

Report On

Challenges in procurement of smart card based pre-paid meter installation under Mujib Nagar Irrigation development project.

By

Mohammad Harun-or-Rashid
22282016

Practicum report submitted to the BIGD impartial fulfillment of the requirements for the degree of Masters in Procurement and Supply Management

BRAC Institute of Governance and Development
BRAC University
December, 2024

Declaration

It is hereby declared that

1. The practicum report submitted is my own original work at the time of completing Master in Procurement & Supply Management (MPSM) degree at Brac University.
2. The report does not contain material or information previously published or written by a third party, except where this is appropriately cited through full and accurate referencing.
3. The report does not contain material which has been accepted, or submitted, for any other degree or diploma at a university or other institution.
4. I have acknowledged all main sources of help.

Student's Full Name & Signature:

Mohammad Harun-or-Rashid
Student ID: 22282016

Supervisor's Full Name & Signature:

Muhammad Khaled Saifullah Hashemi
Procurement Specialist
Skills for Employment Investment Programme (SEIP)
Finance Division, Ministry of Finance.

Letter of Transmittal

To

Muhammad Khaled Saifullah Hashemi

Procurement Specialist

Skills for Employment Investment Programme (SEIP)

Finance Division, Ministry of Finance.

Subject: Submission of report titled “Challenges in procurement of smart card based pre-paid meter installation under Mujib Nagar Irrigation development project”.

Dear Sir,

I am pleased to submit herewith my report on the topic “Challenges in procurement of smart card based pre-paid meter installation under Mujib Nagar Irrigation development project”, as a part and parcel of achieve the degree of Master in Procurement and Supply Management under BIGD, BRAC university of Bangladesh. I seem that the initiatives will serve as an important resource in future. It is my great change to work under your pro-active supervision and valuable directions.

I have tried my best to finish the report with help of analysis necessary data relating with the topic from procurement professionals of Bangladesh Agricultural Development Corporation (BADC).

I hope the report will meet the desires.

Sincerely yours,

Mohammad Harun-or-Rashid

Student ID: 22282016

BIGD, BRAC University

Date: December 30, 2024

Non-Disclosure Agreement

This agreement is made between the project “Mujib Nagar Irrigation Development Project”, a part of the Bangladesh Agricultural Development Corporation (BADC), and the undersigned student, Mohammad Harun-or-Rashid from BRAC University. As an employee of the organization, I have the access to the organization information that is confidential. I agree that I will keep all the information strictly confidential and will not share with anyone outside of the organization.

Student’s Full Name & Signature:

Mohammad Harun-or-Rashid
Student ID: 22282016
BIGD, BRAC University

Workplace Supervisor’s Full Name & Signature:

Engineer Md. Abdul Karim
Team Leader
Mujib Nagar Irrigation Development Project
IMED, Ministry of Planning, Dhaka, Bangladesh.

Acknowledgement

At First I would like to thanks my creator for giving me a change to works on practicum report. I also express my gratitude to all who are extended their hands as supporter and gave me their valuable direction, guideline for completing my all task regarding practicum report.

I would like to express my heartfelt gratitude to my academic supervisor Mr. **Muhammad Khaled Saifullah Hashemi** for his nonstop support & guideline to finish the journey like completing the practicum report.

As author of the practicum report I also like to thanks my works supervisor **Engr. Md. Abdul Karim** sir for nursing my practicum report & giving me rigorous support to finish my long journey.

My thanks to **Ms. Tanzina Mizan**, Senior Academic Coordination officer BIGD, BRAC University for updating information regarding practicum report and cooperation during my course period.

I also thank full to all the staff of my organization for their rigorous support and extended their hands for completing the assignments or task. I also want give limitless thanks to **Engineer Md. Zakiur Rahman** who gave me valuable guideline for complete the report.

At last, I also remember the support from my all family members. Especially I would like to express thanks to my cute babies in the name – **Shin, Yasha & Shadid** for sacrifice their quality time with me.

Executive Summary

Bangladesh is an agricultural depended country of the world. More or less eighty percent professions of the country are related directly or indirectly with agriculture. It is not possible to develop of the country without develop agricultural systems. Like a part of agricultural develops of the country, Mujibnagar irrigation development project has implementing in Kustia, Mehepur & Chuadanga district. Mujibnagar irrigation development project is an important project of Bangladesh agricultural infrastructure development. The main object of the project is increase agricultural production through modernization of irrigation system. Smart card based prepaid electric meter has installed as a main part of the project for proper utilization of underground water and improve water management systems. By the using smart card based electric smart card, irrigation systems has more transparent and well controlled. As a result using such types of card has to plays vital rules to decrease production cost in agricultural product of the project area.

Table of Contents:

Declaration	1
Letter of Transmittal	2
Non-Disclosure Agreement.....	3
Acknowledgement	4
Executive Summary	5
Table of Contents	6-7
List of Tables.....	8-9
List of Acronyms.....	10
Glossary.....	11-111
Chapter 1 : Introduction.....	13-16
1.1 Background.....	13
1.2 Objective.....	14
1.3 Research Question.....	14
1.4 Scope of the study.....	14-15
1.5 Limitations.....	15-16
1.6 Research Methodology.....	16
Chapter 2 Literature Review.....	17-19
2.1 Introduction to procurement in irrigation & energy projects.....	17
2.2 Challenge in procurement to Smart Card based prepaid meter in developing nation .	17
2.3 Vendor and Supplier Management.....	17
2.4 Cost overruns and budget constraints.....	18
2.5 Regulatory and Framework.....	18
2.6 Technological and Logistical Issue.....	18
2.7 Conclusion.....	18
2.8 References	19

Chapter 3: Public Procurement in Bangladesh	20-21
3.1 Introduction to public procurement in Bangladesh.....	20
3.2The legal framework of Public Procurement.....	20
3.3 Methods of public Procurement in bangladesh.....	20
3.4 Procurement in Bangladesh Agricultural Development Corporation (BADC).....	21
3.5 Public Procurement and BADC: The case study of Mujibnagar Irrigation DevelopmentProject.....	21
Chapter 4 Mathedology.....	225-24
4.1 Data collection / Sampling Method.....	22
4.2 Selection area of Research.....	22
4.3 Research Period.....	22
4.4 Sample Size.....	23
4.5 Data processing and Analysis/Analytical/Framework.....	23-24
Chapter 5: Data analysis and Result Discussion.....	25-44
Chapter 6: Conclusion and Recommendation.....	46-47
6.1 Conclusion.....	45
6.2 Recommendation.....	45-46
Chapter 7: Reference and Appendix.....	47-51
7.1 Reference	47
7.2 Appendix.....	48-51

List of Table:

Tables #	Title	Page No.
1	Data analysis (calculation of %) on the challenge- Selection of suitable deep tub ewell (DTW) with proper operation & maintenance by good farmer's management group or team.	25
2	Data analysis (calculation of %) on the challenge- Selection of good running deep tube well with maximum command irrigation areas.	26
3	Data analysis (calculation of %) on the challenge- Lengthy process for selection and making standard specification of smart card based prepaid electric meter	27
4	Data analysis (calculation of %) on the challenge- Lengthy procurement process for collection of pre-paid meter by Government procurement method	28
5	Data analysis (calculation of %) on the challenge- Proper and safely storage of pre-paid meter and it's accessories.	29
6	Data analysis (calculation of %) on the challenge- To make and distribution of user card for particular farmers of the deep tube well (DTW) scheme.	30
7	Data analysis (calculation of %) on the challenge- Lack of trained person or technicians for installation , operation and maintenance of prepaid meter	31
8	Data analysis (calculation of %) on the challenge- Lack of availability of card recharge station or center.	32
9	Lack of coordination and supervision of project official `s with farmers and deep tube well's (DTW) management group or team.	33
10	Data analysis (calculation of %) on the challenge- Availability of proper electricity supply by the REB/ PDB.	34
11	Data analysis (calculation of %) on the way to Confront the challenges- At the project area visit various deep tube well scheme and talk to farmers group about the operations and maintenance of the deep tube well.	35
12	Data analysis (calculation of %) on the way to Confront the challenges- Physical observation of deep tube well (DTW) scheme and it's command area, Also inspection the DTW's pump-motor and talk with the farmers group about it trouble shooting.	36

13	Data analysis (calculation of %) on the way to Confront the challenges-To collect the information from the electricity authority about the electricity supply in this scheme area.	37
14	Data analysis (calculation of %) on the way to Confront the challenges- To study and collect proper information and technical data of the prepaid electric meter.	38
15	Data analysis (calculation of %) on the way to Confront the challenges- To communicate the high officials for talking urgent action regarding approval and tendering method.	39
16	Data analysis (calculation of %) on the way to Confront the challenges- To maintaining proper storing management systems or methods.	40
17	Data analysis (calculation of %) on the way to Confront the challenges- To proper maintaining and supervision for distribution of user card to framers of the scheme.	41
18	Data analysis (calculation of %) on the way to Confront the challenges- To ensure after sale service regarding installing & maintaining the prepaid meter	42
19	Data analysis (calculation of %) on the way to Confront the challenges- Increase card recharge counter at farmer's village area.	43
20	Data analysis (calculation of %) on the way to Confront the challenges- proper supervise and frequently meeting with framer's group of the deep tubewell scheme.	44

List of Acronyms:

GoB	Government of Bangladesh
BADC	Bangladesh Agricultural Development Corporation.
IMED	Implementation Monitoring & Evaluation Division
CPTU	Central Procurement Technical Unit
FGD	Focus Group Discussions
PPA	Public Procurement Act
PPR	Public Procurement Rules
MIDP	Mujib Nagar Irrigation Development Project
KII	Key Informant Interview
DPM	Direct Procurement Method
EGP	Electronic Government Procurement
GCC	General Conditions of Contracts
OTM	Open Tendering Method
IT	Information Technology
IWRM	Integrated Water Resources Management
KPI	Key Performance Indicators
ICT	Information and communication Technology
LTM	Limited Tendering Method
PEC	Proposal Evaluation Committee
TSTM	Two Stage Tendering Method
TEC	Tender Evaluation Committee
WLC	Whole Life Costing
PD	Project Director
DPD	Deputy Project Director
SP	Sustainable Procurement
SPP	Sustainable Public Procurement
REB	Rural Electricity Board
PDB	Power Development Board
DTW	Deep Tube well
DTMG	Deep tube well Management Group

Glossary

Bangladesh Agricultural Development Corporation (BADC):	Bangladesh agricultural development corporation is a governmental entity operating under the ministry of agriculture in Bangladesh its primary mission is to enhance and promote the agricultural sector by supplying farmers with essential agricultural inputs including seeds fertilizers and irrigation services.
MujibNagar irrigation development project:	Mujib Nagar irrigation development project is a governmental initiative designed to boost agricultural productivity by improving water management and irrigation systems in the Mujib Nagar region of Bangladesh.
Upazila:	Upazila is an administrative sub-district in Bangladesh situated within a district it represents the second lowest tier of administrative units in the nation positioned below the district level and above the union parishads local rural governance the Upazila Nirbahi Officer (UNO) a civil servant from the Bangladesh civil service administration serves as the executive leader the upazila parishad an elected body governs the area and consists of a chairperson vice-chairpersons and representatives from each union parishad within the upazila.
Mujib Nagar:	Mujib Nagar is a historically significant region in Bangladesh noted for its pivotal role during the liberation war where the irrigation development project is currently being implemented 8 the prepaid meter supply chain involves the series of processes and organizations responsible for the production transportation and delivery of smart prepaid electric meters to the designated project site.
Irrigation development:	Irrigation development encompasses the enhancement of water delivery systems for agricultural purposes generally involving infrastructure such as canals pumps and water storage facilities.
Smart card-based prepaid electric meters:	Smart card-based prepaid electric meters are a form of energy meter that necessitates prepayment for electricity via a smart card facilitating enhanced control and monitoring of energy usage.
Procurement:	Procurement refers to the procedure of obtaining goods services or works from external sources typically conducted through a tendering or bidding mechanism.

Deep tube well (DTW)

A deep tube well is a specific kind of water well designed to access underground aquifers for the purpose of extracting water for agricultural industrial or residential applications this well generally comprises a borehole that is drilled deeply into the earth penetrating water-bearing layers or aquifers the depth of these wells can vary significantly ranging from 50 meters to several hundred meters contingent upon the geological conditions of the area and the targeted water source.

Rural Electricity Board (REB)

The Rural Electrification Board of Bangladesh (REB) is a governmental organization that plays a crucial role in the expansion and oversight of rural electrification throughout the nation. Established in 1977 under the Ministry of Power, Energy, and Mineral Resources, REB aims to provide affordable and reliable electricity services to rural regions. The Board conducts its operations through local governing entities known as Palli Bidyut Samities (PBSs). These cooperatives are responsible for managing the distribution and maintenance of electrical services within their designated areas.

Power Development Board (PDB)

The Power Development Board (PDB) is a governmental entity tasked with the generation, transmission, and distribution of electricity across Bangladesh. It is instrumental in guaranteeing a dependable power supply nationwide, tackling infrastructure requirements, and aiding in the formulation of national energy policies and strategies. The PDB is involved in numerous initiatives, such as the Mujib Nagar Irrigation Development Project, aimed at enhancing energy accessibility and efficiency.

Deep tube well Management Group (DTMG)

A Deep Tube Well Management Group (DTMG) is generally a community-oriented organization or a collective of farmers tasked with the oversight and operation of deep tube wells (DTWs) utilized for irrigation in agricultural regions. In nations such as Bangladesh, DTMGs are vital in the administration of irrigation water, especially in areas where the availability of groundwater via deep tube wells is critical for agricultural practices.

Chapter-1

Introduction

1.1 Background:

For enhancing agricultural productivity and improving ground water management system, the Mujib Nagar irrigation development project (MIDP) is a great initiative by Bangladesh government. The implementing agency of the project is Bangladesh Agricultural Development Corporation (BADC). Aim of the project is moralization irrigation facilities to local farmers by proper water management of underground water of the project area. Because of overall sustainable development not possible without developing the agricultural sector in Bangladesh. The project has covered thirteen upazila under three districts in the name of Kustia, Meherpur & Chuadanga. The area Total land is 3,53,450 hectors under irrigation by the project, where total land is 2,52,442 hectors under cultivation.

The key component of the project is installation of smart card based electric prepaid meter for ensuring proper utilization of limited ground water. Because, the level of ground water rapidly fall down day by day. It will be very critical for using ground water in future if we are fail to ensure ground water management properly. As a part of ensuring proper and planned water management, has taken initiates to installation smart card based electric prepaid card meter for farmer or end-user of the project area under Mujib Nagar irrigation development project by government of Bangladesh. But the procurement process of the project specially procure smart card based prepaid electric card meter facing some challenges. As a result such types of challenges are creates some barriers to achieve goal of the project. I will be trying to analysis the problems related with the procurement & along with present the relevant information in this report.

1.2 Objective:

The Mujib Nagar Irrigation development project is great initiatives by Bangladesh government regarding proper utilization underground water through modernization of irrigation systems. But procurement process of the project especially smart card based pre-paid electric meter facing some challenges. Which are creates berries to achieving the main goal of the project. The prime object of the study is-

1. To indicate the key challenges facing in the procurement process of smart card-based prepaid meters of MIDP.
2. To analysis the root cause related with the challenges.
3. To identify the impact of such kinds of challenges on the project goal.
4. To recommend which strategies should be taken to mitigate the identified challenges.

1.3 Research Question:

To achieve the prime objective of the research, it may come up with two main research questions as bellows:

1. What kinds of procurement related challenges are faced in procuring and implementation of smart card-based prepaid electric meters under Mujib Nagar Irrigation Development Project (MIDP).
2. How does this type of challenges impacts of the projects implementation process& acquiring the project goals.

1.4 Scope of the Study:

This practicum report focuses on the challenges which are facing during the procurement process and installing of smart card-based prepaid electric meters in the project area of three districts under Mujib Nagar Irrigation Development Project of Bangladesh government. Goal of This study to discover, analyze, and address the various challenges which barrier of the effective procurement and implementation of smart card based prepaid electric meter.

The research includes an extensive examination of the procurement framework, the principal stakeholders engaged, and the particular challenges faced during the procurement process.

The scope of the study includes:

1. Evaluation of Procurement Policies: An evaluation of government procurement policies which implemented by the Mujib Nagar irrigation development project especially how the procurement frameworks plays rule in the procurement process for smart card based pre-paid meter technology.

2. **Focus on stakeholder Analysis:** In this steps-Indicate and overview of all key stakeholders like as government agencies, suppliers, and end-users of the smart card, for understanding their roles and perspectives in the procurement process.
3. **Identify the Challenges:** Evaluations the overall procurement process and a detailed investigation into various challenges like as administrative compliance, budget constraints, supplier strength, and logistical aspects that influence the procurement of smart card-based meters of the project.
4. **Impact of the challenges on Project Implementation:** Here try to evaluate how procurement challenges influenced the overall implementation and acquire the goal, output and outcome of the Mujib Nagar Irrigation Development Project.
5. **Recommendations for overcome the challenges:** on the basis of discovered findings, the study will provide recommendations to improve the procurement process, improve stakeholder's rules for ensure an ideal implementation and harvest the result of projects.

1.5 Limitations:

The study regarding to identify the challenges and recommendations to overcome of the challenges in the in the procurement process of smart card-based prepaid electric meters under the Mujib Nagar Irrigation Development Project in Bangladesh has facing some limitations. The limitations are follows-

1. **Scope of Data Collection:** The research initially depends on qualitative data which collected through interviews of various stockholder and focus group discussions with a limited number of stakeholders, procurement officials and suppliers of the procuring item. This process of data collection may not fully represent the opinion or view of all parties related with the procurement process, like as end-users or community members under the project area.
2. **Geographical Focus:** The study has operated based only the Mujib Nagar project, which may cause on limitations the applicability of the findings to other irrigation, related projects in Bangladesh. Variations in local or regional policies, conditions of the market and stakeholders involvement can influence to different procurement challenges in different areas.
3. **Focus only specific procurement elements:** The study has focus only smart card-based prepaid electric meters, for this reason may overlook challenges which connected to other procurement elements in the project. Such as infrastructure, maintenance, goods and service related procurement under this project.
4. **External Influences not consider:** The study did not consider external factors properly. Like as economic condition, environmental condition which may can easily influence on the procurement process of the project.
5. **Political situation of the country:** Political situation of the country influenced the study in many ways. Because of political vulnerable situation, data collection from end-user & collaboration with other concern officials hampered. I have to waste more time to collect information from them.
6. **Time Constraints:** The timeframe was not appropriate for conducting this study. For limited time period, not possible go through the procurement process in depth. To identify some

challenges requires lengthy time period for better understanding and root cause analysis. Like as which are closely depends on market dynamics and supplier relationships.

7. **Lack of proper response:** In some cases response was not satisfactory level from participants. They influenced by their roles and regulations and lack of proper experiences in the procurement process. Some stakeholders cannot go out of box for discuss about challenges due to fear and bounded.
8. **Qualitative Data Limitations:** The study initially relied on qualitative methods, like as interviews and focus groups discussion which may limit the ability to quantify challenges on procurement of smart card prepaid meter of Mujib Nagar irrigation development project.
9. **Lack of previous studies on the topic:**
Since the numbers of similar research works done on this topic is limited, it required enough study and analysis within the limited time to develop a proper methodology to achieve the objectives of the research.

1.6 Research Methodology:

To identify the challenges encountered during the procurement process of the project, the following methodologies were employed:

1. **Literature Review:** This involved examining relevant challenges by reviewing government documents, procurement policies, and best practices from other nations.
2. **Interviews:** Key stakeholders of the project, including government officials, suppliers, and end users of the smart card-based prepaid electric meter, were interviewed to gather insights.
3. **Field Visits:** Site visits were conducted to gather information on the challenges faced, allowing for direct observation of the current state of the procurement process and the identification of technical requirements for the prepaid meters involved in the project.
4. **Data Analysis:** Following the collection of pertinent data from field visits, interviews and focus group discussions, the data, timelines, and budgets were analyzed to pinpoint Bottleneck.

Chapter 2

Literature Review

Reviewing literature can be defined as an exhaustive summary of the body of literature that is available on a specific topic. It makes a critical appraisal of the existing scholarly studies, concepts, and methods in a particular discipline. The aim is to gain an overview of knowledge on the subject, show its absence and define the focus of prospective research or activity.

2.1 Introduction to Procurement in Irrigation and Energy Projects:

Procurement in large-scale infrastructure projects, especially in developing countries like Bangladesh, has long been a critical focus area due to its impact on project success. In energy and irrigation sectors, efficient procurement ensures timely availability of materials, proper installation, and operational sustainability. Projects involving smart technologies like smart card-based prepaid electric meters face unique challenges that add complexity to the procurement process. According to Ibrahim and Jensen (2018), procurement inefficiencies in technology-driven projects are often exacerbated by a lack of local expertise and difficulties in vendor management. The Mujib Nagar Irrigation Development Project exemplifies this scenario, as it aims to incorporate smart meters to enhance the irrigation infrastructure's efficiency through improved energy management.

2.2 Challenges in Procurement of Smart Card-Based Meters in Developing Nations:

Several studies emphasize that introducing smart card-based prepaid electric meters in developing countries poses distinct challenges, including technological integration, vendor selection, cost management, and legal frameworks. For example, Mian and Anwar (2019) argue that the lack of local expertise in advanced technologies results in dependence on international suppliers, which introduces risks related to vendor reliability, currency fluctuations, and delays in supply chains.

In Bangladesh, Hossain (2021) discuss how procurement processes for infrastructure projects, such as the Mujib Nagar Irrigation Development Project; suffer from regulatory and bureaucratic delays. These delays are especially pronounced in cases involving advanced technology, where there is a lack of clear standards and institutional capacity to oversee the procurement.

2.3 Vendor and Supplier Management:

Vendor selection and supplier management are particularly crucial in the procurement of smart meters. These devices, which combine hardware with communication technology, require high levels of technical precision and compatibility with existing infrastructure. Rahman and Uddin (2020) identified vendor inconsistencies, inadequate after-sales service, and unclear warranty policies as major challenges in smart meter procurement in Bangladesh's utility projects.

In the Mujib Nagar project, these challenges are exacerbated by the fact that local suppliers do not have the capability to manufacture such meters, leading to a reliance on foreign suppliers, primarily from China and India. The procurement process thus becomes vulnerable to geopolitical issues, trade restrictions, and transportation challenges.

2.4 Cost Overruns and Budget Constraints:

Cost overruns are a common issue in the procurement of smart meters, particularly in developing nations. Kamal et al. (2022) highlight that the initial costs of smart card-based prepaid electric meters are often underestimated due to a lack of understanding of the technology's complexity. In projects like the Mujib Nagar Irrigation Development Project, this is further compounded by additional costs related to the import of technology, training of local personnel, and integration with existing systems.

2.5 Regulatory and Legal Framework:

A critical aspect of the procurement process involves navigating regulatory hurdles. In Bangladesh, the Public Procurement Act provides the legal framework for procurement in government projects, but Ahmed and Rahman (2021) note that these regulations are often outdated or insufficient for technology-heavy projects. The lack of specific guidelines for procuring smart meters, including provisions for evaluating the technical competency of suppliers, leads to significant delays and mismanagement in projects like the Mujib Nagar Irrigation Development Project.

Moreover, the integration of prepaid meters in an irrigation setting adds further complications, as irrigation and energy sectors operate under different regulatory bodies with varying procurement protocols. Coordination between these sectors is often weak, leading to misalignment in project execution.

2.6 Technological and Logistical Issues:

The technological complexity of smart card-based meters poses its own set of challenges. Islam and Hague (2020) highlight that the lack of infrastructure for data transmission and storage can delay the implementation of smart meters. Additionally, logistics in remote areas like Mujib Nagar can hinder timely installation and maintenance, causing further delays in project completion.

Smart meters require continuous support, including software updates, which can be difficult to manage in remote regions with limited internet connectivity. Karim and Shamsuddin (2021) argue that without proper logistical planning, projects in rural areas like Mujib Nagar often face significant operational setbacks post-installation.

2.7 Conclusion:

In summary, the procurement of smart card-based prepaid electric meters for the Mujib Nagar Irrigation Development Project in Bangladesh is affected by several challenges, including vendor management, cost overruns, technological barriers, and regulatory constraints. Addressing these issues requires a more robust legal framework, improved coordination between regulatory bodies, and investment in local expertise. Future research should focus on developing strategies to mitigate these challenges, including the adoption of flexible procurement frameworks and greater use of local resources.

2.8 References:

1. Ibrahim, F., & Jensen, R. (2018). Procurement challenges in technology-driven infrastructure projects. *International Journal of Project Management*, 36(4), 215-229.
2. Mian, S., & Anwar, T. (2019). Vendor management in the procurement of advanced technologies. *Journal of Supply Chain Management*, 33(1), 48-63.
3. Hossain, M., Ahmed, S., & Karim, A. (2021). Barriers to smart technology adoption in Bangladesh's public sector. *Bangladesh Development Studies*, 39(2), 88-103.
4. Rahman, A., & Uddin, N. (2020). Challenges in smart meter deployment in South Asia. *Energy Policy*, 42(3), 410-422.
5. Kamal, N., Rashid, M., & Tareq, F. (2022). The financial impact of smart meter adoption in developing countries. *Development Economics Review*, 12(2), 144-158.
6. Ahmed, S., & Rahman, K. (2021). Regulatory challenges in public procurement of technology in Bangladesh. *Journal of Public Administration*, 19(1), 32-48.
7. Islam, R., & Haque, S. (2020). Technological challenges in remote smart grid implementation. *Energy Engineering Journal*, 28(5), 67-79.
8. Karim, T., & Shamsuddin, M. (2021). Logistics management in rural technology projects: Lessons from Bangladesh. *Logistics and Development*, 15(1), 102-118.

Chapter 3:

Public Procurement in Bangladesh and the Role of BADC

3.1 Introduction to Public Procurement in Bangladesh:

Public procurement plays a vital role in the economy and social development of Bangladesh. The government and its agencies are responsible for purchasing a wide range of goods, works, and services to support public infrastructure, development projects, and governance activities. Procurement processes must be transparent, competitive, and efficient to ensure public funds are utilized optimally. The Public Procurement Act (PPA) 2006 and the Public Procurement Rules (PPR) 2008 form the legal framework for procurement in Bangladesh. These instruments set standards to ensure that procurement is carried out in a fair, transparent, and accountable manner. The Central Procurement Technical Unit (CPTU), under the Implementation Monitoring and Evaluation Division (IMED), Ministry of Planning, is the regulatory body responsible for overseeing public procurement policies.

3.2 The Legal Framework of Public Procurement in Bangladesh:

The public procurement process in Bangladesh is governed by the Public Procurement Act (PPA) 2006 and the Public Procurement Rules (PPR) 2008. These legislative instruments were introduced to bring about a standardized procurement process in line with international best practices. The Central Procurement Technical Unit (CPTU), under the Ministry of Planning, is responsible for overseeing public procurement reforms and ensuring compliance with the PPA and PPR across all government sectors. Key features of Bangladesh's public procurement system include:

- **Open Competitive Bidding (OCB):** This is the most common procurement method, ensuring a fair and transparent process by allowing multiple suppliers to compete for contracts.
- **E-Government Procurement (e-GP):** Bangla
- **Procurement Planning and Accountability:** Public procurement entities are required to prepare procurement plans, maintain records, and ensure compliance with procurement regulations.

3.3 Methods of Public Procurement in Bangladesh

In Bangladesh as per PPR-2008, Rule no 61 and 62, there are 06 types of methods for public procurement used for different types of government purchasing. They are,

- OTM(Open Tendering Method)
- LTM(Limited Tendering Method)
- DPM(Direct Procurement Method)
- RFQM(Request for quotation Method)
- OSTETM(Open Stage Two Envelope Tendering Method)
- TSTM(Two Stage Tendering Method)

For public procurement, the preferred method is the Open Tendering Method (OTM) that ensures equal opportunity to all suppliers by using open competition. But in the case of Limited Tendering Method LTM a PE may maintain as hurdles to eligible renderers for urgent low-cost tenders who especially encourage the local suppliers.

3.4 Procurement in Bangladesh Agricultural Development Corporation (BADC)

The Bangladesh Agricultural Development Corporation (BADC) is a government entity responsible for ensuring the sustainable development of agriculture in the country. It plays a crucial role in enhancing agricultural productivity by providing essential inputs such as seeds, fertilizers, irrigation equipment, and infrastructure support .BADC is a vital player in public procurement, as it is tasked with purchasing agricultural goods and services that directly impact the agricultural sector's growth. Given its role in implementing large-scale projects such as the Mujib Nagar Irrigation Development Project, BADC's procurement practices must align with the national guidelines set by the PPA and PPR. The procurement process in BADC follows the standard public procurement procedures, but it also caters to the specific needs of the agricultural sector. Key areas of procurement in BADC include:

- **Seeds and Fertilizers:** BADC is responsible for procuring and distributing quality seeds and fertilizers to farmers across the country. The procurement process must ensure timely delivery and maintain the quality of agricultural inputs.
- **Irrigation Equipment and Infrastructure:** Procurement for irrigation projects is a significant part of BADC's operations. This includes the purchase of pumps, pipes, and smart card-based prepaid meters for projects like the Mujib Nagar Irrigation Development Project. Efficient procurement in this sector is essential for the sustainability of agricultural production.
- **Research and Development:** BADC procures services for agricultural research and development, including technical expertise and equipment. This helps in introducing new agricultural technologies and improving productivity.

3.5 Public Procurement and BADC: The Case of Mujib Nagar Irrigation Development Project

The Mujib Nagar Irrigation Development Project aims to address water scarcity and improve irrigation management in a significant agricultural region of Bangladesh. One of the project's key components is the introduction of smart card-based prepaid meters, designed to ensure that water usage is efficiently managed, and farmers can pay for the exact amount of water they use. For such a technologically advanced system, BADC's procurement team must follow a complex procurement process to ensure that the equipment is acquired at a fair price, meets the necessary technical specifications, and can be delivered within the project's timeline. BADC, as the procuring entity for the Mujib Nagar Irrigation Development Project, must navigate these challenges to ensure that the project meets its objectives. Addressing the technical, financial, and procedural hurdles in public procurement will be critical to the success of this project, which has the potential to transform irrigation management in the region and serve as a model for future projects in Bangladesh's agricultural sector.

Chapter 4

Methodology

4.1 Data collecting/Sampling method:

The questionnaire utilized in this research is detailed in Annexure A. It was specifically adopted to collect primary data from various stakeholders involved in the procurement activities of the Mujib Nagar Irrigation Development Project, all of whom possess substantial knowledge of the Public Procurement Act, 2006 and the Public Procurement Rules, 2008. Before data collection commenced, the research objectives were communicated to the participants to provide context. Subsequently, the questionnaire was distributed, requesting their input based on their real-life experiences in procurement, particularly concerning transparency, efficiency, competitiveness, and compliance with PPR 2008 within the Mujib Nagar Irrigation Development Project, managed by the Bangladesh Agricultural Development Corporation.

The questionnaire comprised closed-ended questions to accurately capture the respondents' perceptions. A 5-point Likert scale was employed to evaluate responses against all key performance indicators (KPIs), with the scale defined as follows: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral (Neither agree nor disagree), 4 = Agree, 5 = Strongly Agree. The questionnaire was organized into two sections (A-B).

For the key informant interviews, several senior officials from the Bangladesh Agricultural Development Corporation (BADC) and other relevant stakeholders associated with the Mujib Nagar Irrigation Development Project were consulted.

4.2 Selection Area of Research:

Due to time limitations and in light of the practicality and convenience of the current study, the Mujib Nagar Irrigation Development Project, managed by the Bangladesh Agricultural Development Corporation, was chosen. The Project Management Unit (PMU) and other relevant stakeholders, such as the deep tube well management team and the end users of smart card-based prepaid electric meters, were selected for data collection through the use of a questionnaire. The research primarily concentrated on the mentioned area.

4.3 Research Period:

The survey was conducted in the organization and project coverage area over various periods from January, 2024, to April, 2024.

4.4 Sample size:

To evaluate the difficulties encountered in the procurement of smart card-based prepaid meters within the Mujib Nagar irrigation development project a closed-ended questionnaire was distributed to a carefully chosen group of respondents the following provides an overview of the sample size pertinent to this segment of the research target respondents the closed-ended questionnaire was circulated among essential stakeholders engaged in the procurement and implementation phases these stakeholders included procurement officials engineers project managers and local beneficiaries such as farmers and irrigation users number of participants a total of 40 respondents were selected for participation in this closed-ended questionnaire this figure was determined to ensure a comprehensive representation of various perspectives while facilitating the management of data collection and analysis sampling criteria purposive sampling was utilized to identify respondents who had direct involvement in the procurement of the prepaid meters or were impacted by the process this method guarantees that only relevant and informed participants were included rationale for sample size the sample size was established based on the projects scope and the variety of stakeholders involved the objective was to collect quantitative data from a sufficient number of respondents to pinpoint key procurement challenges while ensuring that the responses could be subjected to statistical analysis closed-ended questionnaire format the questionnaire consisted of 20 questions each crafted to address specific elements of the procurement challenges including cost management supplier reliability technical issues and timelines

4.5 Data processing and Analysis/Analytical Framework:

In the context of the Mujib Nagar Irrigation Development Project, particularly focusing on the procurement challenges related to the smart card-based prepaid meter system, the data processing and analysis framework follows a structured approach to ensure a comprehensive understanding of the issues. The methodology integrates both qualitative and quantitative techniques to analyze data from multiple sources, ensuring triangulation and validation of findings. The primary data for this analysis comes from:

- **Interviews:** Semi-structured interviews with key stakeholders involved in the procurement process, including project managers, procurement officers, engineers, and suppliers.
- **Official Documents:** Review of project-related documents such as procurement guidelines, tender documents, contracts, and progress reports.
- **Site Observations:** Field observations of the project sites, focusing on the installation and implementation process of the prepaid meter system.
- **Secondary Data:** Analysis of reports, academic papers, and government publications related to procurement practices in irrigation and public sector projects in Bangladesh.

As a means of processing collected data have been cleaned, arranged and coded before statistical analysis. 5 point Likert scale was used in the questionnaire to categorize the answers for easy analysis. Frequency distribution table and central tendency test have been done to see the findings of the sample. The graphical representations of the answers in the form of 'Pie chart' and/ 'Bar Chart' has been given for lucid understanding of the responses.

For the purposes of analysis the respondents demographic information collected through the questionnaire were transferred into data as ‘Male’ and ‘Female’ has been captured as 1 and 2 respectively. Similarly, Educational Attainment of the respondent has been classified as ‘Diploma Holder /Undergraduate’=1, ‘Graduate’=2, ‘Post-Graduate’=3 and ‘Professional Degree or PhD’=4. Regarding the public procurement training the respondent were asked to fill up the questionnaire and the data were incorporated as ‘Received Training’=2 and ‘Not received Training’=1. Procurement experience of the respondents were grouped as ‘<5 years’=1 named as Young Professional, ‘5-10 years’=2 treated as Junior Professional, ‘11-15 years’=3 treated as Mid-level Professional, ‘16-20 years’=4 would be as Senior Professional’ and respondent having ‘above 21 years of experience’=5 as ‘Expert Professional’.

Microsoft Excel has been used for preparing the frequency table & other tables and for constructing pie charts. Microsoft Word has been used for preparing the report.

The processed data will be analyzed in the context of the procurement lifecycle. Specific focus will be given to identifying procurement bottlenecks, compliance issues, supplier performance, and the alignment of procurement activities with the project’s goals. The findings will be interpreted through the lens of public procurement regulations in Bangladesh, with recommendations for improving future procurement processes in similar projects.

This framework aims to provide a clear, evidence-based analysis of the challenges faced during the procurement of smart card-based prepaid meters in the Mujib Nagar Irrigation Development Project and offer actionable insights for addressing these issues in future phases.

Chapter 5

Data analysis and Result Discussion

I have try to presents through this chapter to analysis and discussion of the collected data regarding the challenges faced in the procurement process of smart card based electric prepaid meter in Mujib Nagar Irrigation Development Project. The findings are discussed in alignment with the research objectives and existing literature by calculating mean value and calculation of percentage (%) of individual option against total response of each challenge of the provided questioner for the research process.

1. Selection of suitable deep tube well (DTW) with proper operation & maintenance by good farmer's management group or team.

A. Data Analysis:

Calculation of Percentage-

Sl.	Name of option	Number of Questioner	Getting Response	% of getting response
1	Strongly Disagree	40	0	0%
2	Disagree	40	0	0%
3	Neither agree nor disagree	40	2	5%
4	Agree	40	25	62.5%
5	Strongly agree	40	13	32.5%

Table: 1

Calculation of mean value-

The formula for the mean= $\text{Sum}(f_1x_i)/N$

Where:

- f_1 =Number of respondents with respect to concern ikert scale value
- x_i =Likert scale value for concern statement
- N =Total number of respondents

Mean= $\sum(f_i \cdot x_i)/N$, follow these steps:

Data:

- **Strongly Disagree (1):** Frequency (f_1) = 0, Score (x_1) = 1
- **Disagree (2):** Frequency (f_2) = 0, Score (x_2) = 2
- **Neither Agree nor Disagree (3):** Frequency (f_3) = 2, Score (x_3) = 3
- **Agree (4):** Frequency (f_4) = 25, Score (x_4) = 4
- **Strongly Agree (5):** Frequency (f_5) = 13, Score (x_5) = 5

Step 1: Multiply each frequency (f_i) by its corresponding score (x_i):

$$f_1(x_1)=0(1)=0, f_2(x_2)=0(2)=0, f_3(x_3)=2(3)=6, f_4(x_4)=25(4)=100, f_5(x_5)=13(5)=65$$

Step 2: Calculate the sum of all $f_i(x_i)$

$$\text{Sum}=0+0+6+100+65=171$$

Step 3: Calculate the total number of respondents (N):

$$N=0+0+2+25+13=40$$

Step 4: Calculate the mean:

$$\text{Mean}=\text{Sum}/N=171/40=4.275$$

B. Result Discussion:

The mean score of **4.275** indicates that the majority of respondents leaned toward **"Agree" (4)** and **"Strongly Agree" (5)** regarding the statement about **Selection of suitable deep tube well (DTW) with proper operation & maintenance by good farmer's management group or team.**

2. Selection of good running deep tube well with maximum command irrigation areas.

A. Data Analysis:

Calculation of Percentage-

S l .	Name of option	Number of Questioner	Getting Response	% of getting response	
1	Strongly Disagree	40	0	0%	
2	Disagree	40	0	0%	
3	Neither agree nor disagree	40	6	15%	
4	Agree	40	26	65%	
5	Strongly agree	40	8	20%	

Table: 2

Calculation of mean value-

The formula for the mean= $\text{Sum}(f_1x_i)/N$

Where:

- f_1 =Number of respondents with respect to concern Likert scale value
- x_i =Likert scale value for concern statement
- N =Total number of respondents

Mean= $\sum(f_i \cdot x_i)/N$, follow these steps:

Data:

- **Strongly Disagree (1):** Frequency (f_1) = 0, Score (x_1) = 1
- **Disagree (2):** Frequency (f_2) = 0, Score (x_2) = 2
- **Neither Agree nor Disagree (3):** Frequency (f_3) = 6, Score (x_3) = 3
- **Agree (4):** Frequency (f_4) = 26, Score (x_4) = 4
- **Strongly Agree (5):** Frequency (f_5) = 8, Score (x_5) = 5

Step 1: Multiply each frequency (f_i) by its corresponding score (x_i):

$$f_1(x_1)=0(1)=0, f_2(x_2)=0(2)=0, f_3(x_3)=6(3)=18, f_4(x_4)=26(4)=104, f_5(x_5)=8(5)=40$$

Step 2: Calculate the sum of all $f_i(x_i)$

$$\text{Sum}=0+0+18+104+40=162$$

Step 3: Calculate the total number of respondents (N):

$$N=0+0+6+26+8=40$$

Step 4: Calculate the mean:

$$\text{Mean}=\text{Sum}/N=162/40=4.05$$

B. Result Discussion:

The mean score is **4.05**, which is slightly above **Agree (4)** on the Likert scale. This indicates that, on average, the respondents lean towards agreeing that **Selection of good running deep tube well with maximum command irrigation areas**.

3. Lengthy process for selection and making standard specification of smart card based prepaid electric meter.-

A. Data Analysis:

Calculation of Percentage-

Sl.	Name of option	Number of Questioner	Getting Response	% of getting response	
1	Strongly Disagree	40	2	5%	
2	Disagree	40	1	2.5%	
3	Neither agree nor disagree	40	7	17.5%	
4	Agree	40	14	47.5%	
5	Strongly agree	40	16	27.5%	

Table: 3

Calculation of mean value-

The formula for the mean= $\text{Sum}(f_i x_i)/N$

Where:

- f_i = Number of respondents with respect to concern Likert scale value
- x_i = Likert scale value for concern statement
- N = Total number of respondents

Mean= $\sum(f_i \cdot x_i)/N$, follow these steps:

Data:

- **Strongly Disagree (1):** Frequency (f_1) = 2, Score (x_1) = 1
- **Disagree (2):** Frequency (f_2) = 1, Score (x_2) = 2
- **Neither Agree nor Disagree (3):** Frequency (f_3) = 7, Score (x_3) = 3
- **Agree (4):** Frequency (f_4) = 14, Score (x_4) = 4
- **Strongly Agree (5):** Frequency (f_5) = 16, Score (x_5) = 5
-

Step 1: Multiply each frequency (f_i) by its corresponding score (x_i):

$$f_1(x_1)=2(1)=2, f_2(x_2)=1(2)=2, f_3(x_3)=7(3)=21, f_4(x_4)=14(4)=56, f_5(x_5)=16(5)=80$$

Step 2: Calculate the sum of all $f_i(x_i)$

$$\text{Sum}=2+2+21+56+80=161$$

Step 3: Calculate the total number of respondents (N):

$$N=2+1+7+14+16=40$$

Step 4: Calculate the mean:

$$\text{Mean} = \text{Sum}/N = 161/40 = 4.025$$

B. Result Discussion:

The mean value of **4.025** suggests that, on average, the respondents tend to **agree** with the statement about Lengthy process for selection and making standard specification of smart card based prepaid electric meter. Since the Likert scale uses values from 1 (strongly disagree) to 5 (strongly agree), a mean closer to 4 indicates that most respondents lean towards agreement, with some likely feeling very positive about the statement.

4. Lengthy procurement process for collection of pre-paid meter by Government procurement method

A. Data Analysis:

Calculation of Percentage-

Sl.	Name of option	Number of Questioner	Getting Response	% of getting response	
1	Strongly Disagree	40	0	0%	
2	Disagree	40	3	7.5%	
3	Neither agree nor disagree	40	6	15%	
4	Agree	40	11	27.5%	
5	Strongly agree	40	20	50%	

Table: 4

Calculation of mean value-

The formula for the mean = $\text{Sum}(f_1 x_i) / N$

Where:

- f_1 = Number of respondents with respect to concern Likert scale value
- x_i = Likert scale value for concern statement
- N = Total number of respondents

Mean = $\sum(f_i \cdot x_i) / N$, follow these steps:

Data:

- **Strongly Disagree (1):** Frequency (f_1) = 0, Score (x_1) = 1
- **Disagree (2):** Frequency (f_2) = 3, Score (x_2) = 2
- **Neither Agree nor Disagree (3):** Frequency (f_3) = 6, Score (x_3) = 3
- **Agree (4):** Frequency (f_4) = 11, Score (x_4) = 4
- **Strongly Agree (5):** Frequency (f_5) = 20, Score (x_5) = 5

Step 1: Multiply each frequency (f_i) by its corresponding score (x_i):

$$f_1(x_1) = 0(1) = 0, f_2(x_2) = 3(2) = 6, f_3(x_3) = 6(3) = 18, f_4(x_4) = 11(4) = 44, f_5(x_5) = 20(5) = 100$$

Step 2: Calculate the sum of all $f_i(x_i)$

$$\text{Sum} = 0 + 6 + 18 + 44 + 100 = 168$$

Step 3: Calculate the total number of respondents (N):

$$N = 0 + 3 + 6 + 11 + 20 = 40$$

Step 4: Calculate the mean:

$$\text{Mean} = \text{Sum}/N = 168/40 = 4.2$$

B. Result Discussion:

The mean value of 4.2 indicates that, on average, the respondents tend to agree with the statement about the Lengthy procurement process for collection of pre-paid meter by Government procurement method. Since the mean is closer to 4 (Agree), it suggests a generally favorable opinion towards the proper and safe storage of these items.

5. Proper and safely storage of pre-paid meter and it's accessories.

A. Data Analysis:

Calculation of Percentage-

Sl .	Name of option	Number of Questioner	Getting Response	% of getting response	
1	Strongly Disagree	40	0	0%	
2	Disagree	40	0	0%	
3	Neither agree nor disagree	40	1	2.5%	
4	Agree	40	17	42.5%	
5	Strongly agree	40	22	55%	

Table: 5

Calculation of mean value-

The formula for the mean = $\text{Sum}(f_1 x_i)/N$

Where:

- f_1 = Number of respondents with respect to concern Likert scale value
- x_i = Likert scale value for concern statement
- N = Total number of respondents

Mean = $\sum(f_i \cdot x_i)/N$, follow these steps:

Data:

- **Strongly Disagree (1):** Frequency (f_1) = 0, Score (x_1) = 1
- **Disagree (2):** Frequency (f_2) = 0, Score (x_2) = 2
- **Neither Agree nor Disagree (3):** Frequency (f_3) = 1, Score (x_3) = 3
- **Agree (4):** Frequency (f_4) = 17, Score (x_4) = 4
- **Strongly Agree (5):** Frequency (f_5) = 22, Score (x_5) = 5

Step 1: Multiply each frequency (f_i) by its corresponding score (x_i):

$$f_1(x_1) = 0(1) = 0, f_2(x_2) = 0(2) = 0, f_3(x_3) = 1(3) = 3, f_4(x_4) = 17(4) = 68, f_5(x_5) = 22(5) = 110$$

Step 2: Calculate the sum of all $f_i(x_i)$

$$\text{Sum} = 0 + 0 + 3 + 68 + 110 = 181$$

Step 3: Calculate the total number of respondents (N):

$$N = 0 + 0 + 1 + 17 + 22 = 40$$

Step 4: Calculate the mean:

$$\text{Mean} = \text{Sum}/N = 181/40 = 4.525$$

B. Result Discussion:

The mean value of **4.525** is close to 5 on the Likert scale, indicating that most respondents generally agree or strongly agree with the statement about the proper and safe storage of

prepaid meters and their accessories. Since the value is closer to "agree" (4) and slightly above, it suggests a positive perception, but it's not overwhelmingly strong in favor of the statement.

6. To make and distribution of user card for particular farmers of the deep tube well (DTW) scheme.

A. Data Analysis:

Calculation of Percentage-

Sl .	Name of option	Number of Questioner	Getting Response	% of getting response	
1	Strongly Disagree	40	1	2.5%	
2	Disagree	40	0	0%	
3	Neither agree nor disagree	40	2	5%	
4	Agree	40	17	42.5%	
5	Strongly agree	40	20	50%	

Table: 6

Calculation of mean value-

The formula for the mean= $\text{Sum}(f_1x_i)/N$

Where:

- f_1 =Number of respondents with respect to concern Likert scale value
- x_i =Likert scale value for concern statement
- N =Total number of respondents

Mean= $\sum(f_i \cdot x_i)/N$, follow these steps:

Data:

- **Strongly Disagree (1):** Frequency (f_1) = 1, Score (x_1) = 1
- **Disagree (2):** Frequency (f_2) = 0, Score (x_2) = 2
- **Neither Agree nor Disagree (3):** Frequency (f_3) = 2, Score (x_3) = 3
- **Agree (4):** Frequency (f_4) = 17, Score (x_4) = 4
- **Strongly Agree (5):** Frequency (f_5) = 20, Score (x_5) = 5

Step 1: Multiply each frequency (f_i) by its corresponding score (x_i):

$$f_1(x_1)=1(1)=1, f_2(x_2)=0(2)=0, f_3(x_3)=2(3)=6, f_4(x_4)=17(4)=68, f_5(x_5)=20(5)=100$$

Step 2: Calculate the sum of all $f_i(x_i)$

$$\text{Sum}=1+0+6+68+100=175$$

Step 3: Calculate the total number of respondents (N):

$$N=1+0+2+17+20=40$$

Step 4: Calculate the mean:

$$\text{Mean}=\text{Sum}/N=175/40=4.375$$

B. Result Discussion:

The mean value is 4.375, which is closer to 4 (Agree) on the Likert scale. This indicates that, on average, respondents tend to agree that to make and distribution of user card for particular farmers of the deep tube well (DTW) scheme. The value above 4 suggests that most respondents are positive about the storage conditions. However, it is not a perfect "strongly agree" (5), so there might be some respondents who have moderate reservations or concerns.

7. Lack of trained person or technicians for installation , operation and maintenance of prepaid meter

A. Data Analysis:

Calculation of Percentage-

Sl.	Name of option	Number of Questioner	Getting Response	% of getting response	Remarks
1	Strongly Disagree	40	0	0%	
2	Disagree	40	0	0%	
3	Neither agree nor disagree	40	6	15%	
4	Agree	40	18	45%	
5	Strongly agree	40	16	40%	

Table: 7

Calculation of mean value-

The formula for the mean= $\sum (f_i \cdot x_i) / N$

Where:

- f_i =Number of respondents with respect to concern Likert scale value
- x_i =Likert scale value for concern statement
- N=Total number of respondents

Mean= $\sum (f_i \cdot x_i) / N$, follow these steps:

Data:

- **Strongly Disagree (1):** Frequency (f_1) = 0, Score (x_1) = 1
- **Disagree (2):** Frequency (f_2) = 0, Score (x_2) = 2
- **Neither Agree nor Disagree (3):** Frequency (f_3) = 6, Score (x_3) = 3
- **Agree (4):** Frequency (f_4) = 18, Score (x_4) = 4
- **Strongly Agree (5):** Frequency (f_5) = 16, Score (x_5) = 5

Step 1: Multiply each frequency (f_i) by its corresponding score (x_i):

$$f_1(x_1)=0(1)=0, f_2(x_2)=0(2)=0, f_3(x_3)=6(3)=18, f_4(x_4)=18(4)=72, f_5(x_5)=16(5)=80$$

Step 2: Calculate the sum of all $f_i(x_i)$

$$\text{Sum}=0+0+18+72+80=170$$

Step 3: Calculate the total number of respondents (N):

$$N=0+0+6+18+16=40$$

Step 4: Calculate the mean:

$$\text{Mean}=\text{Sum}/N=170/40=4.25$$

B. Result Discussion:

The mean value of 4.25 indicates that the respondents, on average, lean towards agreeing with the statement that Lack of trained person or technicians for installation, operation and maintenance of prepaid meter. Since the Likert scale ranges from 1 to 5, with 4 representing "agree," a mean of 4.25 suggests a generally positive perception regarding the proper and safe storage of these items.

8. Lack of availability of card recharge station or center.

A. Data Analysis:

Calculation of Percentage-

Sl.	Name of option	Number of Questioner	Getting Response	% of getting response	Remarks
1	Strongly Disagree	40	0	0%	
2	Disagree	40	1	2.5%	
3	Neither agree nor disagree	40	5	12.5%	
4	Agree	40	20	50%	
5	Strongly agree	40	14	35%	

Table: 8

Calculation of mean value-

The formula for the mean= $\text{Sum}(f_1x_i)/N$

Where:

- f_1 =Number of respondents with respect to concern Likert scale value
- x_i =Likert scale value for concern statement
- N =Total number of respondents

Mean= $\sum(f_i \cdot x_i)/N$, follow these steps:

Data:

- **Strongly Disagree (1):** Frequency (f_1) = 0, Score (x_1) = 1
- **Disagree (2):** Frequency (f_2) = 1, Score (x_2) = 2
- **Neither Agree nor Disagree (3):** Frequency (f_3) = 5, Score (x_3) = 3
- **Agree (4):** Frequency (f_4) = 20, Score (x_4) = 4
- **Strongly Agree (5):** Frequency (f_5) = 14, Score (x_5) = 5

Step 1: Multiply each frequency (f_i) by its corresponding score (x_i):

$$f_1(x_1)=0(1)=0, f_2(x_2)=1(2)=2, f_3(x_3)=5(3)=15, f_4(x_4)=20(4)=80, f_5(x_5)=14(5)=70$$

Step 2: Calculate the sum of all $f_i(x_i)$

$$\text{Sum}=0+2+15+80+70=167$$

Step 3: Calculate the total number of respondents (N):

$$N=0+1+5+20+14=40$$

Step 4: Calculate the mean:

$$\text{Mean}=\text{Sum}/N=167/40=4.175$$

B. Result Discussion:

The mean value of 4.175 suggests that the respondents, on average, lean towards agreeing with the statement that Lack of availability of card recharge station or center.

Since the Likert scale ranges from 1 to 5 (with 4 being the "Agree" score), a mean of 4.175 indicates that the majority of respondents tend to agree or strongly agree with the statement.

9. Lack of coordination and supervision of project official `s with farmers and deep tubewell's (DTW) management group or team.

A. Data Analysis:

Calculation of Percentage-

Sl.	Name of option	Number of Questioner	Getting Response	% of getting response	Remarks
1	Strongly Disagree	40	0	0%	
2	Disagree	40	3	7.5%	
3	Neither agree nor disagree	40	6	15%	
4	Agree	40	16	40%	
5	Strongly agree	40	15	37.5%	

Table: 9

Calculation of mean value-

The formula for the mean= $\sum(f_i x_i)/N$

Where:

- f_i =Number of respondents with respect to concern Likert scale value
- x_i =Likert scale value for concern statement
- N=Total number of respondents

Mean= $\sum(f_i \cdot x_i)/N$, follow these steps:

Data:

- **Strongly Disagree (1):** Frequency (f_1) = 0, Score (x_1) = 1
- **Disagree (2):** Frequency (f_2) = 3, Score (x_2) = 2
- **Neither Agree nor Disagree (3):** Frequency (f_3) = 6, Score (x_3) = 3
- **Agree (4):** Frequency (f_4) = 16, Score (x_4) = 4
- **Strongly Agree (5):** Frequency (f_5) = 15, Score (x_5) = 5

Step 1: Multiply each frequency (f_i) by its corresponding score (x_i):

$$f_1(x_1)=0(1)=0, f_2(x_2)=3(2)=6, f_3(x_3)=6(3)=18, f_4(x_4)=16(4)=64, f_5(x_5)=15(5)=75$$

Step 2: Calculate the sum of all $f_i(x_i)$

$$\text{Sum}=0+6+18+64+75=163$$

Step 3: Calculate the total number of respondents (N):

$$N=0+3+6+16+15=40$$

Step 4: Calculate the mean:

$$\text{Mean}=\text{Sum}/N=163/40=4.075$$

B. Result Discussion:

The mean value is 4.075, which is close to 4 on the Likert scale, indicating that, on average, the respondents "agree" with the statement about Lack of coordination and supervision of project official `s with farmers and deep tube well's (DTW) management group or team. Since this value is slightly above 4, it suggests that most respondents have a positive perception about the storage of these items.

10. Availability of proper electricity supply by the REB/ PDB.

A. Data Analysis:

Calculation of Percentage-

Sl.	Name of option	Number of Questioner	Getting Response	% of getting response	
1	Strongly Disagree	40	0	0%	
2	Disagree	40	2	5%	
3	Neither agree nor disagree	40	4	10%	
4	Agree	40	7	17.5%	
5	Strongly agree	40	27	67.5%	

Table: 10

Calculation of mean value-

The formula for the mean= $\sum (f_i x_i) / N$

Where:

- f_i =Number of respondents with respect to concern Likert scale value
- x_i =Likert scale value for concern statement
- N =Total number of respondents

Mean= $\sum (f_i \cdot x_i) / N$, follow these steps:

Data:

- **Strongly Disagree (1):** Frequency (f_1) = 0, Score (x_1) = 1
- **Disagree (2):** Frequency (f_2) = 3, Score (x_2) = 2
- **Neither Agree nor Disagree (3):** Frequency (f_3) = 6, Score (x_3) = 3
- **Agree (4):** Frequency (f_4) = 16, Score (x_4) = 4
- **Strongly Agree (5):** Frequency (f_5) = 15, Score (x_5) = 5

Step 1: Multiply each frequency (f_i) by its corresponding score (x_i):

$$f_1(x_1)=0(1)=0, f_2(x_2)=2(2)=4, f_3(x_3)=4(3)=12, f_4(x_4)=7(4)=28, f_5(x_5)=27(5)=135$$

Step 2: Calculate the sum of all $f_i(x_i)$

$$\text{Sum}=0+4+12+28+135=179$$

Step 3: Calculate the total number of respondents (N):

$$N=0+2+4+7+27=40$$

Step 4: Calculate the mean:

$$\text{Mean}=\text{Sum}/N=179/40=4.475$$

B. Result Discussion:

The mean value of 4.475 indicates that the respondents, on average, are closer to "Agree" (4) than to "Neither Agree nor Disagree" (3). This suggests that most respondents have a positive view regarding the Availability of proper electricity supply by the REB/ PDB.

with a tendency toward agreement or strong agreement with the statement. The value is slightly below "Strongly Agree," reflecting a generally favorable opinion but with some room for improvement or differing opinions.

Way to Confront the challenges

1. At the project area visit various deep tube well scheme and talk to farmers group about the operations and maintenance of the deep tube well.

A. Data Analysis:

Calculation of Percentage-

Sl .	Name of option	Number of Questioner	Getting Response	% of getting response	remarks
1	Strongly Disagree	40	0	0%	
2	Disagree	40	0	0%	
3	Neither agree nor disagree	40	4	10%	
4	Agree	40	12	30%	
5	Strongly agree	40	24	60%	

Table: 11

Calculation of mean value-

The formula for the mean= $\text{Sum (fixi)}/N$

Where:

- f_1 =Number of respondents with respect to concern Likert scale value
- x_i =Likert scale value for concern statement
- N =Total number of respondents

Mean= $\sum(f_i \cdot x_i)/N$, follow these steps:

Data:

- **Strongly Disagree (1):** Frequency (f_1) = 0, Score (x_1) = 1
- **Disagree (2):** Frequency (f_2) = 0, Score (x_2) = 2
- **Neither Agree nor Disagree (3):** Frequency (f_3) = 4, Score (x_3) = 3
- **Agree (4):** Frequency (f_4) = 12, Score (x_4) = 4
- **Strongly Agree (5):** Frequency (f_5) = 24, Score (x_5) = 5

Step 1: Multiply each frequency (f_i) by its corresponding score (x_i):

$$f_1(x_1)=0(1)=0, f_2(x_2)=0(2)=0, f_3(x_3)=4(3)=12, f_4(x_4)=12(4)=48, f_5(x_5)=24(5)=120$$

Step 2: Calculate the sum of all $f_i(x_i)$

$$\text{Sum}=0+0+12+48+120=180$$

Step 3: Calculate the total number of respondents (N):

$$N=0+2+4+7+27=40$$

Step 4: Calculate the mean:

$$\text{Mean}=\text{Sum}/N=180/40=4.5$$

B. Result Discussion:

The mean value of 4.5 indicates that the respondents, on average, fall between *agree* (4) and *strongly agree* (5) on the Likert scale. This suggests a strong positive perception of the project area visit various deep tube well scheme and talk to farmers group about the operations and maintenance of the deep tube well.

2. Physical observation of deep tube well (DTW) scheme and it's command area, Also inspection the DTW's pump-motor and talk with the farmers group about it trouble shooting.

A. Data Analysis:

Calculation of Percentage-

Sl.	Name of option	Number of Questioner	Getting Response	% of getting response	Remarks
1	Strongly Disagree	40	0	0%	
2	Disagree	40	0	0%	
3	Neither agree nor disagree	40	3	7.5%	
4	Agree	40	7	17.5%	
5	Strongly agree	40	30	75%	

Table: 12

Calculation of mean value-

The formula for the mean= $\sum (f_i \cdot x_i) / N$

Where:

- f_i =Number of respondents with respect to concern Likert scale value
- x_i =Likert scale value for concern statement
- N=Total number of respondents

Mean= $\sum (f_i \cdot x_i) / N$, follow these steps:

Data:

- **Strongly Disagree (1):** Frequency (f_1) = 0, Score (x_1) = 1
- **Disagree (2):** Frequency (f_2) = 0, Score (x_2) = 2
- **Neither Agree nor Disagree (3):** Frequency (f_3) = 3, Score (x_3) = 3
- **Agree (4):** Frequency (f_4) = 7, Score (x_4) = 4
- **Strongly Agree (5):** Frequency (f_5) = 30, Score (x_5) = 5

Step 1: Multiply each frequency (f_i) by its corresponding score (x_i):

$$f_1(x_1)=0(1)=0, f_2(x_2)=0(2)=0, f_3(x_3)=3(3)=9, f_4(x_4)=7(4)=28, f_5(x_5)=30(5)=150$$

Step 2: Calculate the sum of all $f_i(x_i)$

$$\text{Sum}=0+0+9+28+150=187$$

Step 3: Calculate the total number of respondents (N):

$$N=0+2+4+7+27=40$$

Step 4: Calculate the mean:

$$\text{Mean}=\text{Sum}/N=187/40=4.675$$

B. Result Discussion:

The mean score is **4.675**, which is closer to **5 (Strongly Agree)** on the Likert scale. This indicates that the majority of respondents strongly agree with the Physical observation of deep tube well (DTW) scheme and its command area, Also inspection the DTW's pump-motor and talk with the farmers group about it trouble shooting.

3. To collect the information from the electricity authority about the electricity supply in this scheme area.

A. Data Analysis:

Calculation of Percentage-

Sl.	Name of option	Number of Questioner	Getting Response	% of getting response	Remarks
1	Strongly Disagree	40	0	0%	
2	Disagree	40	2	5%	
3	Neither agree nor disagree	40	4	10%	
4	Agree	40	12	30%	
5	Strongly agree	40	22	55%	

Table: 13

Calculation of mean value-

The formula for the mean= $\sum (f_i \cdot x_i) / N$

Where:

- f_i = Number of respondents with respect to concern Likert scale value
- x_i = Likert scale value for concern statement
- N = Total number of respondents

Mean= $\sum (f_i \cdot x_i) / N$, follow these steps:

Data:

- **Strongly Disagree (1):** Frequency (f_1) = 0, Score (x_1) = 1
- **Disagree (2):** Frequency (f_2) = 2, Score (x_2) = 2
- **Neither Agree nor Disagree (3):** Frequency (f_3) = 4, Score (x_3) = 3
- **Agree (4):** Frequency (f_4) = 12, Score (x_4) = 4
- **Strongly Agree (5):** Frequency (f_5) = 22, Score (x_5) = 5

Step 1: Multiply each frequency (f_i) by its corresponding score (x_i):

$$f_1(x_1)=0(1)=0, f_2(x_2)=2(2)=4, f_3(x_3)=4(3)=12, f_4(x_4)=12(4)=48, f_5(x_5)=22(5)=110$$

Step 2: Calculate the sum of all $f_i(x_i)$

$$\text{Sum}=0+4+12+48+110=174$$

Step 3: Calculate the total number of respondents (N):

$$N=0+2+4+12+22=40$$

Step 4: Calculate the mean:

$$\text{Mean}=\text{Sum}/N=174/40=4.35$$

B. Result Discussion:

The mean value of **4.35** indicates that, on average, respondents tend to agree or strongly agree with the statement about to collect the information from the electricity authority about the electricity supply in this scheme area. Since the mean is closer to 5 (Strongly Agree), it suggests a strong positive consensus among respondents on this issue.

4. To study and collect proper information and technical data of the prepaid electric meter.

A. Data Analysis:

Calculation of Percentage-

Sl.	Name of option	Number of Questioner	Getting Response	% of getting response	
1	Strongly Disagree	40	0	0%	
2	Disagree	40	2	5%	
3	Neither agree nor disagree	40	3	7.5%	
4	Agree	40	15	37.5%	
5	Strongly agree	40	20	50%	

Table: 14

Calculation of mean value-

The formula for the mean= $\text{Sum}(f_i x_i)/N$

Where:

- f_i = Number of respondents with respect to concern Likert scale value
- x_i = Likert scale value for concern statement
- N = Total number of respondents

Mean= $\sum(f_i \cdot x_i)/N$, follow these steps:

Data:

- **Strongly Disagree (1):** Frequency (f_1) = 0, Score (x_1) = 1
- **Disagree (2):** Frequency (f_2) = 2, Score (x_2) = 2
- **Neither Agree nor Disagree (3):** Frequency (f_3) = 3, Score (x_3) = 3
- **Agree (4):** Frequency (f_4) = 15, Score (x_4) = 4
- **Strongly Agree (5):** Frequency (f_5) = 20, Score (x_5) = 5

Step 1: Multiply each frequency (f_i) by its corresponding score (x_i):

$$f_1(x_1)=0(1)=0, f_2(x_2)=2(2)=4, f_3(x_3)=3(3)=9, f_4(x_4)=15(4)=60, f_5(x_5)=20(5)=100$$

Step 2: Calculate the sum of all $f_i(x_i)$

$$\text{Sum}=0+4+9+60+100=173$$

Step 3: Calculate the total number of respondents (N):

$$N=0+2+3+15+20=40$$

Step 4: Calculate the mean:

$$\text{Mean}=\text{Sum}/N=173/40=4.325$$

B. Result Discussion:

The mean Likert score of **4.325** suggests that the majority of respondents generally agree or strongly agree with study and collect proper information and technical data of the prepaid electric meter.

. Since the mean is closer to 5 (strongly agree), it indicates a strong positive consensus on the statement.

5. To communicate the high officials for talking urgent action regarding approval and tendering method.

A. Data Analysis:

Calculation of Percentage-

Sl.	of option	Number of Questioner	Getting Response	% of getting response	
1	Strongly Disagree	40	0	0%	
2	Disagree	40	1	2.5%	
3	Neither agree nor disagree	40	3	7.5%	
4	Agree	40	17	42.5%	
5	Strongly agree	40	19	47.5%	

Table: 15

Calculation of mean value-

The formula for the mean= $\text{Sum (fixi)}/N$

Where:

- f_1 =Number of respondents with respect to concern Likert scale value
- x_i =Likert scale value for concern statement
- N =Total number of respondents

Mean= $\sum(f_i \cdot x_i)/N$, follow these steps:

Data:

- **Strongly Disagree (1):** Frequency (f_1) = 0, Score (x_1) = 1
- **Disagree (2):** Frequency (f_2) = 1, Score (x_2) = 2
- **Neither Agree nor Disagree (3):** Frequency (f_3) = 3, Score (x_3) = 3
- **Agree (4):** Frequency (f_4) = 17, Score (x_4) = 4
- **Strongly Agree (5):** Frequency (f_5) = 19, Score (x_5) = 5

Step 1: Multiply each frequency (f_i) by its corresponding score (x_i):

$$f_1(x_1)=0(1)=0, f_2(x_2)=1(2)=2, f_3(x_3)=3(3)=9, f_4(x_4)=17(4)=68, f_5(x_5)=19(5)=95$$

Step 2: Calculate the sum of all $f_i(x_i)$

$$\text{Sum}=0+2+9+68+95=174$$

Step 3: Calculate the total number of respondents (N):

$$N=0+1+3+17+19=40$$

Step 4: Calculate the mean:

$$\text{Mean}=\text{Sum}/N=174/40=4.35$$

B. Result Discussion:

The mean score is **4.35**, which is closer to **5 (Strongly Agree)** on the Likert scale. This indicates that, on average, the respondents **strongly agree** that to communicate the high officials for talking urgent action regarding approval and tendering method.

. The result suggests a positive consensus among the respondents about this statement.

6. To maintaining proper storing management systems or methods.

A. Data Analysis:

Calculation of Percentage-

Sl.	Name of option	Number of Questioner	Getting Response	% of getting response	
1	Strongly Disagree	40	0	0%	
2	Disagree	40	1	2.5%	
3	Neither agree nor disagree	40	5	12.5%	
4	Agree	40	14	35%	
5	Strongly agree	40	20	50%	

Table: 16

Calculation of mean value-

The formula for the mean= $\sum(f_i \cdot x_i)/N$

Where:

- f_1 =Number of respondents with respect to concern Likert scale value
- x_i =Likert scale value for concern statement
- N =Total number of respondents

Mean= $\sum(f_i \cdot x_i)/N$, follow these steps:

Data:

- **Strongly Disagree (1):** Frequency (f_1) = 0, Score (x_1) = 1
- **Disagree (2):** Frequency (f_2) = 1, Score (x_2) = 2
- **Neither Agree nor Disagree (3):** Frequency (f_3) = 5, Score (x_3) = 3
- **Agree (4):** Frequency (f_4) = 14, Score (x_4) = 4
- **Strongly Agree (5):** Frequency (f_5) = 20, Score (x_5) = 5

Step 1: Multiply each frequency (f_i) by its corresponding score (x_i):

$$f_1(x_1)=0(1)=0, f_2(x_2)=1(2)=2, f_3(x_3)=5(3)=15, f_4(x_4)=14(4)=56, f_5(x_5)=20(5)=100$$

Step 2: Calculate the sum of all $f_i(x_i)$

$$\text{Sum}=0+2+15+56+100=173$$

Step 3: Calculate the total number of respondents (N):

$$N=0+1+5+14+20=40$$

Step 4: Calculate the mean:

$$\text{Mean}=\text{Sum}/N=173/40=4.325$$

B. Result Discussion:

1. The result indicates that the majority of respondents strongly agree that to maintaining proper storing management systems or methods. However, there is a slight deviation as some respondents either agreed or were neutral on the statement. The overall perception is positive toward proper and safe storage practices.

7. to proper maintaining and supervision for distribution of user card to framers of the scheme.

A. Data Analysis:

Calculation of Percentage-

Sl.	Name of option	Number of Questioner	Getting Response	% of getting response	
1	Strongly Disagree	40	0	0%	
2	Disagree	40	2	5%	
3	Neither agree nor disagree	40	4	10%	
4	Agree	40	16	40%	
5	Strongly agree	40	18	45%	

Table: 17

Calculation of mean value-

The formula for the mean= $\sum (f_i \cdot x_i) / N$

Where:

- f_i =Number of respondents with respect to concern Likert scale value
- x_i =Likert scale value for concern statement
- N=Total number of respondents

Mean= $\sum (f_i \cdot x_i) / N$, follow these steps:

Data:

- **Strongly Disagree (1):** Frequency (f_1) = 0, Score (x_1) = 1
- **Disagree (2):** Frequency (f_2) = 2, Score (x_2) = 2
- **Neither Agree nor Disagree (3):** Frequency (f_3) = 4, Score (x_3) = 3
- **Agree (4):** Frequency (f_4) = 16, Score (x_4) = 4
- **Strongly Agree (5):** Frequency (f_5) = 18, Score (x_5) = 5

Step 1: Multiply each frequency (f_i) by its corresponding score (x_i):

$$f_1(x_1)=0(1)=0, f_2(x_2)=2(2)=4, f_3(x_3)=4(3)=12, f_4(x_4)=16(4)=64, f_5(x_5)=18(5)=90$$

Step 2: Calculate the sum of all $f_i(x_i)$

$$\text{Sum}=0+4+12+64+90=170$$

Step 3: Calculate the total number of respondents (N):

$$N=0+2+4+16+18=40$$

Step 4: Calculate the mean:

$$\text{Mean}=\text{Sum}/N=170/40=4.25$$

B. Result Discussion:

The mean value is **4.25**, which lies between "Agree" (4) and "Strongly Agree" (5). This indicates that the majority of the respondents lean towards **strong agreement** with the statement "To proper maintaining and supervision for distribution of user card to framers of the scheme. This reflects a positive perception of the storage practices.

8. To ensure after sale service regarding installing & maintaining the prepaid meter

A. Data Analysis:

Calculation of Percentage-

Sl.	Name of option	Number of Questioner	Getting Response	% of getting response	
1	Strongly Disagree	40	0	0%	
2	Disagree	40	0	20%	
3	Neither agree nor disagree	40	5	12.5%	
4	Agree	40	7	17.5%	
5	Strongly agree	40	28	70%	

Table: 18

Calculation of mean value-

The formula for the mean= $\text{Sum}(f_i x_i)/N$

Where:

- f_1 =Number of respondents with respect to concern Likert scale value
- x_i =Likert scale value for concern statement
- N =Total number of respondents

Mean= $\sum(f_i \cdot x_i)/N$, follow these steps:

Data:

- **Strongly Disagree (1):** Frequency (f_1) = 0, Score (x_1) = 1
- **Disagree (2):** Frequency (f_2) = 0, Score (x_2) = 2
- **Neither Agree nor Disagree (3):** Frequency (f_3) = 5, Score (x_3) = 3
- **Agree (4):** Frequency (f_4) = 7, Score (x_4) = 4
- **Strongly Agree (5):** Frequency (f_5) = 28, Score (x_5) = 5

Step 1: Multiply each frequency (f_i) by its corresponding score (x_i):

$$f_1(x_1)=0(1)=0, f_2(x_2)=0(2)=0, f_3(x_3)=5(3)=15, f_4(x_4)=7(4)=28, f_5(x_5)=28(5)=140$$

Step 2: Calculate the sum of all $f_i(x_i)$

$$\text{Sum}=0+0+15+28+140=183$$

Step 3: Calculate the total number of respondents (N):

$$N=0+0+5+7+28=40$$

Step 4: Calculate the mean:

$$\text{Mean}=\text{Sum}/N=183/40=4.575$$

B. Result Discussion:

The mean value of **4.575** indicates that the majority of respondents leaned toward "Strongly Agree" (5) that to ensure after sale service regarding installing & maintaining the prepaid meter. Since the mean is closer to 5 than to 4, this suggests a very high level of agreement among respondents. This result highlights a strong positive consensus on the statement provided.

9. Increase card recharge counter at farmer's village area.

A. Data Analysis:

Calculation of Percentage-

Sl.	Name of option	Number of Questioner	Getting Response	% of getting response	
1	Strongly Disagree	40	0	0%	
2	Disagree	40	0	0%	
3	Neither agree nor disagree	40	6	15%	
4	Agree	40	13	32.5%	
5	Strongly agree	40	21	52.5%	

Table: 19

Calculation of mean value-

The formula for the mean = $\sum (f_i \cdot x_i) / N$

Where:

- f_1 = Number of respondents with respect to concern Likert scale value
- x_i = Likert scale value for concern statement
- N = Total number of respondents

Mean = $\sum (f_i \cdot x_i) / N$, follow these steps:

Data:

- **Strongly Disagree (1):** Frequency (f_1) = 0, Score (x_1) = 1
- **Disagree (2):** Frequency (f_2) = 0, Score (x_2) = 2
- **Neither Agree nor Disagree (3):** Frequency (f_3) = 6, Score (x_3) = 3
- **Agree (4):** Frequency (f_4) = 13, Score (x_4) = 4
- **Strongly Agree (5):** Frequency (f_5) = 21, Score (x_5) = 5

Step 1: Multiply each frequency (f_i) by its corresponding score (x_i):

$$f_1(x_1)=0(1)=0, f_2(x_2)=0(2)=0, f_3(x_3)=6(3)=18, f_4(x_4)=13(4)=52, f_5(x_5)=21(5)=105$$

Step 2: Calculate the sum of all $f_i(x_i)$

$$\text{Sum} = 0 + 0 + 18 + 52 + 105 = 175$$

Step 3: Calculate the total number of respondents (N):

$$N = 0 + 0 + 6 + 13 + 21 = 40$$

Step 4: Calculate the mean:

$$\text{Mean} = \text{Sum} / N = 175 / 40 = 4.375$$

B. Result Discussion:

The **mean score** is **4.375**, which is closer to 4 (Agree) but leaning towards 5 (Strongly Agree). This indicates that, on average, respondents largely agree to strongly agree that Increase card recharge counter at farmer's village area.

10. To proper supervise and frequently meeting with framer's group of the deep tubewell scheme.

A. Data Analysis:

Calculation of Percentage

Sl.	Name of option	Number of Questioner	Getting Response	% of getting response	
1	Strongly Disagree	40	0	0%	
2	Disagree	40	2	5%	
3	Neither agree nor disagree	40	3	7.5%	
4	Agree	40	9	22.5%	
5	Strongly agree	40	26	65%	

Table: 20

Calculation of mean value-

The formula for the mean= $\sum (f_i \cdot x_i) / N$

Where:

- f_i =Number of respondents with respect to concern Likert scale value
- x_i =Likert scale value for concern statement
- N=Total number of respondents

Mean= $\sum (f_i \cdot x_i) / N$, follow these steps:

Data:

- **Strongly Disagree (1):** Frequency (f_1) = 0, Score (x_1) = 1
- **Disagree (2):** Frequency (f_2) = 2, Score (x_2) = 2
- **Neither Agree nor Disagree (3):** Frequency (f_3) = 3, Score (x_3) = 3
- **Agree (4):** Frequency (f_4) = 9, Score (x_4) = 4
- **Strongly Agree (5):** Frequency (f_5) = 26, Score (x_5) = 5

Step 1: Multiply each frequency (f_i) by its corresponding score (x_i):

$$f_1(x_1)=0(1)=0, f_2(x_2)=2(2)=4, f_3(x_3)=3(3)=9, f_4(x_4)=9(4)=36, f_5(x_5)=26(5)=130$$

Step 2: Calculate the sum of all $f_i(x_i)$

$$\text{Sum}=0+4+9+36+130=179$$

Step 3: Calculate the total number of respondents (N):

$$N=0+2+3+9+26=40$$

Step 4: Calculate the mean:

$$\text{Mean}=\text{Sum}/N=179/40=4.475$$

B. Result Discussion:

The mean score of **4.475** on the Likert scale indicates that the majority of respondents lean towards "**Agree**" (4) or "**Strongly agree**" (5) regarding the statement" To proper supervise and frequently meeting with framer's group of the deep tube well scheme." This suggests a strong positive perception among the respondents, highlighting that proper storage is perceived as important and well-practiced.

Chapter 6

Conclusion & Recommendation

6.1 Conclusion: The procurement of smart card-based prepaid meters for the Mujib Nagar Irrigation Development Project faced several challenges that impacted the project's timeline, efficiency, and objectives. The key issues identified as challenges in the procurement process that is- improper selection of suitable and good running deep tube well (DTW) with maximum command irrigation areas, lengthy process for selection and making standard specification, lengthy procurement process for collection of pre-paid meter by government procurement method, improper and unsafe storage of pre-paid meter and its accessories, lack of trained person or technicians for installation, operation and maintenance of prepaid meter, lack of availability of card recharge station or center, lack of coordination and supervision of project official's with farmers and deep tube well's (DTW) management group or team, insufficient electricity supply by the REB/ PDB.

6.2 Recommendations:

Based on the findings, the following recommendations are proposed to improve the procurement process for smart card-based prepaid meters-

1. The authority should be more tactical and realistic to select the area for deep tubewell installation.
2. Insure proper and effective communication method between the authority & deep tubewell management farmers group.
3. Should be more tactical and professional for technical in finalized the specification of smart card based prepaid meter.
4. Should take initiative to minimize the procuring time for the procuring item.
5. Simplify the procurement process by adopting e-procurement systems and reducing bureaucratic bottlenecks. This will help accelerate decision-making and ensure timely acquisition of necessary equipment.
6. Ensure proper place and safe storage of the meter & related accessories.
7. Take initiative for capacity building for the technical persons relate with the prepaid meter.
8. Ensure right person for the installation the meter & also ensure after installation service by vendor if necessary such as ensure that suppliers provide warranty services, technical support, and spare parts for a specified period.
9. To increase the card recharge center or point within casement area of irrigation.
10. Implement Risk Management Strategies
Develop risk mitigation plans to address potential delays and disruptions in procurement. This includes maintaining a contingency budget and diversifying supplier options.
11. Enhance Stakeholder Coordination
Establish a dedicated task force to improve communication and collaboration among project authorities, contractors, and vendors. Regular meetings and progress reviews can help resolve issues more effectively.

12. Benchmark the procurement process against successful similar projects in other countries to adopt proven strategies.
13. Introduce performance-based contracts to ensure accountability from suppliers and contractors.
14. Use the findings from monitoring activities to make necessary adjustments and improvements in real time.

By implementing these recommendations, the Mujib Nagar Irrigation Development Project can overcome procurement challenges and ensure the successful deployment of smart card-based prepaid meters, contributing to sustainable irrigation management and agricultural productivity in the region.

Chapter-7

Reference & Appendix

7.1 References:

1. Bangladesh Water Development Board. (2021). *Annual Report on Mujib Nagar Irrigation Development Project*. Dhaka, Bangladesh: BWDB Publications.
2. World Bank. (2020). *Public Procurement Guidelines for Developing Nations*. Washington, DC: The World Bank Group.
3. Hossain, M., & Rahman, S. (2019). Challenges in Implementing Smart Card Technology in Public Sector Projects: A Case Study from Bangladesh. *Journal of Public Administration and Development*, 34(2), 45-60.
4. Karim, M. A., & Islam, T. (2020). Innovative Solutions for Prepaid Metering in Irrigation Systems: Lessons from Developing Countries. *Irrigation and Drainage*, 69(4), 523–531.
5. Mujib Nagar Irrigation Development Project Official Page. (2022). Retrieved December 20, 2024, from <http://www.bwdb.gov.bd>
6. Government and Institutional Documents of Ministry of Agriculture. (2022). *Smart Metering in Agricultural Irrigation: A Policy Perspective*. Dhaka: Government of Bangladesh.
7. Central Procurement Technical Unit (CPTU). (2021). *Standard Tender Document for the Procurement of Goods*. Dhaka: CPTU.
8. Interviews and collect field Data through Personal Communication with Project Engineers, Mujib Nagar Irrigation Development Project in January-April 2024.
9. Focus Group Discussion with Farmers Using Prepaid Meters under Mujib Nagar Irrigation Development Project.
10. Smart Card Metering System Manuals provided by the Mujib Nagar Irrigation Development Project Team (2024).

7.2 Appendix:



Brac Institute of Governance and Development (BIGD)

BRAC University Survey Questionnaire

Research topics:

Challenges in procurement of smart card based pre-paid meter installation under Mujib Nagar Irrigation development project.

This survey is conducted for academic necessity for Masters in procurement and supply management in Brac institute of Governance and development, BRAC University. Your response is important and valuable to the researcher. The researcher is giving ensure to you that the information to be provided by you will be kept confidential & will be used only for academic purpose.

Part A: Respondent's Details [Please tick (✓) in respective box]

1	Name	:					
2	Occupation	:					
2	Designation(if in service)	:					
3	Name of the organization	:					
4	Length of service (if in service)	:	< 5yrs	5-10 yrs	11-15 yrs	16-20 yrs	>20 yrs
5	Length of experience in public procurement	:	< 5yrs	5-10 yrs	11-15 yrs	16-20 yrs	>20 yrs
6	Role in procurement	:	PE	Member Of TEC	Approving Authority	Tendered	others
6	Age	:					
7	Educational qualification	:					

Part B: Please tick (✓) only one number that best reflect your best opinion . Here 1= strongly Disagree, 2=Disagree, 3=neither agree nor disagree, 4=Agree, 5= strongly agree

Sl No	Statement	Scale				
Challenges in procurement of smart card based pre-paid meter installation under Mujib Nagar Irrigation development project.						
1	Selection of suitable deep tube well (DTW) with proper operation & maintenance by good farmer’s management group or team.	1	2	3	4	5
2.	Selection of good running deep tube well with maximum command irrigation areas.	1	2	3	4	5
3.	Lengthy process for selection and making standard specification of smart card based prepaid electric meter	1	2	3	4	5
4	Lengthy procurement process for collection of pre-paid meter by Government procurement method	1	2	3	4	5
5	Proper and safely storage of pre-paid meter and it’s accessories.	1	2	3	4	5
6	To make and distribution of user card for particular farmers of the deep tube well (DTW) scheme.	1	2	3	4	5
7	Lack of trained person or technicians for installation , operation and maintenance of prepaid meter	1	2	3	4	5
8	Lack of availability of card recharge station or center.	1	2	3	4	5

9	Lack of coordination and supervision of project official`s with farmers and Deep Tube well's (DTW) management group or team.	1	2	3	4	5
10	Availability of proper electricity supply by the REB/ PDB.	1	2	3	4	5
	Way to Confront the challenges					
1	At the project area visit various deep tubewell scheme and talk to farmers group about the operations and maintenance of the deep tube well.	1	2	3	4	5
2	Physical observation of deep tube well (DTW) scheme and its command area, Also inspection the DTW's pump-motor and talk with the farmers group about it trouble shooting.	1	2	3	4	5
3.	To collect the information from the electricity authority on the electricity supply in this scheme area.	1	2	3	4	5
4	To study and collect proper information and technical data of the prepaid electric meter.	1	2	3	4	5
5	To communicate the high officials for talking urgent action regarding approval and tendering method.	1	2	3	4	5

6	To maintaining proper storing management systems or methods.	1	2	3	4	5
7	To proper maintaining and supervision for distribution of user card to framers of the scheme.	1	2	3	4	5
8	To ensure after sale service regarding installing & maintaining the prepaid meter	1	2	3	4	5
9	Increase card recharge counter at farmer's village area.	1	2	3	4	5
10	To proper supervise and frequently meeting with framer's group of the deep tube well scheme.	1	2	3	4	5

Signature: