Asset Management and Marketing Framework For Deregulation of Distribution System  
(an Empirical Study)  

1Reza Dashti, 2Shaghayegh Yousefi  
1University of Tehran.  
2Tarbiat Modares University.  

Abstract: In this paper, power distribution activities, including retailing and asset management, aimed to improve asset management and marketing quality in the power distribution system are described. At first, asset management targets and infrastructures are considered and the process corresponding to each stage is determined. The duties of retailers and asset managers are explained regarding the activities of each process. Therefore, all activities are represented as a Master Plan. Afterwards, a framework of factors effecting economic equations of retailing and asset management is provided, using which incentive economic equations are determined. Finally, overlapping points of the benefits of retailers and wipers in increasing the efficiency of distribution system and improving asset management are deliberated. This framework, which provides activities criteria, can also play the role of a comprehensive criterion of supervision, planning and evaluation. Moreover, it can judge the disagreements between retailers and asset managers.  

Key words: Asset Management, Retailer, Distribution Process, Framework.  

INTRODUCTION  

Equations and relationships of retailing market involve various players, among which are disperse generators, consumers, retailers and asset managers. Thus, the relationships among these players, economic equations, the structure of each player and clarification of competition among them are of crucial importance and need accurate consideration.  

For each economic product, distribution structure can be divided into three classes of disperse generators, retailers and asset managers. The relationships are determined based on governmental regulations. Michael, Andrew and Anthony (2007) extend prior research by examining how retailer-cause fit affects consumer evaluations of retailers’ cause-related marketing strategies. Barreda and Georgantzis (2002) discuss public policy towards vertical relations, comparing different types of contracts between a manufacturer and a maximum of two retailers. However, the main target of efficiency is to use the resources up to the consumers point. Perrigot and Pestana Barros (2008) analyze the technical efficiency of a sample of French generalist retailers by a two-step procedure. In the first step, four data envelopment analysis models are used to identify the efficiency scores.  

These relationships have to be defined in a way that external factors have a negligible effect on efficiency. Kaltcheva and Parasuraman (2009) introduce four relational models from the social sciences that are relevant for classifying retailer-consumer interactions. The construct of retail store image is typically built based on a variety of the store's functional attributes. This conceptualization fails to consider the role of corporate social responsibility policies and practices in forming store image (Gupta and Pirsch 2008). Quak and de Koster (2007) study the impact of governmental time-window pressure on retailers’ logistical concepts and the consequential financial and environmental distribution performance. The mentioned issues are only comprehensive when a framework is defined for activities and the relationships among the players of retailing market. In result, this paper provides a criterion and a substructure to optimize the activities and efficiency by representing a comprehensive framework for activities aimed to realize distribution targets. The relationships between retailers and other players are classified into four categories:  

• The relationship between retailers and retailing market: This relationship includes forecasting, price regulation, etc. Yan and Ghose (2010) develop a game-theoretic model to examine the value of forecast information about consumers' willingness to pay. Relationship marketing has taken on a significant role in both retail practice and academic study. Adjei, Griffith and Noble (2009) investigate this issue attempting to gain a greater understanding of the value of relationship marketing activities across targets (i.e., customers and suppliers) and within contexts (i.e., competitive intensity and three elements of market dynamism) on a retailer's ability to develop the capability of market responsiveness. Venkatesan, Mehta and Bapna (2007) propose that market characteristics interact with retailer characteristics to determine online prices.  

• The relationship between retailers and consumers: This relationship includes providing services for consumers, billing, etc. Pierre Sigüé (2008) develops two 2-period models to investigate the impact on channel decisions and profits of manufacturer-controlled and retailer-controlled promotions targeted at consumers.
Bäckström and Johansson (2006) investigate the substance of arguments about an experience-oriented economy and experience-seeking consumption in retailing.

- The relationship between retailers and disperse generators: This relationship includes contract conclusion, energy monitoring, etc. The purpose of (Lindblom, Olkkonen, Oliila and Hyvönen 2009) is to analyze suppliers' roles in category management in the context of Finnish and Swedish supplier–retailer relationships. Glenn, Richey, Tokman and Skinner (2008) examine the technological investments that retail managers must effectively manage in conjunction with supplier partners to reap superior gains.

- The relationship between retailers and competition: This relationship includes competition rules, marketing, services, etc. Xiao and Yang (2008) develop a price–service competition model of two supply chains to investigate the optimal decisions of players under demand uncertainty. Dickson and Urbany (1994) examine whether retail decision-makers' pricing reactions conform to the asymmetric conjecture specified in the classic kinked demand curve theory: that firms will tend to follow competitors' price cuts but not follow price increases. Algarni and Bhattacharya (2009) describe the operation structure in a retailing market. However, it is not comprehensive because distribution targets are not the only electric targets and depend on the rights of retailing stakeholders. Thus, respecting the fact that no studies have been conducted on the relationships between retailing and asset management, this paper clarifies these relationships and describes the framework of activities of each group.

Each player of retailing market, such as the retailer, requires policy-making, planning and management. Gabriel, Ferudun Genc and Balakrishnan (2002) analyze a series of retailer strategies to determine future loads using simulation at the hourly level for a simulated year. Teng (2009) establishes an economic order quantity model for a retailer who receives a full trade credit by its supplier, and offers either a partial or a full trade credit to its customers. An interesting feature of the data is that the price distribution in the absence of promotional activities first order stochastically dominates that under display or feature advertising (Rennhoff and Serfes 2009). When retailers conduct product assortment planning, they determine (1) The variety of merchandise, (2) the depth of merchandise, and (3) Service level or the amount of inventory to allocate to each stock-keeping unit (Mantrala, Levy, Kahn, Fox, Gaidarev, Dankworth and Shah 2009). Eenheer and Bjimolt (2008) examine antecedents of retailers' loyalty program adoption and their perceptions regarding loyalty program effectiveness. Yusta, Ramirez-Rosado, Dominguez-Navarro and Perez-Vidal (2005) define a technical-economic model of an electric energy service provider in the environment of the deregulated electricity market in Spain. Planning the retailers in order to increase efficiency can be performed in one of the following lines:


- Structure: The retailing structure and the corresponding relationships are criticized. Using an organizational theory framework, Sternquist, Rodney and Chen (2008) investigate the use of buying committees by Chinese retailers in the value chain.

An important method of efficiency improvement is to separate retailing and asset management activities. Activities of distribution companies are classified in two categories including marketing and asset management. Power transaction activities belong to the first category while asset management comprises activities respecting energy efficiency and power-related services. The method of separating the structures, processes and indices of each section is described in this paper to determine the activities of retailers and asset managers. This framework can be utilized in economic equations to motivate retailers and asset managers to conduct their activities accurately and realize distribution targets. This framework provides a criterion for execution planning, supervision, revision actions and economic equations and legal relations. Determination of the parameters of economic equations using various economic functions results in the specification of motivation amount or governmental emphasis. Using this framework, the points, in which the activities of each section overlap or in contrast with distribution targets can be recognized.

In the second section of the paper, targets and infrastructures of asset management are considered. Separation methods are described in the third section. The forth section covers the determination of a framework for asset managers. Retailing activities framework is presented in the fifth section. In the sixth section, economic
equations of asset managers and retailers are determined. Overlapping points of retailing and asset management activities are specified in the seventh section. The eighth section contains the results of implementing the model in TPRED and finally, the conclusion is represented in the ninth section.

**Asset Management Infrastructure:**

Distribution companies are expected to operate as economic enterprises. Therefore, their targets are specified respecting the profits of their stakeholders. Major stakeholders of distribution companies are customers, shareholders and the society, each of which has a different set of targets. Using the common language of asset, frameworks for power distribution tariffs, power market regulations and controlling tools are provided so that they can be easily utilized by distribution economic institutions in order to execute activities defined by the distribution asset management framework and also can guarantee the profits of the shareholders. Distribution company as an economic institution has to undertake the obligations defined by the government respecting the price determined in tariff strategy. This requires asset management planning in distribution system. Such planning suggests either developing the distribution network or keeping up with the current assets. Using a collection of natural resources, social economy (financial policies of the society), outer-society communications, etc, the government attempts to constantly and securely provide various high-quality commodities for the public. Thus, in order to fulfill governmental targets, asset governance is inevitable. In asset governance, indices-promoting activities are not discussed. Nevertheless, regulations are determined in a way to provide the distribution sector with enough motivation to increase the efficiency indices. Furthermore, to guarantee the accurate conduction of the activities, expectation limits are defined for the major indices and penalties are determined for distribution companies, which cannot achieve the expectation limits.

Customer bills are calculated based on tariff regulations defined by the government. This is criteria that used in power purchase, lateral costs of distribution companies, the market controlling rules determined by the government and other corresponding regulations. On the other hand, distribution companies have to improve the efficiency of resource utilization and to manage distribution assets and operate them in electrical market. Asset management with the help of DSP and DOS should improve the quality of services and also the efficiency. In result, electricity targets, which can also be considered as power distribution targets, are expressed as follows:

- Best service or service improvement
- Min money or efficiency improvement
- Customer asserts and environment

Asset management targets have to comply with distribution targets. Thus, it requires various infrastructures to realize the mentioned targets. These infrastructures are divided into three major categories including engineering, information and management. A managerial method, which improves asset management is to separate the activities of this segment from other activities of distribution companies.

**The Method of Separating Retailing and Asset Management:**

To separate retailing and asset management, the process illustrated in figure (1) has to be traversed.

![Fig. 1: Process of distribution system deregulation.](image-url)
To describe the implementation of deregulation process, the following two scenarios are represented:

**Scenario 1:**
In this scenario, retailers emerge to conduct marketing activities. They are in direct contact with the customers. They gradually develop and start to accept asset management activities, which they can outsource or manage.

As the retailers grow bigger, they change to the rivals of distribution companies. This model is demonstrated in Fig. 2.

![Fig. 2: Model of Scenario 1.](image)

This scenario is the final target of distribution system deregulation and requires long-term planning and management.

**Scenario 2:**
In this scenario, two sections of retailing and asset management independently exist and operate under the supervision of the distribution company from the beginning. This is shown in Fig. 3.

![Fig. 3: Model of scenario 2.](image)

It is of crucial importance to determine the relations in Fig. 3. This case is used as a transient state and also it’s sometimes utilized as a complement to scenario 1. Relations in Fig. 3 are clarified in this paper. The relationships of retailers and asset managers with distribution companies depend on the duties each section gives in order to achieve the targets of distribution companies. However, the relationships between retailers and asset managers involve the contrast of their benefits or the overlap of their activities.
**Asset Management Framework:**

Asset management mainly include development and operation activities. Both of them have to be planned in a way that distribution targets are achieved in the most economic way. The diagram of asset management activities aimed to realize its targets are as represented in Fig. 4.

![Asset Manager Diagram](image)

**Fig. 4:** Asset manager structure aimed to realize asset management targets.

Moreover, asset management technical indices used to evaluate asset management quality are as follows:
- Reliability
- Safety
- Voltage quality
- Loss
- Economic utilization of capacities

Therefore, asset manager duties must be as follows:

1. **Outage elimination**
   - Outage information
   - Recognition of fault location
   - Maneuver operation and supplying maximum possible number of customers
   - Suggestion of investment plans and projects in order to promote maneuver operations
   - Informing fault to crew of the maintenance
   - Accurate registration of outages
   - Considering respect, quickness and politeness in responding to customer
   - Applying new technologies
   - Suggestion of executive and investment plans can include the installation of new equipment on the network to reduce outage duration and speed up fault restoration (such as fault indicator, recloser, etc.)
   - Updating maneuver map
   - Observation and execution of guidelines including maneuver order, etc.
   - Maximum effort to supply maximum load
   - Coordination with dispatching
   - Accurate and proper completion of the Fault Information and Reporting part of the software

2. **Maintenance**
   - Receiving fault information
   - Defect recognition and loss
   - Dispatching a crew
   - Defect elimination
   - Informing outages crew to normalize the network
   - Suggestion of investment plans and projects
   - Accurate and proper completion of the defects Information and Reporting part of the software
   - Defects elimination in the determined period (one week for instance)
   - Fault declaration is considered as outage and actions regarding fault elimination and returning the network to normal state have to be taken as soon as possible (in the case of having an interrupter or needing a plan, the distribution company is responsible)
   - Planning and prioritizing the defects
   - Crews organization
- Presence of vehicles, personnel and maintenance materials in the location of defects
- Execution based on standards
- Informing outages crew to normalize the network immediately after fault elimination

3. Load control
- Load measuring
- Load analysis on feeders and substations
- Adjustment of load with capacity of equipments
- Suggestion of investment plans and projects

4. Inspection and preventing maintenance
- Periodic inspection of feeders and substations
- Collection and prioritization of the faults recognized in the inspection process
- Planning and execution of preventing maintenance
- Suggestion of investment plans and projects
- Analysis, prioritization and provision of inspection and maintenance plans require authorization and final confirmation of distribution companies.
- Planned outages are monthly authorized by distribution companies (for inspection and maintenance). Moreover, to inspect and maintenance has to be hotline.
- Execution based on the schedule.

5. Lighting
- Lighting defect elimination
- Inspection and maintenance of lighting network
- lighting adjustment with customer expected
- Keeping appropriate and standard lighting regarding the adjustment of passages lighting
- Maintenance of lighting network

6. Voltage management
- Gathering voltage information
- Analysis voltage information
- revision of designing and network planning
- Execution of revision projects
  - Capacitor installation
  - Earthing
  - ....

The Master Plan of asset management is represented as Appendix.1.

**Retailing Activities Framework:**
Retailing activities aimed at realizing business targets are divided into two categories including vending and purchasing services. Diagram of retailing activities is as demonstrated in Fig. 5.

**Fig. 5:** Retailing structure aimed to realize retailing targets.

Retailing activities indices are as follows:
1. Duration of connection establishment
2. Customer’s payment percentage
3. Duration of providing services
The three indices have to be considered in penalty relation. Therefore, retailer activities can be summarized as represented in Table 1.

Table 1: Description of retailer activities.

<table>
<thead>
<tr>
<th>Connection establishment</th>
<th>Connection services</th>
<th>Billing</th>
<th>Customer's payment</th>
<th>Connection maintenance</th>
<th>Information</th>
<th>Lateral</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Official:</strong></td>
<td>- accepting a new customer along with each ampere.</td>
<td><strong>Official:</strong></td>
<td>- Issuing duplicate bills - controlling/revising the bills - Responding to debt inquiries submitted by notary public offices</td>
<td><strong>Executive:</strong></td>
<td>- Examination, test and inspection of electricity meters - Connecting/de disconnecting debtor customers - Detecting and disconnecting unauthorized users</td>
<td><strong>Official:</strong></td>
</tr>
<tr>
<td><strong>Executive:</strong></td>
<td>- Inspecting the location and providing reports to sell a connection - Installing an electricity meter - determining the identification code of the new customer</td>
<td><strong>Executive:</strong></td>
<td>- Reading electricity meters - Distributing the bills</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The official services are provided according to the customer’s request and the corresponding costs are added to the final amount, which is calculated based on executive services. The Master Plan of marketing in sale section is represented in the appendix.

Retailing activities include either buying or selling a product. Buying activities happen as follows and relate to all players of retailing market except for the consumers:

- Electricity pricing
- Price forecasting
- Risk management
- Demand forecasting
- Consumer recognition
- Energy resources recognition

They also do not have any relationship with asset managers.

**Economic Framework For Asset Management and Marketing:**

Economic framework is one of the most important results obtained from asset management and retailing frameworks. These equations have to guarantee the motivation of retailers and asset managers towards accurate conduction of the activities mentioned in the two last sections. Thus, economic equations are determined based on key operational indices. On this basis, power transaction in accordance with specified tariffs is the best kind of relationship for the retailers. In such relationships, power price has to be determined in a way to cover the costs of mentioned activities and motivate the retailer to promote the indices. However, demand side management (regarding tariffs varying based on the time of day), loss reduction and increase of distributed generation (to reduce purchase price) have more than enough benefits for the retailers.

Asset management economic equations are defined based on the final price and the penalties related to the corresponding indices. At the first step, plans to revise the indices are prepared and projects are defined. Afterwards, the asset manager is held responsible to manage the indices according to plans. The costs of the asset management are calculated on the basis of activities final prices and the list of service costs. Nevertheless, the outcomes of the asset manager are assigned with respect to the improvement of indices.

**Overlapping Points of Asset Management and Retailing Activities:**

Interfering and overlapping points of wiring and retailing activities are divided into four classes, of which two are related to efficiency, one corresponds to service quality and one is associated with network reliability. In each part, absence of establishing coordination using legislation and process design leads to the contrast between the benefits and distribution, retailer and asset manager targets, conduction of activities in contrast with these targets, losing motivations, etc.

The four above-mentioned classes are as follows:
A) Reactive Power Compensation:
Reactor power compensation reduces the purchase of reactive energy and thereby, benefits the retailer. It also improves voltage and benefits the asset managers. Moreover, it reduces loss, which doubles the benefits of the retailer. Therefore, each one has to play a role in compensating reactive power and defining the corresponding equations to avoid extra costs and extra voltage resulting from excess capacitor installation.

B) Reliability:
Asset manager is responsible for unplanned or planned outages required for network maintenance and has to pay the penalties to the customers or retailers. However, the retailer also has to pay penalties in case of adding new customers, high power market prices. Penalty indices can be defined based on energy not supplied, outage duration, number of outages and other reliability indices. It is noteworthy that the amount of each penalty, the boundaries in which the penalty is applied and the method of determining the responsibilities have to be clarified locally.

C) Loss:
Asset manager is responsible for ohmic loss and also loss imposed by high impedances resulting from the absence of maintenance. It has to pay the corresponding penalties. On the other hand, the retailer has to undertake measuring and other illegal loss including unauthorized connections. Thus, the methods of separating loss in local systems and assigning responsibilities have to be determined. It has to be noted that these calculations are very complicated. However, in the first scenario the complications are significantly reduced.

D) Selling A Connection:
Selling a connection is considered as a business quality activity for retailers. However, it increases the load over the asset managers. Based on the load forecast, the asset manager conducts activities related to development and determination of operation activities. Therefore, coordination is essential in this section considering the need to represent information to the asset manager.

Proposed Framework Implementation:
The framework proposed in this paper has been implemented in TPREDC. This implementation, considered as a deregulation in power distribution industry, creates numerous challenges in compilation of rules and regulations. By determining financial and legal regulations and clarifying the relationships of asset manager and retailer with distribution companies and the organizational chart changes. Implementing this model results in the following benefits:
• Revision of asset management indices
  o 13 percentage loss reduction
  o 20 percentage reliability improvement
  o 12 percentage of costs is decreased
• Revision of marketing indices
  o 7 percentage improvement in accessible index is increased
  o 10 percentage increment in load factor
• Increase quality of human resources
• Fortification of private segment and the contractors
• Customer satisfaction
• Simplification of official processes
  o 5 percentage of process is removed

Conclusion:
In this paper, the framework of the activities related to asset management and retailing, as two separate parts of a distribution company, was represented. This framework has to cover the targets of the power distribution company, promote the technical and economical distribution indices and thereby, increase the efficiency and productivity. It determines asset management and retailing activities, duties description, economic equations, places having to pay penalties, activities interference points, etc. and can be used as a standard for planning, execution, supervision and taking correctional actions. It also can plan a leading role in financial budgeting, structuring and statistical process and determining distribution indices. At the moment, the authors of this paper are trying to find the methods to apply governance decisions to the framework.
REFERENCES


Appendix

Appendix 1
Asset Management Masterplan

Load management
- Load data base
  - Load information
    - Adjustment Balance and maneuver
      - Providing design

Voltage management
- Raising/falling of voltage levels
  - Load monitoring
    - Load information
      - Adjusting Balance and maneuver

Engineering
- Providing design
  - Evaluating the economy of plans
    - Requesting budget and credit

Protection management
- Database of protection equipment and time errors
  - Low-cost maintenance
    - Panic and coordination
      - Replacing plan and project

Maintenance management
- Scheduling the respective of periods
  - Inspecting the equipment
    - Replacing failures
      - Electrical defects database

Load factor Management
- Planning and scheduling inspection
  - Planning lighting adjustment
    - Inspection and identification of network weaknesses
      - Weak connection diagnosis

Outage management
- Receiving information on disconnection due to damages
  - Locating faults and disconnections
    - Messenger to supply power for the most possible number of customers and to minimize damages
      - Fault elimination

Lighting management
- Planning lighting current inspection
  - Increasing lighting at boundaries
    - Receiving information from customers
      - Lighting current meter readings

Marketing
- Asset operation
  - Execution based on maintenance and budgetary plans
A- Connection establishing management
B- Connection operation management
C- Connection evaluation management
D- Connection revision management
E- After-sale energy services management
F- After-sale connection services management