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Identifying the Risk Factors of the Distribution Section with the Help of Industry Experts to Provide New Insurance Products (Case Study: Power Distribution Company of Tehran)

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Abstract: Risk of any activity because of the uncertainty of the future has always been a challenging endeavor in the business category. The review of insurability criteria of a category in covering the arising risks arising that are apparently uninsurable can be very influential. Eventually amending the relevant terms and conditions, risk selection, appropriate and reasonable pricing, support of public sector and cooperation of public and private sector are presented as the most important factors facilitating the insurable making risks. And meanwhile, the role of the insurers and regulatory agency of that insurance institute in creating appropriate solutions for making interactions between the insurance experts and electric industry and careful review of affecting factors and analysis of insurance coverage for compensation of the damage that was the result of incident, cannot be ignored to enterprise in this part of the industry and gaining the satisfaction of its activists. The present research by identifying the risk factors for the distribution section with the help of industry experts of insurance has aimed to provide new insurance products and the case study was the Electricity Distribution Company in Tehran, explanation and effective discussions in relation to the risks involved in the distribution sector was reviewed.

Key words: Risk, pricing, insurance, electricity industry, Iran

INTRODUCTION

Electrical energy needs in developing countries, including Iran, are growing increasingly. Offering the electrical energy in Iran, like most developing countries has got monopolistic structure and ownership of all facilities is state-owned. High costs of distribution companies having clear legal framework articulated in relation to the construction, operation and transfer 1 contracts (are approaches to use the private sector in the construction project) and feasibility of handing power projects to the customers have provided an appropriate condition for the investments in the sector. In these approaches, often, anIndependent rojectcompany is set up that undertakes all work in construction, operation and financing. Therefore, all the risks associated with the commitment are on the project company. Thus, the risk management is very important in these projects. One of the methods that can be used to reduce the risk in these projects is insurance (Austin and Lavassani, 2010).

Development of insurance is symmetrical with economic development and the economy improvement and living standards will lead to the development of insurance; the mutual progress is that promoting insurance will be effective in improving livelihoods of people and economic development of the countries. In today's world, insurance is in such a position that can play a key role in the countries' social and economic development byensuringtheir overall economic activities. Several studies also indicate that there is a direct relationship between insurance penetration coefficient and per capita income of the countries. Hence, it can be said that the development and insurance are interdependent. It is clear by the fact that during the implementation of the fifth plan, the insurance industry will be crucial support for the country development (Mohapatra *et al*., 1984).

In the Electricity Distribution Company in Tehran, according to case studies only by purchasingengineering and theft insurance contracts can provide the necessary insurance coverage for possible further growth of this industry and can provide the partnership of more economic sectors of society. Finally, it should be noted that if necessary and legal grounds for the power industry with the necessary insurance coverage and providing more insurance penetration coefficient in the developing power industry is provided, insurers as confidence leverage can help for further development of the power industry in the country (Militant, 1983a, b).

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Regarding that in any activity and work there is the possibility of accidents and various events, the need to identify the risks involved in this industry and to choose its coverage methodfrom different ways is deeply felt. Because by an interruption however brief, in the power transmission cycle to the workshops, companies, factories, hospitals, homes, etc., a very heavy or irreparable damage may occur, this represents the protection and preservation of the frequency and continuity of electrification operations and power transmission to all the subscribers (Torshizi, 1387).

In view of the foregoing, this question arises that what are the insurance risk factors affecting the electric power distribution companies that can cause the improvement of serving process of this industry sector and can increase the satisfaction of its staff and subscribers?

MATERIALS AND METHODS

According to the audience and the point that this is an applied research to develop knowledge in a particular field and the necessity of the authorities' attentionto the variables is applied type and is descriptive in purpose. According to the data collection method of this research, it is a survey research.

The population and sample: The population of this study is managers and experts of Electricity Distribution Company of Tehran.

Sampling method: Sampling method is classified and all senior executives and industry experts were interviewed and for question assessment the Delphi method was used that the important factors will be identified after evaluating questions for several times and issuing with experts.

Data and information collection: According to the researcher's objective in research projects, a variety of tools were used to collectinformation that includes:library information and documentation of Electricity Distribution Company in Tehran, questionnaires, interviews. In this research, first to collect information in the field of theoretical and to develop the research literature the reviews with professors and experts as well managers of studied population were used (Sehhat and Dustkuh, 1390).

Prioritizing the risk factors of electricity distribution company using TOPSIS: This method was developed in 1981 by Huang and Ions. In this method, agent or option's m is evaluated by an individual or group of decision making individuals. This technique is based on the notion that each selected factor must have the minimum distance with the ideal positive factor (most important) and maximum distance from the ideal negative factor (least important factor). In other words in this method the distance of a factor from the positive and negative ideal factors is assessed and this is the criteria of grading and prioritizing the factors. The method steps include.

Table 1: Decision-making matrix (N)

	Effectiveness in reducing accidents and damage	Encouraging the consumer to the insurance
Type of indicators	Negative	Positive
Question 1	9	5
Question 2	9	10
Question 3	10	8
Question 4	3	4
Question 5	8	5
Question 6	2	4
Question 7	10	5
Question 8	10	6
Question 9	9	5
Question 10	2	3
Question 11	1	2
Question12	1	1
Weight	0.40	0.60

Creating a decision-making matrix: At this step a matrix will be drawn thatin its row the options and in column theindicator and in the final row the weight of each indicator is brought and in the intersection of rows and columns, the importance that each respondent have had for each of the options with respect to the relevant indicator is brought. In the case of indicators of effectiveness in reducing accidents and damage and encouraging the customer to the insurance, the points are from 1-10. Table 1 shows the project's decision-making matrix.

Creating a matrix of pairwise comparisons: To measure the priority of each of the criteria the pairwise comparison matrix is used. This means that the multi-expert idea is used and the amount each criterion's importance relative to other criteria is put in a matrix. Surly the main diagonal of matrix is 1and square. Each element that is at the top of the main diagonal, the reverse of itis at the bottom of the main diagonal (Table 2). With normalization and then averaging, the weight of each criterion is determined. Encourage the customer to reduce the impact of the accident and damage insurance.

Normalization of decision-making matrix (normalization): In order to be comparable, decision-making matrix by using the Eq. 1 is converted to normalized matrix or no-scale matrix (N1):

Table 2: Matrix of paired comparisons

Variables	Effectiveness in reducing accidents and damage	Encouraging the consumer to the insurance
Effectiveness in reducing accidents and damage	1	0.6
Encouraging the customer to the insurance	6/10	1

Table 3: Normalized matrix

	Effectiveness in reducing accidents and damage	Encouraging the consumer to the insurance
Type of indicator	Negative	Positive
Question 1	3.23741	1.34401
Question 2	3.23741	5.37603
Question 3	3.99680	3.44066
Question 4	0.35971	0.86017
Question 5	2.55795	1.34401
Question 6	0.15987	0.86017
Question 7	3.99680	1.34401
Question 8	3.99680	1.93537
Question 9	3.23741	1.34401
Question 10	0.15987	0.48384
Question 11	0.03997	0.21504
Question 12	0.03997	0.05376
Weight	0.40000	0.60000

Table 4: Weighted matrix

	Effectiveness in reducing accidents and damage	Encouraging the consumer to the insurance
Type of indicator	Negative	Positive
Question 1	1.29496	0.80640
Question 2	1.29496	3.22562
Question 3	1.59872	2.06440
Question 4	0.14388	0.51610
Question 5	1.02318	0.80640
Question 6	0.06395	0.51610
Question 7	1.59872	0.80640
Question 8	1.59872	1.16122
Question 9	1.29496	0.80640
Question 10	0.06395	0.29031
Question 11	0.01599	0.12902
Question 12	0.01599	0.03226

Equation 1:

$$n_{ij} = \frac{r_{ij}}{\sqrt{\sum_{i=1}^{m} r_{ij}^2}}$$

In this equation (r) is the concessions that indicatorshave awarded to each criterion. The normalization matrix is shown in Table 3.

Creating weighted matrix: To obtain a weighted matrix, each column of normalized matrix is multiplied on the weight of the same column (Table 4).

RESULTS AND DISCUSSION

Determining the positive idea and negative ideal factors: At this step, the criteria that according to the respondents are as the most important and least important criteria should be identified. In other words, for positive indicators, positive ideal is the biggest value of v and negative ideal is the smallest value of v also for negative indicators, positive ideal is the smallest value of v and negative ideal is the biggest value of v. Eq. 2 and 3 express this issue.

Table 5: Positive ideal and negative ideal of each indicator

Criteria	Negative ideal	Positive ideal
Encouraging the customer to the insurance	1.59872166	0.011598722
Effectiveness in reducing accidents and damage	3.22562	0.03226

Equation 2: Positive ideal:

$$A^+ = \left\{ \left(\max_i V_{ij} \middle| j \in J \right), \left(\min_i V_{ij} \middle| j \in J' \right) \middle| i = 1, 2, ..., m \right\} = \left\{ V_1^+, V_2^+, ..., V_n^+ \right\}$$

Equation 3: Negative ideal:

$$A^- = \left\{ \left(\min_i V_{ij} \middle| j \in J \right), \left(\max_i V_{ij} \middle| j \in J' \right) \middle| i = 1, 2, ..., m \right\} = \left\{ V_1^-, V_2^-, ..., V_n^- \right\}$$

In these equations, J is positive indicators and J' is negative indicators (Table 5). Calculating the distance from the positive and negative ideal. At this step, the distance of each of the options from positive and negative ideal is determined with regard to Eq. 4 and 5.

Equation 4: The distance of options from positive ideal:

$$d_i^+ = \sqrt{\sum_{j=1}^{n} \left(V_{ij} - V_j^+ \right)^2}; \; i = 1, 2, ..., m$$

Equation 5: The distance of options from negative ideal:

$$d_i^- = \sqrt{\sum_{j=1}^{n} \left(V_{ij} - V_j^- \right)^2}; \; i = 1, 2, ..., m$$

The distance of each of options from the positive and negative ideal is shown in Table 6. Calculating how close each of the indicators is to positive ideal and negative ideal indicators. At this step, how close each of the indicators is to positive and negative ideal (CL). is determined with regard to Eq. 6.

Table 6: The distance of indicators from positive and negative ideal

Indicators	Distance from positive ideal	Distance from negative ideal
Question 1	2.43821	1.4950195
Question 2	0.30376	3.4399601
Question 3	1.16122	2.5757768
Question 4	3.07539	0.5004579
Question 5	2.48673	1.2703311
Question 6	3.11401	0.4862104
Question 7	2.41922	1.7619161
Question 8	2.06440	1.9441208
Question 9	2.43821	1.4950195
Question 10	3.31234	0.2624651
Question 11	3.47764	0.0967648
Question 12	3.56407	3.808E-06

Table 7: Ranking the options

Rows	Options	Distance from positive ideal	Distance from negative ideal	CL	Ranks
1	Question 1	2.43821	1.49502	0.3801	5
2	Question 2	0.30376	3.43996	0.918862	1
3	Question 3	1.16122	2.575777	0.689263	2
4	Question 4	3.07539	0.500458	0.139955	7
5	Question 5	2.48673	1.270331	0.338118	6
6	Question 6	3.11401	0.48621	0.13505	8
7	Question 7	2.41922	1.761916	0.421397	4
8	Question 8	2.0644	1.944121	0.484997	3
9	Question 9	2.43821	1.49502	0.3801	5
10	Question 10	3.31234	0.262465	0.073421	9
11	Question 11	3.47764	0.096765	0.027072	10
12	Question 12	3.56407	3.81E-06	1.07E-06	11

Table 8: Order of criteria's priority

Raws	Items
1	With purchasing network equipment theft insurance can cover the damages from equipment theft
2	Giving Information and requiring subscribers to create card well in buildings and especially in new buildings and ringing it with neutral network can reduce the accidents of the subscribers
3	Provision of safety devices such as clothing, equipment and accessories reflective, safety equipment such as LED flag, reflective clothing, signalized are the factors ofreducing the accident rate on main roads that reduces damage
4	First aid training provided by the Bureau of safety and participating in monthly meetings helps to reduce risks and protect the health of its personnel
5	Devices such as Sewing of wired network and replacement of copper with self-sustaining cable will reduce the theft from the network
6	The use of electronic locks and monitoring and also scanning inside the posts via installing cameras will cause reducing theft of equipment of inside the posts
7	Extreme strictness of the state of public property thieves areas through the establishment of legal experts and the heavy fines imposed by the government for the thieves can be effective in reducing theft
8	Events and bugs in the air medium voltage networks play a major role in damages to the company's
9	Low voltage rolling blackouts has got high share allocated to unplanned outages that is a kind of damage
10	Medium voltage cable seals is one of the most important reasons for feeder cut or medium voltage network on land
11	Removing the highly specialized workshops high voltage (Sixoner and disconnectors) leads to the scrapping of the equipment and will cause the incidence of events
12	Failure to fix flaws highly morbid feeders (feeders that have had more than 5 times a month off) and overloaded transformers pave the way for major events in the network

Equation 6: Calculate the indices close to ideal agents:

$$CL_i = \frac{d_i^-}{d_i^- + d_i^+}$$

Ranking the options: At this step, the options are ranked based on the amount of CL in other words each option that has a higher CL will earn a better ranking because it has got more distance from the negative ideal and also is closer to in the positive ideal. The following table shows the ranking of options.

The results of the ranking option using Topsis techniques indicate that the option "with purchasing network equipment theft insurance can coverthe damages from equipment theft" has got the priority to the other options. Similarly, priorities of othercriteria have been determined.

CONCLUSION

In general, it can be said, the factor of identified factors' risk electricity distribution section has got effects on satisfaction of the subscribers and staff and these effects are positive. It also showed that the identified risk factors have got an improper state among the employees of power Distribution Company in Tehran is. In general, these results were obtained. Engineering consulting services and insurance services in the electricity distribution industry is available in three main areas, namely (equipments of distribution sector, personnel of distribution sector and suppliesof electric energy consumers (subscribers of distribution section), insurance companies that are active in the power distribution industry can cover one, two or all three areas.

According to the obtained results, power industry can be supported through the insurance industry and can reach to an agreement with complete coverage of its equipment and responsibility (property and liability) in exchange for a fit premium that needs the close collaboration of these two parts of the industry, it can also cover its damages resulting from power outages and unattained expected revenue in the form of lack of interest insurance. In addition, through dialogue and defining new fields of insurance cover other issues can also be covered and the concerns will be transferred to the insurer.

In general, the results showed that lack of awareness of insurance policy holders about the engineering insurance and its benefits, poor regulation, weak law enforcement, lack of professional personnel, risk assessment and engineering insurance services in state

monopoly are among the most important factors that inhibits the development of engineering insurance in the country.

Most of the participants in this study to identify the risk factors were men with a bachelor's level education that were approximately, 70% and this indicate that in terms of education this organization is in high level and has got the necessary engineering knowledge to identify the components.

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