The Case Study of Relationship Marketing

Based on Fuzzy and Grey Correlation Analysis

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Abstract

Based on literature review, we can understand that customer's shopping habit is the nonlinear solution. This causes that the traditional deductive methods can't build a trustworthy model for building relationship. For solving this problem, this paper describes the two cardinal methodologies for the kernel of Relationship Marketing (RM). One is fuzzy set theory; the other is grey correlation analysis. Both of these methods can solve nonlinear equation and this paper also analyzes the difference between these two methods and scores them. Finally, we use some data from a company to demonstrate the performance of these two methods.

1. Introduction

In last two decades, variations of society are huge by 10 speeds. This condition makes businesses to do severe changing to fit the uncertainty investment market. The Relationship Marketing (RM) method was used to link sales and customers and to make customers satisfied. The famous example of RM is Amazon, the biggest internet bookstore. In this paper, we try to use RM in transportation industry.

In early stage, managers are difficult to measure the relationship between businesses and customers. The reason can be described by two ways. First, getting the data of customers shopping habits is very hard. Second, the methodology is also difficult to measure. So that, enterprises just can develop logotype or market difference for effect sales. By the trend of electoral commercial, sales use more and more information technology for getting the data of customers's shopping habits. The first problem had been solved. But based on literature review, we can understand that the customer's shopping habit is the nonlinear solution. This causes that the traditional deductive methods can't build a trustworthy model for building relationships. For solving this problem, this paper describes the two cardinal methodologies for the kernel of RM. One is fuzzy set theory; the other is grey correlation analysis. Both of these methods can solve nonlinear equations and this paper also analyzes the difference between these two methods and scores them.

2. Literature Review

2.1 Relationship Marketing

Relationship Marketing, which states that the principle purpose of business is to create and to keep customers, is rooted in the marketing philosophy [1].

Morgan and Hunt (1994) offer further that marketing field forward to relationship marketing in the last decade of the 20th century. Although the relationship of customers and companies is in short period of traditional marketing, RM is still different from traditional marketing. But RM is different from traditional marketing. RM focuses on developing reciprocal cooperated relationship between customers and companies in a long period [2]. But how do we do? Relationship will not make something out of nothing. Companies should to send a message to customers by some

strategies [3]. RM adopts these concepts above and tries to heave the customer's satisfaction and the value by diversification and individual methods [4].

Duboff thinks that factories should concentrate on regular customers who bring the greatest part of benefits and addresses 5 steps as the following [5]:

- Step 1: Find the worthy group
- Step 2: Find the worthy customers' shopping value
- Step 3: Analyze their shopping habit
- Step 4: Establish marketing plan for them
- Step 5: Check their satisfaction

However, how do we collect the customer information and differentiate it correctly? Fortunately, based on the rapid development of information technology, administrators can amass the information in business transactions database [6].

But managers still confuse by these data. Managers can use RFM method (Recency, Frequency, Monetary Value) to measure the relationship between customers and sales and to define who is the worthiest consumer [7-9]. But he can't find the customer exceptional interest. Based on papers of Woodside and Soni in 1991, expenditure behavior is not linear, especially by reciprocal effect of marketing methods [10-11]. Furthermore, the tactics of RM should change based on industry identities. That is why we use fuzzy and grey correlation analysis to solve this problem. In next section, we will explain the methodologies we used.

2.2 Fuzzy Theory

L. A. Zadeh introduced the fuzzy sets theory in 1965 [12-13]. The traditional set theory is using the concept of membership function to deal with the questions that can't be solved by two-valued logic of traditional set theory. After 1965, fuzzy sets have been applied to many fields such as decision analysis, system theory, artificial Intelligence, economics, and control theory.

Fuzzy set theory implements classes or groupings of data with boundaries that are not sharply defined (i.e., fuzzy). Traditional methodology or theory implementing "crisp" definitions such as classical set theory, arithmetic, and programming, may be "fuzzified" by generalizing the concept of a crisp set to a fuzzy set with blurred boundaries. The benefit of extending crisp theory and analysis methods to fuzzy techniques is the strength in solving real-world problems, which inevitably entail some degree of imprecision and noise in the variables and parameters measured and processed for the application. Accordingly, linguistic variables are a critical aspect of some fuzzy logic applications, where general terms such a "large," "medium," and "small" are each used to capture a range of numerical values. While similar to conventional quantization, fuzzy logic allows these stratified sets to overlap (e.g., a 90 kilogram man may be classified in both the "large" and "medium" categories, with varying degrees of belonging or membership to each group). Table 1 can show the different between crisp and fuzzy sets.

Crisp Sets	Fuzzy Set
Use 0 or 1 for weighting function	Use 0 to 1 for membership function
Accept or not	Accept gray condition
Duality	Multiple

Table 1: The difference of Crisp Sets and Fuzzy Set

The key point of fuzzy set is the membership function as figure 1. It is a continue function. The value of it is between 0 and 1. Therefore, we can define the relationship of membership function by 0 for no relationship and 1 for strong relationship.



Fig. 1: Triangular Fuzzy Number

2.3 Grey Correlation Analysis

In 1982, Deng initiated grey system theory. This theory can deal a system with insufficient information contained. And grey correlation analysis is one part of grey theory. This method is believed to have captured the relationship between the main factor and the other reference factors in a given system [14-16]. Here, we apply this technique to relate the reference sequence to the comparison sequence, which show some degree of satisfaction to the reference one such that the best comparison sequence can be determined. The process of grey correlative analysis is illustrated as figure 2.



Fig. 2: Grey Correlation Analysis Process

3. Case Study

3.1 Brief of Company A

Company A is a transportation industry. The main profit is from transiting people between Taipei and Kaoshung, Taiwan. Based on company A's annual statement in 2001, business volume is 253 million. In 2002, company A wants to conduct relationship marketing for heaving it's business volume into 300 million. Company A import intelligent transportation system and formulate 6 tactics for achieving this goal.

Based on questionnaires from June-1999 to August-2001, passengers' shopping frequency can be showed as figure 3. Customers' frequency is normal distribution and the skew to the right.



Fig. 3 Passengers' Shopping Frequency Bar Chart (Unit: Frequency Per Year)

3.3 Analysis Parameters

In this paper, we define that satisfaction can be explain by sum of safety, on schedule, cheerful degree, convenience, and ease. Questionnaires provide the relationship between 6 tactics and 5 parameters. The matrix can be shown as table 2.

			l l		
	Safety	On Schedule	Cheerful Degree	Convenience	Ease
Tactic A	9.00	26.51	26.51 25.00 7.00		0.50
Tactic B	10.30	60.00		6.00	0.33
Tactic C	11.80	32.26	30.00	5.00	0.67
Tactic D	6.70	22.22	80.00	6.00	0.55
Tactic E	8.50	25.00	60.00	8.00	0.67
Tactic F	12.50	56.45	40.00	7.00	0.47
MAX	12.50	56.45	80.00	8.00	0.67
Min	6.70	22.22	25.00	5.00	0.33
Idea Value	12.50	56.45	80.00	8.00	0.67

 Table 2 : Questionnaires Survey Result

3.3 Analytical Process

3.3.1 Fuzzy Method

By fuzzy method, we can measure the relationship between tactics and customers' satisfaction as figure 4 and equation (1).



Fig. 4 Total Performance Fuzzy Number

Total Performance Fuzzy Number = \sum (Weighting Fuzzy Number × Parameter Fuzzy Number) (1)

Table 3 : Parameters' Fuzzy Number							
	Low Satisfaction	Normal Satisfaction	High Satisfaction				
Safety							
On Schedule							
Cheerful Degree							
Convenience							
Ease							

 Table 4 : Tactics' Total Performance Fuzzy Number

	Fuzzy Number	Sorting
Tactic A		6
Tactic B		4
Tactic C		3

Table 4 : Tactics' Total Performance Fuzzy Number (continue)					
	Fuzzy Number	Sorting			
Tactic D	0 0.43 1	5			
Tactic E		2			
Tactic F		1			

3.3.1 Grey Correlation Analysis Method Following figure 2, grey correlation analysis can get performance by table 5-7.

 Table 5 : Data Process							
Data Process	Safety	On Schedule	Cheerful Degree	l Degree Convenience			
Tactic A	0.40	0 0.13 0.00		0.67	0.50		
Tactic B	0.62	0.00	0.64	0.33	0.00		
Tactic C	0.88	0.29	0.09	0.00	1.00		
Tactic D	0.00	0.00	1.00	0.33	0.65		
Tactic E	0.31	0.08	0.64	1.00	1.00		
Tactic F	1.00	1.00	0.27	0.67	0.41		
Idea Value	1.00	1.00	1.00	1.00	1.00		

Tuble o Weighting Tuble							
	Safety	On Schedule	Cheerful Degree	Convenience	Ease		
Subjectively Weighting	0.324	0.294	0.176	0.059	0.147		
Objective Weighting	0.200	0.190	0.190	0.228	0.192		
Total Weighting	0.293	0.268	0.180	0.101	0.158		

Table 6 : Weighting Table

	Safety	On Schedule	Cheerful Degree	Convenience	Ease	Correlation Degree	Sorting
Tactic A	0.62	0.53	0.50	0.75	0.67	0.60	6
Tactic B	0.73	0.50	0.73	0.60	0.50	0.62	5
Tactic C	0.89	0.59	0.52	0.50	1.00	0.72	2
Tactic D	0.50	0.50	1.00	0.60	0.74	0.64	4
Tactic E	0.59	0.52	0.73	1.00	1.00	0.70	3
Tactic F	1.00	1.00	0.58	0.75	0.63	0.84	1

Table 7 : Grey Correlation Degree

4. Discussions, Conclusions and Suggestions

By case study above, we can know that the result of analysis is almost the same. By fuzzy method, the performance of tactic F is the best. The ranking is tactic F > tactic C > tactic B > tactic D > tactic A. By grey correlation method, the performance of tactic F is the best. The ranking is tactic F > tactic C > tactic C > tactic D > tactic B > tactic A.

By table 4 and 7, the gap of fuzzy is smaller than grey correlation method.

This paper applied two analytical methods to measure the relationship between customers and sales. After the discussion above, we can offer conclusions as the following:

- 1. Fuzzy and grey correlation method can explain the relationship between passengers and sales.
- 2. The results of fuzzy and grey correlation method are almost the same.
- 3. The gap of fuzzy is smaller than grey correlation method.

In this paper, we do not collect data about feedback after company A change it's marketing tactics. We expect to get to after six month. After that, we can verify the tactics effectiveness. We also suggest that researcher may analyze the financial affairs in relationship marketing field. Finally, we think fuzzy and grey correlation analysis are power methodology and suggest researcher may use them to solve another field.

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