authority to choose the best possible entrepreneurs from the available options. Thus, sometimes, the entrepreneurs have found less capable or skilled in comparison to other UDCs. Finding skilled and competent female entrepreneurs become another issue.

Governance System and Monitoring Mechanism of the UDCs

Many countries utilize the benefits of PPP model in ICT development. Entrepreneurship and innovation are two most desired characteristics of that nature (Sharma, 2017). The establishment of UDC under PPP model is sustainable institution because the centers are established by the government. Considering the Build, Own and Operate (BOO) model of PPP, the UDCs are built and owned by the public sector. Thus, there is surveillance from the government site. In terms of considering the performance of UDC there is no fixed target for the entrepreneurs as they are not getting any salary from the government, but only earning their livelihood from the charges against services and their invest for utilities and logistics. While monitoring, a2i also considers most earning UDC (one of the criteria among few scales) as the best one. Thus, the outcomes or final result finds 'value for money' which is explained by Wang et al., 2018 under the 'narrow' understanding of PPP's performance.

Up to now, there is only one government circular mentioning the role and relation with monitoring authority. The relation or network starts with the contract between Union Parishadh

(UP), lowest tier of local government, and the entrepreneur. There should be UDC management committee in the Parishadh to recruit the entrepreneur. The UP Chairman and the UP Secretary, permanent administrative staff of the Parishadh, will support the entrepreneur to coordinate the work of UDC. If any citizen complaint against anything the entrepreneur will try to solve that with the help of UP Chairman. If there is any problem, they can seek the support from the Upazila Nirbahi Officer (UNO), the administrative head of the lowest administrative office of the government. Finally, the Deputy Commissioner (DC), administrative head of the district level government office, will oversee the performance of the and will assist when necessary. The entrepreneurs will upload their daily performance in an online platform which is maintained by the a2i, and will submit monthly report to the UP Chairman to present that in the coordination meeting in Upazila level.

However, nowadays, this nexus of supporting, supervising and monitoring the functions of UDCs is become more specified than before. The contract should be made under the consent of DC. The Deputy Director, Local Government of DC office is another responsible person to supervise the contract. Additional Deputy Commissioner (Education & ICT) and, Assistant Commissioner (ICT) of the DC Office are responsible person to oversee the performance. Particularly, there are one Programmer, person in ICT post, in each DC Office who is also responsible to monitor and coordinate the common network with and between all the UDCs under their district. Beside this overall supervision from the DC office, the UNO plays the communication and supervision role for UDCs. The UP Chairman and the entrepreneur together responsible to the UNO for their performance. In this office level, there is an Assistant Programmer, ICT personnel, to communicate with the UDCs under his/her territory. Lastly, the UDC Management Committee of the UP should conduct meeting once a month to coordinate the works of UDCs except financial issues. In the national level a2i works for the most effective supervision, as they take daily reports from all UDCs, and for providing detailed

technical support, as it provides various training to the entrepreneurs. There are different platforms to maintain holistic coordination, communication and networking, such as; online platform (ekseba), facebook group, group email, and specialized working Whatsapp group.

Figure 3

The Levels of Supervision to UDCs
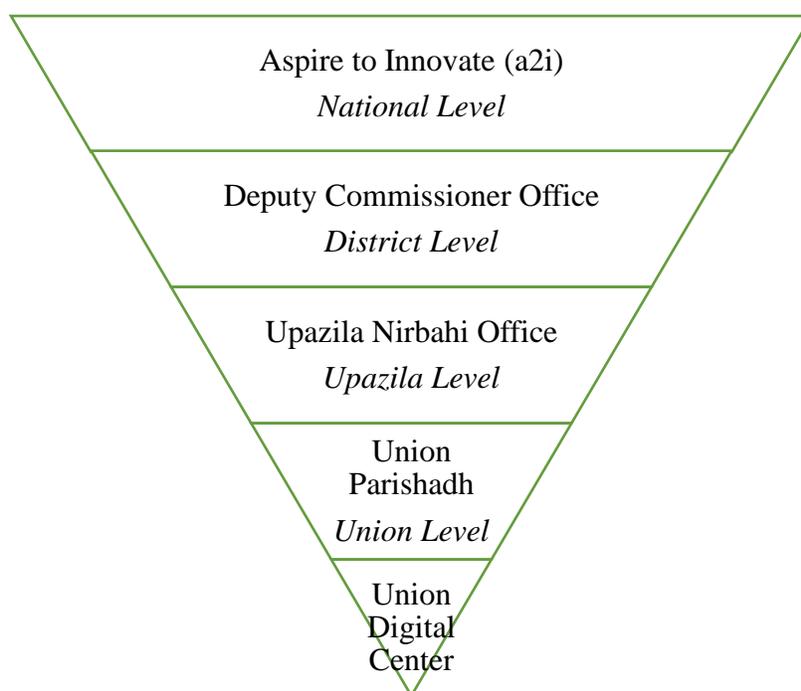
Citizens' Connectivity with UDCs

While running any business, customer satisfaction is an important element which influences the profit. As the UDCs are like micro-enterprises under PPP model, providing services to more

people can ensure more earning form the centers. Beforehand that publicity is an important catalyst. The government circular, 2013 includes two provisions. For instance, the entrepreneur will create demand of digital services in the community and will conduct motivating program. For that, s/he can organize campaign in common crowed places to reach most of the people, like; market places. On the other hand, UP will help the entrepreneurs to do mentioned activities. Moreover, the UNO will also be supportive to the entrepreneurs when s/he will plan to organize any campaign.

On the contrary, awareness of the citizens is important while taking services. For example, for taking any public service the number of National Identity Card (NID) is important. If a person visits UDC for having any public service without NID number, s/he cannot avail the service. For the children the NID numbers of his/her parents are important. Citizens' involvement in knowledge sharing regarding the services available is also another expression of their awareness. Influential local people can also take part in the sustainability of UDC to paying their support. Aware people can also demand for new services which may increase the scope of business of the UDCs.

Performance of UDCs in different Networks

The relation between UDCs and UPs are very close in terms of the location. UDC becomes a part of UP. UP chairman can also monitor the work closely and can support the entrepreneurs. However, this expected situation also demands a healthy official relation. The strongest network that all entrepreneurs maintain is the network among the entrepreneurs. They participated in the online platform and communicate through common facebook groups. The a2i facilitates this network as they arrange training and workshops for different groups of entrepreneurs, for example; newly contracted, best performers, etc.

Beside these, maintaining good communication with the citizens is very important for the entrepreneur as s/he is running a business. S/he can motivate and help citizens by sharing IT based knowledge which also can help to develop a smart society.

2.2 Hypothesis Development

The hypotheses for this study come from the literature review. Primarily, the factors affect the effectiveness of service delivery by the UDCs in locality can be categorized under two broad groups, i. e.; internal factors and external factors. Internal factors indicate the managerial and service delivery capacities. The other one includes the governance, monitoring and networking issues. Thus, with the specific areas under two group of factors, fifteen hypothesis have been developed.

Hypotheses for Internal Factors; Management Capacity

The healthy partnership depends on the suitable structure and the process that have been selected before (Narasimhan & Aundhe, 2014). For any project under PPP, the contract management is very important as the success of the project depends on that as well. The contractual agreement defines the allocation of risk and investment level between the public and private parties (Wang et al., 2018). For the UDCs, the contract mainly signed between a political representative and a ICT skilled person for 5 years where the terms and conditions (regarding risk and investment) are more or less set by the government. After 5 years as there is chance for the UP chairman not being elected again, there is also a risk for the entrepreneurs not being called for the contract (Mamun, 2018). Sometimes, UP chairman recruits new entrepreneur before the completion of running contract (TIB, 2017). Now, a2i intervene in that case and try to maintain the accuracy of the complaint against the entrepreneur. Thus, this is the first factor, contract management, that is being measured in this study.

H1a. The contract management component has a positive influence on effectiveness of UDCs

Generally, the availability of financial resources has influence in the quality of public services (Robinson, 2007). Narasimhan & Aundhe (2014) have found out the financial and technological capacity show influence in ensuring successful project implementation. Studies found that entrepreneurs become reluctant to invest as they have the fear of their job sustainability (Kumar and Kim, 2017, Mamun, 2018). From the annual development budget, the UP can assist the UDC to repair idle equipment and buy necessary ones. TIB, 2017 has found that in the year of 2016, 23 percent UDCs got financial assistance from the UP. On the other hand, it also found out that the average monthly income for the entrepreneurs was very low in the time of data collection. Again, the study of Kumar & Kim (2017) has found that the entrepreneurs have to spend about 22 percent of the center's total income for repairing equipment or buying new equipment. Internet bill is also paid from the income of UDCs. Thus, it is important to know the financial capacity of the UDCs.

H1b. The financial capacity component has a positive influence on effectiveness of UDCs

Hypotheses for Internal Factors; Work & Service Environment
For providing services the UDCs need to use physical infrastructures provided by local government and different utilities where electricity and internet (by paying the bill) are main driving force. Various studies showed that there were problem of load shedding, fluctuation in voltage, inadequate alternative source of electricity, slow internet speed, etc. (Saleheen, 2015, TIB, 2017, Kumar & Kim, 2017, Mamun, 2018). Sometimes, the entrepreneurs use modem connection which depends on the coverage of the network of telephone companies. As UDCs are providing services in rural areas infrastructural capacities are important to measure.

H2a. The infrastructural capacity component has a positive influence on effectiveness of UDCs

The service delivery capacity of the UDCs depends on both infrastructural and human resource capabilities. In terms of infrastructural establishments, citizens comfortability also matters. Saleheen (2015) describes that the effectiveness of UDC largely depends on the infrastructural and logistical set-up of the center and citizens' satisfaction which should be fulfilled by the activities of UDC. For example, waiting room for the service seekers or an open space to wait for getting services can give relief to the citizens. In terms of availability of the entrepreneurs Shamrat and Hossain (2018) found that 77% entrepreneurs were available in the working hour. Again, there is a provision in the government order, 2013 to train alternative entrepreneurs who can take over the responsibilities of UDC in emergency situation.

H2b. The service delivery capacity component has a positive influence on effectiveness of UDCs

Hypotheses for Internal Factors; Digital (online) Service Capacity
The UDCs were playing vital role in reducing time, cost and visit. However, sometimes these digitalized centers are not digital enough to provide modern services, even, sometimes, not well-equipped with tables and chairs (Samrat & Hossain, 2018). On the other hand, availability of required services is very important to attract the citizens to UDCs. A study found that 95% service seekers who were the respondents of that study showed satisfaction regarding the accessibility of required services and 70% of them shared satisfaction about the availability of services (Mamun, 2018).

H3a. The availability of online government services component has a positive influence on effectiveness of UDCs

Professional and technical skills of the service providers improve the capacity of the organization (Robinson, 2007), and personal factors like individual skills, confidence, commitment, etc. affect the performance as well (Mwita, 2000). The qualification of entrepreneurs (professionalism and technical skill) are important factors for running UDCs as the provided services are mostly computer and internet based. The entrepreneurs are supposed to be skilled in that field. However, sometimes they get familiar with computer application after beinh involved with UDCs. Only few entrepreneurs have advanced level of degree, like Diploma and Bachelor (TIB, 2017, Kumar and Kim, 2017).

H3b. The quality of workforce component has a positive influence on effectiveness of UDCs

Hypotheses for External Factors; Governance System
For organizational development performance review, personal appraisal, staff training, etc. are important issues (Mwita, 2000). In Bangladesh, there is UDC management committee comprised of 7-9 members and chaired by the UP Chairman to facilitates the performance of UDC. Like other committees of the UP, in that committee there should be one-third women member. They are supposed to conduct monthly meeting to review the activities of UDC (Khatun, 2020). However, there are less acquainted with the notion of PPP model and unfamiliar to the information technologies (TIB, 2017).

H4a. The UDC management committee component has a positive influence on effectiveness of UDCs

Besides the UDC management committee, as per the government circular, 2013, the UP and the UP chairman have specific roles and responsibilities toward the centers. Those includes both side of organizing, like; to support the existence and review UDC's work. TIB, 2017 study

found that sometimes lack of required personal understanding with UP chairman and secretary, the entrepreneur faces challenges to expend the business or services, and to maximize profits. It is also found that entrepreneurs do not get their payment properly after doing requested work for UP.

H4b. The union parishadh component has a positive influence on effectiveness of UDCs

Again, that circular mentions the responsibility of UNO as to assist the system to become familiar and sustained. However, the present practice is more vibrant and important than the statement. Both the UP chairman and the entrepreneurs are responsible to the UNO for their performance. In every Upazila, there is one assistant programmer to assist in technical issues and communicate with all the UDCs under the territory. Thus, the Upazila or the UNO becomes able to scrutiny both the administrative and technical issues of the UDCs. Moreover, in the monthly Upazila Coordination Meeting, UNO reviews the performance of UDCs.

H4c. The Upazila Nirbahi Officer component has a positive influence on effectiveness of UDCs

Aspire to Innovate (a2i) Program is running as an initiative under the Prime Minister Office. This present program is running with the assistant of UNDP, with the same workforce who worked to establish UDCs (or UISCs) under Access to Information Programme. Now a2i is in the mid-way of five years program. Though the government didn't mention anything in the legal paper about the responsibility of a2i, a2i is the body who developed the online monitoring and communication system to promote UDCs. It provides technological, operational, monitoring and advisory services to the entrepreneurs thus they can sustain their business as well as the UDCs. (Kumar & Kim, 2017). Firstly, it provides training to the entrepreneurs as

per their requirement and government instructions which is a vital component for performance management (Mwita, 2000) and, to enable staff user-centric improvement (Curtis, 2019). For example, basic ICT, Office Management, Freelancing, e-Commerce, and so on. They maintain continuous communication with the entrepreneurs through the 'eksheba' platform and facebook group. There the service providers can share their problem and get the feedback easily. There are focal persons in a2i for every region (divisional) who solves shared problems within short time. They also help to introduce new services. A2i also provides regular feedback to the concerned entrepreneurs and local administration after reviewing UDCs' performance. This kind of feedback includes capacity development of the service providers, customer management, campaign and promotional activities, sustainable income generation, etc. It also provides permission and suggestions when an entrepreneur wants to open a computer center in rural commercial place which can generate new jobs or promote entrepreneurships.

H4d. The Aspire to Innovate component has a positive influence on effectiveness of UDCs

Hypotheses for External Factors; Citizens' Connectivity
For running any program, stakeholders' connectivity or beneficiaries' awareness is important where dissemination of information plays a vital role. Saleheen (2015) observed the importance of UDCs were getting realized by the citizens including less educated persons. He noticed different knowledge sharing or information related services of UDCs were reducing the gap between the government and the citizens. On the contrary, Shamrat & Hossain (2018) noticed there was also lack of promotional activities to familiarize the functions of the UDCs. Because of limited publicity initiatives, local people are being less aware about the service provisions (TIB, 2017). Though the role of the public side should be taken care by the local representative, sometimes they were not aware about their role to familiarize UDCs among local people (Shamrat & Hossain, 2018). However, the common publicity methods include meeting with

citizens in village area, printing and distributing banner, signboard, poster/leaflet, etc., miking, video presentation, and so on. Here, miking and public communication were found most popular for publicity works (Kumar & Kim, 2017).

H5a. The publicity about the UDCs component has a positive influence on effectiveness of UDCs

Though the citizens' or service seekers' awareness about the service provisions is very important while providing online-based services, Shamrat (2018) observed that 38.33% of the respondents did not know about the UDCs. As Bangladesh is going through a continuous development towards digitalization, the whole system of public service delivery (from the sides of both service providers and service receivers) is going under simplification and modernization which needs intensive concentration and upgradation. Any public management demands citizens' engagement or users' involvement extensively (Osborne, 2012). Thus, the government has vital role to disseminate proper knowledge and information about the digital services, and the citizens have influential role to be involved in new changes by being informed with the process and by providing feedbacks for the further development.

H5b. The awareness of the citizens component has a positive influence on effectiveness of UDCs

Hypotheses for External Factors; Network Performance
In the era of technological advantage, online platforms make the communication very easy and quick. Government of any country cannot be progressive without maintaining various networks. PPP is also a kind of networks using to foster e-governance. In developing countries, besides physical or financial resources, the e-governance projects face challenges for human

and intellectual capitals. Specifically, the knowledgeable or capable human resource or social capital can play effective role to increase the efficiency of any program, and information diffusion. Here, the successful factors of PPP may include the practice of shared goals, open communication, trust on program, willingness to collaborate, etc. As an organizational form, projects under PPP influence the formation of social capital, development of collective knowledge which pave the new way for bringing innovation (Narasimhan & Aundhe, 2014). Thus, for the functions of UDCs it is important to learn about the networking with the local government entities, horizontal communication in the same level of service providers, and, knowledge and information sharing with the stakeholders.

H6a. The network between the Local Government and entrepreneurs component has a positive influence on effectiveness of UDCs

H6b. The network within the UDCs component has a positive influence on effectiveness of UDCs

H6c. The network towards the citizens component has a positive influence on effectiveness of UDCs

2.3 Conceptual Framework

The following conceptual framework is followed to conduct the research:

Figure 4

The Proposed Service Delivery Framework for the UDCs
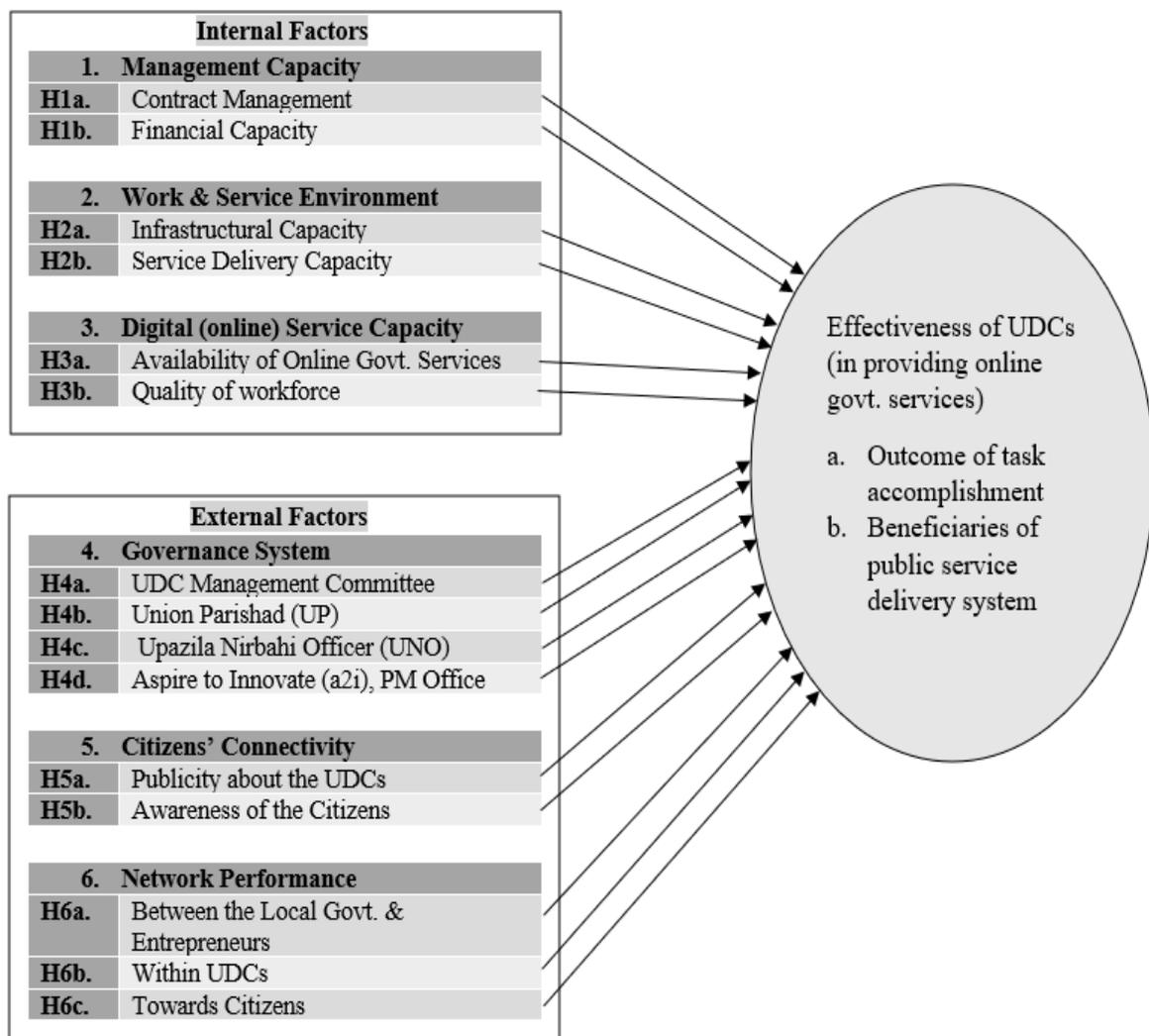
The effectiveness of UDCs in providing online government services to the grass-root level is considering as the dependent variable in this model. Here, effectiveness includes other criteria that will define the term, these are: outcome of task accomplishment, monetary return of the UDCs or income, and, the beneficiaries of public service delivery system, or the number of service recipients. The fifteen independent variables under two broad categories (internal and external factors) are the criteria to measure effectiveness of UDCs. The sub-headings under the two broad categories are showing various fields those ensure effectiveness of UDCs.

This study has conducted the multiple linear regression analysis by following the general equation, that is:

$$Yi = \beta_1 + \beta_2 X_{2i} + \beta_3 X_{3i} + ... + \beta_k X_{ki} + ui$$

By using the dependent and independent variables in above equation, the equation has been used in this study to find out the factors affecting the effectiveness of UDCs in providing online government services at the grass-root level is;

$$Ef = \beta_1 + \beta_2 \, CM + \beta_3 \, FC + \beta_4 \, IC + \beta_5 \, SDC + \beta_6 \, OGS + \beta_7 \, QW + \beta_8 \, MC + \beta_9 \, UP + \beta_{10} \, UNO + \beta_{11} \, a2i + \beta_{12} \, Pb. + \beta_{13} \, AC + \beta_{14} \, LG\&E + \beta_{15} \, WU + \beta_{16} \, TC$$

Here, Y= Ef (Effectiveness of UDCs) is the dependent variable

And, the independent variables are;

X_2 = Contract Management, CM, X_3 = Financial Capacity, FC, X_4 = Infrastructure Capabilities, IC, X_5 = Service Delivery Capacity, SDC, X_6 = Availability of Online Services, OGS, X_7 = Quality of workforce, QW; which are under internal factors, and,

X_8 = UDC Management Committee, MC, X_9 = Union Parishadh, UP, X_{10} = Upazila Nirbahi Officer, UNO, X_{11} = Aspire to Innovate, a2i, X_{12} = Publicity about the UDCs, Pb., X_{13} = Awareness of the Citizens, AC, X_{14} = Between the Local Government and Entrepreneurs, LG&E, X_{15} = Within UDCs, WU, X_{16} = Towards Citizens, TC; which are under external factors.

Chapter 3: Research Methodology

3.1 Research Method

As the research method of this study follows both quantitative and qualitative methods, this utilizes the opportunities of mixed method to measure the effectiveness of UDCs in delivering government services to the rural people in the Jashore district. This study conducts content analysis for getting both qualitative and quantitative data. Theoretical analysis gathers information from the existing literature relating to public-private-partnership, PPP in ICT sector, and the successful factors for ICT projects under PPP. On the other hand, findings of different research work enrich this study to present similar projects in different developing countries and describe the situation of UDCs in the context of Bangladesh. Quantitative data of those research works also helps to analyze the country situation in an easy explanation. Moreover, collected primary data are mainly quantitative in nature. Both numeric and descriptive method has been used to present a clear understanding about the subject and reliable conclusion in the study. Thus, this study goes under mixed research method to utilize both qualitative and quantitative type of data.

3.2 Method of Data Collection

This research includes the utilization of both primary and secondary sources of data. Data from secondary sources is mostly qualitative which has been used to develop the conceptual framework of the study. Primary data collected from the service providers under a quantitative measurement where the items derived from the conceptual framework. Besides the service provider few data have been collected from the monitoring authority through telephone conversation and email which are qualitative in nature.

Table 2

Nature and Sources of Data

Data Type	Primary	Secondary
Quantitative	Questionnaire Survey	Reports & Research Findings
Qualitative	Telephone Conversation	Published Documents

3.2.1 Collection of Primary Data

The main primary data of this study comes from the service providers or entrepreneurs of UDCs under Jashore District, Bangladesh. The data have been collected through survey questionnaire from the entrepreneurs of 96 UDCs of Jashore district. The questionnaire has been prepared in English first and then been translated into Bengali (Bangla, the native language of Bangladesh) to ensure clear understandability. A google from has been prepared to disseminate the survey form through the email addresses of the respondents. Before that, the questionnaire has been shared with few relevant people to check the understandability of the statement which have been used to collect responses. After bringing minor changes in the translated statements from their comments, the form was distributed. Theoretically, there should be two entrepreneurs (one male and one female) in each center and altogether there should be 192 respondents (96×2). However, all UDC do not have both posts covered. Even, only 139 entrepreneurs are registered in the government platform, 'eksheba'. It is because without being registered under the platform, one entrepreneur can provide specific online based services. Thus, email addresses of the entrepreneurs have been collected firstly from 'ekseba' platform through the monitoring authority, a2i, and secondly from the filed level authority. The survey form was email to everyone following the email addresses. The form was also shared by the common

platform where entrepreneurs are included. After that 174 responses were received. Through the process of deleting duplicate and biased response 164 responses were ready to use. However, while collecting data all posts were not occupied, and even few entrepreneurs were being changed because of sub-election in the union level. Again, there were few centers where two males, or two females work. As the unit of analysis of this study is UDCs, from all the responses single response has been chosen for each of 96 centers. For choosing the data two criteria have been applied; a) taking the response of male entrepreneur where there are both male and female entrepreneurs, and b) choosing the entrepreneur with more experience where there are two entrepreneurs of same gender.

The survey questionnaire has seven sections, i.e.; demographic information, information related to management capacity, work & service environment, digital (online) service capacity, governance system, citizens' connectivity, and network performance, with 43 statements. That may take less than 30 minutes to filled by the practitioner. The first section includes open spaces to get objective data from the respondents, such as: name of the center, location, gender of the entrepreneur, job experience as entrepreneur, etc. From the second to last sections, the respondents have to choose one option from five to share their best possible opinion. For getting the responses Likert scale has been used containing 5 points (strongly disagree to strongly agree). There are only three statements where the options of 5 points are different then agreement, such as; to know the no. of people can take service, keep the center in the weekends, etc.

3.2.2 Collection of Secondary Data

The secondary data has been collected mainly from published documents, there are research reports, census report, scholarly articles, information available in government website, public office websites and online communication platform. Websites and online platform have been

used to get quantitative information regarding the research area and UDCs. The contextual, situational and UDCs' nature and service related information have been collected from various reports and articles. A report/datasheet has been collected from a2i including the monthly performance (income or commission of entrepreneurs against providing online-based government services, and, number of service recipients) of UDCs in Jashore district for the month October, 2022, which is mainly quantitative in nature.

3.3 Method of Data Analysis

The data which are qualitative-secondary, quantitative-secondary and qualitative-primary in nature have been analyzed and presented in an explanatory approach. The quantitative-primary data have been collected though questionnaire survey is the main data for this study to find out the factors affecting the effectiveness of UDCs' performance while providing online-based government services to the rural citizens of Jashore district. There are (as per the conceptual framework) fifteen independent variables (information related to contract management, financial capacity, infrastructural capacities, service delivery capacity, availability of online government services, quality of workforce, role of UDC Management Committee, Union Parishadh, Upazila Nirbahi Officer and Aspire to Innovate, publicity about the UDCs, awareness of the citizens, networking between the local government and entrepreneurs, withing the UDCs and, communication with citizens) showing the positive relation with dependent variable; effectiveness of UDCs. Here, effectiveness will be demonstrated with the monthly income of the centers and number of service recipients. All the independent variables were categorized under two broad categories; 1. Internal Factors (with first six variables), and 2. External factors (with later nine variables). Whatever, the data collected by using the Likert scale has been analyzed with Multiple Linear Regression model. SPSS software has been used in that case. Six set of regression analysis has been conducted to find out the relationship of

independent variables with dependent variable, these are; internal factors with monthly income, external factors with monthly income, all independent variables with monthly income, internal factors service recipients, external factors with service recipients, and, all independent variables with service recipients. Finally, the result shows which factors are more vibrant to influence the effectiveness of UDCs.

Table 3

Models with the inter-relations of variables

		Internal Factors	External Factors	All Independent Variables
	Income (monthly)	Model 1	Model 2	Model 3
Indicators of Dependent Variable	No. of Service Recipient (monthly)	Model 4	Model 5	Model 6

3.4 Definitions of Variables

3.4.1 Defining Dependent Variable; Effectiveness

The establishment of Digital Centers in Union, Upazilla and City Corporation opens the opportunity to reach marginal people. The objectives of UDCs stated by the government include long term impacts on the whole system, for example; '(i) to make various government, commercial and information services available to the door-step of citizens; (ii) reduce time, cost and visits for receiving services through making them easy and affordable; (iii) bring

transparency, accountability and efficiency in the activities of union parishads; (iv) contribute to develop skilled and entrepreneurial human resources at local level, and (v) reduce digital divide between people living in rural and urban areas' (TIB, 2017, p. 2). The latest document of a2i (newsletter; 10 years of Service at Doorsteps) published that more than 6 million people take services every month throughout the country. There are more than 270 types of services delivered through the UDCs. According to the public opinion, they can get easy and quick services from the nearby UDC, like; voter ID card, passport renewal, land mutation, etc. Citizen can save 1.68 billion working hour and over \$8 billion by taking services from the UDCs (a2i, 2022). These performance of the UDCs can be considered as their efficiency in providing services to the marginalized people. Edmiston (2003) states that efficiency should include minimizing the social cost which has been spent to use or receive public services and information, rather only focusing on the decrease of government expenditure. Citizens can save more from previous way of spending time and travel cost for enjoying online options. Again, the technological change emphasizes on the quality of service with quickness. In terms of public services delivery, it is not only to achieve the target or service specification, but also it deals with the change of social value (Walsh, 1991). Nguyen et al. (2020) have found that this efficiency of ensuring service and information quality has strong influence on the citizens' satisfaction. In this ground, UDCs are playing vital role in digitalization of the governance system. However, as the monitoring authority a2i helps those centers and entrepreneurs under technological ground. It collects monthly data for the commission earned by the entrepreneurs providing online-based government services and the number of people visited the centers to get services. An entrepreneur can input the data in the platform for five times a month. S/he needs to upload the data of service recipients under the fields of man, women, other, disable and indigenous people.

Thus, to measure the effectiveness of UDCs under this study is being counted with the data from a2i; income, as the outcome of task accomplishment, and number of service recipients as the beneficiaries of public service delivery system.

3.4.2 Defining Independent Variables

Both of the sets of dependent and independent variables of proposed service delivery framework (Figure 4) come from various literatures. Besides those variables, the study has been used few factors as the control variables which are not presented in the framework (gender, education level, state of training, and tenure of experiences of the UDC service providers or entrepreneurs). Use of control variable (which will be constant in the analysis) is important to ensure that these variables will not affect the result of the analysis with independent and dependent variables. These also helps to prevent biasness and improve the internal validity among the variables. Hence, the following table is presenting the operationalization of variables, declarations of indicators which indicate each variable separately, and the construction of questions or statements which have been used to collect the primary data:

Table 4

Operationalizing the Variables

Hy. No.	Variables	Codes	Indicators	Statements to be supported (for entrepreneurs)	References
Dependent Variable					
N/A	Effectiveness of UDCs (in providing online govt. services)	Ef	Outcome of task accomplishment/ monthly income of the UDC	N/A	Sbea & Guzzo, 1987
			Beneficiaries of public service delivery system/ no. of service recipients	N/A	Besley & Ghatak, 2005
The Demographic Variables					
N/A	Name of the UDC				
	Location/ Address				
	Tenure of the Present Contract between the Entrepreneur & UP				

Hy. No.	Variables	Codes	Indicators	Statements to be supported (for entrepreneurs)	References
	Name of the Entrepreneur			Age	
	Sex (TIB, 2017, Kumar & Kim, 2017, Khatun, 2022)				
	Educational Qualification (TIB, 2017, Kumar & Kim, 2017, Khatun, 2022)				
	ICT Related Training (TIB, 2017, Kumar & Kim, 2017, Mamun, 2018)				
	Years of Working as an Entrepreneur (Own Statement)				
Independent Variables: Internal Factors					
Unit of Measurement: Ordinal (5 to 1 rating Scale/ Strongly agree, agree, neutral, disagree, strongly disagree)					
Theme 1: Management Capacity					
H1a.	Contract Management	CM	Allocation of risks & responsibilities between the govt. and entrepreneurs	1. The allocation of risks & responsibilities are properly mentioned in the contract.	Wang et al., 2018
			Conditions under contract	2. The tenure and the terms and conditions under the contract are suitable to provide online services.	Own Statement

Hy. No.	Variables	Codes	Indicators	Statements to be supported (for entrepreneurs)	References
H1b.	Financial Capacity	FC	Investment	3. I invest in the center on a regular basis.	Govt. Circular, 2013 Kumar & Kim, 2017 Robinson, 2017
			Income of UDC & Entrepreneurs	4. My UDC earns enough to run the business.	Kumar & Kim, 2017 TIB, 2017 Mamun, 2018 Robinson, 2017

Hy. No.	Variables	Codes	Indicators	Statements to be supported (for entrepreneurs)	References
				5. My monthly income from the center is enough to run my life.	Kumar & Kim, 2017 TIB, 2017 Mamun, 2018
Theme 2: Work & Service Environment					
H2a.	Infrastructure Capabilities	IC	Space for two entrepreneurs to provide service	6. There is enough space for two entrepreneurs to provide service simultaneously.	Own Statement
			Waiting space for service seekers	7. There is enough space for the service seekers while waiting to get services.	Own Statement
			Availability of internet & electricity	8. I enjoy electricity for the whole day. 9. I enjoy internet connotation for the whole day.	TIB, 2017 Kumar & Kim, 2017 Mamun, 2018

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Hy. No.	Variables	Codes	Indicators	Statements to be supported (for entrepreneurs)	References
				10. The alternative source of electricity to use in the time of loadshedding is sufficient.	Saleheen, 2015
				11. The UDC has alternative source of internet to utilize if there is any disruption in the regular connection.	
			Suitable work environment for female entrepreneurs	12. The work place is suitable for a female entrepreneur.	Kumar & Kim, 2017

Unit of Measurement: Ordinal (5 to 1 rating Scale/ different options)

Hy. No.	Variables	Codes	Indicators	Statements to be supported (for entrepreneurs)	References
H2b.	Service Delivery Capacity	SDC	Capacity of providing services	13. No. of people can take services daily. (5= more than 30. 4= 25 to 30, 3= 20 to 25, 2= 15 to 20, 1= 10 to 15)	Shamrat & Hossain, 2018
				14. Daily working hours except the break time (5= more than 7 hours, 4=	

Hy. No.	Variables	Codes	Indicators	Statements to be supported (for entrepreneurs)	References
				7 hours, 3= 6 hours, 2= 5 hours, 1= less than 5 hours)	
				15. I keep my UDC open in the weekends as well. (almost always, sometimes, in a while, rarely, never)	

Unit of Measurement: Ordinal (5 to 1 rating Scale/ Strongly agree, agree, neutral, disagree, strongly disagree)

Hy. No.	Variables	Codes	Indicators	Statements to be supported (for entrepreneurs)	References
			Alternative Entrepreneurs	16. There are two alternative entrepreneurs ready to take the responsibility of UDC if any of present entrepreneurs leave the contract.	TIB, 2017 Govt. Circular, 2013
				17. I provide the necessary orientation to the alternative entrepreneurs.	Govt. Circular, 2013

Hy. No.	Variables	Codes	Indicators	Statements to be supported (for entrepreneurs)	References
			No. of computers	18. The computers of the center are well functioning to provide services.	TIB, 2017
				19. There are enough facilities for the citizens to browse internet or use computers by themselves.	Own statement
Theme 3: Digital (online) Service Capacity					
H3a.	Availability of Online Govt. Services	OGS	Services regarding online Govt. Services	20. All the online govt. services available in the upazila and district are easily accessible from the center.	Kumar & Kim, 2017
					Mamun, 2018
				21. The citizens can get each & every information about any public service procedures from the center.	BBS, 2014
					Khatun, 2020

Hy. No.	Variables	Codes	Indicators	Statements to be supported (for entrepreneurs)	References
				22. Getting services from the UDC is cheaper for the citizens than to visit public offices.	Khatun, 2020 TIB, 2017
				23. Citizens need not to visit public offices after getting help from the UDC.	TIB, 2017
H3b.	Quality of Workforce	QW	ICT based knowledge	24. My ICT based knowledge is suitable to provide service to the citizens.	Kumar & Kim, 2017 Mamun, 2018 Robinson, 2007 Mwita, 2000

Hy. No.	Variables	Codes	Indicators	Statements to be supported (for entrepreneurs)	References
			Skill development training (own initiative)	25. I take ICT based training by my own initiative to develop my skill to become an Entrepreneur.	TIB, 2017 Saleheen, 2015 Khatun, 2020
Independent Variables: External Factors					
Unit of Measurement: Ordinal (5 to 1 rating Scale/ Strongly agree, agree, neutral, disagree, strongly disagree)					
Theme 4: Governance System					
H4a.	UDC Management Committee	MC	Knowledge about Online Govt. Services	26. The members of the UDC Management Committee have proper knowledge about the online based govt. services.	TIB, 2017
			Monthly Meeting to review the work of UDCs	27. The UDC Management Committee conducts monthly review meeting on a regular basis.	Govt. Circular, 2013 Khatun, 2020 Mwita, 2000

Hy. No.	Variables	Codes	Indicators	Statements to be supported (for entrepreneurs)	References
H4b.	Union Parishad	UP	Coordination between UDC and Union through Monthly report	28. The Union Chairman collects monthly report to share that with Upazila Nirbahi Officer in Upazila Coordination Meeting.	TIB, 2017 Govt. Circular, 2013
			Solving Problems of UDC or Entrepreneurs	29. The Union Chairman provides necessary support to solve any problem.	Govt. Circular, 2013 Saleheen, 2015 Khatun, 2020 Mwita, 2000
H4c.	Upazila Nirbahi Officer (UNO)	UNO	Necessary directions and support for the entrepreneurs	30. The UNO provides direction and support, if needed, for the betterment of the UDC.	Govt. Circular, 2013 Mwita, 2000

Hy. No.	Variables	Codes	Indicators	Statements to be supported (for entrepreneurs)	References
H4d.	Aspire to Innovation (a2i), Prime Minister Office	A2i	Providing necessary training and technical support	31. The basic training provided by a2i is sufficient to manage service providing in UDC.	Kumar & Kim, 2017 Curtis, 2019
				32. I get technical support from a2i while necessary.	Mwita, 2000
			Monitoring UDCs' performance	33. A2i provides feedback, where necessary, to ensure better service providing after monitoring UDCs' performance.	Own Statement
Theme 5: Citizens' Connectivity					
H5a.	Publicity about UDCs	Pb.	Publicity Campaign by the entrepreneurs	34. I often conduct campaign to familiarize UDC among local people.	Govt. Circular, 2013 Kumar & Kim, 2017

Hy. No.	Variables	Codes	Indicators	Statements to be supported (for entrepreneurs)	References
			Publicity initiatives by the UDC Management Committee	35. The UDC management committee often takes initiative for the publicity of UDC.	TIB, 2017
			Initiative of the UNO for UDCs' publicity	36. The UNO takes initiative for UDC's publicity.	TIB, 2017
H5b.	Awareness of the citizens	AC	Awareness regarding online services	37. Citizens are being aware about online govt. services for the presence and functionalities of UDC.	Own Statement
				38. Citizens feel comfort to take online govt. services from UDC.	
			Citizens' concerns regarding services and quality	39. Citizens often demand to introduce different non-governmental services in the center.	Own Statement

Hy. No.	Variables	Codes	Indicators	Statements to be supported (for entrepreneurs)	References
				40. Citizens shows their support to the UDC and the entrepreneurs to ensure better service delivery.	Osborne, 2012
Theme 6: Network Performance (Wang et al., 2018)					
H6a.	Between the Local Govt. & Entrepreneurs	LG&E	Knowledge and information sharing between the UP & entrepreneurs	41. I collaborate with the UP to share knowledge and information for better service delivery.	Narasimhan & Aundhe, 2014
H6b.	Within UDCs	WU	Networks within UDCs for sharing knowledge & information	42. I maintain the networks with other entrepreneurs for sharing knowledge & information.	Own Statement
H6c.	Towards Citizens	TC	Transmitting knowledge to citizens	43. I maintain good communication with citizens to share IT knowledge.	Narasimhan & Aundhe, 2014

Chapter 4: Data Analysis & Discussion

4.1 Respondent Demography

As the unit of analysis for this study is the UDC, the demography of the respondents presents the information of service providers who are working in those UDCs in the Jashore district. Though there is a provision of running the center by two entrepreneurs, response from one entrepreneur has been kept after collecting data by following two criteria (prime role and experience). Finally, responses from 83% male and 17% female entrepreneurs under all 96 units went under the data analysis process. Under the broad category 96% of entrepreneurs have achieved ICT related training, and 4% do not take any formal training yet. There are varieties in there educational and experience level. 1% of respondents did not pass or complete secondary school certificate examination. However, the high percentage, 31%, is visible for both higher secondary school certificate examination and master degree. Few, 6%, has short term degree for 2 years. On the other hand, the most varieties can be found in the level of their experience. Responses are available with 1 year to 15 years of experience. The 12 years of experience has the highest frequency with 25% of units. Secondly, 18% of respondents have 11 years of experience. Experience of 6, 7, and 10 years have moderate proportion. And, lastly, less years of experience and 13 to 15 years of experience have minimal proportion in the data-set. These four types of data have been used as the control variable in regression analysis. The following table provides the brief of demographic information:

Table 5

Demographic Information of the Service Providers

Demographic Items	Category	Frequency	Percent (%)
Unit of analysis: Union Digital Center (UDC)			
Number of Units: 96 (ninety-six)			
Gender of Service Providers (Entrepreneurs)	Male	80	83
	Female	16	17
Level of Education	School Pass (below and equivalent to Grade 10)	01	01
	Secondary School Certificate	12	11
	Higher Secondary School Certificate	33	31
	Diploma/ Degree (2 Years)	06	06
	Honors (4 Years)	21	20
	Masters (1/2 Years)	33	31
Training	Attained	88	96
	Don't Attained	08	04
Experience	1 Year	02	02
	2 Years	01	01
	3 Years	03	03
	4 Years	01	01

Demographic Items	Category	Frequency	Percent (%)
	5 Years	04	04
	6 Years	07	07
	7 Years	08	08
	8 Years	09	10
	9 Years	09	10
	10 Years	06	06
	11 Years	17	18
	12 Years	24	25
	13 Years	02	02
	14 Years	01	01
	15 Years	02	02

Figure 5

Graphical Presentation of Demographic Information:

Charts of the proportion of Demographic presence of the respondents
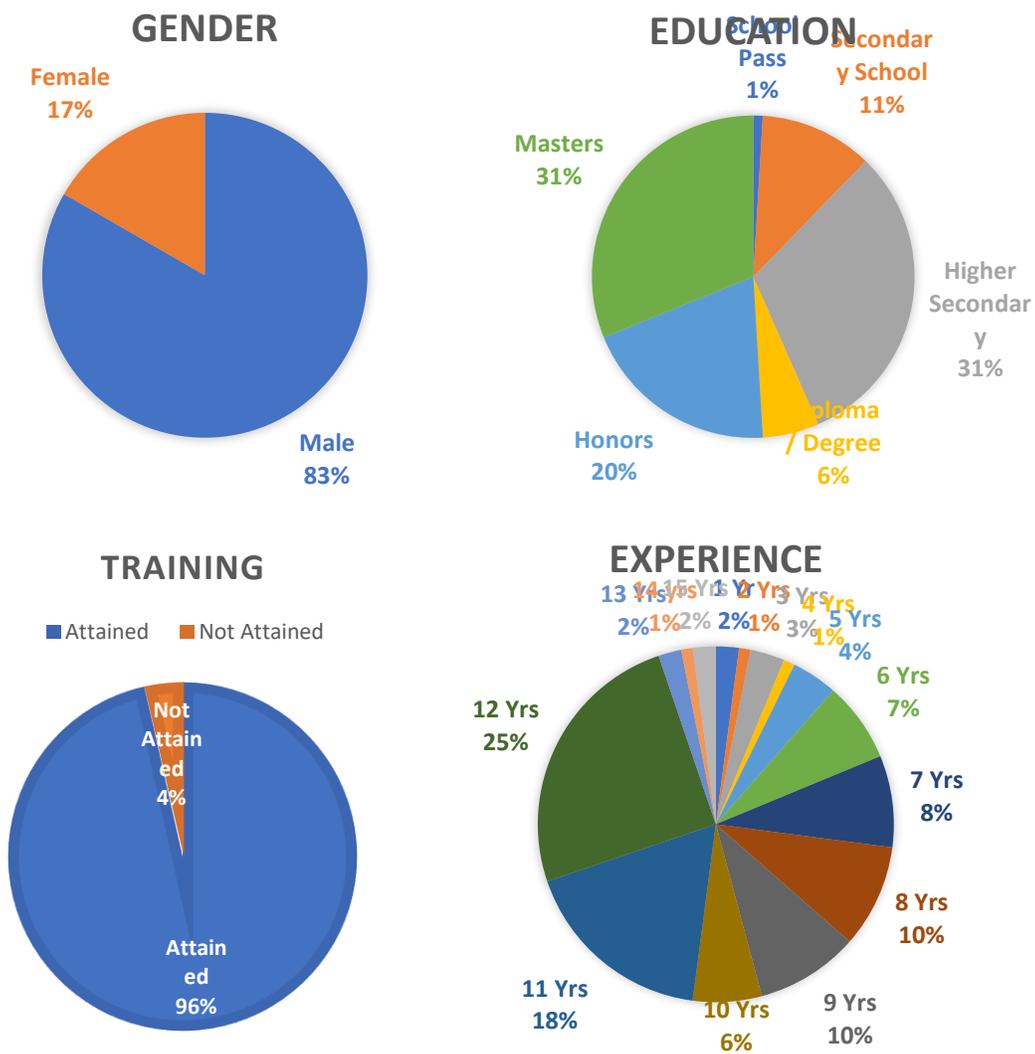
4.2 Descriptive Statistics of survey respondents

The descriptive statistics, as presented in the following table, of the survey respondents consisting number of respondents, minimum, maximum, mean and standard deviation of the responses for each and every variable. There are two broad categories of independent variables: internal factors and external factors. Even there are two indicators for the dependent variable: monthly income of the UDCs and number of service recipients. Data for independent variables have been collected by questionnaire survey where 5 point of Likert scale was used. Data for the indicators of dependent variable have been collected from the monitoring authority and used in the actual form of raw data. For example, income is showing in the currency of Bangladesh, Taka, and, the actual number of service recipients visit UDCs monthly.

The number of respondents for all variables is 96. The maximum response from survey is the highest scale, 5, and, for the minimum the scale responses stayed between 1 and 2. For the data used for dependent variable, the maximum monthly income is BDT 48201 ($467.53), and the minimum is BDT 13180 ($127.84). For the number of service recipients the maximum is 992 persons and the minimum is 269. The calculated means for the survey questions shows that there is no mean less than 3. Eight variables out of fifteen got responses in between 3 & 4, where rest of all got mean more than 4. It means most of the people agreed the statement where few people chose to stay in neutral. In terms of standard deviation, only three variables show high variance as those have score more than one, and rest of those all have low variance with score less than 1. It means the responses are not biased and nicely spread among the whole data set. Lastly, the mean for monthly income is BDT 33621.71 ($326.12) where the monthly per capita income in the fiscal year 2021-22 was 24378 ($226.46). The mean for the number of service recipients is 678.81 where it was assumed that providing service to more than 30 people daily from a center is well performing. In that case this mean is higher than the assumed

number, such as, more than 30 people daily counts more than 660 (30×22 days) monthly. However, the standard deviation for the service recipient as 162.25 is showing a high variance.

Table 6

Descriptive Statistics of the Variables

Variables	Mean	Standard Deviation	Minimum	Maximum
No. of Observation: 96				
Dependent Variable: Effectiveness of UDCs				
Outcome of task accomplishment/ Income (BDT)	33621.71	7928.38	13180	48201
Beneficiaries of public service/ No. of Service Recipients (Persons)	678.81	162.25	269	992
Independent Variables: Internal Factors				
Management Capacity				
Contract Management	3.84	1.09	1.00	5.00
Financial Capacity	3.73	0.93	1.00	5.00
Work & Service Environment				
Infrastructural Capacity	3.44	0.81	1.43	5.00
Service Delivery Capacity	3.74	0.61	1.86	5.00
Digital (Online) Service Capacity				
Availability of Online Government Services	4.00	0.70	1.50	5.00
Quality of Workforce	4.19	0.83	1.00	5.00

Variables	Mean	Standard Deviation	Minimum	Maximum
Independent Variable: External Factors				
Governance System				
UDC Management Committee	3.82	1.02	1.00	5.00
Union Parishadh	3.73	1.06	1.00	5.00
Upazila Nirbashi Officer	4.27	0.90	1.00	5.00
Aspire to Innovate (a2i)	4.05	084	1.33	5.00
Citizens' Connectivity				
Publicity about the UDC	3.95	0.80	1.33	5.00
Awareness of the Citizens	4.16	0.83	1.00	5.00
Network Performance				
Between the Local Government & Entrepreneurs	4.37	0.77	2.00	5.00
Within UDCs	4.41	0.83	1.00	5.00
Towards Citizens	4.45	0.79	1.00	5.00

4.3 Reliability of the Survey Instrument

To analyze the reliability, Cronbach Alpha test has been conducted that is showing the internal consistency of a group containing a set of items. The number of items is 43 carrying 43 survey statements under a 5 point of Likert scale. The Cronbach Alpha test result for these items is 0.919 that shows a very good level of reliability because it is greater than 0.8 and not higher than 0.95. Sometimes, values higher than 0.95 is considered as an indication of redundance, and this value is out of that problem.

Table 7

Cronbach Test Result

Number of Items in the Scale (Survey)	Scale Reliability Coefficient
43	0.919

Several reliability analyses have also run to know the alpha value for all the independent variables separately. There are no reliability tests for the indicators of dependent variable because those are fixed kind of data collected from the monitoring authority rather asking anything from the respondents. The following table shows the individual alpha with question summation:

Table 8

Variable Formation and Reliability Analysis

Variable	Question Summation	No. of Items	Alpha
Contract Management	**CM1.** The allocation of risks & responsibilities are properly mentioned in the contract. **CM2.** The tenure and the terms and conditions under the contract are suitable to provide online services.	2	0.787
Financial Capacity	**FC1.** I invest in the center on a regular basis. **FC2.** My UDC earns enough to run the business.	3	0.744

Variable	Question Summation	No. of Items	Alpha
	FC3. My monthly income from the center is enough to run my life.		
Infrastructural Capacity	**IC1.** There is enough space for two entrepreneurs to provide service simultaneously.	7	0.724
	IC2. There is enough space for the service seekers while waiting to get services.		
	IC3. I enjoy electricity for the whole day.		
	IC4. I enjoy internet connotation for the whole day.		
	IC5. The alternative source of electricity to use in the time of loadshedding is sufficient.		
	IC6. The UDC has alternative source of internet to utilize if there is any disruption in the regular connection.		
	IC7. The work place is suitable for a female entrepreneur.		
Service Delivery Capacity	**SDC1.** No. of people can take services daily	7	0.551
	SDC2. Daily working hours except the break time		
	SDC3. I keep my UDC open in the weekends as well.		

Variable	Question Summation	No. of Items	Alpha
	SDC4. There are two alternative entrepreneurs ready to take the responsibility of UDC if any of present entrepreneurs leave the contract.		
	SDC5. I provide the necessary orientation to the alternative entrepreneurs.		
	SDC6. The computers of the center are well functioning to provide services.		
	SDC7. There are enough facilities for the citizens to browse internet or use computers by themselves.		
Availability of Online Government Services	**OGS1.** All the online govt. services available in the upazila and district are easily accessible from the center.	4	0.568
	OGS2. The citizens can get each & every information about any public service procedures from the center.		
	OGS3. Getting services from the UDC is cheaper for the citizens than to visit public offices.		
	OGS4. Citizens need not to visit public offices after getting help from the UDC.		

Variable	Question Summation	No. of Items	Alpha
Quality of Workforce	**QW1.** My ICT based knowledge is suitable to provide service to the citizens. **QW2.** I take ICT based training by my own initiative to develop my skill to become an Entrepreneur.	**2**	**0.606**
UDC Management Committee	**MC1.** The members of the UDC Management Committee have proper knowledge about the online based govt. services. **MC2.** The UDC Management Committee conducts monthly review meeting on a regular basis.	**2**	**0.755**
Union Parishadh	**UP1.** The Union Chairman collects monthly report to share that with Upazila Nirbahi Officer in Upazila Coordination Meeting. **UP2.** The Union Chairman provides necessary support to solve any problem.	**2**	**0.704**
Aspire to Innovate (a2i)	**A2i1.** The basis training provided by a2i is sufficient to manage service providing in UDC. **A2i2.** I get technical support from a2i while necessary.	**3**	**0.800**

Variable	Question Summation	No. of Items	Alpha
	A2i3. A2i provides feedback, where necessary, to ensure better service providing after monitoring UDCs' performance.		
Publicity about the UDC	**Pb.1.** I often conduct campaign to familiarize UDC among local people.	3	0.724
	Pb.2. The UDC management committee often takes initiative for the publicity of UDC.		
	Pb.3. The UNO takes initiative for UDC's publicity.		
Awareness of the Citizens	**AC1.** Citizens are being aware about online govt. services for the presence and functionalities of UDC.	4	0.875
	AC2. Citizens feel comfort to take online govt. services from UDC.		
	AC3. Citizens often demand to introduce different non-governmental services in the center.		
	AC4. Citizens shows their support to the UDC and the entrepreneurs to ensure better service delivery.		

Here, all the 43 items or question summations are not included because there are few variables with single statement for measuring the relativeness to efficiency, these are: role of Upazila

Nirbahi Officer, Network performance between Local Government and Entrepreneurs, network Within UDCs, and networking flow Towards the Citizens. Eight variables (contract management, financial capacity, infrastructural capacity, UDC management committee, Union Parishadh, Aspire to Innovate, publicity about the UDC, and awareness of the citizens) among eleven counted variables have more than 0.7 alpha. One variable (Quality of Workforce) has got alpha around 0.6 which is a bit lower than previous values. However, these all are in the acceptable levels. Among them one has 0.8 alpha which is considered as a very good level of reliability. Two components (service delivery capacity & availability of online government services) in the table are showing the alpha value less than 0.6. Sometimes these is considered as moderate reliability and sometimes as questionable. In the questionnaire of conducted survey, the service delivery capacity component incudes six statements with various scale, such as; the working hours of the entrepreneurs. Again, there were statements about the alternate entrepreneurs, the status of computers, and extra facilities for the citizens to use the computer and internet facility of the center. On the other hand, availability of online government services faced the similar short scale problem because the service providers were asked about some kind of dependent situations.

4.4 Pearson's Correlation Coefficients Test

The following two matrixes are showing the values from Pearson's Correlation Coefficients Test. This test normally is used to find out linear relations between different variables, and the strength of the relationships. Thus, the following matrixes include the relationships between fifteen independent variables with the indicators (income and service recipients) of dependent variable separately in Table 9 and 10 because the indicators are not related to each other. Here, both positive and negative relations are visible. No clear 0 (zero) value means there are relationships between the variables. And, there is no total positive (1) or total negative (-1) linear correlation as well.

Table 9

Pearson's Correlation Coefficients Matrix with Monthly Income of UDCs Dependent Variable

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Income	-															
2. Contract Management	-0.071	-														
3. Financial Capacity	0.261**	0.338***	-													
4. Infrastructural Capacity	0.157	0.271***	0.334***	-												
5. Service Delivery Capacity	0.603***	0.049	0.404***	0.525***	-											
6. Availability of Online	0.107	0.306***	0.441***	0.209**	0.220**	-										

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Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Government Services																
7. Quality of Workforce	0.054	0.204**	0.460***	0.194*	0.138	0.697***	-									
8. UDC Management Committee	0.075	0.484***	0.347***	0.344***	0.303***	0.458***	0.374***	-								
9. Union Parishadh	-0.155	0.516***	0.167	0.395***	0.158	0.296***	0.286***	0.662***	-							
10.Upazila Nirbahi Officer	-0.126	0.386***	0.173*	0.407***	0.085	0.373***	0.375***	0.533***	0.669***	-						
11. Aspire to Innovate	0.141	0.373***	0.511***	0.363***	0.205**	0.539***	0.550***	0.470***	0.452***	0.501***	-					
12. Publicity about the UDCs	0.050	0.402***	0.360***	0.396***	0.279***	0.476***	0.395***	0.675***	0.585***	0.642***	0.642***	-				

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
13. Awareness of the Citizens	0.098	0.191*	0.286***	0.141	0.158	0.585***	0.461***	0.352***	0.236**	0.325***	0.569***	0.647***	-			
14. Between the Local Government & Entrepreneurs	0.133	0.258**	0.305**	0.251**	0.209**	0.547***	0.439***	0.572***	0.326***	0.489***	0.642***	0.689***	0.713***	-		
15. Within UDCs	0.223**	0.217**	0.300***	0.189*	0.240**	0.532***	0.446***	0.390***	0.301**	0.500***	0.561***	0.590***	0.630***	0.781***	-	
16. Towards Citizens	0.112	0.325***	0.286***	0.100	0.149	0.517***	0.422***	0.494***	0.334***	0.507***	0.593***	0.653***	0.676***	0.858***	0.842***	-

* Correlation is significant at the 0.1 level (2-tailed)

**Correlation is significant at the 0.05 level (2-tailed)

***Correlation is significant at the 0.01 level (2-tailed)

Table 10

Pearson's Correlation Coefficients Matrix with Monthly Service Recipients of UDCs Dependent Variable

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Service Recipients	-															
2. Contract Management	-0.061	-														
3. Financial Capacity	0.256**	0.338***	-													
4. Infrastructural Capacity	0.183*	0.271***	0.334***	-												
5. Service Delivery Capacity	0.611***	0.049	0.404***	0.525***	-											
6. Availability of Online	0.131	0.306***	0.441***	0.209**	0.220**	-										

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Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Government Services																
7. Quality of Workforce	0.042	0.204**	0.460***	0.194*	0.138	0.697***	-									
8. UDC Management Committee	0.98	0.484***	0.347***	0.344***	0.303***	0.458***	0.374***	-								
9. Union Parishadh	-0.137	0.516***	0.167	0.395***	0.158	0.296***	0.286***	0.662***	-							
10.Upazila Nirbahi Officer	-0.110	0.386***	0.173*	0.407***	0.085	0.373***	0.375***	0.533***	0.669***	-						
11. Aspire to Innovate	0.149	0.373***	0.511***	0.363***	0.205**	0.539***	0.550***	0.470***	0.452***	0.501***	-					
12. Publicity about the UDCs	0.065	0.402***	0.360***	0.396***	0.279***	0.477***	0.396***	0.675***	0.585***	0.642***	0.642***	-				

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
13. Awareness of the Citizens	0.118	0.191*	0.286***	0.141	0.158	0.585***	0.461***	0.352***	0.236**	0.325***	0.569***	0.647***	-			
14. Between the Local Government & Entrepreneurs	0.159	0.258**	0.305**	0.251**	0.209**	0.547***	0.439***	0.572***	0.326***	0.489***	0.642***	0.689***	0.713***	-		
15. Within UDCs	0.243**	0.217**	0.300***	0.189*	0.240**	0.532***	0.446***	0.390***	0.301**	0.500***	0.561***	0.590***	0.630***	0.781***	-	
16. Towards Citizens	0.131	0.325***	0.286***	0.100	0.149	0.517***	0.422***	0.494***	0.334***	0.507***	0.593***	0.653***	0.676***	0.858***	0.842***	-

* Correlation is significant at the 0.1 level (2-tailed)

**Correlation is significant at the 0.05 level (2-tailed)

***Correlation is significant at the 0.01 level (2-tailed)

These results of correlations show that only three variables have positive and significant relation with income (financial, and service delivery capacity, network within the UDCs). Besides those three factors infrastructural capacity gets significance relation with service recipients under $p>0.1$. Among them the service delivery capacity shows r at 0.603 and 0.611 for income and service delivery as dependent variable respectively. This is significant at the level of $p<0.01$. The other two factors; financial capacity and network within the UDCs have their significance level at $p<0.05$. There are nine and eight variables under table 9 & 10 with only positive relations with dependent variable which are not significant. However, these relations (positive) indicate the increase of value of independent variable will increase the value of dependent variable. Clearly, three components in both tables are carrying non-significant negative correlation, these are: contract management, role of Union Parishadh and Upazila Nirbahi Officer. It means the correlations are opposite; increase of value of independent variables indicates the decrease of value for dependent variable. Excepts these, the correlations between the independent variables are mostly showing the significant level of relations as there is no negative value as well. Mostly, network within the UDCs has significant relation with all other variables. On the contrary, service delivery capacity cannot find relation with quality of workforce, Union Parishadh, Upazila Nirbahi Officer, and factors related to connections with citizens.

4.5 Multiple Regression Analysis

Regression analysis or linear regression analysis is used to measure the strength and nature of relations of independent variable to the dependent variable. Multiple regression analysis helps to run analysis with many independent variables with single dependent variable. Because of two non-related indicators under the dependent variable 'Effectiveness of UDCs', following there are distinct two regression analyses:

Table 11

Multiple Regression Analysis (Monthly Income of the UDC as Dependent Variable)

Group of Variables	Variable	Unstandardized Coefficients Beta	Coefficients Standard Error	t-Value
Internal Factors				
	(Constant)	9630.694	6495.714	1.483
Management Capacity	Contract Management	361.496	669.880	0.471
	Financial Capacity	150.291	946.858	0.159
Work & Service Environment	Infrastructural Capacity	-1469.470	1122.507	-1.309
	Service Delivery Capacity	8248.148***	1420.109	5.808
Digital (Online) Service Capacity	Availability of Online Government Services	-283.545	1449.217	-0.196
	Quality of Workforce	-909.516	1207.566	-0.753
External Factors				
Governance System	UDC Management Committee	1627.797	1128.520	1.442
	Union Parishadh	-2495.207**	1029.043	-2.425
	Upazila Nirbahi Officer	-321.507	1210.486	-0.266
	Aspire to Innovate (a2i)	2482.891**	1236.907	2.007
Citizens' Connectivity	Publicity about the UDCs	-1961.411	1607.463	-1.220
	Awareness of the Citizens	419.613	1332.812	0.315

Group of Variables	Variable	Unstandardized Coefficients Beta	Coefficients Standard Error	t-Value
Network Performance	Between the Local Government & Entrepreneurs	-960.312	2014.098	-0.477
	Within UDCs	3549.424**	1580.146	2.246
	Towards Citizens	-1618.704	2058.913	-0.786
Control Variables	Gender	2525.854	1854.940	1.362
	Education	-1009.309**	461.445	-2.187
	Training	766.124	2485.540	0.308
	Experience	-217.404	222.798	-0.976
R^2 = 0.538/ 53.8%		**F= 4.650*****		

The Significance level: $*p < 0.1$, $**p < 0.05$, $***p < 0.01$

The information of model summary with the value of R^2 (square) and F show how well all data fit in the regression model. The coefficient of determination or R^2 presents the extent of independent variables in explaining the proportion of variance in the dependent variable. Here, the value of R square in between 0 and 1 means the independent variables can explain 53.8% variability of the dependent variable. Normally, the value of R square increases with the number of newly added variables thus the adjusted R square is used to ignore this overfitting problem. Though there is no further analysis with this same set of data that value for adjusted R square is not presented here. However, another measurement F ratio: F (19,76) = 4.650, p<0.0005, from Anova analysis, shows these data are suitable or fit for the research model. It also shows high significance. Finally, All the values of the variables have showed significant statistics in the table.

For understanding the relationship between independent variables and dependent variable whether it is positive or negative the unstandardized coefficients beta is using. That indicates

how the dependent variable is going to vary with any change in the value of independent variable when all other independent variables stay constant. Positive value means increase in independent variable will bring the dependent variable to the same direction or increase the value of dependent variable. On the other hand, negative value means increase the value of independent variable will push the change of dependent variable to opposite direction, or decrease the value of dependent variable.

The column of t-value and the starts (*) have been used with the values of first column show the statistical significance of the independent variables. The significance level checks the unstandardized coefficient whether that is equal to '0' or not. In that understanding, one variable, service delivery capacity, gets '0' significance. Two other variables, Aspire to Innovate and network within the UDCs, are significant under the $p<0.1$ and $p<0.05$ respectively. These are statistically significant to predict income (monthly) of the UDCs. However, there are two variables, quality of workforce and role of Union Parishadh, show negative and significant relation to the dependent variable.

In the last part of the table the four types of control variable, which are also been collected and presented as the demographic information of the service providers; gender, education, training and experience, are showing their values in regression analysis. Using control variable in the analysis is important because these factors can enhance the strength of causal relations between the variables of interest. It is also considered that use of control variable can limit the influence of outlying variables. Here, in the above-mentioned analysis only the educational background of the service providers get significance under $p>0.05$ but under a negative relation.

Table 12

Multiple Regression Analysis (Monthly Service Recipients of the UDC as Dependent Variable)

Group of Variables	Variable	Unstandardized Coefficients Beta	Coefficients Standard Error	t-Value
Internal Factors	(Constant)	161.025	131.911	1.221
Management Capacity	Contract Management	6.620	15.573	0.425
	Financial Capacity	1.307	19.228	0.068
Work & Service Environment	Infrastructural Capacity	-22.890	22.795	-1.004
	Service Delivery Capacity	164.893***	28.839	5.718
Digital (Online) Service Capacity	Availability of Online Government Services	6.479	29.430	0.220
	Quality of Workforce	-30.540	24.523	-1.245
External Factors				
Governance System	UDC Management Committee	36.525	22.917	1.594
	Union Parishadh	-49.788**	20.897	-2.383
	Upazila Nirbahi Officer	-5.976	24.582	-0.243
	Aspire to Innovate (a2i)	49.750*	25.118	1.981
Citizens' Connectivity	Publicity about the UDCs	-47.409	32.643	-1.452
	Awareness of the Citizens	12.125	27.066	0.448

Group of Variables	Variable	Unstandardized Coefficients Beta	Coefficients Standard Error	t-Value
Network Performance	Between the Local Government & Entrepreneurs	-16.897	40.901	-0.413
	Within UDCs	74.703**	32.089	2.328
	Towards Citizens	-32.708	41.811	-0.782
Control Variables	Gender	57.117	37.669	1.516
	Education	-21.048**	9.371	-2.246
	Training	18.434	50.475	0.365
	Experience	-4.764	4.524	-1.053
R^2 = 0.545/ 54.5%		**F= 4.784***		

The Significance level: $*p < 0.1$, $**p < 0.05$, $***p < 0.01$

This model is to show the relationships of independent variables to number of service recipients (monthly) of UDCs as dependent variable. The value of R^2 (square) shows how well the calculated or dependent variable can be explained by the predicted, pre-assumed, or independent variables. Here, the value shows independent variables can explain 54.5% variability of the dependent variable. In social science, 0.5 is considered as a strong fit. The F value as 4.785, when $p<0.0005$, presents the data are suitable or fit for this research model. Overall, all the values of the variables have showed significant statistics.

To know the nature of relationship unstandardized coefficients beta and to know the significance t-value and p-value are being considered. Under these understanding, this table also carries three significant variables. The service delivery capacity variable gets a full '0' value which means the highest level of significance. On the other hand, Aspire to Innovate and network within the UDCs; these two variables are significant with $p<0.1$ and $p<0.05$ respectively. There is one significant variables (role of Union Parishadh) with negative values

as well under the p>0.05. Here again, among four control variables only the educational factor gets negative value under p>0.05.

4.6 Comparative Models

There are two broad categories of independent variables as the internal factors and external factors. As the unit of analysis for this study is union digital centers, measuring the role and functions of the organization in the surrounding environment is important. Here, internal factors include the ability or capability of the centers in providing effective online-based government services to the rural people. Instead, external factors include the role of different governing bodies, citizens and networking with external actors who can influence the effectiveness in service delivery by the UDCs. For that reason, to learn the influences of internal factors and external factors separately on the dependent variable, separate regression analyses have been run. The following table is showing the significant influence of independent variables, firstly of internal factors under Model 1, secondly of external factors under Model 2 and all variables together under Model 3, to the monthly income of UDCs as dependent variable.

Table 13

Estimated Results of the relationship Independent Variables with the Monthly Income of UDC as the Dependent Variable

Group of Variables	Independent Variables	Data From Regression Analysis		
		Model 1 Internal Factors	**Model 2** External Factors	**Model 3** All Factors
Management Capacity	Contract Management	-469.130(678.726)		361.496 (669.880)
	Financial Capacity	1115.038(907.328)		150.291 (946.858)
Work & Service Environment	Infrastructural Capacity	-2120.891(991.910)**		-1469.470 (1122.507)
	Service Delivery Capacity	8748.024(1361.439)***		8248.148 (1420.109)***
Digital (Online) Service Capacity	Availability of Online Government Services	603.171(1387.785)		-283.545 (1449.217)
	Quality of Workforce	-763.991(1199.775)		-909.516 (1207.566)

Group of Variables	Independent Variables	Data From Regression Analysis		
		Model 1 Internal Factors	**Model 2** External Factors	**Model 3** All Factors
Governance System	UDC Management Committee		3199.185(1251.694)**	1627.797 (1128.520)
	Union Parishadh		-2645.989(1169.318)**	-2495.207 (1029.043)**
	Upazila Nirbahi Officer		-2352.188(1348.674)*	-321.507 (1210.486)
	Aspire to Innovate (a2i)		2481.196(1314.641)*	2482.891 (1236.907)**
Citizens' Connectivity	Publicity about the UDCs		-676.836(1879.080)	-1961.411 (1607.463)
	Awareness of the Citizens		-33.491(1494.509)	419.613 (1332.812)
Network Performance	Between the Local Government & Entrepreneurs		-1729.206(2294.260)	-960.312 (2014.098)

Group of Variables	Independent Variables	Data From Regression Analysis		
		Model 1 Internal Factors	**Model 2** External Factors	**Model 3** All Factors
	Within UDCs		6164.682(1803.185)***	3549.424 (1580.146)**
	Towards Citizens		-2991.086(2242.316)	-1618.704 (2058.913)
Control Variable	Gender	925.587 (1813.740)	2895.929 (2192.454)	2525.854 (1854.940)
	Education	-777.288 (464.476)*	-1359.582 (536.164)**	-1009.309 (461.445)**
	Training	1396.540 (2526.371)	-969.097 (2840.859)	766.124 (2485.540)
	Experience	-217.812 (225.385)	70.324 (254.128)	-217.404 (222.798)

Note: Standard Errors are in parenthesis

The Significance level: *$p < 0.1$, **$p < 0.05$, ***$p < 0.01$

This table shows some interesting findings, such as; the new significant variables in model 1 and 2. Firstly under the regression analysis between the internal factors and income (Model 1), besides the service delivery capacity infrastructural capacities component is showing a negative relation with significant value at $p<0.05$. Secondly, the Model 2 (relations of external factors with income) brings two new values. The role of UDC management committee gets a significance at the p value of 0.05. The role of Union Parishadh remains same for model 2 and 3 (collective factors). The role of Upazila Nirbahi Officer gets a new negative value at the significance of $p<0.1$. In model 2, the role of Aspire to Innovate lost its level of significance from $p<0.05$ to $p<0.1$ as that is in model 3. Lastly, the significance of network within the UDCs increase to the highest level at $p<0.01$ in model 2. Among the control variables only education carries negative significance. For model 1, that goes under $p<0.1$, and for both model 2 & 3, it goes with p value 0.05.

The following table consisting of three models where the model 4 carries the result of regression analysis between internal factors of independent variables and number of service recipients (monthly) of the UDCs as the dependent variable. Model 5 carries external factors of independent variables and model 6 carries the relation of all factors with the dependent variable (service recipients).

Table 14

Estimated Results of the relationship Independent Variables with the Monthly Service Recipients of UDC as the Dependent Variable

Group of Variables	Independent Variables	Data From Regression Analysis		
		Model 1 Internal Factors	**Model 2** External Factors	**Model 3** All Factors
Management Capacity	Contract Management	-9.575 (13.860)		6.620 (15.573)
	Financial Capacity	19.930 (18.528)		1.307 (19.228)
Work & Service Environment	Infrastructural Capacity	-36.627 (20.255)*		-22.890 (22.795)
	Service Delivery Capacity	176.463 (27.800)***		164.893 (28.839) ***
Digital (Online) Service Capacity	Availability of Online Government Services	27.369 (28.338)		6.479 (29.430)
	Quality of Workforce	-26.352 (24.499)		-30.540 (24.523)
Governance System	UDC Management Committee		67.878 (25.531)***	36.525 (22.917)
	Union Parishadh		-51.981 (23.851)**	-49.788 (20.897)**
	Upazila Nirbahi Officer		-46.426 (27.509)*	-5.976 (24.582)

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Group of Variables	Independent Variables	Data From Regression Analysis		
		Model 1	Model 2	Model 3
		Internal Factors	External Factors	All Factors
	Aspire to Innovate (a2i)		47.717 (26.851)*	49.750 (25.118)*
Citizens' Connectivity	Publicity about the UDCs		-19.811 (38.328)	-47.409 (32.643)
	Awareness of the Citizens		3.052 (30.484)	12.125 (27.066)
Network Performance	Between the Local Government & Entrepreneurs		-27.764 (46.797)	-16.897 (40.901)
	Within UDCs		128.581 (36.780)***	74.703 (32.089)**
	Towards Citizens		-65.971 (45.737)	-32.708 (41.811)
Control Variable	Gender	23.660 (37.036)	65.057 (44.720)	57.117 (37.669)
	Education	-15.631 (9.485)	-28.196 (10.936)**	-21.048 (9.371)**
	Training	30.788 (51.588)	-24.252 (57.946)	18.434 (50.475)
	Experience	-4.722 (4.602)	1.462 (5.184)	-4.764 (4.524)

Note: Standard Errors are in parenthesis

The Significance level: *$p < 0.1$, **$p < 0.05$, ***$p < 0.01$

Above presented table shows some difference in results between model 4 and 6, and, model 5 and 6. While comparing the results between the regression model of internal factors and combined factors, infrastructural capacities component gets a negative value at the significance of $p<0.1$. Besides these, service delivery capacity remains same. Model 5 in comparison with model 6 keeps the value of Union Parishadh similar. Two independent variables get new significance. The role of UDC management committee takes the significance at the p value of 0.01. The role of Upazila Nirbahi Officer takes negative value at the significance of $p<0.1$. In model 5, Aspire to Innovate shows no change from model 6. Finally, the significance of network within the UDCs increase to the highest level at $p<0.01$ in model 5 what is in the significance of $p<0.05$ under model 6. Education, as a kind of control variable, does not find any significance in model 4, where the significance for this factor remains same in model 5 & 6.

Finally, for hypotheses testing the results from combined models (3 and 6) are being considered because it is generally accepted that multiple linear regression analysis shows standard result under complex situation.

4.7 Hypotheses Testing

As all the independent variables are categorized under two broad groups, the hypotheses are presenting here by following that manner;

Hypotheses for Internal Factors: It includes three sub-groups, and the first one is Management Capacity. Under this, there are two hypotheses:

Hypothesis 1a. The contract management, between the local government and the entrepreneur, component gets no significance in both analysis (Table 11 & 12). Though this analysis is accepting the highest p value as <0.1, generally, this hypothesis is not supported in any case.

Hypothesis 1b. In the regression analysis the financial capacity, of the entrepreneur to earn livelihood and to invest in the center, shows positive beta in both tables (11 & 12) but the p value does not go under 0.1. As the previous one, this hypothesis also is not supported.

Secondly, the sub-group work and service environment includes two hypotheses:

Hypothesis 2a. The component of infrastructural capacity gets negative relationship with both monthly income of UDC and number of service recipients. The p-values show, as before, this hypothesis is not supported.

Hypothesis 2b. This service delivery capacity component is in positive relation under both analyses with income and service recipients. This is the significant component to ensure effectiveness which is lesser than $p < 0.001$. thus, this hypothesis is supported.

Thirdly, as the last sub-group of internal factors the digital (online) service capacity has two hypotheses:

Hypothesis 3a. Availability of online government services is a component where there is no influence of the entrepreneurs but the role of government and higher authority are important. However, the results it gets in table 13 & 14 make this hypothesis as not supported one.

Hypothesis 3b. This hypothesis of quality of workforce component gets negative values in beta. With no significance level. This hypothesis is not supported.

Hypotheses for External Factors: This category of external factors consisting with three sub-groups; the first one is Governance System. It has four hypotheses by covering the external influence of local, sub-district and national level governance bodies.

Hypothesis 4a. The UDC management committee component shows high numerical values for both beta and p-value (Table 11 & 12). While running regression under separate segments

(in Model 2 & 5), this factor gets significant value. Though the combined analysis is not supporting this hypothesis, it is considered as not supported.

Hypothesis 4b. As the primary local government body, Union Parishad component shows negative results in both analyses. Thus, after being significant with the p value <0.05, this hypothesis is not supported.

Hypothesis 4c. In the regression analysis with income and service recipients as dependent variable, the Upazila Nirbahi Officer component takes negative beta value in both cases. This hypothesis is not supported even with p-value in any case.

Hypothesis 4d. Aspire to Innovate (a2i), a program under the Prime Minister Office, component is supported in both analyses. It is supported under the p value of <0.5 with the monthly income, and p< 0.1 with the service recipients.

The second sub-group under the external factors is Citizens' Connectivity. It includes two hypotheses related with the communication with the citizens.
Hypothesis 5a. Publicity about the UDCs component gets its beta at negative values. P-values are also higher than the ones. Thus, this hypothesis is not supported.

Hypothesis 5b. With the relation with 'income of the UDC' and 'service recipients' as dependent variable, this 'awareness of the citizens' component shows no statistically significant results. Thus, this hypothesis is not supported.

The third and last sub-group is Network Performance that contains three components:
Hypothesis 6a. Network between the local government and entrepreneurs component takes negative beta values in both analyses. The significant levels are also not under accepted value. Thus, this hypothesis is not supported.

Hypothesis 6b. With the relation with the income and service recipients of UDCs, network within the UDCs component shows beta with positive value. The value for significance at p value of < 0.05. While running model 2 & 3, the significance for this factor increases to $p<0.01$. This makes this hypothesis supported under both analyses.

Hypothesis 6c. Network flow towards the citizens component takes negative beta values and high numbers for significance under both analyses. This hypothesis is not supported.

Table 15

Brief result of Hypotheses Testing

Hypothesis	Relationship Statement	Results
H1a.	The contract management component has a positive influence on effectiveness of UDCs	**Not Supported**
H1b.	The financial capacity component has a positive influence on effectiveness of UDCs	**Not Supported**
H2a.	The infrastructural capacity component has a positive influence on effectiveness of UDCs	**Not Supported**
H2b.	The service delivery capacity component has a positive influence on effectiveness of UDCs	**Supported**
H3a.	The availability of online government services component has a positive influence on effectiveness of UDCs	**Not Supported**
H3b.	The quality of workforce component has a positive influence on effectiveness of UDCs	**Not Supported**

Hypothesis	Relationship Statement	Results
H4a.	The UDC management committee component has a positive influence on effectiveness of UDCs	**Not Supported**
H4b.	The union parishadh component has a positive influence on effectiveness of UDCs	**Significant but not Supported**
H4c.	The Upazila Nirbahi Officer component has a positive influence on effectiveness of UDCs	**Not Supported**
H4d.	The Aspire to Innovate component has a positive influence on effectiveness of UDCs	**Supported**
H5a.	The publicity about the UDCs component has a positive influence on effectiveness of UDCs	**Not Supported**
H5b.	The awareness of the citizens component has a positive influence on effectiveness of UDCs	**Not Supported**
H6a.	The network between the Local Government and entrepreneurs component has a positive influence on effectiveness of UDCs	**Not Supported**
H6b.	The network within the UDCs component has a positive influence on effectiveness of UDCs	**Supported**
H6c.	The network towards the citizens component has a positive influence on effectiveness of UDCs	**Not Supported**

4.8 Discussion of Findings

The proposed service delivery framework for the UDCs (Figure 4) includes fifteen components as independent variables which may have strong influence on the effectiveness of UDCs in providing online services. For measuring the effectiveness, the monthly income of the centers has been used as the outcome of task accomplishment, and number of monthly service recipients as the beneficiaries of public service delivery system. The analysis of the collected data shows three variables among fifteen variables as the influential in ensuring more income and more service recipients. According to that the regression model can be rewritten as the following:

$$\textbf{Ef (In)} = 9630.694 + (8248.148 \times \textbf{SDC}) + (2482.891 \times \textbf{a2i}) + (3549.424 \times \textbf{WU})$$

$$\textbf{\&}$$

$$\textbf{Ef (SR)} = 161.025 + (164.839 \times \textbf{SDC}) + (49.750 \times \textbf{a2i}) + (74.703 \times \textbf{WU})$$

Here,   Ef= Effectiveness

In= Monthly Income of the UDCS

SR= Number of Service Recipients

SDC= Service Delivery Capacity

a2i= Aspire to Innovate, Prime Minister Office

WU= Network Within the UDCs

Thus, it is clear that with the increase of service delivery capacity, role of Aspire to Innovate and network within the UDCs increase the effectiveness of the UDCs.

4.8.1 The Variables of Supported Hypotheses

Firstly, the service delivery capacity is the most significant variable, with the value p=0.000, for ensuring effectiveness of the UDCs. It shows that if more people can take services, entrepreneurs keep the center open after general office working hours, the equipment of online service delivery, i.e.; computers, printers, etc., are functioning well, there are alternative entrepreneurs ready to take the responsibility of UDC while necessary, there are extra computers for citizens to use by their own, the UDCs will be effectively functioning. Research found that though the entrepreneurs are responsible to repair or replace the unfunctional equipment they were not interested to do so in the initial stage of establishment of UDCs because of the short length of contract (TIB, 2017). However, nowadays, Union Parishadh spends to replace idle equipment from their welfare fund. Again, this practice is not common all over the country. Nevertheless, when the entrepreneurs keep the UDC open more than normal working hour, people find relief by visiting UDC after their office (a2i, 2018). Also, the practice of keeping the UDC open in the weekends ensures the business of the entrepreneurs and easy service to the citizens. As a whole, these criteria of entrepreneurs and UDCs make the service effective. And, the indicators under this service delivery component, as an internal factor, are vital for UDC management.

Secondly, the network within the UDCs get significance under p<0.05. Networking is an external factor for the UDC management. While running model 2 and 5 (relation of external factors with income and service recipients), this component get more statistical significance at p<0.01 which focuses on sharing experience with other entrepreneurs that enhances the effectiveness. Mwita (2000) emphasizes on the external and internal communication as an important function for organizational performance. In case of UDCs, there are 'eksheba' blog, facebook group for the entrepreneurs and so on. They can share their problems there to find suggestions among them. On the other hand, sharing experience, best practices and success

stories inspire other entrepreneurs to develop their centers for providing better services. The respective members of a2i as the monitoring authority also play active role in those groups to communicate with entrepreneurs and share advices. Nowadays, facebook group becomes a more active platform.

Lastly, the role of Aspire to Innovate (a2i) program under the Prime Minister Office is vital as a national level actor from the time of establishment of UDCs. It gets the significance at different p value, such as; under the relationship with monthly income of the UDCs the p is less than 0.05, and, under the relation with service recipients the p is <0.1. It is responsible to provide different training to the entrepreneurs, solve day to day problem, collect performance report, arrange workshops to get feedbacks and to provide awards to the best performing entrepreneurs. Curtis (2019) finds staff training as an important element to develop an organization. Likewise, performance review is also important to define which training is needed. Mwita (2000) defines the staff development as empowering and supporting them for well-functioning of the organization. In this ground, a2i is the sole entity to maintain these works. The training it provides include basic ICT training to freelancing, agent banking to e-commerce, and so on. Entrepreneurs can communicate with the members of a2i to get any technical support as well. The workshop for the entrepreneurs becomes a place to generate innovate ideas for ensuring better and new services to the citizens. It also arranges orientation programs for the members of Unioin Parishadhs and Union Nirbahi Officers as the closest actors in the governance system thus they can facilitate the entrepreneurs. As a whole, still there is no entity except a2i to facilitate the UDCs to provide effective online services to the citizens.

4.8.2 The Variables of Not Supported Hypotheses

Quite the reverse, it is also important to analyze the other twelve variables which were not supported by the final regression analysis. Among those hypotheses only one component gets significant values while running regression of only internal factors, i.e., the role of UDC management committee as the first governing body gets significance at $p<0.05$ with the relation to monthly income of the UDCs in model 2, and gets p at <0.01 in model 5 under the relation with service recipients. This component does not get significance in final analysis. Hence, those not-supported components can be categorized under three groups, such as; significant with negative or alternative relation, non-significant but positive relation, and, non-significant and negative relation.

First of all, though the role of Union Parishadh is showing the significant opposite relation to the effectiveness (income and service recipients) of the UDCs, it gets a significance level at $p<0.05$ in model 2 and 5 (relation of external factors with income and service recipients) in final models, 3 and 6 (of all independent variables), it does not get importance. It may happen because where it should be the first supervising and facilitating authority for the UDCs, UPs are not playing the similar role everywhere. Research found that the UP members have less understanding about how to run the center (TIB, 2017). They don't even conduct the monthly meeting regularly. Some Chairmans are interested to develop the centers, some are not. As the Chairmans are elected representatives, sometimes they wanted to change the entrepreneurs with their own patronized candidates which situation is now trying to be tackled by the close observation of the Deputy Director, Local Government of the District administration and Upazila Nirbahi Officer. However, change the entrepreneurs by the newly elected UP Chairman still is a common phenomenon. In the dataset, there are many new entrepreneurs as the last Union Parishadh Election occurred in 2021. The role of supervising the UDC is also being handled by the Assistant Programmer of Upazila office; sub-district level. They directly

ask for the monthly report from entrepreneurs. Thus, the data finds negative influence of UP on the effectiveness of the centers.

In the second category, five hypotheses are carrying variables which are not statistically significant but under positive relation. The identity of an entrepreneur starts with signing a contract with the Union Parishadh. As the contract is signed only for 5 years, that is not enough to secure the career of an entrepreneur. The terms and conditions are only valid in paper, those are not followed properly in practice. For example; though entrepreneurs should be responsible to invest, mostly they get financial support to buy new equipment. Again, the Union Parishadh do not monitor UDC regularly and the management committee do not conduct monthly meeting. Thus, while it is the matter of investing under the financial capacity of the center, the entrepreneurs need to do small investment only like for running day to day activities. There are only few entrepreneurs throughout the country where entrepreneurs invest vastly and start business with computer center or training labs. However, In the Pearson's correlation coefficient test, this financial capacity component shows strong and positive linear relationship with effectiveness in service delivery (both income and service recipients) in $p<0.05$. Again, the process to make all the government services available online is still under development. UDC can only ensure the full access to information with the help of bangladesh.gov.bd website. For few services citizens can only apply online and for getting the service they need to visit public offices. In terms of awareness of the citizens, it brings the generation gap into light. The generation with minimal knowledge of technology enjoy the benefits of UDC. Thus, these discussed variables cannot find statistically significant results.

The last group is of hypotheses having non-significant statistical results and negative relation. Under this group the first component is infrastructural capacity that gets the minimal significance level at $p<0.1$ while running analyses with only internal factors and service

recipients as dependent variable. Nevertheless, it cannot find any significance in the combined analysis. Here, tough the provision was to provide a space for the UDC within the Union Parishadh complex, in the initial stage many local government bodies cannot provide sufficient space (TIB, 2017). Generally, there is no waiting room for the service recipients. Thus, the infrastructural capacity of all UDCs is not the same. For the electricity, all solar panels in all UDCs, which was installed in the time of establishment, are not functional now. Mostly, there are no extra computers for the citizens to browse internet. There are differences in case of the availability of women washroom nearby the UDCs. Considering the quality of workforce, in the case of educational qualification, training, and skill or ICT based knowledge as the indicators of the quality of workforce, there is no fixed requirement from the government. It is like to choose the best as the entrepreneur among the available candidates. There is no provision to take exam as well. UP Chairman and UNO choose the way to find out the entrepreneurs. The data also shows that there are people playing the role of service providers who didn't appear to the secondary school certificate examination and also who have achieved the highest-level degree. There are few persons without having any formal ICT based training who are providing digital services. In contrast there are entrepreneurs who attained self-funded training courses. These kinds of contradictory criteria bring non-significant coefficient value in the analysis. Under the circular of the government, the role of Upazila Nirbahi Officer was to monitor the UDCs like to visit the centers and to resolve disputes among UP Chairman and entrepreneurs if necessary. As there is an Assistant Programmer in each and every Upazila Office, the Upazila Nirbahi Officer is being reluctant to learn about UDCs as his/her regular office work. S/he has a role in familiarizing the functions of UDCs among citizens. This role remains limited in assisting the entrepreneurs only. Moreover, publicity works are conducted annually and occasional basis. The whole country observed 11 November as the anniversary of UDC and in that time the Aspire to Innovate instructs the entrepreneurs to campaign for fifteen days (dates are fixed by them). UDCs can get a scope to demonstrate their works in the

time of Innovation Fair and Development Fair in the divisional level. On the other hand, as UDCs are mandatory establishments the relation of dependency on the local government are being faded. Many entrepreneurs are establishing digital centers in commercial places under the name of 'Eksheba' digital centers with the permission of Aspire to Innovate. Lastly, the networking or the flow of knowledge sharing towards the citizens is a limited approach because the entrepreneurs only can reach those people who visit the centers to take services. Moreover, there are computer shops in the commercial areas of a village where citizens can also go. Nowadays, many services are available in mobile apps, for example; Bangladesh directory, agriculture app, e-mutation, LD tax, telemedicine, online market, online study, banking apps, IP calling App, and so on. In this ground, if citizens understand how to use these mobile apps they need not to visit UDCs for those services. These circumstances limited the communication between the entrepreneurs and citizens. Consequently, these kinds of various situation make the assumed relation not statistically significant and negative towards the effectiveness of UDCs in terms of income and service recipients.

Chapter 5: Conclusion and Recommendation

5.1 Conclusion

As the world is moving towards new achievements every day, the citizens are also running with that pace. They are willing to embrace new systems to make lives easier than before. Thus, digitalizing public services becomes the new way of Governance which is demanding by the citizens as well. Digital services provide the citizens easy access to government information and public services, and, also reduce the scope of visiting any office and facing any government officials. Availability of the information, such as; prices of services, empowers and makes the citizens aware not to pay any bribe. However, digitalization reveals the gap between the educated and uneducated, technologically skilled and unskilled, unban and rural, young and older generation, etc. group of people. Th reduce this gap, the government of Bangladesh has established digital enters in rural level under public-private-partnership. The role of private individual as service provider is to facilitate citizens to access the public information and provide online-based government services in exchange of a small or fixed amount of money. To assess the effectiveness of those centers, this is a study based on quantitative research method. This study has found out the three most influential which ensure the effectiveness of UDCs in terms of earning more money and delivering services to more people. Following is the summary of findings, followed by the limitations and implications of the study.

5.1.1 Summary of Findings

This study about the Union Digital Centers of Bangladesh has aimed to find out the factors affecting the effectiveness of UDCs in providing online government services to the grass-root level. The factors were categorized under two groups which contracts two sub-questions to find out the which internal factors and external factors are affecting more for ensuring effectiveness.

While collecting primary data the study concentrated on the Jashore district which accommodates 96 UDCs.

Fifteen hypotheses were developed to find out the relations between various internal and external factors related to the effective service delivery context. After analyzing the collected data under regression analysis model three hypotheses become supported. Moreover, the regression analysis only with the external factors and the effectiveness finds one more component with significant influence. Therefore, as an internal factors of work and service environment of the UDCs, the service delivery capacity shows positive influence on the effectiveness. If the service providers or entrepreneurs are available more than official working hours and in the weekend with the capacity of providing more people daily the UDC can ensure effective service delivery. Moreover, there should be alternative entrepreneurs ready to run the center when needed. Enough facilities for the citizens to use computer and internet by themselves also increase effectiveness of a center. Two external factors have been supported from network performance and governance system. Networks among the entrepreneurs, role of Aspire to Innovate as the supporting and monitoring authority have strong positive influence on effectiveness of UDCs. Besides, the role of UDC management committee is also important to monitor the work of UDC regularly which get supported under segmented analysis.

On the other hand, most of the hypotheses have been not supported with the data, for example; the contract management, infrastructural capacity, quality of workforce, etc. from the group of internal factors, and, role of Upazila Parishadh, publicity about the UDCs, network or communication with the citizens and others from external factors. The common reason behind that the facilities for delivering services from the UDCs are not similar, such as; the quality (educational, training and experience) of entrepreneurs is not same everywhere as there is no government rule for any minimum requirement. On the other hand, actors of governance

system are not paying attention for the UDCs in a similar manner. Therefore, the government should focus on these not supported components which were proven important by the previous studies.

5.1.2 Implications of the Study

The implications of this study can be discussed under two broad areas; academic and policy implications. Firstly, the finding of this research is unique in nature. No research before run any regression or other software based systematic quantitative analysis to measure relation in between the factors and to reveal which factors have more importance in ensuring the effectiveness of UDCs. In this ground, this study adds some mentionable disclosure in the existing literature for the academicians. On the other hand, as it only focuses on the UDCs of Jashore district, this study is replicable to any other regions of the country. Again, the conceptual model has been developed for this study covers almost all variables or factors are linked to the UDCs. Future research can be conducted with different parts of the model, such as; internal factors or external factors. In-depth research also can learn focusing on small areas, i.e., management capacity, work and service environment, governance system of the UDCs and so on. Likewise, the factors which were not get supported by the data analysis can also be a field of analysis. Moreover, the finding of the research will help future researchers to enrich their literature and to get some valuable insights.

The policy implication of this study is more vital as it works with the digital center which is also an outcome of a policy decision. The GoB had started the piloting (since the last of 2009) of digital centers with the financial help of UNDP and USAID, under Access to Information (a2i) programme. Presently, the UDCs are being monitored by the Aspire to Innovate (a2i) programme (since 2016) with the financial assistance from only UNDP. Both programmes run under the Prime Minister Office. There is no certainty of future financial assistance from the international organizations. Therefore, the government is planning to include the Cabinet

Division in the role of monitoring. However, the effectiveness of the UDCs is important to make it sustained. There is, at least, no confusion that UDCs become an essential establishment for each and every locality. If there is no UDC, citizens have to find private alternative like computer shops or centers to get help. In that case, government may have less control to maintain the service quality or price. Thus, maintaining or enhancing the effectiveness of UDCs is crucial. In this ground, the findings and recommendations of this study will provide the policy makers valuable information and insights. It shows which factors are playing role to ensure effectiveness and where the government can focus more. For example; infrastructural capacities, quality of workforce, role of Union Perishadh or Upazila Nirbahi Officer, etc. are showing a less significant relation to UDCs effectiveness. Here, the decision makers should focus for brining future development to provide easy and quick services to the citizens.

5.1.3 Limitations of the Study

By nature, the study has been focused to only a district (Jashore) among sixty-four districts of the country for collecting primary data which limited the reliability of the research findings. At the initial stage of data collection, the survey questionnaire as the google form was shared via the email addresses of enlisted entrepreneurs under 'eksheba' platform. But then again, as it was revealed that all the entrepreneurs are not registered in that platform all the assistant programmers of Upazila; sub-district level were requested to share the google form in their common facebook groups. Again, official use of email or trusting any email is not a common culture in Bangladesh. Thus, the distance between the researcher and study area brought challenges to collect data.

By way of the responses were asked from the service providers, few questions were kind of self-evaluating. For example, they were asked to response about the suitability of their ICT based knowledge, whether the citizens feel comfort to take services from the centers or not,

they are asking for introducing new services or not, they are supporting the entrepreneurs in providing better services, etc.

While analyzing the data with SPSS software the average value of each response against the statements under each independent variable from 96 respondents have been used. It was not possible to run factor analysis because there was one and two indicator(s) under four and three, respectively, variables. At least three feedbacks or responses are needed to run factor analysis which was not being possible for limited number of indicators under few variables.

The data collected over telephone conversation was not in a full structured form. It was a need base step where the researcher thought real-time information is not available in existing literature, and where more explanations were needed.

The measurement indicators of the dependent variable (monthly income and number of service recipients) were not dependable enough to explain the effectiveness of the centers fully. It has collected data from monitoring authority, that's how it shows the weakness of the governance system.

Finally, because of the time constrains it was not possible to interview the service providers who are providing services to more people and earning more, and in contrast who are performing less. The qualitative data from their experience may enrich this study more.

5.2 Recommendations

5.2.1 Opportunities and Challenges of UDCs

In a general understanding, UDCs are playing the role of a vital instrument for the government to ensure the availability of online based government services to the doorstep. While working closely to the rural people these empower the citizens and reduce the digital gap between the urban and rural areas by ensuring the easy access to information. It is also giving the opportunities to reduce the corruption in the public governance system. Citizens can know the

price of public services, and, information about the place from where they can find particular service. Without visiting any public offices, they can apply for different kinds of certificates from nearby centers. Considering the work of government, UDCs are also helping in the disbursement of welfare facilities in an easier and simple way than before, i.e., distributing financial support for the extreme poor. Previously, the political representatives chose the people to provide the support that became an issue of being subjective and corrupted. Now people can apply online with the help of UDCs rather requesting the members of the Union Parishadh. Moreover, the agent banking system of the UDCs are facilitating citizens to get the allowances. Citizens do not need to visit the bank even to open an account. They can learn mobile banking system from the entrepreneurs easily.

However, when the situation of UDCs is not similar throughout the country, there are mentionable number of challenges. Firstly, legal basis is an issue. There is no law or policy about establishing the centers in the local level. Only one circular of 2013 is describing the provisions and responsibilities of different actors related to digital centers. All functions depend on the contract between local government authority and service providers. Thus, it cannot make the entrepreneurs legally bound to share the report regularly as they are not doing any job of the government. Secondly, monitoring could be easier if there were an online platform to keep counting the service provided. The government is still going under the transactional period. In initial stage, it starts with 'digital center management system' online platform. Now, entrepreneurs, supervising and monitoring authority are using 'eksheba' platform. And now, the GoB is working to bring all the government services under 'mygov.bd' platform. Under the 'eksheba' platform all the government services are not included. The primary idea was that entrepreneurs would login the platform with own ID and password to provide services from there. But there are many government services outside, and, without being a registered member entrepreneur can provide those services. This makes monitoring

system complicated. Moreover, there is no institutional body to monitor the functions of UDCs. The Aspire to Innovate is only a program under the Prime Minister Office runs with the financial assistance of the International Organizations. There is a plan to involve the role of cabinet Division as the monitoring body thus they can keep the established system functional after the end of the program. In particular, UDCs are facing challenges other issues as well under the factors presented in the proposed service delivery framework of this study. Following is a brief discussion:

1. Local government body is not capable to monitor digital center,

2. If the entrepreneur does not have good relation with the UP Chairman, s/he does not feel interest to invest in UDC. Even, the role of political person brings the scope of corruption.

3. Generally, there is no separate place as waiting room for the service seekers and no separate washroom for women. Most of the UDCs do not have extra computer for the citizens.

4. All online services offered by different ministries are not included in the 'eksheba' platform which hampers the monitoring UDCs.

5. There is no required minimum qualification (education, training or experience) for being entrepreneurs as the circular guides to choose the best available one.

6. There is no IT expert person in the UDC management committee, and even, the members of the management committee, sometimes, do not have any orientation about the functions of UDC.

7. The UP Chairman is the head of the Management Committee. For that reason, the Union Parishadh do not play significant role separately to monitor the center.

8. Aspire to Innovate collects information and measure the performance with the amount of income of the entrepreneurs and how many people take services. But there are many services should be provided free, like; printing ID card, getting information, etc.

9. To make the citizens aware, there are no publicity initiative from the central. No public office provides the information to the service seekers how they can get help from the UDCs, etc.

5.2.2. Recommending Solutions

Recently the GoB has celebrated the '10 Years of Service to Doorsteps' for the UDCs. This initiative of the government wins WSIS Award in 2014. However, there are less initiatives to develop the UDCs now. This study has shown that there are many scopes where changes are required. Following are some policy recommendations for the decision makers of the government regarding this issue:

1. The GoB can take a policy about the establishment and management of UDCs. It can decide UDC as a mandatory establishment of local government body, Union Parishadh.

2. The GoB can establish one new wing in the ICT Division to monitor the functions of UDCs rather being dependent on any short-term program or transferring the responsibility to the Cabinet Division. Because the work is no more mere administrative functions, it is e-governance. The flow and availability of services on online is important. In that case, the service providers will go under the contract with the ICT division or respective the ministry.

3. In the present situation, the role of the governing bodies should make clearer. For example, UP Chairman and Upazila Nirhabhi Officer are both responsible to monitor the activities and to facilitate the publicity. Their jurisdictions can be separated by making guideline.

4. Guideline is also needed to fix the minimum criteria of being recruited as entrepreneurs, and to have similar selection process all over the country. As the private part under this PPP model is individual, guideline is mandatory to ensure the quality.

5. The GoB should open one single website including all the online services. To ignore the existing problem with 'eksheba' platform, in the new website all the links of service providing ministries and offices can be included rather making different links for the service directly. On the other hand, there should be a single website carrying all the information of the citizens. While taking services the identification number of the citizens have to be submitted. Entrepreneurs may help citizens to apply for services, edit information, or apply for editing, etc. It will help to conduct automatic monitoring. Information should be open for all. Thus, there will be no need to ask the entrepreneurs to upload their performance in the website and scope for submitting fake information or report. How the Aspire to Innovate decides the performance with income is problematic, thus the monitoring should focus on the number of services provided.

6. Previously mentioned challenges also need to be emphasized. For example:

   a. The local government can build waiting room for the service seekers and washroom for the women. Extra computer can also be provided for the citizens to browse internet or be trained by themselves.

   b. The members of the UDC management committee and even the members of Union Parishadh should get some orientation about UDC. There should also be a clear instruction to include one IT knowledgeable person in the management committee.

   c. The role of Union Parishadh should only relate to the infrastructural issues, and the management committee can be related with service providing issues. On the other hand, only the Upazila Parishadh should have the responsibility to monitor the centers in sub-district level. The district can play the role to arrange different

workshops and seminars for providing necessary orientation and to build awareness.

d. Finally, the government should take different initiatives for the publicity of UDCs and can instruct the public offices to share the information how the service seekers can get services from UDC and from online.

To recapitulate this paper, it is mentionable that to reduce the gap between cities and villages, the UDCs are playing vital role which was targeted by the GoB. However, all the centers throughout the country cannot perform similarly. The nexus between and within the local government, ICT experts of the executive branch, and the private individuals makes a unique and complex situation which opens the scope to scrutinize which factors are essential to ensure effective service delivery by the UDCs. A regression analysis based on survey data shows that service delivery capacity, network within the entrepreneurs, role of Aspire to Innovate and UDC Management Committee, etc. factors play influential role in ensuring effectiveness of UDCs in providing online government services to the grass-root level. There are so many other internal and external factors related to the service providing practice of the UDCs that cannot get statistically significant values in the analysis. These findings facilitate the researcher to discover the opportunities and challenges of the centers. The recommendations provided in this paper will help the policy makers to focus on the different areas to bring effective development of UDCs. Thus, these centers can function effectively to fulfil the vision of government of making 'Digital Bangladesh'.

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국문초록

(Korean Abstract)

방글라데시의 UDC(Union Digital Centers): UDC 에 대한 효율성 평가 연구

탄지나 악터
전자정부 및 공공 관리 석사 학위 프로그램
행정학과, 대학원
연세대학교

정부 서비스 제공 과정에 있어서 정보, 통신, 기술 (ICT)을 포용하는 것이 시대적 요구이긴 해도, 게발도상국 정부는 대폭적인 전환을 일으키는데 끌어들여야 할 자산이 부족해서 많은 난관에 때론 부딪치고있다. 방글라데시 정부는 전세계에걸쳐 공동 관심사로 떠오르고있는 민간부문와 관련된 전문지식과 재정문제에 대한 해결책을 강구하고있다. 방글라데시 정부는 공공-민간 협력모델 범위내에서 온라인 공공서비스를 제공하기 위해 지방정부 사무소 근처 전역에 자리잡은 연방 디지털 센터 (UDCs)를 세웠다.

1 차 자료는 자쇼어구 (Jashore district)에 설문지 조사를 활용하면서 총리실 관할 온라인 정부서비스 감시당국인 정부혁신추구강령 (연방 디지털센터에서 수집된 월 보고서) 에서 수집하였다. 2 차 자료 출처는 서적, 저널 기사, 학술 논문, 보고서 등등을 토대로 하였다. 정량적 자료는 SPSS 소프트웨어로 회귀분모델을 통해 분석되었다. 연방 디지털 센터 (UDCs) 효율성에 영향을 미칠 수 있는 15 가지 분석 요소들 중에서 딱 3 가지 요소 즉 서비스 제공 능력, 정부혁신추구강령이 지닌 역할과 연방 디지털

센터 (UDCs) 내 네트워크가 정적(+)인 관계내지 정적(+)인 영향을 미친것으로 확인되었다. 본 논문은 정식으로 입증되지 않는 변수를 통해서 연방 디지털 센터 (UDCs)가 직면한 도전과제 예컨대 기업가 선별과정에 아무런 자격조건이 부여되지 않고 정책 등등이 마련되지 않는 등 지방정부의 부실한 감독 관리체계에 대해서 설명했다. 이와 같은 문제를 해결하기 위해 본 논문은 정보, 통신, 기술 (ICT) 부문관할을 받고있는 기관을 독립시켜 연방 디지털 센터 (UDCs)을 제대로 감독하자는 제안을 하고자한다.

이러한 연방 디지털 센터 (UDCs)설립이 현지에서 의무화되어 시민이 온라인 공공서비스를 활용하도록 독려받으면 정부는 그러한 디지털센터를 추진할 중차대한 방안을 강구해야 한다.

주요어: 공공-민간 협력, 연방 디지털센터, 온라인 정부서비스 제공, 효율성, 영향을 미치는 요소들