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Sales Performance Evaluation Based on Borda Method

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Abstract
The performance evaluation of salesman is an important part of enterprise. In this paper, six real selling practices to 10 salesmen of a world top 500 company were analyzed based on Fuzzy supervision and method. The performance evaluation ranks results were 15 years ago, the tracking present status about the 10 salesmen verifies the related research method and assumption in the past. The performance evaluation method can be developed to many other domains.

1. Introduction

Salesman is a key factor to the success of any companies. Performance evaluation of salesman is related to such as knowledge skill, psychological personality, organization design, behavior and environment etc. The real sales practice of salesman can reflect their synthetic ability to great extent. Making use of Fuzzy supervision, not only qualitative but also quantitative evaluation can be obtained.

Fuzzy synthetic evaluation supplies the method and tool of quantitative analysis to salesman. In this method, to the factor set $U=\{u_1, u_2, ..., u_n\}$, evaluation result can be expressed by different class, appraisal and data. Assuming there are m kind of evaluation class or appraisal, the relevant evaluation set is $V=\{v_1, v_2, ..., v_m\}$. Because of the different extent of different evaluation factor, evaluation factor u_i is arranged relevant weight factor a_i, and $\sum_{i=1}^{n} a_i = 1$. Different weight assignments can lead to different synthetic evaluation results. The weight assignment of various factors can be described as $A=\{a_1, a_2, ..., a_n\}$. After getting U, V and A, evaluation set can be obtained through combining Fuzzy transform ($A°(U×V)$), see (Hu Shuli, 1994; Yan Lunbiao and Gao Yingyi, 1995). [1][2] The Fuzzy synthetic evaluation method had been gradually used in many cases such as nuclear power plant operators evaluation. [3] The relevant method can be as one of many ways to evaluate nuclear power plant operators. [4]

The progresses of Fuzzy synthetic evaluation can be induced as
a) confirming factor set;
b) doing single factor evaluation to each factor;
c) assigning the weight of various factors;
d) obtaining evaluation set through Fuzzy transform;
e) Fuzzy decision making.

2. Performance Evaluation of Salesmen

2.1. Confirming the Fuzzy Synthetic Evaluation Factor Set of Salesmen

In order to do human reliability research to salesmen, six sales practice real performance results are selected. They are low-end products (PRT1), middle-end products (PRT2), high-end products (PRT3), channel development (CUS1), system integrator development (CUS2) and key account development (CUS3). These real practice results can lead to the capacity of salesmen under restrained time facing to target and requirement. The real performance result percentage ratio of salesmen can reflect their ability to handle various complicated environments and events. This can be as their Fuzzy synthetic evaluation factor set.

Fuzzy synthetic evaluation factor set of salesman is B={PRT1, PRT2, PRT3, CUS1, CUS2, CUS3}.

2.2. Single Factor Evaluation About Synthetic Ability of Salesmen

In this paper, Borda score method is used to evaluate the synthetic ability of salesmen. Borda score method and Borda rule have been widely used in many researches such as

selection (Le Breton and Truchon, 1997) [5], healthy life research (Bleichrodt, 1997) [6] and social economy research (Fine and Simister, 1995) [7] etc. The calculation methods was discussed in detail by Wilfried (1993) [8] and Thierry (1998). [9]

Borda's decision rule as a method can be used in Fuzzy synthetic evaluation. Wilfried introduced the relevant method in 1993. Borda's rule of marks is probably the best-known procedure for aggregating a given set of m rankings into a single rank-order. From a formal perspective, it does not matter whether the rankings express the evaluations of alternatives by different persons or the comparison of the options with regard to different attributes or criteria. So, even though the rule was initially conceived as a group decision method, it could be adapted to deal with the problem of multiple criteria decision making faced by a single decision maker. In general, the rule specifies that the preferred option is found by calculating the mean rank position of alternatives. Table 1 shows a typical application of the rule. The rows of Table 1 pertain to the alternatives Y_i, and columns (a)-(c) contain the ranks r_{ik} assigned to the alternatives on three different occasions, labeled $R_1 - R_3$. The mean ranks, $\bar{r_i}$, are given in column (d), while column (e) reports the corresponding aggregate order.

Table 1. *Example of the mean rank decision rule.*

Alternative	(a) R_1	(b) Ranking R_2	(c) R_3	(d) Mean Rank $\bar{r_i}$	(e) Aggregate Order
Y_1	3	1	1	5/3	1
Y_2	2	3	4	9/3	3
Y_3	1	2	3	6/3	2
Y_4	4	4	2	10/3	4

The formula of synthetic evaluation is described as

$$B(x) = \sum_{i=1}^{n} B_i(x) \qquad (1)$$

$B_i(x)$ is the number of quantity that less than x in i kind of factor evaluation of factor set; n is the number that NPP operators attend experiments. The benefit of the method is the single factor based on different unit and content which belong to Fuzzy synthetic evaluation factor set can be changed to integer easily. When weight factor being added, the Fuzzy synthetic evaluation can be obtained rapidly. In this paper, the single factor in the factor set is the real achievement percentage ratio to different products and customers of salesmen.

In different product selling targets and customer developments, the Borda score of single factor evaluation to each salesman (achievement percentage ratio) can be obtained. Making use of weight fact table supplied by experts, the overall Borda score $B(x)$ can be calculated to make Fuzzy decision.

10 salesmen were tested among six real sales practices to get single factor evaluation research. The salesmen selling

performance can be obtained based on their actual performance. The actual data divided by sales target of each salesman, the achievement percentage ratio can be calculated. The actual response probability p of 10 salesmen to six selling targets is described in Table 2.

Table 2. *Achievements response probability of salesmen (p).*

No.	PRT1	PRT2	PRT3	CUS1	CUS2	CUS3
1	0.72	0.47	0.36	0.3		
2	0.86	0.81	0.66	0.55		
3	0.6	0.54	0.43	0.32		
4	0.92	0.74	0.6	0.49		
5	0.95	0.9	0.8	0.85		
6	0.99	0.8	0.7	0.8		
7	0.78	0.73	0.61	0.51		
8	0.96	0.72	0.9		0.86	0.97
9	0.76	0.39	0.48		0.77	0.62
10	0.98	0.99	0.94		0.91	0.92

2.3. The Weight Factor of Synthetic Evaluation of Salesmen

The weight factor ω suggested by experts is showed in Table 3.

Because the kinds of customer being different to each salesman, the weight factor is changeable for each different salesman. The suggestion of managers or advisors needs to be considered to apply.

For example, No. 1 salesman sells all kinds of product and develops channel. The evaluation items include 4 to the salesmen. They are PRT1, PRT2, PRT3 and CUS1. Obviously channel is important. Because channel partners can cover more areas in the region of the salesman, so the factor weight of CUS1 is most important. Among 3 kinds of product, high-end products could bring more profits, it should get more weight.

Table 3. Evaluation weight factor of salesmen (ω).

No.	PRT1	PRT2	PRT3	CUS1	CUS2	CUS3
1	0.1	0.2	0.3	0.4		
2	0.1	0.2	0.3	0.4		
3	0.1	0.2	0.3	0.4		
4	0.1	0.2	0.3	0.4		
5	0.1	0.2	0.3	0.4		
6	0.1	0.2	0.3	0.4		
7	0.1	0.2	0.3	0.4		
8	0.1	0.25	0.25		0.15	0.25
9	0.1	0.25	0.25		0.15	0.25
10	0.1	0.25	0.25		0.15	0.25

2.4. Synthetic Evaluation Results of Salesmen

The overall Borda score can be calculated through combing Fuzzy transform.

The Borda score about salesmen is described in Table 4.

To each salesman, the sum of total weight factor is 1, or $\sum_{i=1}^{n} \omega_i(x) = 1$. n is the number that salesman covers relevant items. The overall Borda score of each salesman is $B_t = \sum_{i=1}^{n} \omega_i(x) B_i(x)$. In order to calculate easily, the score is based on relevant ranks. The synthetic evaluation results of 10 salesmen are showed in Table 5.

Table 4. Borda score of evaluated salesmen (B).

No.	PRT1	PRT2	PRT3	CUS1	CUS2	CUS3
1	2	1	0	0		
2	4	7	5	4		
3	0	2	1	1		
4	5	5	3	2		
5	6	8	7	6		
6	9	6	6	5		
7	3	4	4	3		
8	7	3	8		1	2
9	1	0	2		0	0
10	8	9	9		2	1

For example, in low-end products item, 10 of 10 salesmen had the relevant results. No. 6 sales got highest score 9 because his achievement percentage ratio is highest.

The Borda score can be calculated in Table 5. For example, No. 2 salesman did four items. His Borda score is as below:

$$4 \times 0.1 + 7 \times 0.2 + 5 \times 0.3 + 4 \times 0.4 = 3.2.$$

The other Borda score can be calculated with the same method.

Table 5. Synthetic performance evaluation results of salesmen.

Operator No.	B_t	Ranks
1	0.4	10
2	4.9	4
3	1.1	8
4	3.2	7
5	6.7	1
6	5.9	2
7	3.5	6
8	4.1	5
9	0.6	9
10	5.75	3

2.5. Synthetic Ability Evaluation about Salesmen

The Fuzzy synthetic evaluation of salesmen is based on the value of both products selling and different customer development. The value is higher, the Borda score is bigger. The Borda score is bigger, the synthetic ability of salesman is stronger.

The evaluation result is influenced by many factors of salesmen such as age, education background, psychological factor and environment etc. The 10 salesmen were valuated 15 years ago. Their backgrounds were similar at that time. So the result of synthetic evaluation could represent their status.

2.6. Tracking Result About the Synthetic Evaluation

Based on the ranks 15 years ago, the present situation of 10 salesmen can verify the related analysis method and model.

Among 10 salesmen, the top 5 ranks have been promoted or appointed important work. These important positions include regional sales director, industry director and etc. The salesmen ranked 8, 9 and 10 had to leave company because of their both capability and performance issues. The evaluation result in the past reflected their relevant ability.

3. Conclusion

The Fuzzy synthetic evaluation method is used in the paper. The method is effective to the complicated factor environment. The quantitative evaluation will do good to the evaluation of salesmen. The method needs to be adjusted to different external environment. For example, with internet growing to some extent, the resellers will disappear gradually. More and more business is going to change to B2C model. [10] [11] The evaluation factor to salesmen also needs to change.

The evaluation actually needs to consider many factors. Especially to human beings, the evaluated targets are quite important. However, in further research, the related complicated such as psychological factor, environment factor

etc. can be analyzed in next step. Hope the method can be useful in other domains.

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