Research on the Competence of Opinion Leaders of Electronic Products Based on DANP

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Abstract. In order to help enterprises to identify the opinion leaders of electronic products, reduce the cost of buyers and sellers satisfied with the deal, this article from the perspective of victory force elements, opinion leader of electronic products, which can identify the key elements to build the evaluation index system of electronic products of opinion leaders, according to the DEMATEL-Basd Analytic Network Process (DANP) method for empirical research. The results show that there is a mutual influence relationship between the competency factors of opinion leaders of electronic products. Among them, activity is the most important competency factor, and centrality has the greatest influence on other competency factors. Based on this study, management suggestions are put forward for marketers.

1 INTRODUCTION

The Internet is open, virtual and interactive, which makes the quality of information on the network uneven, the information density is low, and the human communication generally exists weak connection. China's electronic products market has stepped into the mature period, electronic products upgrade fast, innovation ability is constantly enhanced, the competition is more and more fierce, severe market competition for enterprises put forward higher requirements. Opinion leaders can help consumers quickly get the electronic product information they need, help information producers and marketers quickly establish effective connections with the right users, and greatly reduce the cost for consumers to collect electronic product information and the marketing cost of enterprises. Therefore, how to identify opinion leaders of electronic products and evaluate their competence is of great significance.

2 MATERIALS AND METHODS

An opinion leader refers to a person who often provides information and exerts influence on other audiences in interpersonal communication network, and plays two important roles of "information intermediary" and "influence" [1-2]. Previous studies mainly from three dimensions of activity, centrality, and intermediary index system of competence of opinion leaders to build [3-4], activity reflects the opinion leaders in the process of information dissemination activity, centrality reflect the opinion leaders information production capacity and production quality, the intermediary reflects the opinion leader ability to filter information and control connection.

Table 1 Competency evaluation index system of opinion leaders of electronic products.

Dimensions	Indicators	Meaning
Activity (A)	Attention a1	Pay attention to the number of electronic product information release subjects.
	Sharing Frequency a2	How often you actively share information about your electronic products.
	Recovery Frequency a3	How often you answer questions and puzzles about electronics.
Centrality (B)	Influence b1	Audience size and electronic product information diffusion speed.
	Professional b2	The degree of professionalism of the electronic product information published.
	Innovative b3	Originality and differentiation of shared electronic product information.
	Focus b4	The percentage of tweets, palindromes, and reposts of specific product information.
Intermediary (C)	Control connection capability c1	The ability to control and connect with an audience.
	Information filtering capability c2	The ability to filter information from electronic products.

The number of attention can reflect the extensive information source channels of opinion leaders to some extent. The initiative of opinion leaders to share and answer questions and information related to electronic products represents the willingness of opinion leaders to play the role. The more professional the opinion leaders are, and the more they focus on electronic products, the

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higher the quality of information produced, the stronger the originality and influence, and the better the effect of electronic product information dissemination. Opinion leaders are at the core of many communication paths and can influence groups through information filtering and connection and other intermediary capabilities [5]. This paper attempts to establish a competency evaluation index system for opinion leaders of electronic products based on previous studies on the industry and characteristics of electronic products, as shown in Table 1.

The analysis method of decision laboratory (DEMATEL) reveals the complex relationship and intensity among influencing factors by establishing Influence Network Relation Map(INRM). The DEMATEL-Basd Analytic Network Process (DANP) takes DEMATEL's total influence matrix as the unweighted super matrix of ANP to process, which eliminates the need to collect the questionnaire again. The weight of each evaluation index can be calculated by the DANP technology. This paper uses DEMATEL-ANP technique to carry out empirical research.

Step1: Obtain the initial scoring matrix. Nine experts engaged in marketing research or work were invited to rate the degree of influence among the nine evaluation indicators of competence factors from 0 to 6, which in turn represented: no influence, little influence, little influence, average influence, large influence, great influence, and complete influence. The initial score matrix M (Table2) of the degree of interaction among key competency features was finally obtained after repeated modification according to their feedback.

$$M = \begin{pmatrix} 0 & m_{12} & \cdots & m_{1n} \\ m_{21} & 0 & \cdots & m_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ m_{n1} & m_{n2} & \cdots & 0 \end{pmatrix} = (m_{ij})_{n \times n} \quad (1)$$

Table 2 The initial score matrix M.

	a1	a2	a3	b1	b2	b3	b4	c1	c2
a1	0.000	4.778	4.222	3.889	4.333	3.444	4.667	3.556	5.222
a2	4.889	0.000	5.111	5.222	3.889	3.889	4.444	5.111	3.556
a3	4.333	5.000	0.000	4.556	4.000	4.111	4.222	4.333	4.222
b1	5.000	5.111	4.778	0.000	4.222	4.111	4.778	5.222	5.111
b2	4.889	4.333	4.111	5.111	0.000	4.667	5.000	5.111	5.222
b3	4.556	4.778	4.444	4.889	5.222	0.000	4.667	4.556	4.444
b4	4.556	4.778	4.889	5.000	4.444	4.778	0.000	4.000	5.000
c1	3.556	5.000	4.444	4.667	4.889	4.000	4.444	0.000	3.556
c2	3.556	5.000	5.000	5.111	5.000	3.889	5.111	5.222	0.000

Step2: Obtain the direct influence matrix. Through Equation(2) and Equation(3), the initial score matrix M is standardized, so that the direct influence matrix X meets the requirement that the sum of one row or one column is at least 1.

$$s = \min \left\{ 1 / \max_i \sum_j m_{ij}, 1 / \max_j \sum_i m_{ij} \right\} \quad (2)$$

$$X = sM \quad (3)$$

Step 3: Use Equation(4) to get the total influence matrix T_c .

$$T_c = X + X^2 + X^3 + \cdots + X^n = X(I - X)^{-1} \quad (4)$$

Table 3 The total influence matrix T_c .

	a1	a2	a3	b1	b2	b3	b4	c1	c2
a1	1.5981	1.8463	1.7656	1.8151	1.7200	1.5795	1.7845	1.7559	1.7544
a2	1.7878	1.8210	1.8643	1.9253	1.7890	1.6611	1.8604	1.8684	1.7987
a3	1.7243	1.8787	1.6938	1.8561	1.7389	1.6171	1.8016	1.7986	1.7591
b1	1.8838	2.0399	1.9560	1.9085	1.8919	1.7540	1.9666	1.9696	1.9270
b2	1.8907	2.0338	1.9516	2.0350	1.8034	1.7744	1.9810	1.9770	1.9394
b3	1.8480	2.0030	1.9203	1.9912	1.8849	1.6330	1.9358	1.9276	1.8860
b4	1.8431	1.9981	1.9248	1.9884	1.8640	1.7381	1.8233	1.9112	1.8925
c1	1.7021	1.8713	1.7896	1.8517	1.7505	1.6093	1.7993	1.6916	1.7387
c2	1.8406	2.0226	1.9463	2.0109	1.8939	1.7374	1.9590	1.9560	1.7964

Step 4: Build the INRM diagram. Add each row and each column of the total influence matrix $T_c = [T_{ij}]$ to get the sum of vectors of all rows and columns, as shown in Equations (5) and (6). The INRM diagrams within the dimension and between dimensions are shown in Figure.1 from (a) to (d).

$$k = [k_i]_{n \times 1} = \sum_{j=1}^n t_{ij} = (k_1, \dots, k_i, \dots, k_n) \quad (5)$$

$$d = [d_j]_{1 \times n} = \sum_{i=1}^n t_{ij} = (d_1, \dots, d_i, \dots, d_n) \quad (6)$$

(c) Intermediary dimension (d) Total
Figure.1 Each dimension and total INRM diagram.

Table 4 The influence degree value of each competency factor.

	k_i	d_i	k_i+d_i	k_i-d_i
A	5.3182	5.6051	10.9232	-0.2869
B	4.2936	4.1084	8.4019	0.1852
C	8.2418	8.3370	16.5788	-0.0952

Among them, k_i on behalf of the competency elements i (include A, B, C three competency elements) impact on other competency elements total value, d_i representative competency elements i affected by other competency elements total value, k_i+d_i representative competency i have all influence factors of value, on behalf of the center of the competence elements, k_i-d_i representative competency elements i the net impact of value, because of the competence elements are represented.

Step 5: Normalize the matrices T_c and T_D to obtain the matrices T_c^a and T_D^a . The total influence matrix T_c of element angles and the total influence matrix T_D of dimension angles are obtained from the previous sections. Note that the value of T_D is the average of the corresponding dimension T_c . The normalization process of matrix T_c is shown in Equations (7) - (15).

$$C_i = \sum_{j=1}^n T^{ij}, j = 1, 2, \dots, n \quad (7)$$

$$T_c^{aj} = T_c^{ij} / C_i, i = 1, 2, \dots, n \quad (8)$$

$$T_c = \begin{matrix} & \begin{matrix} D_1 & c_{11} & c_{12} & \vdots & c_{1m_1} \end{matrix} \\ \begin{matrix} c_{11} \\ c_{12} \\ \vdots \\ c_{im_1} \end{matrix} & \begin{bmatrix} T_c^{11} & T_c^{12} & \dots & T_c^{1m_1} \\ T_c^{21} & T_c^{22} & \dots & T_c^{2m_1} \\ \vdots & \vdots & \ddots & \vdots \\ T_c^{m_1 1} & T_c^{m_1 2} & \dots & T_c^{m_1 m_1} \end{bmatrix} \end{matrix} \quad (9)$$

$$T_c^a = \begin{matrix} & \begin{matrix} D_1 & c_{11} & c_{12} & \vdots & c_{1m_1} \end{matrix} \\ \begin{matrix} c_{11} \\ c_{12} \\ \vdots \\ c_{im_1} \end{matrix} & \begin{bmatrix} T_c^{a11} & T_c^{a12} & \dots & T_c^{a1m_1} \\ T_c^{a21} & T_c^{a22} & \dots & T_c^{a2m_1} \\ \vdots & \vdots & \ddots & \vdots \\ T_c^{am_1 1} & T_c^{am_1 2} & \dots & T_c^{am_1 m_1} \end{bmatrix} \end{matrix} \quad (10)$$

$$d_i = \sum_{j=1}^n t_D^{ij}, i = 1, 2, \dots, n \quad (11)$$

$$t_D^{ij} = \left(\sum_{i=1}^p \sum_{j=1}^q T_{ij} \right) / (p \times q), i = 1, 2, \dots, p; j = 1, 2, \dots, q \quad (12)$$

$$t_D^{aj} = t_D^{ij} / d_i, i = 1, 2, \dots, n \quad (13)$$

$$T_D = \begin{bmatrix} t_D^{11} & t_D^{12} & \dots & t_D^{1m} \\ \vdots & \vdots & \ddots & \vdots \\ t_D^{i1} & t_D^{i2} & \dots & t_D^{im} \\ \vdots & \vdots & \ddots & \vdots \\ t_D^{m1} & t_D^{m2} & \dots & t_D^{mm} \end{bmatrix}_{m \times m} \quad (14)$$

$$T_D^a = \begin{bmatrix} t_D^{11}/d_1 & t_D^{12}/d_1 & \dots & t_D^{1m}/d_1 \\ \vdots & \vdots & \ddots & \vdots \\ t_D^{i1}/d_i & t_D^{i2}/d_i & \dots & t_D^{im}/d_i \\ \vdots & \vdots & \ddots & \vdots \\ t_D^{m1}/d_m & t_D^{m2}/d_m & \dots & t_D^{mm}/d_m \end{bmatrix} = \begin{bmatrix} t_D^{a11} & t_D^{a12} & \dots & t_D^{a1m} \\ \vdots & \vdots & \ddots & \vdots \\ t_D^{ai1} & t_D^{ai2} & \dots & t_D^{aim} \\ \vdots & \vdots & \ddots & \vdots \\ t_D^{am1} & t_D^{am2} & \dots & t_D^{amm} \end{bmatrix}_{m \times m} \quad (15)$$

Step 6: According to Equation (16), the unweighted supermatrix W is obtained.

$$W = (T_c^a)^{-1} \quad (16)$$

Step 7: The normalized super-matrix W^a is obtained by using Equation (17).

$$W^a = T_c^a \cdot W = \begin{matrix} & \begin{matrix} D_1 & c_{11} & c_{12} & \vdots & c_{1m_1} \end{matrix} \\ \begin{matrix} c_{11} \\ c_{12} \\ \vdots \\ c_{im_1} \end{matrix} & \begin{bmatrix} T_c^{a11} \cdot W^{11} & T_c^{a12} \cdot W^{12} & \dots & T_c^{a1m_1} \cdot W^{1m_1} \\ T_c^{a21} \cdot W^{21} & T_c^{a22} \cdot W^{22} & \dots & T_c^{a2m_1} \cdot W^{2m_1} \\ \vdots & \vdots & \ddots & \vdots \\ T_c^{am_1 1} \cdot W^{m_1 1} & T_c^{am_1 2} \cdot W^{m_1 2} & \dots & T_c^{am_1 m_1} \cdot W^{m_1 m_1} \end{bmatrix} \end{matrix} \quad (17)$$

Step 8: Use Equations (18) to limit processing of the standardized super matrix W^a to obtain the steady-state matrix.

$$\lim_{z \rightarrow \infty} (W^a)^z \quad (18)$$

3 RESULTS & DISCUSSION

Can be seen from Figure.2, in the heart (B), in turn, affects the activity in the intermediary (C) and (A), it shows that electronic products competence elements of opinion leaders need most is centrality, that is to say, the quality of the production of electronic products information by opinion leaders and effect directly affect the opinion leader in electronic products in the process of information transmission control, connect the ability of the masses,

opinion leader specialization and concentration can improve the filtering ability of opinion leaders; the influence and professionalism of opinion leaders make them recognized and respected, which makes them more active on the Internet. The ability of opinion leaders to filter information and connect with the masses encourages them to understand and pay attention to more product-related information, which also makes them more eager to share and more active on social platforms.

Figure.2 The INRM diagram between dimensions.

Table 6 Summary of weights in the dimension of opinion leaders of electronic products and the global weights of each index.

Dimensions/Indicators	Weight within dimension	Global weight
Activity (A)	0.3361	
Attention a1	0.3193	0.1073
Sharing Frequency a2	0.3472	0.1167
Recovery Frequency a3	0.3335	0.1121
Centrality (B)	0.3305	
Influence b1	0.2644	0.0874
Professional b2	0.2487	0.0822
Innovative b3	0.2297	0.0759
Focus b4	0.2572	0.0850
Intermediary (C)	0.3335	
Control Connection Capability c1	0.5055	0.1686
Information Filtering Capability	0.4945	0.1649

According to Table 6, the weights of activity, centrality and intermediation are respectively 33.61%, 33.05% and 33.35%, with little difference and relatively uniform distribution. The more active the opinion leader is, the more 'opinions' he puts forward directly to the audience. Second, it is necessary to have a strong intermediary ability. Good opinion leaders need to extract and summarize the complex information of electronic products, and have enough ability to control and connect the audience, so as to make electronic product information dissemination more effective and powerful. Electronics opinion leaders in the production of information quality and communication effect, namely the opinion leaders to produce 'opinion' more professional, more easily accepted by the audience and convincing, more focus on electronic products, the production information is more targeted, opinion leaders personal view would be more objective and more convincing, the flow of opinion leaders has great value.

4 CONCLUSIONS

This paper discusses the identification and analysis of the competency elements of opinion leaders of electronic products, and quantifies the weights of these elements and

their evaluation indexes. According to the research results of this paper, it can help enterprises to identify opinion leaders of electronic products and provide empirical support to make the process of electronic product information transmission from enterprises to consumers more direct and effective, and provide scientific decision-making basis for marketers in the electronic product industry to carry out marketing activities.

The conclusions and contributions of this study are summarized as follows: (1) Determine the key competency elements of opinion leaders of electronic products and construct an evaluation index system. (2) The interaction between the various elements of the competence of opinion leaders of electronic products and their evaluation indicators is discussed. (3) The weights of each dimension of competency elements and its evaluation indexes are obtained.

There are still some shortcomings in this study. First, the reconstruction of the index system based on the current situation of the electronic product industry is subjective to a certain extent; second, the collection of expert questionnaires is limited to marketers and marketing researchers, and the questionnaire collection is not conducted from the perspective of consumers and opinion leaders.

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