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The Application of Analytic Network Process in Brand Crisis Management: A Case of the Chery and Geely of China

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Abstract: Analytic network process is a new kind of decision-making method that deals with the relationship of dependence and feedback and it was developed and evolved from the foundation of analytic hierarchy process. When it comes to brand crisis management it contributes significantly and vigorously to the survival and development of companies in a more and more competitive world nowadays. This paper comes up with 12 criterions of crisis management from three dimensions: strategic criterions, operational criterions and financial criterions. Meanwhile it takes a case of the national brands CHERY and GEELY of China and applies analytic network process to analyze the 12 criterions mentioned above. Then, a conclusion was drawn: CHERY does a better job than GEELY in terms of brand crisis management according to the outcome of our research.

Key words: Analytic network process, national brands, brand crisis management, indicator analysis

INTRODUCTION

It is really a time that corporations' brand crisis can happen easily and unpredictably. With existence of the uncertainties of outward environment and problems and deficiencies of brand crisis management of corporations themselves, brand crisis may come up suddenly and abruptly during the process of corporations' development and growth (Kuklan, 1988). Brand crisis management plays a more and more important role for survival and prosperity of corporations under the circumstance in which competition seems fierce and vigorous in the marketing nowadays. It is a directive sign of corporations' core competence that whether corporations can deal with brand crisis successfully or not. In fact, brand crisis management has become a compulsory course for healthy expanding of corporations' fate (Doug, 1998; Laureen, 2008). As we know, Toyota recalled its cars (e.g., the Camry, the Yaris and the Carola Brand) with the sum total of 688314 because of the fault of components and parts on 25th, August, 2009. This incident, namely recalling of Toyota, reduced and depressed the assets of Toyota brand to some degree. Therefore, whether tackling the brand crisis timely and appropriately or not correlates closely and tightly with the competence for Toyota to grow continually. Jiugui Liquor is a well-known brand of Chinese Liquor industry. However it was detected that plasticizer exceeded the standard by 2.6 times on

November 19th, 2012. Influencing by this incident, Jiugui Liquor had no choice but to accept temporary suspension. Actually, the incident of plasticizer are harmful and pernicious for Chinese white spirit the whole market, like Maotai, the direct loss is falling of its market and stock value. Besides Toyota, Jiugui Liquor, Shuanghui, Nongfu Spring water etc, these brands all have faced brand crisis more or less. Even Macdonald and KFC also got into trouble because of publicity of fast-growing chicken. Facing these scandals, customers cannot help wondering: which brand can I should believe on earth? Why did it happen? Who should be responsible for the brand crisis, government or corporation?

Brand crisis influences corporations' survival and development directly, for Toyota and for those brands that are still in the stage of emerging and evolving in China. When a brand crisis breaks out, the victims are not only consumers but also corporation itself and society. In a word, brand crisis is always there, the research of which seems very essential and necessary.

Analytic network process is a new kind method that facilitates the manager to realize the management of quantitative one rather than qualitative one. Taking the example of CHERY and GEELY, two well-known national brand of cars, this paper analyzes the effects of crisis management from three dimensions: financial one, strategic one and operational one. There are 12 indexes of

the three dimensions in total. This paper mainly make analysis about which company (CHERY and GEELY) do a better job in terms of brand crisis management with application of analytic network process.

PRINCIPLE OF ANALYTIC NETWORK PROCESS

Analytic network process is a new kind of decision-making method that was proposed by an outstanding American professor, T.L. Saaty. Analytic network process adapts to situations that are characterized by non-independent hierarchical structure. It was evolved from the foundation of analytic hierarchy process and it is considered as a practical and innovative method for making decisions. Its structure contains two parts: controlling layer and network layer. In controlling layer, there are principles and objectives of decisions. Generally, the principles are supposed to be mutually independent and they can only be affected by the objectives of the decisions. Network layer consists of components that are ruled by the controlling layer. It is a network structure in which the components are closely correlated with each other and having relationship of dependence and feedback. In the analytic network process, all the components are interconnected compactly (Xiaoli and Junwen, 2006). Figure 1 explains the basic and elementary analyzing structure of analytic network process

(Wang, 2001; Chi *et al.*, 2012). Generally speaking, after construction of control level, analysis network process has three steps (Li and Tang, 2012).

Step one: Construction of unweighted super-matrix:

A network layer is supposed to be composed by $C_t (t = 1, 2, 3, \dots, n)$, for every layer, there are components $e_{11}, e_{12}, \dots, e_{1n}$ to combine, so, the correlation and interconnection of layers can be shown by the unweighted super matrix. An unweighted super matrix M_0 is constructed under every control criterion when making pair wise comparison between components. During this process it is necessary to regard the criterion $P_s (s = 1, 2, \dots, n)$ as a principal criterion and a certain component $e_{ij} (j = 1, 2, \dots, n_s)$ of components C_i as a sub-principal criterion. A judgement matrix is formulated on the basis of impact that components influences on e_{ij} . Then, normalized feature vectors ($m_{11}^{jk}, m_{12}^{jk}, m_{13}^{jk}$) can be concluded. Put normalized feature vectors together, we can obtain M_0 and it represents the effect that component i have on component j . In fact, we can get n unweighted super matrix in total, in condition that other components being treated as a principal component. Here, M_0 is called unweighted super matrix mainly because this matrix is not normalized-just every part m_{ij} is normalized. Therefore it cannot indicate priorities of each component, further weighted super matrix is needed:

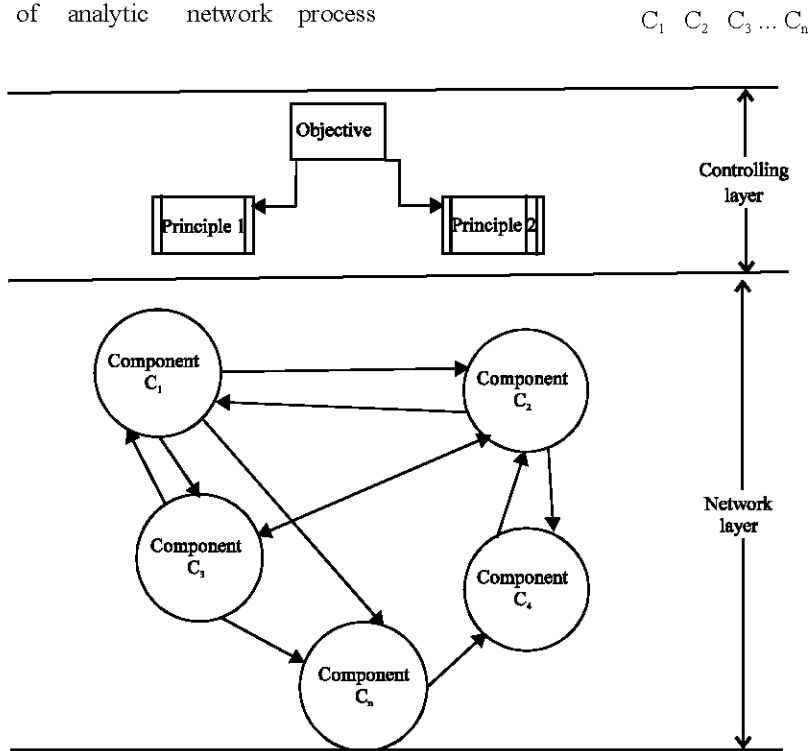


Fig. 1: Analysis structure of ANP

$$M_0 = \begin{matrix} c_1 \\ c_2 \\ c_3 \\ \vdots \\ c_n \end{matrix} \begin{bmatrix} m_{11} & m_{12} & \dots & m_{1n} \\ m_{21} & m_{22} & \dots & m_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ m_{n1} & m_{n2} & \dots & m_{nn} \end{bmatrix}$$

m_{ik} represents the degree of impact that the i th components influence the components of the k th layer. Often it is measured by order of importance. The m_{ik} is a section of the un-weighted super matrix. Generally its form lies below:

$$m_{jk} = \begin{bmatrix} m_{j1}^{k1} & m_{j1}^{k2} & \dots & m_{j1}^{kn} \\ m_{j2}^{k1} & m_{j2}^{k2} & \dots & m_{j2}^{kn} \\ \vdots & \vdots & \ddots & \vdots \\ m_{jn}^{k1} & m_{jn}^{k2} & \dots & m_{jn}^{kn} \end{bmatrix}$$

Step two: Construction of weighted super-matrix: Making pair wise comparison between components rely on principal criterion P_s and sub-principal criterion C_i . Then judgement matrix x_k can be calculated. After normalization, we can get normalized feature vector $(x_{1k}, x_{2k}, \dots, x_{nk})^T$.

Finally, a matrix M_s that can reflect relationship of priority of each component is confirmed under a certain criterion. Having M_s , weighted super matrix can be calculated as following: $M_n = M_0 M_s$, M_n stands for weighted super matrix:

$$x_k = \begin{matrix} c_1 & c_2 & c_3 & \dots & c_n \\ c_1 \\ c_2 \\ c_3 \\ \vdots \\ c_n \end{matrix} \begin{bmatrix} x_{11}^k & x_{12}^k & \dots & x_{1n}^k \\ x_{21}^k & x_{22}^k & \dots & x_{2n}^k \\ \vdots & \vdots & \ddots & \vdots \\ x_{n1}^k & x_{n2}^k & \dots & x_{nn}^k \end{bmatrix} \rightarrow \begin{matrix} x_{1k} \\ x_{2k} \\ \vdots \\ x_{nk} \end{matrix}$$

$$M_s = \begin{matrix} c_1 & c_2 & c_3 & \dots & c_n \\ c_1 \\ c_2 \\ c_3 \\ \vdots \\ c_n \end{matrix} \begin{bmatrix} x_{11} & x_{12} & \dots & x_{1n} \\ x_{21} & x_{22} & \dots & x_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ x_{n1} & x_{n2} & \dots & x_{nn} \end{bmatrix}$$

Step three: Calculation of limited super-matrix: Generally, the order of every component is in the network layer under certain criterion. Each column of each row is normalized vector in the un-weighted super matrix. However, the impacts of other layers on the certain criterion have not been taken into consideration. If we expect the outcome of the priority relatively accurate, we should regard each layer as one component and make pair wise comparison in terms of one certain layer and calculate corresponding priorities. Here, a^{ik} represents the function priority that the i th layer

influences on the k th. In the formula $M = \lim_{k \rightarrow \infty} M_n^k$, M_n represents weighted super matrix, M stands for limited super matrix.

After getting limited super matrix, relative priority can be synthesized. For every limited vectors of controlling principles, add weight, respectively, then each component's priority can be conclude and obtained under the overall objective (Kuo *et al.*, 2012).

Application of ANP in corporations' brand crisis management:

Brand crisis is one of the enterprise crises. The systematic research about enterprise crisis traced back to 1980s in Europe, America and Japan. What they focused on was five aspects: the first, conception of enterprise crisis and its evolving stages (Heath, 1998; Barton *et al.*, 2001; Mitroff, 2005), the second, strategies of how to deal with enterprise crisis and get rid of its negative effects (Heath, 1998); the third, research of warning system from financial perspective (Laitinen and Chong, 1999); the fourth, plentiful effective skills and methods of managing enterprise crisis (Heath, 1998; Barton *et al.*, 2001); the fifth, the accomplishment of techniques of early warning system of enterprise crisis management (Chandy, 2005; Andrienko and Andrienko, 2006). Throughout these literatures, researches of brands that are combined with crisis are limited and infrequent. The majority of similar researches often concentrate on negative brand publicity of marketing and exploring its impact to society, corporations and consumers. These researches mainly rely on attribution theory, image theory, spillover effects (Votola and Unnava, 2006) and so on. Only Shire *et al.* (2006) submitted a paper that was related with brand crisis management to INTA Annual Meeting with some insightful ideas such as setting up work group, establishing information system of brand crisis management.

Brand crisis management refers to adopt a comprehensive, visionary, process-oriented tools and techniques to manage all the brand crisis to make the best use of wholesome value of a certain brand (Greyser, 2009) When brand crisis management is applied it has at least two functions and meanings: on one side, increasing the awareness of brand crisis and analyzing the roots of brand crisis so as to take precautions against brand crisis and nip the brand crisis in the bud; on the other side, enhancing and improving the confidence and ability to reply to brand crisis and cutting the losses down to its minimum and buffering the tremendous destructiveness caused by brand crisis (Thomas *et al.*, 2010). In one word, brand crisis management is more and more vital for any advanced modern corporations that still seek for the edge of competence and prosperity.

GEELY is the only private enterprise among the top ten car corporations in Chinese domestic car industry. As

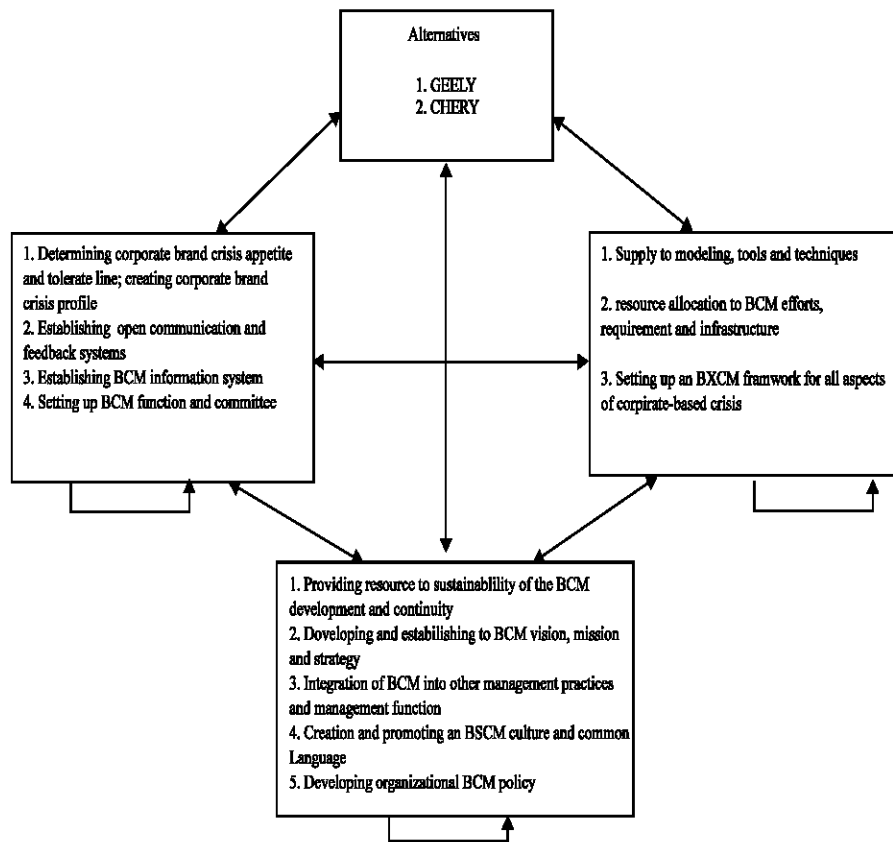


Fig. 2: Evaluation model of BCM: GEELY and CHERY

a national brand, GEELY has been achieving great performance accomplishment with its total assets amounting to 10.5 billion depending on flexible operation and management and sustainable self innovation since, 1997 in which GEELY entered the car industry. GEELY has been assessed as one of the top 500 corporations in China and estimated as “the fastest developing speed and the best company ”in the last 50 years in Chinese car industry. It is really an excellent corporation especially after it afforded 1.8 billion to buy the stock right of Volvo on 28th, March, 2010. It walk forward to come closely to transnational operations.

CHERY is another national car corporation. It has been keeping the sales champions of Chinese self-owned brand for nine years. In other words it has become an example and model for other Chinese self-owned brand. It is a company with huge potential of development.

This paper makes use of analytic network process to find out which company does a better job on brand crisis management. Before starting, some indexes or criterions should be confirmed or some indicators must be established. This paper adopts 12 criterions of brand crisis management from three dimensions on the

foundation of related researches and literatures (McDowell, 2011; Olejarsk and Gamett, 2010; Barton *et al.*, 2001) (Table 1).

Because the calculation of multiple matrix is very complicated, we need to rely on Super Decisions (a kind of software) to facilitate and simplify the counting (Zhiqiang, 2010). After applying the Super Decision, a new model was constructed as Fig. 2 shows.

Each component is under one certain principle and it ought to be made pair-wise comparison with other components and judged its priorities in the analytic network process. However, this process is very subjective and casual it is necessary and indispensable to consult with professors and scholars in specified field. Only in this way can relatively exact and precise information be obtained. Figure 2 shows an example of the pair wise comparison between the first-class indicators on the basis of financial index and its outcome of allocating weights.

In the Table 2, “1.1457”represents the following meanings: according to judgments of specialists, the degree of importance of strategic criterions is 1.1457 times than of financial criterions. Obviously, the importance of

Table 1: Evaluation Index system of BCM

Criteria to BCM practice	
Financial	Supply to modeling ,tools and techniques Resource allocation to BCM efforts, requirements and infrastructure
Strategic	Setting up an BCM framework for all aspects of corporate-based crisis Providing resource to sustainability of the BCM development and continuity Developing and establishing to BCM vision ,mission and strategy Integration of BCM into other management practices and management functions Creation and promoting an BCM culture and common language
Operational	Developing organizational BCM policy Determining corporate brand crisis appetite and tolerate line; creating corporate brand crisis profile Establishing open communication and feedback systems Establishing BCM information system Setting up BCM function and committee

Table 2: Pair wise comparison between the first-class indicators

Inconsistency	Financial	Strategic	Operational
Alternatives	2.4931	2.1372	2.5258
Financial	1.0000	1.1457	1.2323
Operational			1.0000

Table 3: The consistency check between the first-class indicators*

Alternatives	0.122052
Financial	0.287977
Strategic	0.247099
Operational	0.342872

*The inconsistency indicator is 0.0022, It is desirable to have a value of less than 0.1

Table 4: The final priority value computed by super decision

Items		Final priority	Limit value
Company	CHERY	0.62248	0.147496
	GEELY	0.37752	0.089453
Financial indicators	Supply to modeling, tools and techniques	0.21904	0.054252
	Resource allocation to BCM efforts, requirements and infrastructure	0.3199	0.079233
	Setting up an BCM framework for all aspects of corporate-based crisis	0.22405	0.055492
Strategic indicators	Providing resource to sustainability of the BCM development and continuity	0.23701	0.058703
	Developing and establishing to BCM vision ,mission and strategy	0.21553	0.061487
	Integration of BCM into other management practices and management functions	0.23023	0.065741
	Creation and promoting an BCM culture and common language	0.2279	0.065076
Operational indicators	Developing organizational BCM policy	0.32655	0.093247
	Determining corporate brand crisis appetite and tolerate line; creating corporate brand crisis profile	0.22237	0.051104
	Establishing open communication and feedback systems	0.25222	0.057965
	Establishing BCM information system	0.27941	0.064215
	Setting up BCM function and committee	0.246	0.056536

operational indicators is the same with operational indicators’, therefore, the outcome of comparison is 1. In the same way, first-class indicators’ priorities can be gained on the basis of strategic and operational indicators, respectively.

Similarly, second-class indicators’ priorities can be acquired by the correlation matrix in the Table 2 besides the pair wise comparison of the first-class indicators.

Consistency check of statistics is essential and vital after we input the statistics through the indent matrix of Super Decision. Only when the value of consistency check is lower than 0.1, the information we get on the foundation of professors’ subjective and intuitional judgments can be accepted and adopted. Otherwise, statistics will be collected through professors again until the value of consistency check is lower than 0.1. In the Super Decision, after imputing statistics it can calculate

the consistency check automatically. In Table 3, we can see that the consistency check value of first-class indicators is 0.0022, lower than 0.1, therefore, statistics in Table 3 is reasonable and logical. Similarly, consistency check between second-class indicators are also badly needed. Only when checking results are lower than 0.1 can they be retained and applied, In fact, the principle and method of pair-wise comparison process between first-class indicators or second-class indicators are identical and similar.

After inputting all statistics of priorities that pair wise comparison of every layers’ components, if consistency check is allowed and passed though, weighed super matrix, limited super matrix and final priorities can be achieved with the aid of Super Decision.

In Table 4, we can see the final priority value gained by Super Decision.

CONCLUSION AND DISCUSSION

From Table 4, we know CHERY gets the priority value 0.622480, larger than that GEELY gets (0.377520). Therefore, we conclude that CHERY does a better job than GEELY in terms of brand crisis management.

Brand crisis management is an intricate and systematic engineering, which needs investment of human, money and physical resources. From Table 4, we conclude that establishing BCM information system, developing organizational BCM policy, resource allocation to BCM efforts, requirements and infrastructure are significant to brand crisis management.

Nowadays, corporations are facing an informationalized society in which new products, new ideas, new brand are like mushrooms after rain. In order to make achievement, corporations should try utmost to establish their information system and database. To some degree, information management is indispensable.

Even we have perfect plans and schedules, without organizational policies' support and specific implementation, the goal is vague and uncertain. In a sense, developing organizational policy of brand crisis management can make sure implementation capacity more powerful and remarkable. It can ensure measures of brand crisis management put into effect. Meanwhile, the policy itself needs great devotion careful research.

As we all know, the resource is always limited and scarce. How to make the best use of resources is not only a subjective for economists but also for managers. For a company, human resource, finance and property are always restricted. So managers should learn to allocate these things wisely and rationally. Brand crisis management as one of management activities of planning it also needs resources investment. However, the time, the amount, the direction deserve deeply consideration.

Whether the resource allocation or information system, they do help corporations to make better preparations for a rainy day for brand crisis in the foreseeable future.

Analytic network process is a powerful tool in the field of Operational Research. It has many advantages along with disadvantages. Though its theories are convincing it relies on scholars' and specialists' judgment, so controversy and limitations are unavoidable. In later research, every ambitious scholar can make improvements about this method.

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