Based on the MADM model wine sales manager competency research

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Abstract. In order to solve the problem of the lack of professional wine marketing team, this paper identified the key influencing factors of wine sales managers from the competency point of view, constructed the competency model and evaluation index system of wine sales managers, and introduced the improved multi-attribute decision making method (MADM) to evaluate the competency. The results show that there is an interactive relationship between the competency dimensions and indicators of wine sales managers, and the professional knowledge dimension has the greatest influence on the other four dimensions. Based on these findings, suggestions are made for future research.

1 Introduction

In recent years, with the improvement of people's consumption level and the gradual formation of the concept of health and health, wine has begun to enter the attention of consumers with its characteristics of beneficial cardiovascular, beauty and skin care. Although statistics predict that China will become the world's second largest wine consumer in 2022, wine only accounts for 1.5% of the total annual wine consumption in terms of the consumption structure of domestic beverage wine, so there is considerable space for the development of China's wine market. Therefore, with the rapid development of the market, the wine industry needs complex professionals with global thinking.

2 Determine Competency Characteristics

Follow the principle of science, this study on the literature review, discussion, and experienced experts in wine sales manager has carried on the thorough analysis, identifies 5 dimensions, respectively Personal traits(A),Marketing management ability (B),Professional knowledge (C), Self-management ability (D) and Physical quality (E). The key factors that influence wine sales managers are showed in Table 1.

3 Methods

Multiple Attribute Decision Making (MADM) refers to the Decision problem of choosing the optimal solution or ranking the solution under the condition of considering Multiple attributes, which mainly adopts DEMATEL technology and DANP (DEMATEL-BASD Analytic Network Process).

Table 1 The key factors that influence wine sales managers

Dimensions/Criteria	Contents
Personal traits（A）	Work attitude and values
Team spirit（a1）	Sense of teamwork
Adaptive（a2）	The ability to adapt to the new environment
Marketing management ability（B）	Flexible marketing strategy
Policy sensitivity（b1）	Information processing ability of market policy
Customer Service Awareness（b2）	Satisfy the customer's wishes
Professional knowledge（C）	Marketing related education and experience
Wine knowledge（c1）	Wine professional technical ability
Experience（c2）	Experience in wine industry
Self-management ability（D）	Thinking and behavior are constantly improved
Learning ability（d1）	Ability to learn new knowledge
Innovation ability（d2）	Ability to adapt to the new technology
Physical quality（E）	Physical health
Mental state（e1）	Mental stability
Compressive ability（e2）	Acceptability to work under high intensity

3.1 Based on DEMATEL technique to identify interaction relations

DEMATEL technique is put forward by the research centre for the first time from Geneva , the main purpose is to solve the impact between the complex relationship

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between the network, through the establishment of relationship between network diagram (influence network relation map, INRM) to explore the interaction relationship between the various indicators. Therefore, this paper analyses the interaction relationship between key competency indicators based on the DEMATEL technique. The specific steps are as follows.

Step 1: Obtain the initial score **matrix *A***

A total of 7 wine experts were asked to rate the degree to which each of 10 key competency traits influenced the other. After several rounds of modification, until experts no longer modify their opinions, the initial score matrix *A* is finally obtained, which is constituted by the degree of mutual influence among key competency characteristics. The initial influence **matrix *A*** is showed in **Table 2**.

Table 2 The initial influence **matrix *A***

matrix *A*	a1	a2	b1	b2	c1
a1	0	2.4096	3.3334	3.3479	2.2614
a2	3.7187	0	2.2941	2.1868	2.1376
b1	2.7748	3.6021	0	2.7362	2.9039
b2	2.2301	2.1217	2.5816	0	2.154
c1	3.2811	2.6221	2.1016	3.8844	0
c2	3.7301	3.8283	2.2637	3.0123	3.0842
d1	2.8801	2.6999	3.6733	2.9759	3.6285
d2	2.2941	3.5814	2.9051	2.9811	2.4705
e1	2.4977	3.9394	2.3664	2.4199	3.0229
e2	2.2604	2.8748	3.7603	3.5817	3.4282
matrix *A*	c2	d1	d2	e1	e2
a1	2.6326	3.6857	2.5311	3.1887	3.6032
a2	2.2844	3.3462	3.8283	3.2785	2.0251
b1	2.7606	2.1605	3.2793	3.5502	2.3544
b2	2.6707	2.4313	3.0094	3.7982	2.8711
c1	3.0682	3.8518	3.0971	3.7795	3.2188
c2	0	2.695	2.8008	2.019	3.5074
d1	3.8391	0	2.2411	3.4922	3.0023
d2	2.7629	2.7243	0	2.7205	3.4339
e1	3.316	3.453	2.0418	0	3.187
e2	3.213	3.4492	3.7852	3.7935	0

Step 2: Get a direct score matrix. The initial score **matrix *A*** is normalized so that the direct impact **matrix *X*** meets the sum of 1 with at least one row or one column. By using Eq. (1) and (2)**.**

$$s = \min\left\{1/\max_i \sum_j^n z_{ij}, 1/\max_j \sum_{i=1}^n z_{ij}\right\} \quad (1)$$

$$X = sZ \quad (2)$$

Step 3: Obtain the total influence **matrix *T*** using Eq.(3).

$$T = \mathrm{X} + \mathrm{X}^2 + X^3 + \ldots + X^n = X(I - X)^{-1} \quad (3)$$

Step 4: Construct the INRM. Each row and column of the total influence matrix T = [t_{ij}] is totaled to obtain the sum of all row and column vectors, as indicated in Eqs. (4)–(5). The influence between dimensions or by influence degree is showed in **Table 3**:

$$k = [k_i]_{n\times 1} = \sum_{j=1}^n t_{ij}]_{n\times 1} = (k_1, \cdots k_i \cdots, k_n) \quad (4)$$

$$d = [d_j]_{1\times n} = \sum_{i=1}^n t_{ij}]_{1\times n} = (d_1, \cdots d_i \cdots, d_n) \quad (5)$$

Among them, k_i represents the total influence value of influencing factor ***i*** on other factors; d_i represents the total influence value of influencing factor ***i*** on other factors; k_i+d_i represents the total influence degree value of influencing factor ***i***, which is the centrality; k_i-d_i represents the net influence degree value of influencing factor ***i***, which is the causation degree.

Table 3 Influence between dimensions or by influence degree

Dimensions	***ki***	***di***	***ki+di***	***ki-di***
A	3.9635	4.0529	8.0164	-0.0895
B	3.8063	3.9783	7.7846	-0.172
C	4.2273	3.9395	8.1668	0.2878
D	4.1193	4.1215	8.2407	-0.0022
E	4.2635	4.2877	8.5512	-0.0242

3.2 Based on the method of DANP to measure the weight of each dimension and the index

DANP method is an ANP method proposed by Professor Zeng on the basis of DEMATEL. The total influence matrix of DEMATEL is taken as the unweighted super matrix of ANP, which eliminates the steps of questionnaire

and can be used to calculate the weight of indicators.

Step 1: Normalize the ***matrix T_c*** and ***T_d*** to obtain matrix ***T_c^a*** and matrix ***T_d^a***. The total influence matrix ***T_c*** in a criterion level and ***T_d*** in a dimension level are obtained from the previous section. Notably, the value of ***T_d*** is the mean of the values in the corresponding dimension ***T_c***. The normalization process of ***matrix T_c*** is outlined in Eqs. (6)-(11)

$$d_i = \sum_{j=1}^{n} t_D^{ij}, i = 1, 2, \cdots n \tag{6}$$

$$t_D^{\alpha ij} = t_D^{ij} / d_i, i = 1, 2, \cdots, n \tag{7}$$

$$T_D = \begin{bmatrix} t_D^{11} & \cdots & t_D^{1j} & \cdots & t_D^{1m} \\ \vdots & & \vdots & & \vdots \\ t_D^{i1} & \cdots & t_D^{ij} & \cdots & t_D^{im} \\ \vdots & & \vdots & & \vdots \\ t_D^{m1} & \cdots & t_D^{mj} & \cdots & t_D^{mm} \end{bmatrix}_{m \times m} \tag{8}$$

$$T_D^{\alpha} = \begin{bmatrix} t_D^{11}/d_1 & \cdots & t_D^{1j}/d_1 & \cdots & t_D^{1m}/d_1 \\ \vdots & & \vdots & & \vdots \\ t_D^{i1}/d_i & \cdots & t_D^{ij}/d_i & \cdots & t_D^{im}/d_i \\ \vdots & & \vdots & & \vdots \\ t_D^{m1}/d_m & \cdots & t_D^{mj}/d_m & \cdots & t_D^{mm}/d_m \end{bmatrix}$$

$$= \begin{bmatrix} t_D^{\alpha 11} & \cdots & t_D^{\alpha 1j} & \cdots & t_D^{\alpha 1m} \\ \vdots & & \vdots & & \vdots \\ t_D^{\alpha i1} & \cdots & t_D^{\alpha ij} & \cdots & t_D^{\alpha im} \\ \vdots & & \vdots & & \vdots \\ t_D^{\alpha m1} & \cdots & t_D^{\alpha mj} & \cdots & t_D^{\alpha mm} \end{bmatrix}_{m \times m} \tag{9}$$

$$T_c = \begin{array}{c} D_1\ c_{11} \\ \quad c_{12} \\ \quad \vdots \\ \vdots\ c_{1m_1} \\ \quad \vdots \\ \quad c_{i1} \\ D_i\ c_{i2} \\ \quad \vdots \\ \quad c_{im_i} \\ \vdots\ \vdots \\ \quad c_{m1} \\ \quad c_{m2} \\ \quad \vdots \\ D_m\ c_{mm_m} \end{array} \begin{array}{c} \overset{D_1}{c_{11}\cdots c_{1m_1}} \quad \overset{D_j}{\cdots} \quad \overset{D_m}{c_{j1}\cdots c_{jm_j}} \quad \cdots \quad c_{m1}\cdots c_{mm_m} \\ \begin{bmatrix} T_c^{11} & \cdots & T_c^{1j} & \cdots & T_c^{1m} \\ \vdots & & \vdots & & \vdots \\ T_c^{i1} & \cdots & T_c^{ij} & \cdots & T_c^{im} \\ \vdots & & \vdots & & \vdots \\ T_c^{m1} & \cdots & T_c^{mj} & \cdots & T_c^{mm} \end{bmatrix}_{\substack{n \times n | m < n, \\ \sum_{j=1}^{m} m_j = n}} \end{array} \tag{10}$$

$$T_c^{\alpha} = \begin{array}{c} D_1\ c_{11} \\ \quad c_{12} \\ \quad \vdots \\ \vdots\ c_{1m_1} \\ \quad \vdots \\ \quad ci1 \\ D_i\ c_{i2} \\ \quad \vdots \\ \quad c_{im_i} \\ \vdots\ \vdots \\ \quad c_{m1} \\ \quad c_{m2} \\ \quad \vdots \\ D_n\ c_{mm_m} \end{array} \begin{array}{c} \overset{D_1}{c_{11}\cdots c_{1m_1}} \quad \overset{D_j}{\cdots} \quad \overset{D_m}{c_{j1}\cdots c_{jm_j}} \quad \cdots \quad c_{m1}\cdots c_{mm_m} \\ \begin{bmatrix} T_c^{\alpha 11} & \cdots & T_c^{\alpha 1j} & \cdots & T_c^{\alpha 1m} \\ \vdots & & \vdots & & \vdots \\ T_c^{\alpha i1} & \cdots & T_c^{\alpha ij} & \cdots & T_c^{\alpha im} \\ \vdots & & \vdots & & \vdots \\ T_c^{\alpha m1} & \cdots & T_c^{\alpha mj} & \cdots & T_c^{\alpha mm} \end{bmatrix}_{\substack{n \times n | m < n, \\ \sum_{j=1}^{m} m_j = n}} \end{array} \tag{11}$$

Step 2: Obtain the unweighted ***super-matrix W***. The unweighted super-matrix is obtained using Eq. (12):

$$W = \left(T_c^{\alpha}\right)^{-1} \tag{12}$$

Step 3: Obtain the normalized ***super-matrix W^{α}***. The normalized ***super-matrix W^{α}*** is showed in **Table 4**.The normalized ***super-matrix W^{α}*** is obtained using Eq. (13):

$$W^a = T_d^{\alpha} \cdot W = \begin{array}{c} D_1\ c_{11} \\ \quad c_{12} \\ \quad \vdots \\ \vdots\ c_{1m_1} \\ \quad \vdots \\ \quad ci1 \\ D_i\ c_{i2} \\ \quad \vdots \\ \quad c_{im_i} \\ \vdots\ \vdots \\ \quad c_{m1} \\ \quad c_{m2} \\ \quad \vdots \\ D_m\ c_{mm_m} \end{array} \begin{array}{c} \overset{D_1}{c_{11}\cdots c_{1m_1}} \quad \overset{D_j}{\cdots} \quad \overset{D_m}{c_{j1}\cdots c_{jm_j}} \quad \cdots \quad c_{m1}\cdots c_{mm_m} \\ \begin{bmatrix} T_d^{\alpha 11} \cdot W^{11} & \cdots & T_d^{\alpha i} \cdot W^{i1} & \cdots & T_d^{\alpha m1} \cdot W^{m1} \\ \vdots & & \vdots & & \vdots \\ T_d^{\alpha 1j} \cdot W^{1j} & \cdots & T_d^{\alpha ij} \cdot W^{ij} & \cdots & T_d^{\alpha mj} \cdot W^{mj} \\ \vdots & & \vdots & & \vdots \\ T_d^{\alpha 1m} \cdot W^{1m} & \cdots & T_d^{\alpha im} \cdot W^{im} & \cdots & T_d^{\alpha mm} \cdot W^{mm} \end{bmatrix}_{\substack{n \times n | m < n, \\ \sum_{j=1}^{m} m_j = n}} \end{array} \tag{13}$$

Table 4 The normalized *super-matrix W^{α}*

	a1	a2	b1	b2	c1
a1	0.087	0.099	0.096	0.097	0.099
a2	0.103	0.091	0.105	0.104	0.104
b1	0.096	0.096	0.085	0.096	0.093
b2	0.101	0.101	0.101	0.090	0.104
c1	0.093	0.094	0.096	0.094	0.085
c2	0.099	0.099	0.100	0.101	0.100
d1	0.108	0.105	0.102	0.103	0.105
d2	0.100	0.102	0.102	0.101	0.099
e1	0.109	0.112	0.113	0.112	0.110
e2	0.103	0.100	0.101	0.102	0.101
	c2	d1	d2	e1	e2
a1	0.098	0.097	0.095	0.094	0.096
a2	0.105	0.103	0.106	0.105	0.104
b1	0.094	0.098	0.097	0.096	0.096
b2	0.102	0.101	0.102	0.101	0.101
c1	0.096	0.096	0.096	0.096	0.097
c2	0.089	0.101	0.101	0.101	0.100
d1	0.104	0.094	0.103	0.107	0.104
d2	0.100	0.098	0.089	0.098	0.101
e1	0.107	0.111	0.109	0.099	0.111
e2	0.105	0.102	0.104	0.103	0.091

Step 4: Limit processing ($\lim_{z \to \infty} (W^{\alpha})^{z}$) is carried out on the **standardized *super-matrix W^{α}*** to obtain the steady-state matrix.

4 Result

According to the influence relationship network diagram, As shown in Figure 1. **Professional knowledge (C)** has the greatest impact on the other 4 dimensions, which in turn affect **self-management ability (D)**, **physical quality (E)**, **personal traits (A)** and **marketing**

management ability (B). This shows that wine sales, professional knowledge is essential, sales managers need to be familiar with the vintage of wine production, variety, origin and dietary collocation, in order to better recommend to customers. **Self-management ability (D)** also had a significant impact on **physical fitness (E)**, **personal traits (A)** and **marketing management ability (B)**. This is because marketing activities are constantly updated, requiring sales managers to innovate ways and ideas to attract customers to buy. **Physical fitness (E)** also has an impact on **personal traits (A)** and **marketing management ability (B)**, because sales itself requires strong energy, and strong physical fitness can better adapt to the sales environment. **Personal traits (A)** and **marketing management ability (B)** are greatly affected by other dimensions, because in the wine marketing market, it is mainly affected by wine brand and price factors, and too little consideration is given to personal factors and marketing ability.

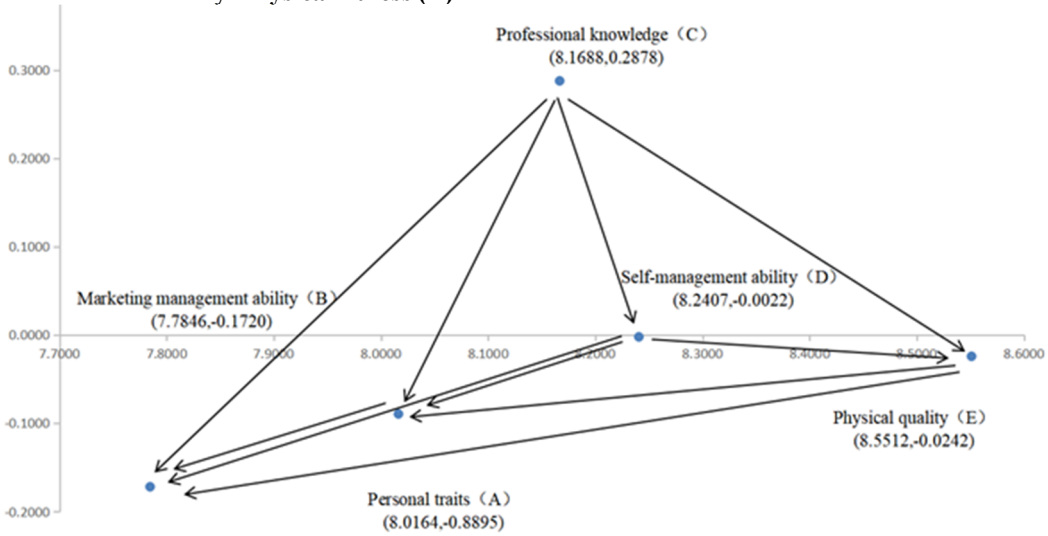

Fig.1 Dimensions affect the relational network graph

According to the results in **Table 5**, the weight ratios of **personal traits (A)**, **marketing management ability (B)**, **professional knowledge (C)**, **self-management ability (D)** and **physical quality (E)** are 19.88%, 19.51%, 19.35%, 20.22% and 21.04%, respectively. According to the results, it can be seen that the proportion difference of these 5 dimensions is not very big, and the distribution is relatively uniform. Among them, self-management ability and physical quality accounted for a higher proportion. Because the sales manager plans and implements different activities, it is necessary to carry out continuous innovation, which requires a high learning and thinking ability. The design, inspection and implementation of the planning scheme, as well as the discussion and communication with customers, all need to be carried out continuously. There are also high requirements for the physical quality of sales managers. Secondly, they also need to have strong personal characteristics and marketing management ability. A good sales manager needs to have strong personality charm, so that he can lead the team to complete the goals and tasks as expected. He also needs to have sufficient sales skills and have an understanding of profits, rebates and transportation methods. At the same time, as a wine sales manager also need to have a high level of professional knowledge, and can communicate with customers, professional level.

Table 5 Weighting within the wine sales manager dimension and global weight

Dimensions/Factors	Weight within dimension	Global weight
Personal traits（A）	0.1988	
Team spirit（a1）	0.4824	0.0959
Adaptive（a2）	0.5176	0.1029
Marketing management ability（B）	0.1951	
Policy sensitivity（b1）	0.4854	0.0947
Customer Service Awareness（b2）	0.5146	0.1004
Professional knowledge（C）	0.1935	
Wine knowledge（c1）	0.4873	0.0943
Experience（c2）	0.5127	0.0992
Self-management ability（D）	0.2022	
Learning ability（d1）	0.5109	0.1033

5 Conclusions and remarks

This paper explores the systematic identification and analysis of key factors that influence wine sales managers and calculates the performance weights of these factors. Managers in the wine industry can use these results to provide scientific decision-making basis and recommendations for the selection, performance

evaluation management, training and professional development of wine sales managers. The conclusions and contributions of this study are summarized as follows:

(1) Determine the key characteristics of wine sales manager and build a model.

(2) Discusses the wine sales manager competency of each dimension and the interaction relationship between indicators.

(3) Each dimension and index weight of competency are obtained.

However, this study also has some limitations, which should be recognized and valued. First of all, the number of experts should be more appropriate to ensure that expert advice can fully cover all aspects of the wine industry. Secondly, it should be analyzed by actual cases. Finally, the wine industry is an emerging industry, and future research needs to expand the research scope to make the data more accurate.

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