

Research on the Cause Analysis and Prevention and Control Mechanism of Over-marketing Health Care Products Purchased By The Elderly Under The Background of E-commerce Live Broadcast

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Abstract

In recent years, with the rapid development of digital technology and the popularity of mobile terminals, e-commerce live broadcast as an emerging business model has rapidly penetrated into all areas of social consumption. However, the combination of real-time interaction, emotional rendering and time-limited promotion in the live broadcast scene makes it easier for products such as health care products to form consumption induction through verbal packaging and trust binding. Due to health anxiety, limited information screening ability and emotional companionship needs, elderly consumers often have irrational purchase behavior in the urgent atmosphere created by the anchor, resulting in excessive consumption of high-priced health care products and even fraud. This study constructs a hierarchical directed topology model by integrating decision-making laboratory analysis (DEMATEL) and interpretative structural modeling (ISM) in the field of system science, and systematically reveals the hierarchical correlation and action path of core influencing factors in the process of health care product consumption. It provides a quantitative analysis framework with both theoretical depth and practical value for the scientific regulation of the elderly health care product consumption market under the background of e-commerce live broadcasting.

Keywords

E-commerce live broadcast; the elderly; health products; over-marketing; DEMATEL-ISM model.

1. Introduction

In recent years, with the rapid development of digital technology and the popularity of mobile terminals, e-commerce live broadcast as an emerging business model has rapidly penetrated into all areas of social consumption. According to the data of China Internet Network Information Center, as of June 2023, the number of live webcast users in China reached 765 million, of which e-commerce live webcast users accounted for more than 60 %, becoming an important engine to promote online consumption. In this context, the elderly group has accelerated its integration into the digital society, and its network usage rate has increased significantly. Shopping through the live broadcast platform has become the new normal of some elderly people 's daily life.

However, the combination of real-time interaction, emotional rendering and time-limited promotion in the live broadcast scene makes it easier for products such as health care products to form consumption induction through verbal packaging and trust binding. Due to health anxiety, limited information screening ability and emotional companionship needs, elderly consumers often have irrational purchase behavior in the urgent atmosphere created by the

anchor, resulting in excessive consumption of high-priced health care products and even fraud. On March 15, 2023, the CCTV '315' party exposed the 'misery' broadcast room that defrauded the elderly. Some of the anchors staged a "bitter drama" in the live broadcast room. These anchors pretended to play the roles of orphans, disabled people, cancer patients and so on in the live broadcast. In the live broadcast room, under the banner of helping people solve disputes and mediate family conflicts, they actually used excessive marketing methods to deceive the elderly to buy health care products and other products, so that the elderly were deeply involved.

2. Literature Review

In view of the phenomenon of over-marketing, in recent years, the academic community has carried out extensive and in-depth research, mainly focusing on : (1) Studying the current situation of the elderly using the network. Zhou Zige (2023) [1]combined with QuestMobile's information in the '2020 Silver Economy Insight Report', with the intensification of aging, the proportion of the elderly over 50 years old has reached one-third. This group of people has more than 100 million mobile active device users, and the user growth rate is much higher than the entire network, laying a solid foundation for the Internet silver economy. (2) Study the current situation of the elderly health care products market. Wang Zhanfeng and other scholars (2024) [2]pointed out in the paper that some journalists have found that in some places, the health care market is chaotic, health care publicity has become a major disaster area for false advertising, and some criminals use the so-called health care products as a cover to extend the 'black hand' to the elderly. In recent days, the reporters of the economic reference newspaper have seen from more than 50 health care product sales broadcast rooms on multiple network platforms that a large number of anchors promote health care products and use fancy words to promote health care products, which has spawned many chaos.(3) What kind of consumption preferences affect the purchase of health care products by the elderly. Zhou Jia and other scholars (2016) [3]explored the influencing factors of the elderly's trust in science and technology health care products, and found that the decline in recognition ability may have an impact on the elderly's trust in science and technology health care products, and the higher the age of the elderly, the stronger the loneliness, the lower the recognition ability, and the higher the chance of being cheated ; at the same time, the number of pictures in the flyer and the content of the picture will affect the elderly's trust in the content of the flyer. Chen Haibo and other scholars (2024) [4]found that the adoption of false health information in the elderly was mainly affected by information manipulation, and high self-efficacy was easily manipulated by information manipulation.(4) How to guide the purchase behavior of the elderly in health care products. By constructing the DEMATEL-ISM model, Xie Guoning and other scholars (2024) [5]divided the influencing factors of the consumption of health care products for the elderly group into different levels, and put forward suggestions from the elderly themselves and their families, communities, health care products enterprises, governments and other aspects.

It can be seen that the current academic circles' attention to the consumption of elderly health care products mainly focuses on the traditional market and consumption decision-making characteristics, but there are still few studies on the consumption behavior of elderly health care products under the background of e-commerce live broadcast. In this study, through the integration of decision-making laboratory analysis (DEMATEL) and interpretative structural modeling (ISM) in the field of system science, the multi-dimensional elements are structured by means of graph theory and matrix tools. On the basis of traditional methods, the questionnaire survey method is introduced for data collection and frequency statistics. Through the empirical data support factor screening and matrix assignment process, the limitations of subjective experience judgment in existing research are effectively alleviated. By constructing a hierarchical directed topological model, this paper systematically reveals the

hierarchical correlation and action path of the core influencing factors in the consumption process of health care products, aiming to break through the shackles of single perspective research and provide a quantitative analysis framework with both theoretical depth and practical value for the scientific regulation of the consumption market of elderly health care products under the background of e-commerce live broadcast.

3. Research Methods and Data Analysis

3.1. Data collection and validity testing

The elderly over 60 years old in Taiyuan City, Shanxi Province were selected as the research object, and the questionnaire was distributed offline. In order to ensure the validity of the questionnaire, the elderly correctly understood the questionnaire and adopted a one-to-one approach to help the elderly fill in the questionnaire. A total of 215 questionnaires were distributed and 199 were valid. Firstly, the structural validity of the data was verified by KMO test and Bartlett sphericity test. The results showed that the KMO value was 0.885 (> 0.7), indicating that there was a strong correlation between variables. The approximate chi-square value of the Bartlett test was 1335.317 ($P = 0.000$), rejecting the null hypothesis of independent variables, and proving that the data were suitable for factor analysis. The specific test indicators are as follows :

Table 1. Validity test

The KMO test and Bartlett 's test			
KMO value		0.885	
Approximate chi-square		1335.317	
Bartlett sphericity test	df	153	
	P	0.000***	

3.2. Construction of influencing factor set

We selected two factors, 12 variables constitute a direct impact factor set, as shown in Table 2.

Table 2. Direct influencing factors

type	sign	factor
consumer factors	A1	age
	A5	dwelling condition
	A4	health conditions
	A2	judgment capacity
	A3	level of consumption
	A6	Watch live frequency
	A7	purchasing channels
	A8	The attitude of the family
	A9	Awareness of health care products
	A10	The frequency of use of health products
production factors	A11	marketing behavior
	A12	after-sales

3.3. Analysis of DEMATEL-ISM model

According to the results of the questionnaire, the relationship between the two factors is quantified as $O_{ij} = 0, 1, 2, 3$ four levels, respectively, indicating that there is no correlation, weak

correlation, general correlation and strong correlation between the two factors. (as shown in Matrix O)

$$O = \begin{bmatrix} 0 & 2 & 3 & 1 & 0 & 1 & 2 & 2 & 1 & 0 & 0 & 1 \\ 0 & 0 & 2 & 0 & 1 & 0 & 1 & 2 & 0 & 1 & 1 & 0 \\ 0 & 1 & 0 & 2 & 3 & 0 & 1 & 0 & 1 & 2 & 0 & 3 \\ 0 & 0 & 1 & 0 & 1 & 0 & 3 & 0 & 2 & 1 & 2 & 2 \\ 0 & 0 & 0 & 0 & 0 & 0 & 2 & 0 & 1 & 3 & 0 & 2 \\ 0 & 0 & 0 & 1 & 1 & 0 & 0 & 0 & 0 & 0 & 3 & 2 \\ 0 & 0 & 1 & 2 & 2 & 0 & 0 & 0 & 2 & 1 & 1 & 2 \\ 0 & 1 & 2 & 0 & 0 & 0 & 0 & 0 & 0 & 3 & 3 & 1 \\ 0 & 0 & 0 & 3 & 1 & 0 & 2 & 0 & 0 & 1 & 1 & 3 \\ 0 & 0 & 1 & 0 & 2 & 0 & 1 & 0 & 0 & 0 & 0 & 3 \\ 0 & 0 & 0 & 2 & 2 & 1 & 3 & 0 & 1 & 2 & 0 & 3 \\ 0 & 0 & 2 & 1 & 1 & 0 & 0 & 0 & 1 & 2 & 0 & 0 \end{bmatrix}$$

Based on the DEMATEL method, various index values are calculated. According to the comprehensive influence matrix Z, the influence degree D_i , the influence degree C_i , the cause degree R_i and the centrality degree M_i of each factor are obtained. The expression is as follows:

$$D_i = \sum_{j=1}^n a_{ij}, i = 1, 2, 3, \dots, n \quad (1)$$

$$C_i = \sum_{j=1}^n a_{ji}, j = 1, 2, 3, \dots, n \quad (2)$$

$$M_i = D_i + C_i \quad (3)$$

$$R_i = D_i - C_i \quad (4)$$

Finally, the influence degree (D), influence degree (C), centrality (M) and cause degree (R) of each factor are calculated. The results are as follows :

Table 3. Parameters of DEMATL (Decision Making Laboratory Analysis)

factor	influence degree (D)	influenced degree(C)	centrality(M)	cause degree(R)
A1	3.105	0.000	3.105	3.105
A2	1.916	0.489	2.405	1.426
A3	2.742	2.496	5.238	0.245
A4	2.846	2.910	5.756	-0.064
A5	1.657	3.696	5.353	-2.039
A6	1.702	0.271	1.974	1.431
A7	2.538	3.471	6.009	-0.933
A8	2.321	0.356	2.677	1.966
A9	2.541	2.511	5.053	0.030
A10	1.457	4.067	5.524	-2.610
A11	3.042	1.798	4.840	1.244
A12	1.603	5.405	7.008	-3.802

4. Results and discussion

Using Python to draw the scatter plot of each factor 's centrality M and cause degree R is as follows. The cause degree R measures the influence of a factor on other factors, and the centrality M quantifies the importance of the factor to the overall system. In general, the reason degree is positive and the larger the factor is, the better the effect is as a key influencing factor, and the reason degree is negative is the result factor. The greater the centrality, the higher the importance, and the better the effect as a key influencing factor.

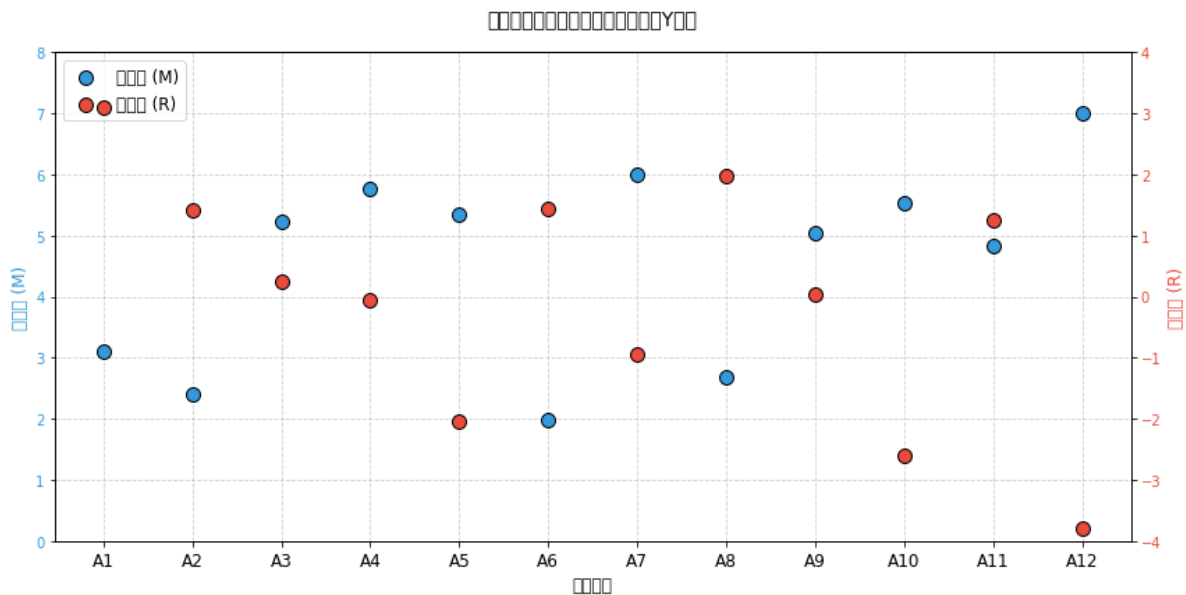


Figure 1. Scatter plot of each factor 's centrality and cause degree

According to the quadrant distribution of centrality (M) and cause (R) (see figure 1), the factors with cause $R > 0$ and high M value are the core driving factors of the system. $R = 3.105$ for age (A1), indicating that it directly affects health decline (A3) and residential changes (A6) as a fundamental driving force. The effect cognition (A12) has the highest centrality ($M = 7.008$), but $R = -3.802$, which is a passive outcome indicator and needs to be indirectly intervened by optimizing the purchase channel (A7). The center degree M is larger for 3,4,5,7,9,10,12, and the reason degree R is larger for 1,2,6,8,11.

The reachability matrix is constructed by the ISM model, and the influencing factors are divided into six levels (see Table 1). The age of the fundamental driving layer (L6) (A1) is transmitted to the purchase channel (A7) and marketing behavior (A11) of the core conduction layer (L4) by triggering health recession (A4), changes in living conditions (A6) and changes in family attitudes (A8); among them, the purchase channel (A7) as a key hub ($M = 6.009$) integrates the input of consumption level (A5) and family attitude (A8), while marketing behavior (A11) directly strengthens the understanding of health products (A9). These factors ultimately promote the consumption decision of the transition layer (L3), and lead to the formation of the effect cognition (A12) of the surface layer (L1) through the accumulation of the frequency of use of health care products (A10). The whole path presents the transmission characteristics of ' age-driven-channel amplification-cognitive solidification ', in which purchase channels and marketing behaviors are the core intervention points, and age-related health and family factors are the root causes of long-term governance. The age of the fundamental driving layer (L6) (A1) is transmitted to the purchase channel (A7) and marketing behavior (A11) of the core conduction layer (L4) by triggering health recession (A4), changes in living conditions (A6) and changes in family attitudes (A8); among them, the purchase channel (A7) as a key hub

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$$A = \begin{bmatrix} 0 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 \\ 0 & 0 & 1 & 1 & 1 & 0 & 1 & 1 & 1 & 1 & 1 & 1 \\ 0 & 1 & 0 & 1 & 1 & 0 & 1 & 0 & 1 & 1 & 0 & 1 \\ 0 & 1 & 1 & 0 & 1 & 0 & 1 & 0 & 1 & 1 & 1 & 1 \\ 0 & 1 & 1 & 1 & 0 & 0 & 1 & 0 & 1 & 1 & 0 & 1 \\ 0 & 0 & 1 & 1 & 1 & 0 & 1 & 0 & 1 & 0 & 1 & 1 \\ 0 & 1 & 1 & 1 & 1 & 0 & 0 & 0 & 1 & 1 & 1 & 1 \\ 0 & 1 & 1 & 1 & 1 & 0 & 1 & 0 & 1 & 1 & 1 & 1 \\ 0 & 1 & 1 & 1 & 1 & 0 & 1 & 0 & 0 & 1 & 1 & 1 \\ 0 & 0 & 1 & 0 & 1 & 0 & 1 & 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 1 & 1 & 1 & 1 & 1 & 0 & 1 & 1 & 0 & 1 \\ 0 & 0 & 1 & 1 & 1 & 0 & 0 & 0 & 1 & 1 & 0 & 0 \end{bmatrix}$$

Table 4. Sets and hierarchical division

Factor number	reachable set(R)	Advance set(Q)	Common set (T=R∩Q)	hierarchy
1	{2,3,4,5,6,7,8,9,10,11,12}			L6
2	{3,5,7,8,10,11}	{1}		L5
3	{2,4,5,7,9,10,12}	{1,2,6,7,8,10,11,12}	{2,7,10}	L5
4	{3,5,7,9,10,11,12}	{1,3,6,7,8,11,12}	{3,7,11,12}	L4
5	{7,9,10,12}	{1,2,3,4,6,7,8,9,11,12}	{7,9,12}	L3
6	{3,4,5,7,9,11,12}	{1}		L2
7	{3,4,5,9,10,11,12}	{1,2,3,4,5,6,8,9,10,11,12}	{3,4,5,9,10,11,12}	L4
8	{2,3,5,7,9,10,11,12}	{1}		L4
9	{4,5,7,10,11,12}	{1,3,4,5,6,7,8,11,12}	{4,5,7,11,12}	L3
10	{3,5,7,12}	{1,2,3,4,5,6,7,8,9,11,12}	{3,5,7,12}	L1
11	{3,4,5,7,9,10,12}	{1,2,4,6,7,8,9,12}	{4,7,9,12}	L4
12	{3,4,5,9,10}	{1,3,4,5,6,7,8,9,11}	{3,4,5,9}	L2

Through the DEMATEL-ISM model, the multi-level topological hierarchy diagram of the influencing factors of the elderly group in the over-purchasing of health care products is as follows.

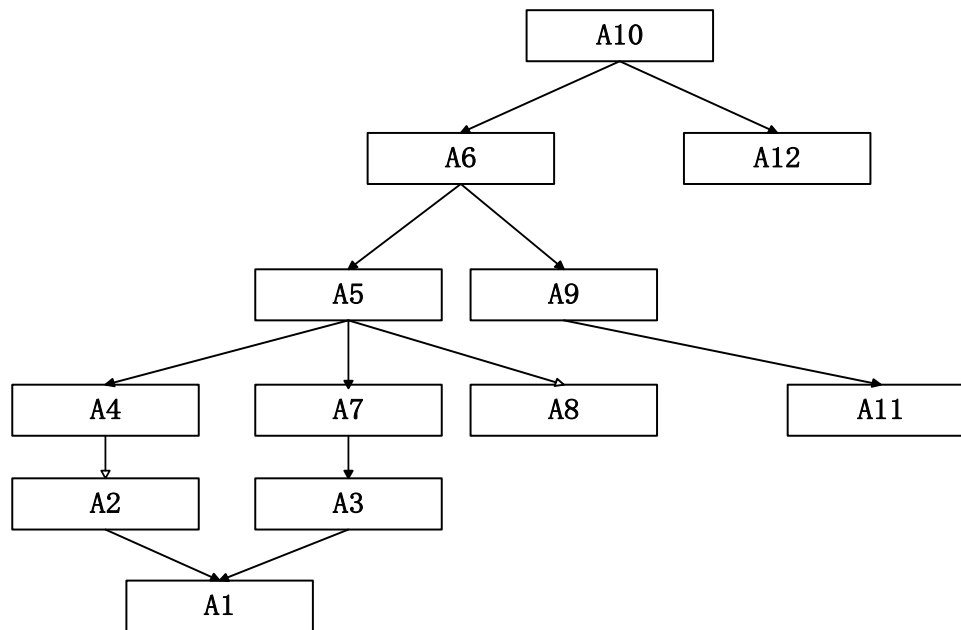


Figure 2. Topological hierarchy graph

5. Suggestions

First, build a 'trinity' protection network at the community level, and propose the implementation of the 'silver hair digital shield' plan for the information penetration of e-commerce live broadcasts. Establish a community live anti-fraud education base, simulate the live broadcast room marketing scene through VR technology, and carry out 'immersive anti-fraud drills'. A team of 'live broadcast supervision volunteers' composed of retired teachers and medical staff was formed to carry out regular inspections of live broadcast marketing activities around the community. Develop the 'community health cloud platform', integrate the white list of formal live broadcast channels, product traceability query and other functions, and form a 'early warning-intervention-service' closed loop. Through the 'time bank' mutual assistance mechanism, the young elderly are organized to provide live shopping assistance to the elderly, alleviating the emotional consumption demand driven by loneliness.

Secondly, the platform level establishes the whole process control of live broadcast marketing, and proposes to implement the 'Qinglang live broadcast' project in view of the amplification effect of live broadcast channels. Establish a "double review system" for the elderly live broadcast area, that is, the combination of content pre-review and real-time AI review, and automatically filter absolute terms such as "cure all diseases." Develop the exclusive function of 'old age mode', and force the setting of 'consumption cooling-off period' and 'large payment face recognition verification'. Implement the anchor grading certification system, and implement the access mechanism of 'health knowledge assessment + psychological assessment' for the marketing anchors of the elderly group. Establish a live broadcast data monitoring system, automatically trigger risk prompts for abnormal high-frequency consumption behavior, and synchronously push them to the family end.

Third, improve the social support security system at the government level. In view of the lack of institutional supervision, it is suggested to build a 'silver consumption safety network'. Formulate the 'Elderly Live Marketing Management Measures', and clarify the 'triple protection obligations' of the platform for elderly users: risk notification, consumption limit, and rights protection assistance. A provincial-level consumer rights protection center for the elderly was established, and a 24-hour live complaint line was opened to implement "immediate investigation" for misleading propaganda such as "health care products instead of drugs." Implement the policy of "subsidy for aging transformation" and give tax incentives to

the development of barrier-free functions of the live broadcast platform. The elderly consumption satisfaction of live broadcast enterprises is included in the social responsibility evaluation system, which is linked to the platform traffic distribution.

Fourth, promote the construction of institutional guarantee at the national level. In view of the deep social causes, it is suggested to implement the national strategy of " active aging. " We will incorporate digital literacy education for the elderly into the compulsory education curriculum and develop standardized teaching materials for ' silver hair digital security '. Establish a special fund for elderly health management, and pay for health monitoring and nutrition guidance services through medical insurance personal accounts. The implementation of the national standard of ' live broadcast traceability ' requires that all live broadcasts of elderly health care products must display complete supply chain information. Improve the supporting laws and regulations of the " Elderly Law, " clarify the guardianship responsibility of children for parents ' live broadcast consumption, and establish a family health decision-making filing system.

Under the background of e-commerce live broadcast, the governance of over-marketing of elderly health care products needs to build a " four-in-one " collaborative governance system. At the community level, the construction of ' silver hair digital shield ' should be strengthened, and information penetration should be cut off through immersive education and mutual assistance mechanisms ; the platform needs to implement the whole process control to suppress irrational consumption by technical means ; the government should improve the system guarantee and establish the consumption safety network ; at the national level, it is necessary to reconstruct the governance ecology through strategic planning. With multi-party cooperation, the elderly can improve their ability to distinguish information, the platform can standardize marketing behavior, and the government and the country provide institutional support to jointly cope with the challenges brought about by the interweaving of aging and digitization. With the improvement of the governance system and the progress of technical means, the elderly health care product market will gradually return to rationality, truly become an important barrier to protect the health of the silver-haired group, and provide strong support for the implementation of the active aging strategy.

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