Chapter 7

The main objective of this chapter is to identify the key factors for the development of strategic information in the selected department of PSPCL
CHAPTER 7

This chapter enlists various important factors in the form of sub systems for the development of strategic information in the distribution network of PSPCL.

7.1 Introduction

Since the area of governance of PSPCL is very extensive the current system of information flow does not allow the strategic level management to have a full control over the operations. To have effective management it is very important that strategic level management should have access towards the critical activities of PSPCL. But in present setup the strategic level of management has got virtually no control over the critical activities. The basic purpose of this study is to make a model for accurate flow of information. In order to have a wider perspective it is very important that the strategic level of the management should monitor critical activities. The present set up of information flow does not take into account the most important activities of PSPCL. Firstly it is very important to enlist critical activities of PSPCL. The researcher has made this effort to firstly jotting down the critical activities of PSPCL and then clubbing the related activities into one basic activity. To start with a broad description has been made to enlist all the basic activities. This is very important aspect of the study because the researcher has tried to jot down the most critical activities of PSPCL and hence subsequent steps are based on this aspect.

7.2 Major Activities

1. Customer Services
• New connections
• Any changes in master data
• Disconnection
• Re-connection
• Grievance and queries
• Complaints
• Bill generation
• Bill distribution
• Revenue collection

2. Operations and Maintenance

• Equipment monitoring
• Monitoring, testing and commissioning of all equipments after maintenance
• Issuance of work permit for maintenance
• Supervision of equipment
• Workshop management

3. Processing

• Energy accounting and audit
• Realization
• Reconciliation
• Materials management
• Accounts
• Establishment

4. Material Management

This area covers the functions of the purchase, stores and inventory management

a. Purchase Management

Purchase management involves procurement of the spares/consumables on the basis of the indent rosters by users:

• Preparation of Bidding Document
Preparation of the notice inviting tender.
- Issue and receipt tenders.
- Tender Openings.
- Bid analysis.

- Comparative Statement Compilation
  - Bids Evaluation.
  - Selection of contractor and contract negotiation.
  - Issue of letter of intent.
  - Issue of purchase Order.
  - Post award contract Administration.
  - Review of goods Received.

b. Stores and Inventory

- It involves analyzing movement of goods to optimize inventory levels.
- Codification of various items and consumables.
- Receipts and Issue of Goods.
- Optimal level strategies for various spares/consumables.
- Review and risk coverage requirements.
- Valuation of inventory for accounting purposes.

5. Operations and Maintenance

- Monitoring of all equipments related to Sub-transmission and distribution.
- Preparation of Daily Performance Report.
- Issuance of Work Permit for Maintenance.
- Monitoring of Testing and commissioning of all equipments after maintenance.
- Fire and safety management.
- Performance Analysis and Optimization.

6. Maintenance

- There are three types of maintenance carried out by the departments.
- Routine Maintenance.
• Breakdown Maintenance.
• Annual / Capital Overhauling.

7. Energy Accounting and Auditing

• Energy accounting.
• To add receiving capacity, consumption.
• To calculate the losses.
• Ability to record energy imported and exported.
• Facility to record energy received to the consumption.
• Ability to generate bills according to the consumption.
• Capacity to compare the received and consumption at different locations.
• Calculate actual system losses at distribution and feeders.
• Ability to audit energy under prescribed parameters by PSPCL.

8. Establishment

• Establishment of policies and procedures.
• Recruitment, Staffing and Career Progression Services.
• Design of organizational structure.
• Induction and management Development Training.
• House Keeping Functions.
• Salary Sheet Preparation.
• Legal matters.

In this section the researcher has made an endeavor to identify key factors that are important for the development of strategic information in the distribution department of PSPCL. Keeping in view above critical activities that are performed in the distribution network an effort has been made to point out important factors that can cover all the aspects of the critical activities. Rather the researcher has gone one step further by making information systems that can provide information regarding all the key activities of PSPCL. These information systems are critical for the development of the model. With
the help of factor analysis the following section provides the key factors are important for the development of the strategic information in the distribution network. As discussed earlier that in order to take rational decisions it is very important that the strategic management should have information of all the important activities of PSPCL. In this section the important activities were listed so that the strategic level should not face any problem in taking any policy decision. Now once all the activities are identified and enlisted the second step is to jot down all the important factors that are essential for the development of strategic information systems. Based on the critical activities subsystems are developed

7.3 Distribution Network Management System

Distribution network management covers a number of key operational areas of the distribution department/ PSPCL. Optimal management of the distribution network would result in substantial cost savings for the distribution companies and automation of the same would go a long way in ensuring that PSPCL’s organizational objectives are achieved.

Some of the solutions included as part of the distribution network information management system include-

- Network Map Digitization.
- Network Information management System.
- Asset Management System.
- Sub-station Monitoring.
- Feeder Management System.
- Outage management
- Connection Information System.
• MRI Based Metering and Billing.
• Spot Billing.
• Billing and Collection.
• Electronic Bill Presentation and Payment.
• Complaint Handling System.
• Customer Relationship Management.
• Demand and Forecasting Management Solution.
• System Studies and Loss Assessment Solution.
• Congestion Management Solution.

Based on the functionality parameters of these information systems, a list of important factors is prepared for each information systems. Wherever there is ambiguity in the enlisting of these factors a factor analysis is applied to enlist most important factors for each information systems.

7.3.1. **Network Map Digitization**

7.3.1.1 **Requirement and functionality**

• Facilitates to view the assets installed in the field, provide static information related to its location and attribute related data of the assets installed. This provides a better system of data storage leading to superior management process plus enhancement of cost benefit ratio.

• Conduct network studies and use them to work out practical and affordable network improvement schemes.

• The system can be integrated with the Supervisory Control and Data Acquisition (SCADA) system and used for detecting network conditions in real time.
• Quick identification of the source a fault and hence more efficient dispatch of repair crew to the appropriate location. GIS mapping can thus assist the Facility Management System, Network Monitoring and Maintenance System and Customer Information Management System.

As the area of functionality of this information system is very wide, it is not possible to directly enlist the key factors based on the functionality parameters that are important for the smooth functioning of this information system. So a set of ten broad statements is presented to the respondents to know the factors. After getting the response a factor analysis is performed to reach to most important set of factors:

1. Should provide information about the property of the PSPCL.
2. Should provide information about the resources.
3. Should provide information about location.
4. Should provide information about network schemes.
5. Should provide better administration of assets.
6. Should provide accurate information about present system of management process.
7. Helps in the proper management of the data.
8. Should provide information about which are the key networks.
9. Should provide information about the layout of the system.
10. Should provide static information regarding location and assets.
7.3.1.2 FACTOR ANALYSIS

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<tr>
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Table-7.1 Rotated Factor Matrix

Looking at Table-7.1, the rotated factor matrix, the variable numbers 1, 2 have loadings of 0.964 and 0.945 on factor1. This suggest that factor1 in table-1 is a combination of these two variables. Similarly factor2 is the combination of variable numbers 3 and 10, factor 3 is the combination of variable numbers 5, 6 and 7 and factor 4 is the combination of variable numbers 8 and 9. So a combined interpretation is done on the basis of these four factors

Hence the key application areas of Network Map Digitization should be

- Help in knowing the assets installed in the field.
- Provide static information related to the location.
- Provide better system of data storage leading to superior management process.
- Conduct network studies and use them to make network schemes.
7.3.1.3. **Pre-Requisites for Implementation**

The utility should place its assets correctly on the accurate and reliable geographical maps of its service area.

- Availability of Supply Feeder Network Schematics or Single Line Diagrams. These are generally available for almost all the feeders for Indian utilities.
- Availability of LT Network sketches
- Equipment related engineering parameters and other data supplied by manufacturers. Generally, these data are availability readily with the utility or can be collected easily.
- Supply feeders drafted on the published geographical map as per the field layout of these feeders.
- Load data should be available for effective network analysis. Integration with SCADA can be beneficial.
- Conduct cost-benefit analysis of GIS implementation and its spread.

7.3.2 **Network Information management System (NIMS)**

7.3.2.1 **Requirement and Functionality**

- Documentation of sub-transmission distribution network and development of HT and LT networks and consumer database.
- Provides detailed information availability regarding the network layout i.e. under the ground route, conduits, electric cables, aerial route and poles etc.
- Segregation of the 333/11 KV load wise, feeder wise, distribution transformer wise and Sub-Station wise.
- Ability to plan network improvement and to calculate the costs for the same.
• Record of equipment maintenance history and audit of system maintenance.

As the area of functionality of this information system is very specific, it is possible to directly enlist the key factors based on the functionality parameters that are important for the smooth functioning of this information system.

Hence the key application areas of Network Information Management Systems should be

- Helps in the development of HT and LT networks.
- Record of equipment maintenance history.
- Provides detailed information regarding the network layout.
- Helps in documentation of sub-transmission distribution network.
- Ability to plan network improvement schemes.
- Segregation of load customer wise, distribution transformer wise and sub-station wise.

7.3.2.2 Pre-Requisites for Implementation

• Development of digitized land base and electrical network maps and indexing of electrical entities by proper application of GIS.

• Accuracy of data collection for 33, 11 KV and LT networks as well as data for consumers needs to be ensured by conducting walk-down surveys of the geographical areas.

• Linkages should exist with the Connection Information System, and Billing and Collection System.

7.3.3 Asset Management System

7.3.3.1 Requirement and Functionality
- Manage sub-station assets so that the unplanned downtime is minimized, unscheduled maintenance is reduced, investment in inventory is decreased, parts available is ensured, sourcing and procurement is streamlined, overall operational performance is improved and the need for the new expenditures is decreased.
- Profile assets and equipment and optimize maintenance activity.
- Complete identification of asset right from the procurement to the operational life and finally to the divestment.

As the area of functionality of this information system is very specific, it is possible to directly enlist the key factors based on the functionality parameters that are important for the smooth functioning of this information system.

Hence the key application areas of Asset Management Systems should be
  - Reduction of unplanned downtime
  - Helps to manage sub-station assets
  - Unscheduled maintenance is reduced
  - Sourcing and procurement is streamlined
  - Increase labour productivity
  - Investment in inventory is decreased
  - New capital expenditure is decreased

7.3.3.2 Pre-Requisites for Implementation

- Proper process for updating the asset condition so as to provide the system with all the relevant asset details
Data regarding the sub-station equipments, poles, transformers, meters, new connection, disconnections, maintenance and capital work should be procured and verified through field surveys. Interface with the NIMS would be required.

7.3.4. **Sub Station monitoring**

7.3.4.1. **Requirement and functionality**

- Sub station need to be monitored locally by Operation and Maintenance and remotely by System Operator. Routine operation and maintenance including planned and unplanned outages would be taken care of by local staff posted in the sub station.

- Remote monitoring system (SCADA- data acquisition system) interrogates electrical analog parameters and digital status from all major grid sub stations for real time demand supply matching, frequency and voltage management, load shedding and overall monitoring of network healthiness.

As the area of functionality of this information system is very wide, it is not possible to directly enlist the key factors based on the functionality parameters that are important for the smooth functioning of this information system. So a set of ten broad statements is presented to the respondents to know the factors. After getting the response a factor analysis is performed to reach to most important set of factors.

1. Should provide information about household demand
2. Should provide information about routine checkups
3. Should provide information about monitoring
4. Should provide information about maintenance schedule
5. Should help in forecasting demand
6. Should find the installed capacity
7. Help in existing supply
8. Should provide information regarding the deficit
9. Should provide information about availability of power
10. Should provide information about fluctuations in voltage
11. Should provide information about peak hours
12. Should provide information about agricultural demands
13. Should provide information about industrial demand
14. Should provide information about various operations

7.3.4.2 FACTOR ANALYSIS

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Table 7.2 Rotated Factor Matrix
Looking at Table 7.2, the rotated factor matrix, the variable numbers 2, 3 and 4 have loadings of 0.821 and 0.800 and 0.799 on factor 1. This suggests that factor 1 in table-2 is a combination of these three variables. Similarly, factor 2 is the combination of variable numbers 5, 6 and 7, factor 3 is the combination of variable numbers 9, 10 and 11 and factor 4 is the combination of variable numbers 1 and 13. So a combined interpretation is done on the basis of these four factors.

Hence the key application areas of Sub Station Monitoring should be

- Routine operation & Maintenance is taken care off

- Real time demand supply matching.

- Frequency & Voltage management.

- Load shedding.

7.3.4.3 Pre-Requisites for Implementation

- Equipment in the sub station shall be checked for compatibility with monitoring equipment and if not suitable, Distribution Company needs to Upgrade/ Repair/ Replace the respective components. If required, new equipments may be procured and installed in the Sub Station.

- Suitable communication system need to be finalized based on several selection criteria.

- Technical requirements capabilities, software needs, applications, compatibility with existing equipments/system and physical coverage for the remote data acquisition system shall be clearly brought out during conceptualization/ Preliminary stage itself.

7.3.5 Feeder Management System
7.3.5.1 Requirement and functionality

- Conduct feeder wise revenue analysis, extent of cost coverage at the bulk supply tariff and at average cost of supply
- Assessment of losses for each feeder and impact of losses on revenue
- Keep track of feeder maintenance and to ensure that the maintenance is carried out as per regulatory norms
- Quick identification of faulty feeder in case of supply interruption

As the area of functionality of this information system is very specific, it is possible to directly enlist the key factors based on the functionality parameters that are important for the smooth functioning of this information system.

Hence the key application areas of Feeder Management Systems should be

- Finding the impact of losses on revenue
- Load shedding
- Routine operation and maintenance is taken care off
- Overall monitoring of networks
- Frequency and Voltage management

7.3.5.2 Pre-Requisites for Implementation

- Proper data acquisition and communication system infrastructure
- Interface with the NIMS
- Clear understanding of regulatory norms and guidelines so that the system can be customized according to those norms

7.3.6 Outage Management Solution and Network Scheduled and Conditional Maintenance
7.3.6.1 Requirement and functionality

- Determine the place of outage and to locate the device causing the outage in order to increase the reliability of the electricity system.

- Built in graphic based tools to assist the operator in tracking the problem device more easily and accurately.

- Generate outage reports for each relevant device e.g. substation, transformer etc. for the purpose of submitting to the regulator on a timely basis.

As the area of functionality of this information system is very wide, it is not possible to directly enlist the key factors based on the functionality parameters that are important for the smooth functioning of this information system. So a set of ten broad statements is presented to the respondents to know the factors. After getting the response a factor analysis is performed to reach to most important set of factors:

1. Should provide information about position of the transformers.

2. Should provide information about key areas where needs special attention.

3. Should provide information about devices that are causing outages.

4. Should provide information about devices.

5. Should provide information about new and old installations.

6. Should focus on error prone installations.

7. Should provide information about problems in handling outages.

8. Should assist operators in fixing faults.

9. Provide various tools that help to find fault especially graphic tools.

10. Should report the outages.

11. Prompt action to rectify fault.
7.3.6.2 FACTOR ANALYSIS

<table>
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Table-7.3 Rotated Factor Matrix

Looking at Table-7.3, the rotated factor matrix, the variable numbers 1, 2 and 11 have loadings of 0.912, 0.901 and 0.922 on factor1. This suggests that factor1 in table 3 is a combination of these three variables. Similarly factor2 is the combination of variable numbers 5 and 6, factor 3 is the combination of variable numbers 8 and 9 and factor 4 is the combination of variable numbers 10 and 3. So a combined interpretation is done on the basis of these four factors.

Hence the key application areas of Outage Management Solution should be:

- Determine the place of outage.
- Helps to locate device causing outage.
- Built in graphic based tools to assist the operator in tracking problem.
- Generate outage reports for each relevant device.

7.3.6.3 Pre-requisites for Implementation

- A dynamic connectivity model must be developed among the devices in the field.
- Storing of information of normally open devices for exception reporting.
- Interacting of the system with mobile data devices in the field for quick communication with the utility’s outage restoration personnel.

7.3.7. Connection Information System

7.3.7.1 Requirement and functionality

- This system is required to better manage the process of acquisition of new connection, maintenance and updation of the database of metered consumers and to facilitate disconnections and reconnections in case bills are not paid.
- The solution has to integrated with the GIS database for consumers for prompt resolution of issues such as grant of new connection, reconnection and disconnection.
- Operational efficiency of the lineman and also the service levels for the consumers would register an increase with the implementation of this system.

As the area of functionality of this information system is very specific, it is possible to directly enlist the key factors based on the functionality parameters that are important for the smooth functioning of this information system.

Hence the key application areas of Connection Information System should be:
- Provides interface with the consumers.
- Grant the new connections.
- Helps in reconnection.
- Helps in disconnection.
- Maintenance of metered consumers.
- Better management of the acquisition of new connection.

7.3.7.2 Pre-Requisites for Implementation

- The GIS based consumer mapping has to be carried out and the GIS needs to be linked with this system to ensure that the maximum benefit can be derived from this system.
- Service level arrangements have to be reached either internally within different departments or with the vendors for properly addressing the customer requirement and also ensure the timely payment of bills by consumers.
- The system has to be linked with to the billing and collection system.

7.3.8. MRI Based Metering and Billing

7.3.8.1 Requirement and functionality

- The purpose of the MRI based billing is put a systematic process in place that transfers the information in electronic form from meters to base computer for bill generation, data analysis and detection of malpractices. Consolidated database of metering and billing history can be very useful for several analysis and MIS.
- MRI based billing system can yield remarkable achievement in terms of the revenue improvement and reduction in the theft and pilferage of electricity. MRI
based system eliminates human intervention at great extent hence reduces errors in the bills drastically and billing process becomes fast.

- Manage unbundled and consolidated billing accordingly to regulatory and the legal requirements.

As the area of functionality of this information system is very wide, it is not possible to directly enlist the key factors based on the functionality parameters that are important for the smooth functioning of this information system. So a set of ten broad statements is presented to the respondents to know the factors. After getting the response a factor analysis is performed to reach to most important set of factors:

1. Should provide information about problems in bill.
2. Should provide information about reasons about the malpractices.
4. Should provide information about proper evaluation.
3. Should provide information about knowing the techniques about the evaluation.
4. Should provide information about what is error in the system.
5. Should provide information about cause about the problem.
6. Should provide information about timely preparation of bills.
7. Should provide information about prompt knowledge of the loopholes.
8. Should provide information about the sensitive areas.

### 7.3.8.2. FACTOR ANALYSIS

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Looking at Table 7.4, the rotated factor matrix, the variable numbers 1, 7 have loadings of 0.921 and 0.920 on factor 1. This suggest that factor 1 in table 4 is a combination of these two variables. Similarly factor 2 is the combination of variable numbers 3 and 4, factor 3 is the combination of variable numbers 5, 6 and factor 4 is the combination of variable numbers 8 and 9. So a combined interpretation is done on the basis of these four factors.

Hence the key application areas of MRI Based Metering and Billing should be:

- Provides a systematic process for bill generation
- Helps in data analysis
- Assists in detection of malpractices
- Detection of theft

7.3.8.3. Pre-requisites for Implementation

- Suitable energy meters having local communication capability as well as data/event storage capabilities as desired should be put in place
- Meter output data format shall be standardized
For MRI based data downloading system, key pre-requisites are selection of the suitable data memory and capability to download all make of meters exists in the system. Apart from this, design of the logistic arrangements like meter reader route optimization, field training to meter reader staffs and clear data flow processes is essential.

7.3.9. Spot Billing

7.3.9.1 Requirement and functionality

- Metering billing and collection function is the most important activity of the revenue cycle for any distribution utility. The purpose of using spot billing machines is to shorten the revenue cycle and hence to increase the cash flow. The spot billing means the combining distinct activities of the meter reading, bill generation and serving of the bill of the consumer at the same time.

- Using Spot Billing, consumers gets different due dates, hence it avoid rush at the payment centers. Spot billing brings more focus on attending exceptions for the better customer satisfaction by means of reduction in billing error complaints, reduction in complains of non-receipt of bills, delayed receipt of bills etc.

As the area of functionality of this information system is very wide, it is not possible to directly enlist the key factors based on the functionality parameters that are important for the smooth functioning of this information system. So a set of ten broad statements is presented to the respondents to know the factors. After getting the response a factor analysis is performed to reach to most important set of factors:

1. Should provide information about place where bills centers should be located.
2. Should provide information about problems in the present system.
3. Should provide information about cash.

4. Create friendly environment.

5. Should provide information about reasons about the overcrowded deposit centres.

6. Should provide information about real time management.

7. Should provide information about reasons in the delay in payment.

8. Reduce billing error complaints.

9. Reduction in complaints of non receipt.


7.3.9.2. FACTOR ANALYSIS

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Table 7.5 Rotated Factor Matrix
Looking at Table 7.5, the rotated factor matrix, the variable numbers 1, 2 have loadings of 0.992 and 0.986 on factor1. This suggest that factor1 in Table 7.5 is a combination of these two variables. Similarly factor 2 is the combination of variable numbers 3 and 7, factor 3 is the combination of variable numbers 5, 6 and factor 4 is the combination of variable numbers 8, 9 and 10. So a combined interpretation is done on the basis of these four factors.

Hence the key application areas of Spot Billing should be:

- Helps in shortening the revenue cycle.
- Increasing the cash flow.
- Assigning different due dates.
- Detection of theft.

7.3.9.3. Pre-requisites for Implementation

Database containing following regarding consumers:

1. Consumer details (name, address, service number, contracted connections load etc.).
2. Administration jurisdiction of the consumers (Circle, Division, Section etc.).
3. Arrears, interest and other payment history of the consumers.
4. Tariff stricture for each consumer category (including any surcharges).
5. Meter status (healthy, faulty, change/new).
6. Format of electricity bill shall be finalized covering all essential details like Section Numbers, Consumer Number and category, Name and Address, Connected Load, Previous Reading and Present reading, Total units consumed,
Total Amount, Arrears, Surcharge and Net Amount, Date of billing and due date for the payment etc.

7.3.10. Billing and Collections

7.3.10.1 Requirement and functionality

- Keep track of billing (billed units, billed amount etc.), collection (collection amount, arrears, interest etc.) for the consumers as well as utilities.
- Information can be used for the forecast, revenue projections.
- Based on the analysis of such information, pilferage and the theft of the electricity can be detected.
- Disconnection list can be generated for defaulters.
- Precise and focused information to higher management.

As the area of functionality of this information system is very wide, it is not possible to directly enlist the key factors based on the functionality parameters that are important for the smooth functioning of this information system. So a set of ten broad statements is presented to the respondents to know the factors. After getting the response a factor analysis is performed to reach to most important set of factors:

1. Make user friendly bills.
2. Should provide information about billed amount.
3. Should provide information about collected amount.
4. Should track the deficit in billed amount and collected amount.
5. Should provide information about unbilled amount.
6. Should provide information about late submission of bills.
7. Should provide information about reasons for unbilled amount.
8. Should provide information about exact information about existing connections.

9. Should provide information about billed amount from the connections.

10. Should provide information about consequences for the defaulters.

7.3.10.2 **FACTOR ANALYSIS**

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**Table 7.6 Rotated Factor Matrix**

Looking at Table 7.6, the rotated factor matrix, the variable numbers 1, 2, 3 have loadings of 0.890, 0.828, and 0.821 on factor 1. This suggests that factor 1 in table 6 is a combination of these three variables. Similarly, factor 2 is the combination of variable numbers 4, 5, and 6 and factor 3 is the combination of variable numbers 7, 8, and 9. A combined interpretation is done on the basis of these three factors.

Hence the key application areas of Billing and Collections should be
- Keep track of billed amount and collected amount.
- Gives the list of defaulters.
- Provides the list of disconnections.

7.3.10.3. **Pre-requisites for Implementation**

- Consumer database.
- Design shall take care of integration with other billing and collection systems like spot billing, MRI based billing, payments through various options etc.

7.3.11. **Electronic Bill Presentation and Payment**

7.3.11.1. **Requirement and functionality**

- Improving collection is always a big challenge for any utility. Efficient, fast, hassle free and flexibility payment systems would lead to the higher revenue collection and reduction in the disconnection of services.
- Introduction of flexible, fast and hassle free payment option like computerized collection counters, payments through ECS, payment through credit card, collection counters under e-governance projects will yield greater revenue, better cash flow and better customer satisfaction.

As the area of functionality of this information system is very wide, it is not possible to directly enlist the key factors based on the functionality parameters that are important for the smooth functioning of this information system. So a set of ten broad statements is presented to the respondents to know the factors. After getting the response a factor analysis is performed to reach to most important set of factors:

1. Should provide information about reasons for the delay in payment.
2. Should provide data for computerized systems.
3. Should provide information about mode of payment.

4. Should provide information about problems in hard cash.

5. Should provide information about alternative modes of payments.

6. Should provide information about problem areas in the present system.

7. Should provide information about performance of the manual system.

8. Should plug the loopholes.

7.3.11.2 FACTOR ANALYSIS

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Table 7.7 Rotated Factor Matrix

Looking at Table 7.7, the rotated factor matrix, the variable numbers 1, 8 have loadings of 0.887 and 0.864 on factor 1. This suggest that factor 1 in table-7 is a combination of these two variables. Similarly factor2 is the combination of variable numbers 3, 4 and 5, factor 3 is the combination of variable numbers 2, 6 and 7. So a combined interpretation is done on the basis of these three factors.
Hence the key application areas of Electronic Bill Presentation should be

- Assist in efficient and fast payment.
- Payment through credit cards.
- Computerized collection centers.

7.3.11.3 Pre-requisites for Implementation

- Database containing following information regarding consumers.
- Consumer details (name, address, service number, category, contracted/connected load etc.)
- Administrative jurisdiction of consumer (circle, division, ERO, section etc).
- Arrears, interest and other payment history of consumers.
- Billing and payment dates.
- Agreement between utility and ECS service providers under guidelines of reserve bank of India for secure payments.
- Identify requirements to integrate it to the spot billing system and consumer management system.

7.3.12. Complaint Handling System

7.3.12.1. Requirement and functionality

- The main purpose of implementing this system is to attend the customer complaint 24 hours regarding the billing, metering, availability of supply, quality of supply or any other problem pertaining to operation and maintenance of distribution of supply
• This system helps in faster progress and resolving of the complaints since it tracks the status of complaints, provides information to higher management about unresolved complaints and provides feedback to customer as complaint is resolved.

As the area of functionality of this information system is very specific, it is possible to directly enlist the key factors based on the functionality parameters that are important for the smooth functioning of this information system.

Hence the key application areas of Compliant Handling System should be:

- Billing.
- Metering.
- Availability of supply.
- Quality of supply.

7.3.12.2. Pre-Requisites for Implementation

• Identify unique telephone number for all kind of complaints for recognizing the customers.

• Consumer database including name, address, service number, phone number etc.

7.3.13. Customer Relationship Management

7.3.13.1. Requirement and functionality

• Online availability of billing data for the consumers, facility to log complaints and track the status of progress, online registration for new connection, disconnection notice to be served online to the defaulting customers.

• Tracking the quality of supply to consumers.
- Create the facility for online payment either directly or through the third party vendor e.g. a bank.
- Rapidly access and manage customer accounts and up-to-date request information.
- Support call centre management in addition to the online based query system.
- Seamless integration with the Billing and Collection System to enable the utility to better track the customer energy usage and suggest real time improvements to the customers such as when to run energy intensive processes so as to save on the energy payment.
- Outage information to be made available in advance and on real time basis.
- Correct and easy information on tariffs and terms and conditions of power supply.
- Prompt reporting of complaint on quality of power supply like low voltages.

As the area of functionality of this information system is very specific, it is possible to directly enlist the key factors based on the functionality parameters that are important for the smooth functioning of this information system.

Hence the key application areas of Customer Relationship Management should be:

- Facility to lodge complaints.
- Rapid access and manage customer accounts.
- Prompt solution of complaint.
- Up to date request information.
- Provides online availability of billing data.
- Online query system.

7.3.13.2. Pre-Requisites for Implementation

- Detailed consumer indexing and mapping to poles.
• Creation and documentation of the consumer database.
• Identification of the needs and requirements of the consumers in terms of services desired and expected from the distribution network.
• Identify infrastructure requirements and employee training needs for setting up the call center facility.

7.3.14 Demand and Forecasting Management Solution

7.3.14.1. Requirement and functionality

• Forecast demand based on the historical data and account for the externalities like weather conditions, customer profile, competition, regulatory and policy decisions likely to affect the consumption.

As the area of functionality of this information system is very specific, it is possible to directly enlist the key factors based on the functionality parameters that are important for the smooth functioning of this information system.

Hence the key application areas of Demand and Forecasting Management Solution should be:

- Historical data.
- Externalities.
- Policy decisions.

7.3.14.2 Pre-Requisites for Implementation

• Integration with the Billing and Collection system to obtain the energy consumption, load supplied and connected load information at regular time intervals.
• Information about the consumption pattern and supply restrictions.
• Account for the various provisions of the tariff which may have an impact on the consumption pattern of the consumers.

• Accurate method of forecasting should be taken into account.

7.3.15. **System studies and loss assessment solution**

7.3.15.1 Requirement and functionality

• Determination of the network condition, identification of the areas of high/low voltage and system strengthening.

• Planning for expansion of system to meet forecasted demand, reduce over loadings and reduce technical losses.

• Assess technical losses in the network, which may help in detecting commercial losses.

• Simulate scenarios and prepare contingency plans to ensure system stability.

As the area of functionality of this information system is very wide, it is not possible to directly enlist the key factors based on the functionality parameters that are important for the smooth functioning of this information system. So a set of ten broad statements is presented to the respondents to know the factors. After getting the response a factor analysis is performed to reach to most important set of factors.

1. Should provide information about present layout.

2. Should provide information about gaps.

3. Should provide information about performance of the system.

4. Should provide information about desired performance about the system.

5. Should provide information about problems in the form of fluctuations.

6. Should provide technical information.
7. Should provide information about new technological advances.

7.3.15.2 FACTOR ANALYSIS

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Table 7.8 Rotated Factor Matrix

Looking at Table 7.8, the rotated factor matrix, the variable numbers 1, 5 have loadings of 0.719 and 0.798 on factor 1. This suggest that factor 1 in Table 7.8 is a combination of these two variables. Similarly factor 2 is the combination of variable numbers 3 and 4 factor 3 is the combination of variable numbers 6, 7. So a combined interpretation is done on the basis of these three factors.

Hence the key application areas of System Studies and Loss Assessment Solution should be:

- Determination of network connection.
- Identification of areas of high/low voltages.
- Planning for expansion of system.
7.3.15.3 Pre-requisites for Implementation

- Integration with the billing and metering solution to obtain load and connected load information at regular time intervals.
- Database of the network having details about network parameters.
- System to update network conditions and modifications.

7.3.16. Congestion Management Solution

7.3.16.1 Requirement and functionality

- Increased competition and choice of suppliers for the consumer contribute to entail new pattern of electricity flow and hence more uncertainty in the management of the distribution network. The Congestion Management Solution would aim to assist the distribution utility in dealing with this uncertainty.
- Identify points in the distribution network which are prone to congestion, analyze the scenario and performance appropriate methods to reduce congestion.
- Assist in network planning and expansion by ensuring that congestion points in existing network are taken care.
- Analyze the cost benefit of network expansion vis-à-vis demand side management to reduce congestion in the distribution network.

As the area of functionality of this information system is very wide, it is not possible to directly enlist the key factors based on the functionality parameters that are important for the smooth functioning of this information system. So a set of ten broad statements is presented to the respondents to know the factors. After getting the response a factor analysis is performed to reach to most important set of factors.
1. Should provide information about identification of networks.
2. Should provide information about networks where there is less traffic.
3. Should provide information about network where there is more traffic.
4. Should provide information about present network capabilities.
5. Should provide information about required capabilities.
6. Should provide information about gap in the present system.
7. Should provide information about impact of the gap on the system.
8. Should provide information about financial implications to rectify this gap.
9. Should provide information about financial position of the organization.

7.3.16.2 FACTOR ANALYSIS

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Table 7.9 Rotated Factor Matrix
Looking at Table 7.9, the rotated factor matrix, the variable numbers 1, 2 and 3 have loadings of 0.912, 0.931 and 0.953 on factor 1. This suggests that factor 1 in Table 9 is a combination of these three variables. Similarly, factor 2 is the combination of variable numbers 4, 5 and 6 and factor 3 is the combination of variable numbers 7, 8 and 9. So a combined interpretation is done on the basis of these three factors.

Hence the key application areas of Congestion Management Solution should be:

- Identify points in the distribution network which are prone to congestion.
- Assist network planning and expansion.
- Analyze cost-benefit of network expansion.

7.3.16.3. Pre-requisites for Implementation

- Identify the factors which impact of congestion management e.g. influence of compensation on price based methods of congestion management.
- Increase the network efficiency by curtailing technical and commercial losses in the system.
- Integration with the Network Management System so as to find out the possible sources of congestion based on the historical data.