

Research Article

Economic Analysis of the Juice and Concentrate Industry: (A Case Study of East and West Azerbaijan)

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Received: December 02, 2024; **Accepted:** December 23, 2024; **Published:** December 30, 2024**Abstract**

The juice and concentrate industry is one of the important food and beverage industries, playing a vital role in meeting consumers' beverage needs for natural products. The aim of the present study is to identify and analyze the interaction of bottlenecks in the juice and concentrate food industries for their optimal utilization. In this regard, the effectiveness, impact, and ranking of bottlenecks in these industries in West and East Azerbaijan provinces have been investigated using a descriptive-survey research method. In the present study, bottlenecks have been investigated using a library and field method for 30 food industry companies from 60 active experts using a paired comparison questionnaire. First, the bottlenecks were identified and then determined using DEMETL multi-criteria decision-making methods and interactive communication network analysis process and prioritization of factors. Among the identified bottlenecks in the juice and concentrate industry, five factors, namely product cost price, specialized human resources, inflation, packaging, and raw material purchase costs, are influential and ranked higher, respectively. Therefore, it is necessary to focus the strategic plans of these companies on priority influencing factors instead of influencing factors in order to reduce bottlenecks.

Keywords: Food industry; Fruit juice and concentrate industry; Denp method**JEL Classification:** L66, L69, C40**Introduction**

Today, fruit juice is used as one of the most widely consumed beverages in the world. Due to this widespread use, it is considered a strategic product. Therefore, achieving self-sufficiency in the production of this product should be considered in the country's capabilities in fruit production. Among the barriers to food industry exports, the factors of laws and regulations, the banking system, and obtaining health permits have been the most important and have had the greatest impact on the barriers to export development. [22] The most appropriate solution for making strategic decisions for food industry companies in conditions of stagflation is to make decisions related to development and organization to reduce costs and increase quality in a continuous cycle to improve the company's competitive position [20]. A study of the impact of financial development and economic freedom on the economic growth of the agricultural sector in Middle Eastern countries, including Iran, during the period 2006-2017 showed that financial development, economic freedom, physical capital, and the labor force employed in the agricultural sector had the most direct and significant impact on the growth of agricultural production in their sectors, respectively [11]. A significant amount of waste is produced by the juice industry every year, and the impact of disposing of this waste on the environment is undeniable. For this reason, researchers have focused their study on the juice production process to help reduce the waste load and

provide new sources of bioactive compounds known to be protective against certain diseases such as heart disease, cancer, and diabetes [8]. For example, orange juice production generates large amounts of waste, and its waste is used to reduce environmental impacts. Pressed and ensiled orange juice waste is converted into raw materials for biogas and bioethanol production, respectively. These measures are in line with the European Union's circular economy goals of reducing waste and using resources optimally and the sustainability goals of improving the environment [1]. For food and confectionery companies, adapting products to customer needs, overcoming logistics and export management constraints are important from an international perspective, and solving pricing problems and having marketing capabilities are essential for achieving higher sales. These factors are present in market focus and market expansion strategies [21]. Innovation in the food and beverage industry comes in many forms, but no specific classification has been provided for it yet [2]. Climate change, population growth, changing lifestyles, and consumer demand for new products allow food industry companies to innovate for environmental sustainability. In these industries, where various stakeholders are involved in the value chain, government support and R&D investment in corporate collaboration affect their sustainable performance [15] In examining strategic strategies for developing concentrate exports in West Azerbaijan Province, it was found that the

weaknesses in social factors, marketing, and legal factors are identified, and the weaknesses in juice products are in marketing, political, and economic factors, respectively [18]. Process analysis of the juice and concentrate industry is an important aspect of improving product performance and quality. For example, by continuously analyzing the production process, pomegranate juice producers are able to improve efficiency, reduce waste, and increase product quality, and are more compliant with regulations. Food safety is ensured, ultimately leading to increased profitability and customer satisfaction [23]. Investigating potential value chains such as raw material selection, use of effective processing techniques, storage conditions, and packaging of fruit juice and concentrate products can help identify areas for improvement and optimization in this industry. Conducting this type of research can lead to the development of strategies to improve product quality, increase efficiency, and meet consumer demands [19].

Currently, the complexity and breadth of the food juice and concentrate supply chain has made it difficult to control their safety and health. Blockchain technology is a new tool to solve this problem, providing transparency, traceability, and data security, and therefore identifying the barriers and challenges of this technology in the food industry supply chain has become essential. The food industry is increasingly using blockchain to track the path and safety of food along its path to its destination (user). Therefore, internal organizational barriers and regulations are the most important bottlenecks in the application and use of this technology in the food industry supply chain. The food industry in developing countries has experienced a significant transformation, and there are significant differences in the performance of companies in these industries in rural and urban areas. In this regard, the flexibility of tax laws for businesses in rural areas helps these companies perform better [26].

Excessive sugar consumption causes diet-related diseases. Companies and researchers in this field are looking for ways to reduce the sugar level in food products such as juices. Therefore, the main challenge is to produce low-sugar juices while maintaining the original composition of the juice. The search for technological innovations is inevitable to obtain high-quality products without changing the composition, except for their sugar. Therefore, today, due to the limitations, there is a need to review the production of low-sugar juices with technological innovations [5]. The present study seeks to identify and assess the types of bottlenecks and issues in the juice and concentrate food industries, emphasizing the main technological bottlenecks (human-intensive, information and knowledge-intensive,

organization-intensive, technology-intensive) and the other two main bottleneck factors, economic and laws and regulations, using multi-criteria decision-making techniques, in order to gain insight into those main and secondary important factors affecting these food industries in terms of technology. According to the objective of the study, the DEMET method and the Network Analysis Process (DANP) have been used for juice and concentrate companies in East and West Azerbaijan provinces. According to the research background, the conceptual framework of the main bottleneck factors in these industries is presented in Figure 1.

Materials and Methods

The DANP method, which is a combination of DEMATEL and ANP methods, is known. This method provides a more comprehensive and accurate analysis to examine the causal relationships between factors and rank the dimensions and technical connections between them. Also, due to the flexibility of this combined method, it provides more opportunities in solving multi-criteria decision-making problems by creating the ability to use quantitative and qualitative information. Therefore, the DEMATEL method is very suitable and effective in extracting the degrees of interactions between criteria and Sub-criteria as well as the formation of the structure of mutual relationships between them and the ANP method is used to weight the criteria and sub-criteria. In recent years, various issues have been addressed for performance evaluation and management strategy selection. In this study, a combined DANP approach has been used with the following steps (Su et al., 2012): Step 1: Calculate the average matrix of initial relationships 'A'. In this step, experts in the research area are asked to determine the direct impact of each element *i* on each element *j*, represented by the symbol *a_{ij}*, using an integer numerical scale from 0 to 4. In this scale, 0 represents "no impact", 1 represents "low impact", 2 represents "medium impact", 3 represents "high impact" and 4 represents "very high impact". After obtaining the expert response matrices, an average matrix is calculated. Each component of the matrix *A* is equal to the average of the same components in the expert response matrix. The average matrix of initial relationships 'A' is shown in equation [1].

$$A = \begin{pmatrix} \alpha_{11} & \alpha_{1j} & \alpha_{1n} \\ M & M & M \\ \alpha_{i1} & \alpha_{ij} & \alpha_{in} \\ M & M & M \\ \alpha_{n1} & \alpha_{nj} & \alpha_{nm} \end{pmatrix} \quad (1)$$

Second step: Calculating the normal matrix of relations 'X'. In this step, the initial average matrix of relations 'A', obtained from the previous step, is normalized with the help of equations (2) and (3) and is called the normal matrix of relations 'X'.

$$K = \frac{1}{\max_{1 \leq i \leq n} \sum_{j=1}^n a_{ij}} \quad (2)$$

$$X = K \times A \quad (3)$$

Step 3: Obtain the total relation matrix 'T'. The total relation matrix 'T' is obtained by solving equation (4) where 'X' refers to the normal relation matrix (obtained from step 2) and 'I' is the identity matrix.

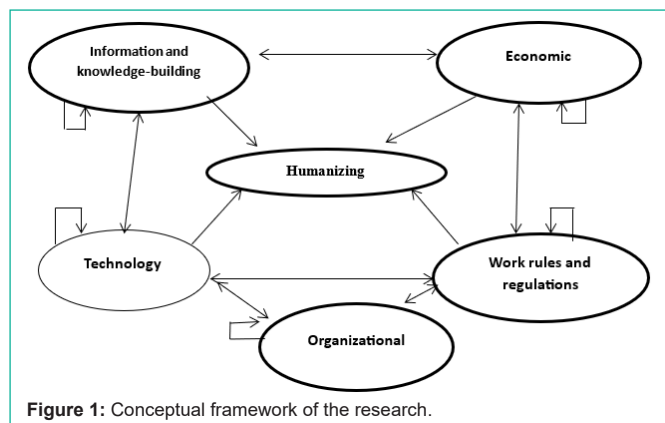


Figure 1: Conceptual framework of the research.

$$T = X + X^2 + L + X^n = X(I - X)^{-1} \quad (4)$$

Step 4: Determine the sum of rows and columns. The components ‘r’ and ‘s’ are the sum of the i-th rows and the sum of the j-th columns of the matrix ‘T’, respectively, and are calculated with the help of equations (5) and (6).

$$r = [r_j]_{n \times 1} = [\sum_{j=1}^n ij]_{n \times 1}, S = [s_j]_{n \times 1} = [\sum_{j=1}^n t_{ij}]' \quad (5)$$

$$T = [t_{ij}], i, j = 1, 2, L, n. \quad (6)$$

Step 5: Draw the direct relationship diagrams. Suppose that the sum of the values of the i-th row of the matrix ‘T’ determines the sum of the effects of the factor on the other factors. Similarly, suppose that the sum of the values of the m-th row of the matrix ‘T’ determines the sum of the effects of the factor on the other factors. Hence, the direct relationship diagrams are drawn with the help of the values of ‘r’ and ‘s’.

Step 6: Obtain the uneven matrix ‘W’. Suppose that and denote the total relationship matrices for the sub-criteria and the criteria, respectively. The matrix is shown in equation (7).

$$T_c = D_i \begin{pmatrix} D_1 & D_j & D_n \\ c_{11} \dots c_{1m1} & \dots & c_{j1} \dots c_{jmj} & \dots & c_{n1} \dots c_{nmn} \\ T_c^{11} & \dots & T_c^{1j} & \dots & T_c^{1n} \\ \vdots & & \vdots & & \vdots \\ c_{i1}^1 & \dots & c_{imj}^1 & \dots & c_{in}^1 \\ T_c^{i1} & \dots & T_c^{ij} & \dots & T_c^{in} \\ \vdots & & \vdots & & \vdots \\ c_{n1}^2 & \dots & c_{nmj}^2 & \dots & c_{nn}^2 \\ T_c^{n1} & \dots & T_c^{nj} & \dots & T_c^{nn} \end{pmatrix} \quad (7)$$

In the next step, by intra-cluster normalization of the matrix, a new matrix named as shown in equation (8) is obtained.

$$T_c^\alpha = D_i \begin{pmatrix} D_1 & D_j & D_n \\ c_{11} \dots c_{1m1} & \dots & c_{j1} \dots c_{jmj} & \dots & c_{n1} \dots c_{nmn} \\ T_c^{\alpha 11} & \dots & T_c^{\alpha 1j} & \dots & T_c^{\alpha 1n} \\ \vdots & & \vdots & & \vdots \\ c_{i1}^1 & \dots & c_{imj}^1 & \dots & c_{in}^1 \\ T_c^{\alpha i1} & \dots & T_c^{\alpha ij} & \dots & T_c^{\alpha in} \\ \vdots & & \vdots & & \vdots \\ c_{n1}^2 & \dots & c_{nmj}^2 & \dots & c_{nn}^2 \\ T_c^{\alpha n1} & \dots & T_c^{\alpha nj} & \dots & T_c^{\alpha nn} \end{pmatrix} \quad (8)$$

Then the non-uniform supermatrix ‘W’ is obtained through equation (11).

$$W = (T_c^\alpha)' = D_j \begin{pmatrix} D_1 & D_j & D_n \\ c_{11} \dots c_{1m1} & \dots & c_{j1} \dots c_{jmj} & \dots & c_{n1} \dots c_{nmn} \\ W^{11} & \dots & W^{1j} & \dots & W^{1n} \\ \vdots & & \vdots & & \vdots \\ c_{i1}^1 & \dots & c_{imj}^1 & \dots & c_{in}^1 \\ W^{ij} & \dots & W^{jj} & \dots & W^{jn} \\ \vdots & & \vdots & & \vdots \\ c_{n1}^2 & \dots & c_{nmj}^2 & \dots & c_{nn}^2 \\ W^{ln} & \dots & W^{ln} & \dots & W^{nn} \end{pmatrix} \quad (11)$$

Step 7: Obtaining the weighted supermatrix. Obtaining the weighted supermatrix requires normalization, which is calculated from the sum of each column, as shown in equation (13).

$$T_D = \begin{pmatrix} t_D^{11} & \dots & t_D^{1j} & \dots & t_D^{1n} \\ \vdots & & \vdots & & \vdots \\ t_D^{i1} & \dots & t_D^{ij} & \dots & t_D^{in} \\ \vdots & & \vdots & & \vdots \\ t_D^{n1} & \dots & t_D^{nj} & \dots & t_D^{nn} \end{pmatrix} \quad (13)$$

After normalizing the matrix of total relations, the matrix Td is obtained through equation (14), where.

$$T_D^\alpha = \begin{pmatrix} t_D^{11}/d_1 & \dots & t_D^{1j}/d_j & \dots & t_D^{1n}/d_n \\ \vdots & & \vdots & & \vdots \\ t_D^{i1}/d_i & \dots & t_D^{ij}/d_j & \dots & t_D^{in}/d_i \\ \vdots & & \vdots & & \vdots \\ t_D^{n1}/d_n & \dots & t_D^{nj}/d_n & \dots & t_D^{nn}/d_n \end{pmatrix} = \begin{pmatrix} t_D^{\alpha 11} & \dots & t_D^{\alpha 1j} & \dots & t_D^{\alpha 1n} \\ \vdots & & \vdots & & \vdots \\ t_D^{\alpha i1} & \dots & t_D^{\alpha ij} & \dots & t_D^{\alpha in} \\ \vdots & & \vdots & & \vdots \\ t_D^{\alpha n1} & \dots & t_D^{\alpha nj} & \dots & t_D^{\alpha nn} \end{pmatrix} \quad (14)$$

By multiplying the normalized matrix of total relations by the unbalanced supermatrix, the weighted supermatrix is obtained as shown in equation (15).

$$W^\alpha = T_D^\alpha \times W = \begin{pmatrix} t_D^{\alpha 11} \times W^{11} & \dots & t_D^{\alpha 1j} \times W^{1j} & \dots & t_D^{\alpha 1n} \times W^{1n} \\ \vdots & & \vdots & & \vdots \\ t_D^{\alpha i1} \times W^{1j} & \dots & t_D^{\alpha ij} \times W^{ij} & \dots & t_D^{\alpha in} \times W^{nj} \\ \vdots & & \vdots & & \vdots \\ t_D^{\alpha n1} \times W^{1n} & \dots & t_D^{\alpha nj} \times W^{jn} & \dots & t_D^{\alpha nn} \times W^{nn} \end{pmatrix} \quad (15)$$

Step 8: Obtaining the limit supermatrix. Calculating the limit supermatrix requires raising the matrix to a large power such as g so that each row of it converges to a number. For example: where g represents the power. Then, the weights of the criteria and sub-criteria, which are also called dependency weights or DANP weights, are obtained from the limit supermatrix.

In general, despite its advantages, the DEMATEL method is not able to form a supermatrix, and in contrast, ANP has such an ability. In the next step, the initial supermatrix is formed based on the outputs of DEMATEL and ANP, and the limit supermatrix is calculated, and the weights of the factors are obtained based on it, and finally the causal factors and the prioritization of the factors relative to each other are obtained. In the research, the technological bottlenecks of this industry were identified based on the research model according to Table 1. The calculation of the inconsistency index, which is an important coefficient in determining the accuracy and validity of experts' answers, was found to be 0.07 in the present study, which is less than 0.1 and indicates sufficient validity.

Research Ontology

The research is applied in terms of purpose, descriptive in nature, and causal-relational in terms of analysis. A paired comparison

questionnaire was used to collect data as a survey. East and West Azerbaijan provinces are very important in the production and export of fruit juice and concentrate products. These provinces are known as centers for agriculture and industry in Iran and play a vital role in the production of various fruits and their processing into concentrates and juices. The presence of a large number of factories and processing industries in these regions indicates the diversity and excellent equipment for the production and processing of fruit juice products. For this reason, these provinces have been selected to conduct this research on technological bottlenecks. The statistical population includes experienced managers and experts active in the fruit juice and concentrate industry who have work experience and expertise in the field of management. Given the limited number of experts and experts, purposive sampling was used. Through purposive sampling from 30 juice and concentrate companies, 60 active experts in the research field were identified, of whom 14 were female and 46 were male with an average work experience of 17 years, of whom 11 (18.3%) had a bachelor's degree, 35 (58.3%) had a master's degree, and 14 (23.4%) had a doctorate. Also, 16 (26.7%) held the position of production manager, 12 (20%) had the position of managing director, 5 (8.3%) had the position of marketing manager, 5 (8.3%) had the position of sales manager, 11 (18.3%) had the position of technical manager, and 11 (18.4%) had the position of quality control manager. The research implementation process was as follows: first, the main and secondary bottlenecks of this industry were extracted from the research background, with an emphasis on technological bottlenecks, and were confirmed by the relevant experts. After collecting information, the internal cause-and-effect relationships between the main and secondary factors were calculated computationally and graphically using the DEMAT method, and then their rankings were made relative to the target by forming a neural network process. One of the main reasons for combining these two DEMAT methods and the neural network process is to provide more information to analysts for better decision-making. In this regard, the DEMAT method is the only multi-criteria decision-making method for examining the effectiveness and impact of factors, and the analytic network process method has been used to rank bottlenecks. The advantages of the analytic network process method model and the DEMAT method for examining dependencies and relationships between criteria are the possibility of prioritizing criteria to improve the decision-making process and increase the transparency and interpretability of decision-making.

Results and Discussion

Technological progress in the last decade has led to an increase in the production and consumption of horticultural products worldwide. This increase in consumption has resulted in various consequences and challenges for industries. The relative position and importance of the main bottlenecks are calculated based on the relative importance coefficient of each (Table 2 & Figure 2) using pairwise comparisons and are seen for the secondary bottlenecks in Table 3. Relative importance according to the DEMETEL method is the sum of the impact and impact of factors. According to the above table, the first three factors with the greatest importance in relation to each other in these industries include organizational, economic, and laws and regulations. Therefore, the organizational system itself (meaning the optimal use of new technologies and innovations) has

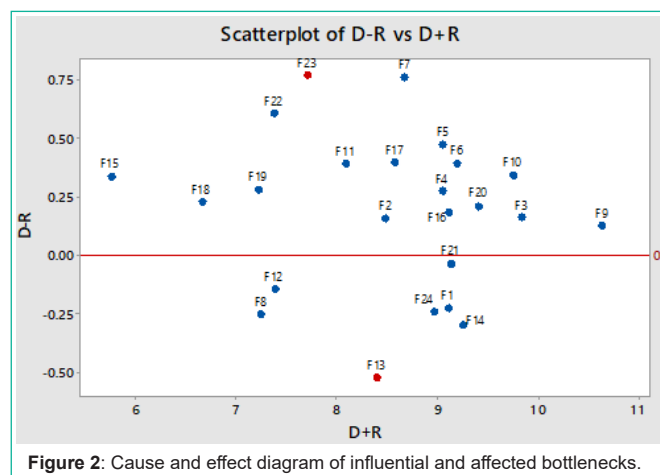


Table 1: Main and secondary bottlenecks of the fruit juice and concentrate industry.

Sub-factors	Symbol	the main factors
Connection with universities	F8	Information and knowledge-enhancing
Consulting services	F23	
Cost of importing devices and equipment	F6	Technology-enhancing
Packaging	F20	
Marketing	F22	
Specialized human resources	F3	Human-enhancing
Inadequate company management skills	F14	
Human resource costs	F13	
Energy costs (electricity and water)	F12	Organization-enhancing
Environmental Organization supervision	F18	
Ministry of Health and Treatment supervision	F19	
Supervision of the Penal Code and the Semaat Organization	F22	
Branding and trade name	F24	Economic
Product cost price	F9	
Bank financing interest	F2	
Foreign exchange services and exchange rates	F4	
Inflation and price growth	F10	
Cost of purchasing domestic raw materials	F16	Laws and regulations
Import tariff for product raw materials	F5	
Tax rate	F11	
Social security premiums	F15	
Number of licenses	F1	
Product export tariff	F7	
Standards	F17	

Table 2: Relative importance (impact and impactability) of the main bottleneck factors in the juice and concentrate industries.

Rank	Main factors	Relative importance (D+R)
1	Organizational	56/58
3	Economic	46/93
2	Laws and regulations	23/52
4	Technological	27/71
6	Information and knowledge	23/51
5	Human	17/64

the greatest position and importance. The secondary factors with the greatest relative importance (Table 3 & Figure 2) are ranked first to fifth, respectively, including the cost of products, specialized human resources, inflation and price growth, packaging, and inadequate company management skills. The high cost of raw materials, including raw material prices, compared to global prices is a problem facing the fruit juice industry. When industries want to compete internationally, in addition to having the desired quality, they must also have a suitable competitive price, which is in line with the results of studies such as

Table 3: Relative importance of secondary bottleneck factors in the juice and concentrate industries.

Rank	factors	Symbol	Relative importance (D+R)
1	Cost of products	F9	10/62
2	Specialized human resources	F3	9/83
3	Inflation and price growth	F10	9/74
4	Packaging	F20	9/39
5	Improper company management skills	F14	9/25
6	Cost of importing machines and equipment	F6	9/19
7	MarketingCost of purchasing domestic raw materials	F21	9/13
8	Number of licenses	F16	9/10
9	Import tariff for product raw materials	F1	9/1
10	Foreign exchange services and exchange rates	F5	9/05
11	exchange rates	F4	9/04
12	Branding and trade name	F24	9/68
13	Product export tariff	F7	8/67
14	Standards	F17	8/57
15	Bank financing interest	F2	8/48
16	Human resource costs	F13	8/4
17	Tax rates	F11	8/08
18	Consulting services	F23	7/7
19	Energy costs (electricity and water)	F12	7/38
20	Penalty and prison supervision	F22	7/37
21	Relationship with universities	F8	7/24
22	Ministry of Health supervision	F19	7/21
23	Environmental organization supervision	F18	6/65
24	Social security premiums	F15	5/57

Source: Research findings

Naziri et al. [14] (Naziri and Mota Habil et al. [12]). That is, the price of the product should be at a level that can compete with other foreign products and attract new foreign markets.

One of the important factors is specialized human resources. Given that human resources are one of the factors of production, paying attention to this factor can play a significant role in increasing production and subsequently increasing productivity, which is in line with the results of studies such as Hasheminejad et al. [16] and Harirchi & [17] and Rouzrokh & Eskandari [24]. Another important factor, according to the results obtained, is the factor of inflation and price growth. In line According to the research of Moazami & Yazdani [13], Jones & Singh [7], Smith & Brown [25], and Bohlmann & Panagariya [3], economic experts believe that high liquidity growth and chronic inflation are the source of market instability, this disrupts the planning process of firms and increases the risk of long-term production and investment.

The results of the DEMATEL method analysis to determine the effective and affected main factors and their sub-criteria are seen in Tables 4 and 5 and Figure 2, respectively. According to Table 4, the first four main factors are effective and the last human factor is affected, and in other words, by focusing on improving the four effective factors, the human factor will improve. According to Table 5, out of 24 sub-factors and sub-criteria, 17 influential factors and 7 influenced factors have been identified from other factors. Among them, the factors of consulting services, product export tariffs and supervision

Table 4: Main bottleneck factors affecting (positive) and affected (negative) the juice and concentrate industries.

Main factors	Relative importance (D-R)
Economic	1/42
Laws and regulations	1/26
Information and knowledge development	0/91
Technology development	0/57
Organization development	0/33
Human development	-0/14

Source: Research findings

of the penal code and the Islamic State Organization have the most influential, and the factors of human resource costs, inadequate company management skills and relations with the university have the highest level of influence. Also, in Figure 2, the results of the influential and influenced factors are specified in the form of a graphic of cause (influencing) and effect (influenced). Based on the results obtained (Table 5), the most important factor and the first important priority of consulting services is in line with the research of Wang & Lee [27] and Larsen & Smith [9], which states that more and better use of the experiences of domestic and foreign consultants and successful entrepreneurs in this field, the transfer of the experiences of foreign companies to the country and the interaction of domestic companies with each other can definitely lead to the growth and prosperity of this industry.

The second influential factor is the export tariff factor for fruit juice products, especially concentrates, which is in line with the results of the studies of Zhao & Patel [28] and Chen & Wang [6]. According to experts in this field, the biggest obstacle to the export of products from these industries is the high customs tariff rate for some products compared to their actual price in the world market, and this factor poses a challenge to the export of products abroad. Therefore, to solve this problem and boost the export of these products abroad, it is necessary to formulate a preferential customs tariff between Iran and the export target countries. Following the two challenges raised, the most influential challenges include supervision of sanctions, import tariffs for raw materials, standards, and the cost of importing devices and equipment.

Table 5: Sub-factors of bottlenecks affecting (positively) and affected (negatively) the juice and concentrate industries.

Main factors	Relative importance (D-R)
Consulting services	0/77
Product export tariff	0/76
Punishment and Sanctions Organization supervision	0/61
Product raw material import tariff	0/47
Standards	0/397
Cost of importing devices and equipment	0/393
Tax rate	0/39
Inflation and price growth	0/34
Social security premium	0/336
Monitoring of the Ministry of Health	0/28
Foreign exchange services and exchange rates	0/27
Monitoring of the Environmental Organization	0/23
Packaging	0/21
Cost of purchasing domestic raw materials	0/18
Expert human resources	0/16
Benefits of financing from banks	0/156
Cost of products	0/125
Marketing	-0/04
Cost of energy (electricity and water)	-0/14
Number of licenses	-0/23
Branding and trademark	-0/24
Relationship with universities	-0/25
Inadequate skills of company management	-0/3
Cost of human resources	-0/52

Source: Research findings

Table 6: Ranking of the main bottleneck factors affecting the juice and concentrate industries.

Weight and importance factor	Main criteria	Rank
0/28	Organizational development	1
0/2	Laws and regulations	2
0/18	Economic	3
0/14	Technological development	4
0/11	Information and knowledge development	5
0/096	Human development	6

Source: Research findings

Table 7: Ranking of sub-bottleneck factors affecting the juice and concentrate industries.

Weight and importance factor	Sub-criteria	Rank
0/0526	Product cost	1
0/0486	Expert human resources	2
0/0479	Inadequate company management skills	3
0/0470	Inflation and price growth	4
0/0468	Number of licenses	5
0/0462	Packaging	6
0/0461	Marketing	7
0/0458	Brand	8
0/0446	Human resources costs	9
0/0445	Cost of purchasing raw materials within	10
0/0439	Cost of importing devices and equipment	12
0/0439	Foreign exchange services and exchange rates	13
0/0429	Raw material import tariffs	14
0/0417	Bank financing interest	15
0/0410	Standards	16
0/0390	Product export tariffs	17
0/0385	Tax rate	18
0/0377	Communication with universities	19
0/0375	Energy cost (water and electricity)	20
0/0349	Monitoring by the Ministry of Health	21
0/0349	Consulting services	22
	Corrections Monitoring by the Penal Code and the Ministry of	
0/0329		23
0/0323	Monitoring by the Environmental Protection Agency	24
0/0272	Social security premiums	25

Source: Research findings

In the following, the Analysis of the Network Process (ANP) method is used to calculate the final weight of the main and secondary factors by forming a balanced supermatrix matrix obtained by multiplying the initial matrix by the unbalanced supermatrix. Given the large volume of supermatrices, the results of the limit supermatrix obtained from the power of 32 of the balanced supermatrix are shown in Tables 6 and 7. The findings from the combination of the two multi-criteria decision-making techniques DEMATEL and ANP show that, in order of rank and importance, the main factors of organizational technology, laws and regulations, and economic, and the secondary and sub-criteria factors of product cost, specialized human resources, and inadequate company management skills are in the first to third priority, and also the other factors of social security premiums, environmental organization supervision, and penal organization supervision and the Semat organization are in the lower rank. The main reason for this is due to the cause-effect relationship between the factors, and by improving the priority factors, other factors are optimized. In this step, the network analysis method was used to weight and rank the bottlenecks, and the weights of the main factors and their sub-criteria, along with their prioritization, are specified in Tables 6 and 7, respectively. The influential factors (specified by the DEMET method) that have greater weight were considered the most important bottleneck factors in the juice and concentrate industry, and those factors, including reducing the cost price of products, increasing the skills of specialized human resources, and increasing management skills, were identified as three important and prioritized factors for eliminating the bottlenecks of the industry. Regarding the importance and position of the management skill factor, in line with the research results of Lee & Chen [10] and Brown & Patel [4], it can be noted that in every large organization there is a series of management factors that make the work process go smoothly. A good and successful manager should pay attention to small issues in addition to integrating the work environment to have a greater impact on the work process. A good manager must first and foremost have peace of mind at work, this is a very important factor.

Conclusions and Suggestions

The results of this study showed that the juice and concentrate processing industries in the market face numerous challenges and obstacles that can be classified into six main areas: organizational, legal, economic, technological, information and knowledge, and human resources. Therefore, first, the important and effective challenges and bottlenecks of juice and concentrate companies were identified from various aspects, and in the next step, by determining their importance and ranking, the influential factors and interactions between them were examined. Among the findings of the study, it was determined that the most influential challenges, in order of priority, included the cost of products, specialized human resources, inflation and price growth, packaging, raw material purchase costs, equipment import costs, exchange rates, raw material import tariffs, bank interest rates, standards, export tariffs, tax rates, health and treatment supervision, consulting services, supervision by the Penal Organization, supervision by the Environmental Organization, and social security premiums.

Therefore, juice and concentrate producing industries have stronger internal connections and in order to eliminate the bottlenecks and important challenges of this industry sector, the following suggestions are presented based on the findings of this study and approved by relevant experts:

- To correct the cost price of juice and concentrate products, it is recommended to analyze the market of these products, analyze the cost costs, determine the added value of this activity, adopt an appropriate pricing strategy, and adjust customer feedback so that by applying appropriate changes to the cost price of juice and concentrate products, these companies will increase their competitiveness and improve their finances.
- It is necessary to attract and retain specialized human resources in the juice and concentrate industries along with setting up continuous training programs for employees in order to update their skills and knowledge in fields related to this industry.
- To manage inflation and price growth in the juice and concentrate industry, accurate market analyses and forecasting of price changes and inflation in the market should be carried out to know its possible trends, while effectively communicating with customers and understanding their needs and preferences in order to provide products and services at a reasonable and satisfactory price. Therefore, adjusting prices logically and in proportion to changes in costs and market conditions is one of the solutions to manage inflation and price growth in this industry.
- Reducing export tariffs and customs fees for juice and concentrate products, along with improving their quality, will increase the export of these products. The use of advanced technologies in the production, packaging and transportation processes can reduce production costs to increase the competitiveness of products.

Along with utilizing specialized consulting services in the field of juice and concentrate products, accurate and specialized information in the field of production, packaging, marketing, and export of juice and concentrate products should be provided to customers to increase their knowledge and awareness and consequently increase their

consumption. Because by obtaining technical advice in the field of production and quality of products and marketing advice for entering domestic and foreign markets to manufacturing companies and providing correct information to customers, it can help them make the best decisions.

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