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Investigating and Explaining Factors Affecting on Iranian Pharmaceutical Distribution Industry Using Fuzzy Delphi Technique

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Abstract
It is widely accepted that drugs are one of the most important components of health care, and their prompt access has become one of the most important goals of health care systems around the world, as well as one of the main concerns of governments. The purpose of this study was to Investigating and Explaining Factors Affecting on Iranian Pharmaceutical Distribution Industry Using Fuzzy Delphi Technique. This research is applied in terms of purpose and descriptive-survey in terms of implementation method. The statistical population of the study is made up of 35 experts in Iran's Pharmaceutical distribution industry who were selected by snowball sampling. First, with a deep review of the research literature and based on the content analysis, 41 factors affecting the pharmaceutical distribution industry were identified. To screen and ensure the importance of the identified factors and select the final factors through the design of a Researcher-made questionnaire and the fuzzy Delphi method was used in two stages. Kendall's coefficient of concordance was used to calculate the agreement of the experts. According to the nature of this research, fuzzy Delphi method and Excel and SPSS software were used to analyze the collected data. Based on the obtained results, the members of the Expert Panel found a total of 49 factors effective on the pharmaceutical distribution industry, of which 41 factors have been mentioned in previous researches and studies, and 8 other factors have been introduced by the panel members.
Keywords: *Drug, fuzzy Delphi method, Iran, Pharmaceutical Distribution, Pharmaceutical Supply chain*

Introduction

The pharmaceutical industry is an integral part of every domestic healthcare system, with a high value and significance as a critical need and strategic asse (Jassbi et al., 2021:2). From the perspective of the World Health Organization (WHO), the importance of a drug is due to three main reasons (Esmaeillou et al., 2017:347):

1. Medicines constitute a considerable portion of the relationship between a patient and healthcare officials. Therefore, availability or rather lack of adequate access to them would have negative consequences on community health. 2. Management of medicine in the state sector, especially in developing countries, is a determinant of success and its improvement can help maintain the capital of countries and increase people's accessibility to medicines. 3. Medical services and issues related to it are not only dependent on the performance of health workers, but even political; economics; financial and cultural factors

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have a significant impact on it. Considering that pharmaceutical and related costs in Iran include about 30% of the total cost of health care and nearly 50% of the cost of outpatient health care, it is of main importance in the country's health system (Tavakol et al., 2023:102). Gradually, the role of drugs in healthcare systems is increasing. The drug supply network is part of the healthcare system, and if not properly addressed, the concept of health in that community is unlikely to grow significantly (Darvish Motevalli & Ebrahimi,2021:63). Therefore, the pharmaceutical distribution industry is an intermediary that performs a range of social functions related to improving the quality of life and longevity of the population. The pharmaceutical distribution system in a country is required to provide the right and quality drugs at the right price, at the right time and in the right place to achieve the goals of the health system as well as the goals of the stakeholders in the pharmaceutical supply chain.

The global pharmaceutical market has experienced significant growth in recent years. For 2022, the total global pharmaceutical market was estimated at 1.48 trillion U.S. dollars. This is an only a slight increase from 2021 when the market was valued at 1.42 trillion U.S. dollars. (Statista, 2023). Global Market for Medicines to Rise to $1.9 Trillion by 2027, says Report from IQVIA Institute. Highest volume growth is expected in Latin America, Asia and Africa, driven by a mix of population growth and expanded access. North America and Europe will see very low growth (Statista, 2023). In 2022, the U.S. market accounted for 50 percent, emerging markets accounted for 24 percent, and Europe totaled 18 percent of the global pharmaceutical market. Revenue generated by the pharmaceutical market has continued to rise in North America, generating some 605 billion U.S. dollars in 2022. Emerging markets have experienced the largest growth between 2020 and 2022, from 238 up to 290 billion dollars.

The value of Iran's pharmaceutical market in 2018 was estimated at 6,200 million dollars, which reached 7,100 million dollars in 2020. It also reached 15,400 million dollars in 2021 and 26,500 million dollars in 2022. It is expected to reach 39200 million dollars in 2023 with an increase of 48%(Food and Drug Administration, 2023). One of the reasons for increasing the rial value of the drug market in Iran during this period is the growth of drug prices due to the increase in the dollar rate and the dependence of pharmaceutical companies on the raw materials and imported packaging, as well as the departure of some drugs from the preferred currency .Other reasons such as increasing in diseases, entering new drugs in to the market, and more patients visiting medical centers.

Iran's pharmaceutical industry has grown by an average of 27% annually in the past decade, which is about 10% in terms of dollar value. Also, despite the application of international sanctions during the last five years, the volume of domestic production of pharmaceutical products has increased by 19%. But the comparison of the value of the drug market with the gross domestic product during the years 1382-1401 indicates that the value of the country's drug market is kept small compared to the total production of the country. The lack of proper drug pricing and its stabilization in recent years has led to capital flight and investors' reluctance to invest in these years, and finally, the lack of desirable and needed development of the strategic drug distribution industry. In such a way that the share of the drug market in the GDP has not exceeded 1%.

Also, currently 64 national drug distribution and distribution companies, 184 major provincial distribution companies are operating in Iran, so that 100% of drug distribution in the country's pharmaceutical market is done by domestic distribution companies. In this market, there are 174 manufacturers of human medicines, 43 raw material production and extraction factories, 82 registered drug import companies, 6300 pharmaceutical brands, 44 billion and 700 million drugs, 1929 generic drugs and 15082 pharmacies (Iran distribution Industry Society, 2023).

Theoretical Foundations and Research Background:

Pharmaceutical distribution enterprises include the wholesale and the retail enterprises that responsible for the addressing the challenges caused by temporal and spatial constraints (Liu et al., 2023:704).

The distribution of pharmaceutical products is an important activity in the supply chain and involves several players. It consists of procuring, holding, supplying, importing and exporting of pharmaceutical products. Distribution activities are carried out by manufacturers, importers, wholesalers/distributors, retailers and other persons authorized to supply pharmaceutical products in the public and private sectors (NAFDAC, 2016) .

The supply and distribution of pharmaceutical products is often highly centralized and marked by poor storage facilities, inaccurate demand planning processes, insufficient human resource management capabilities, high stock pilferage and inadequate financing all these resulting in frequent stock outs Some of these challenges can be reduced by adoption of relevant technology at the distribution channel level., Several studies with regard to the impact of technology on channel distribution have been done (Zeben,2021:1).

Proper packaging regulatory and compliance issues relating to transportation, storage, packaging and technical compliance, influences the safety cold chain items to the user level are critical in this process to avoid degradation (Baker, 2018:29). Proper storage facility for drugs ensures the effectiveness, safety, strength, and quality of drugs. Unless the drugs are segregated from other non-pharmaceutical items and stored properly, long shelf life of the drugs is not guaranteed. Medicines need to be stored to maintain the intended quality and prevent damage while handling until it reaches the consumer (Balakrishnan et al., 2015:149).

Disruptions to this supply of medicines undermine health outcomes as supply chains have an impact on the availability, cost and quality of medicines available to patients. Developing countries face a number of challenges that limit access to medicines. These include: Regulating the quality and flow of medicines into and within the country, Geographic access to medicines, financial access to medicines, Supply chain forecasting and planning, Limited warehousing (McCabe, A. 2009:24).

In most developed regions of the world the wholesaling and distribution segment of the distribution system is concentrated amongst a few players. The three largest US wholesalers, Cardinal Health, McKesson, and AmerisourceBergen, distribute more than 90% of all pharmaceuticals sold in the US. Increasingly, these companies behave more like distributors in that they have inventory management agreements with manufacturers under which they do not necessarily own stock or carry the associated inventory risk but instead receive a fee from the manufacturers. Similar to the US, in Europe, Japan and other developed regions of the world four to five major distributors with national coverage account for 90% of the market. This is due to the underlying economies of scale in the pharmaceutical distribution business (Yadav and Smith, 2014:4). However, for historical reasons, the pharmaceutical distribution system in most emerging markets has a different market structure compared to developed countries. The main differences include a lack of distribution networks with national reach; excessive fragmentation and too many small players; too many intermediaries between the manufacturer and the patient; poor IT and communication flow systems resulting in poor coordination across actors in the distribution channel (Yadav and Smith, 2014:6).

The pharmaceutical industry is considered very strategic with its extraordinary financial turnover and employment generation power; But in recent years, due to various reasons, many pharmaceutical companies in Iran have faced problems in the supply of raw materials, production, and liquidity required for the reconstruction and upgrading of their technology due to excessive imports, and they have also been unsuccessful in the international arena (Sayyari et al., 2023: 75). This situation was exacerbated, when the United States (US) withdrew from the Joint Comprehensive Plan of Action (JCPOA), the agreement aimed at halting Iran's uranium enrichment beyond a certain level, in exchange for the lifting of some sanctions, prompting the other parties to the agreement, such as the European Union (EU), to reinstate all the previous sanctions (Nouhi et al., 2019:2721). This should be seen in the light of the fact that the EU was the primary source of Iranian supplies of medicines. Under this condition, although medicines have not been the direct subject of sanctions against Iran, the PSC has encountered numerous problems, including payment for imported medicines, the supply of raw materials, and the sale of pharmaceutical products (Cheraghali, 2013:2).

Mort (2014) emphasized the negative impact of sanctions on the access and use of medicines by citizens of Iran and Syria (Bastani et al. 2022:180). According to Kokbi Saghi (2018:374) the sanctions on Iran caused a fall of country's revenues, devaluation of national currency, and increase of inflation and unemployment. These all resulted in deterioration of people's overall welfare and lowering their ability to access the necessities of a standard life such as nutritious food, healthcare and medicine. Also, the sanctions on banking, financial system and shipment led to scarcity of quality lifesaving medicines. The impacts of sanctions were more immense on the lives of the poor, patients, women and children. Humanitarian exemptions did not protect Iranians from the adverse effects of sanctions.

Local pharmaceutical companies face several risks and vulnerabilities due to nature of pharmaceutical industry and its complex processes in one hand and political condition of Iran in the other hand (Jaberidoost et al., 2015: 3). Medicine imports whose equivalents are produced domestically have high tariffs (40–65%). Major proportion of drug imports are from developed countries whose drug prices are higher compared to other countries. Currently, reforming the price of manufactured and imported medicines and transferring the ownership of pharmaceutical industry to private sector are top priorities in pharmaceutical industry. This process not only increases the motivation for competition and improves the quality of medicines, it also prevents importing raw materials which can be used for domestic production and prevents exit of limited resources from the country.

The formation of the pharmaceutical industry in Iran was accompanied by the government's entry into this industry, and the structure chosen for this industry was based on the support of the government. Government and regulatory institutions tend to intervene with more and increase the pressures in further development. Pharmaceutical distribution enterprises include the wholesale and the retail enterprises. They are responsible for the entire supply chain of pharmaceutical products, from manufacturing to selling, addressing the challenges caused by temporal and spatial constraints. Pharmaceutical distribution enterprises, being an industry closely associated with human health and social development, exhibit a natural inclination towards safeguarding public interest. These companies should abide by laws and regulations, adhere to ethical and moral principles, prioritize public health, and promote sustainable development of enterprises and society (Liu et al., 2023:706)

According Dierks et al. (2016:572) pharmaceutical industry faces with numerous macroeconomic challenges including an increased cost of health care, pricing policy, R&D, pharmaceutical innovation, economic uncertainty, political and economic shocks, structural changes, new demands from patients, amending regulation and competition in markets. Collaboration as an effective means to tackle those challenges has been practiced in general by many big pharma companies for a long time (Forster et al., 2014:352). A number of empirical results showed that supply chain collaboration had positive impacts on decision-making, problem-solving, and cost saving (Ramanathan, 2014:2013).

Also, various factors affect the growth of the pharmaceutical market. One of the main growth factors is the demographic factor related to the decrease in the birth rate and increase in life expectancy, as well as the continuous process of aging and population growth (Global Pharmaceuticals Industry Analysis and Trends, 2023:19).

As per World Population Prospects by United Nations, the worldwide population is likely to cross 9.3 billion by 2050 and around 21% of this population is expected to be aged 60 and above. Apart from ageing and rising population the improvements in purchasing power and access to quality healthcare and pharmaceuticals to poor and middle-class families worldwide also is driving the growth of global pharma industry. Another aspect which is leading this growth is rising focus of pharmaceuticals companies to tap the rare and specialty diseases market. Innovations in advanced biologics, nucleic acid therapeutics, cell therapies and bioelectronics & implantable has attracted investments in the industry by even non-pharma companies like Facebook, Qualcomm etc. which is also driving the global pharmaceuticals industry growth (Global Pharmaceuticals Industry Analysis and Trends, 2023:28).

Also, one of the factors that boosts the growth of the global sales of pharmaceutical products and the growth of the global drug market is the large increase in the number of drugs used in recent years. During the period of 2013-2021, the per capita consumption of drugs has quadrupled and in a number of countries it is even more than this amount. This growth factor is related to the previous factor (population aging) as well as to changes in clinical practices and increased prevalence of chronic disease (Health at a Glance, 2015:37).

The practical foundations of the functioning and distribution of the pharmaceutical industry and market, as well as health problems in several foreign countries, are considered by many scientists (Shabaninejad, Mehralian, Rashidian, Baratimarnani, & Rasekh, 2014:1-7; Tyagi & Nauriyal, 2017: :271-290). A significant number of works are devoted to the pharmaceutical distribution industry and the identification of their specifics (Hristova, Stevcevska-Srbinoska, Mileva, & Zafirova, 2019:135).

So, important indicators of medicine supply chain management are coordination, customer relationship management, distribution management with impact factor, enterprise resource planning, financial management, globalization, IT management, knowledge management, logistics management, medical insurance system, pharmaceutical structure programming, pharmaceutical structure, and risk management (Esmaeillou, Asl, Tabibi, & Cheraghali, 2017:348; Grujić, Morača & Fajsi, 2020:81).

Moreover, some studies highlight that there are key factors of competitiveness and management of pharmaceutical distribution market: human capital; macrolevel policy; management strategy and operational efficiency of pharmaceutical companies; development of auxiliary and related industries and clusters; administrative infrastructure; potential for innovation; organizational practice; capital market infrastructure; internationalization of companies and the competitive environment (Shabaninejad et al., 2013:39).

Rossetti et al. (2019:601-622) in an article entitled "Forces, Trends and Decisions in Pharmaceutical Supply Chain Management", studied the changing nature of pharmaceutical procurement and distribution in the supply chain and the various forces associated with it. This article also provides insights into the major forces that are changing the pharmaceutical supply chain.

Yu et al. (2010-:8-15) studied pharmaceutical supply chain problems and their implications in the health system in China. This article briefly discusses the performance and challenges of the pharmaceutical market in China and provides some insights and policy implications for reforming the current system. The authors argue that the new drug pricing mechanism is the key to current drug reform.

In Abedini et al.'s research (2019: 45-59) with the title of identifying and prioritizing the critical success factors in the drug supply and distribution chain using the DIMTEL technique, senior management support, the use of information technology and government intervention, as three important factors affecting success in the drug supply and distribution chain were identified.

According to Panje Kobi and Firouzi Jahantigh (2021:42-50), changes in interest rates and inflation rates, changes in exchange rates, inflexibility in production and disruption in customer service are the most important risks in the drug supply chain.

Studies on pharmaceutical distribution industry are focused on the assessment of the impact of such directions as healthcare sector and pharmaceutical companies' compliance with competition rules. Additionally, there were provided studies on assessing the impact of digitalization on drug sales (Abha, 2018:21-29).

Some studies consider government and stakeholder relations, financial capacity and information technology as the main factors influencing the performance of pharmaceutical product distribution (Achuora, Arasa, Nzioki, Ochiri & Muangangi, 2012:55-61).

Some research considered the analysis of factors, which affected the profitability of the pharmaceutical distribution industry and the prices of medical products (Tyagi & Nauriyal, 2017:1-21, Islam & Khan, 2019:36-42).

Distribution is an expensive undertaking, and requires careful channeling and management of funds. Purchase of distribution fleet, Fleet maintenance, dispatch personnel emoluments and other costs should be well handled to ensure continued performance (Stern and Heskett, 2014:239). Cooper (2016) argues that there can never be an effective distribution if an organization is challenged financially. Finances are used to modernize fleet, to compensate drivers, to buy enough stock for distribution and more importantly, to implement and maintain a robust information system.

Use of Information technology to manage distribution system increases efficiency, predictability and reduce costs in value chains, which has positive impact on all market players (Odek, R. Elmad O. 2019:236).

Innovations such as blockchain and artificial intelligence (AI) are paving the way for distributors to play a greater role in securing the supply chain, expanding patient access, and improving health outcomes. Artificial intelligence (AI) continues to change our lives and the pharmaceutical distribution industry. Artificial intelligence is a general term for any digital technology with the ability to mimic human intelligence. The impact of artificial intelligence is evident in all sectors of healthcare (Paul, 2021:83).

Research Methodology

Since the studies conducted in the field of pharmaceutical distribution industry have different and diverse areas, territories and levels of analysis and are highly complex, a qualitative-quantitative approach has been used in this study. In this research, although the effective factors on drug distribution were determined by reviewing the research history and examining the theoretical foundations, localization of the factors and the defined initial model was done with a qualitative approach and by using the opinions of experts or the Delphi technique. In other words, after a detailed review and summarization of related studies in the form of cross tables of authors and criteria, a comprehensive understanding of the factors affecting the drug distribution industry, their dimensions and components was obtained. Then, the initial conceptual model was developed. The fuzzy Delphi method in this study was done in two rounds, so two questionnaires were developed.

At this stage, the initial conceptual model along with the questionnaire was provided to them by visiting the experts' offices in person. This questionnaire included four sections. The first part of the questionnaire was dedicated to generalities about the research and appreciation of the participation of experts in this process. The second part was related to demographic characteristics and information of experts. In the third part, there was a guide on how to answer the questions, and then a list of possible factors affecting drug distribution was presented in the form of questions. In this section, the selected experts expressed their opinions about the extent to which each factor can influence the drug distribution industry by choosing one of the available options in front of the mentioned question on a Likert scale. Choosing the 7-point scale was preferred because the greater the number of scales, the more precise and accurate the data collected (Chang et al., 2011:14174). The fourth part was dedicated to factors that were not included in the list of the second part, but were considered important and key from the point of view of experts.

The questionnaire of the second round of fuzzy Delphi was designed to a large extent similar to the questionnaire of the first round in three sections. In the first part, the demographic information and characteristics of the experts were mentioned. In the second part, a set of factors were presented that the panel members had expressed their opinions about in the first round as factors influencing the drug distribution industry. In front of each factor, the average answers of the panel members in the previous round were included. In this section, the experts should again express their opinions about the extent to which the mentioned factors affect the drug distribution industry. The third part of the questionnaire was also dedicated to the factors that were added by the panel members in the first part. In this section, the experts should also express their opinions about the impact of these factors on the drug distribution industry in the form of a Likert scale.

Fuzzy Delphi Method

Delphi Method (DM) was first developed by Dalkey and Helmer and since then, it has undergone some enhancement and modifications. It is considered not only one of the most widely used and reliable surveying and expert judgment collection methods, but one of the most widespread methods for solving numerous group decision-making problems by selecting and/or ranking factors, criteria, questionnaire elements, or measuring index elements (Lund, 2020:931). The classic Delphi method has always been associated with low convergence of experts' opinions, high implementation cost, and the possibility of excluding some people's opinions (Fendereski et al., 2023:154). While the efficiency of this technique and the widespread use of it over time have been proven, the inappropriateness of its application for many groups decision-making situations has also been proven.

In this regard, the fuzzy version of this method has been developed by, and its calculation procedures rely on fuzzy numbers and allow experts to express their opinions through them. It is also able to deal with the uncertainty problem on the one hand. On the other hand, it relies on a limited number of survey rounds, which contributes to reducing the costs, effort, and time of researchers and experts at the same time.

Meanwhile, Fuzzy Delphi Method (FDM) is the modified and enhanced version of the classical Delphi technique. FDM is different from the Delphi technique because the latter employs the probability theory instead of mathematical concepts when dealing with fuzziness in decision-making. Thus, FDM has been proposed based on the combination of fuzzy theory and traditional DM to consider human linguistic preferences in making-decision (Woodcock,2020:3). the enhancement of traditional Delphi to the fuzzy Delphi had been made due to the imperfection posed by the traditional DM that led to low convergence in getting the outcomes, loss of important

Sampling Technique

The statistical population of this research is made up of experts from Pharmacia distribution companies under Social Security Investment Company (SSIC). This study uses purposive sampling. This method is best suited because the researcher wants to reach agreement on something developed. According to Noremy et al. (2022:4) the most appropriate method in FDM is purposive sampling. There is no “magic formula” for expert selection (Keeney et al., 2006:209) and panels tend to be purposive or convenience samples rather than representative random samples from particular populations (Devaney and Henchion, 2018:48). Typical criteria used in Delphi research include having a specified number of relevant academic publications (Belton, 2019:77), professional experience/activity in the field of interest (Toma and Picioreanu, 2016:53) and/or membership of relevant organizations/institutions. Experts are normally identified on the basis of their skills, training, experience, professional membership and peer recognition (Perera, Drew & Johnson, 2012:134). In terms of the number of expert panelists that are required, many ranges have been suggested: 5–20 (Rowe and Wright, 2011:129), 15–60 (Hasson et al., 2000:1011), no > 50 (Toma and Picioreanu, 2016:54), or 15–30 for homogenous Delphi panels (Clayton, 1997:375) and 5–10 for heterogeneous panels (Delbecq et al., 1975:19). Empirical research suggests that the lower end of these ranges may be adequate (Belton et al., 2019:78).

It is generally desirable to use a heterogeneous panel of experts Rather than a homogenous panel. One of the ‘bestselling’ characteristics of the Delphi method is that because it involves a group of panelists interacting and making decisions about particular topics or issues, the potential for bias inherent in a single opinion becomes less of a threat In more heterogeneous samples, participants will have more varied opinions and experience of the topic or issues in question, and are therefore more likely to represent the variety of perspectives that exist on a particular topic and achieve more accurate and plausible judgments (Bolger and Wright, 2011; Rowe and Wright, 2001:128; Spickermann et al., 2014:208). Further, empirical research suggests that opinion diversity can improve the accuracy of the Delphi yield (Belton et al., 2019:79). Diversity can be encouraged by selecting experts who differ on a set of relevant criteria such as sector (academic, industry or government), field of expertise and/or demographics (Gheorghiu et al., 2017:106).

In this study, in addition to experts working in the pharmaceutical distribution industry, academic figures that had education and research records related to the subject under study, as well as experience in this industry, were also used. Also, the experts who plan or make policies for this field in Iran Food and Drug Administration. On the basis of very strict selection criteria, the researcher selects experts with 5 years of experience and above, and experts who are exactly right with their field of expertise and with regard to the study. While collecting data, researchers take into account several important factors such as difficulty in getting an appointment with an expert and also time constraints. Therefore, the researcher is only able to access only 35 experts. However, this amount is sufficient for the data of this study. Table 1 shows the number of questionnaires distributed, received and the percentage received.

Table 1.
Distribution and collection of questionnaires

Phase	Distributed questionnaires	questionnaires received	Received percentage	Follow up number
First	35	32	91.4	4
second	35	29	82.8	6

Research Findings
Demographic findings

In Table 2, the demographic characteristics of the respondents are presented:

Table 2.
Demographic characteristics of respondents

Variable	Category	frequency	frequency percentage
gender	Female	7	%28
	male	25	%72
Level of Education	Less than a bachelor's degree	0	0%
	Bachelor's degree	0	0%
	Master's Degree	3	%9
	Doctor of philosophy (Ph.D.)	16	%50
	Professional Doctorate	13	%41
work experience	≥ 5	0	0%
	6-10	4	%12
	11-15	8	%25
	16-20	12	%38
	≤ 21	8	%25
Age	≥ 25	0	0%
	26-30	0	0%
	31-35	1	%3
	36-40	10	%31
	≤ 41	21	%66
area of expertise	faculty member	3	%9
	managing director & Board of directors	13	%41
	Sales department	5	%15
	Buying department	2	%8
	planning department	4	%12
	Logistics department	1	3%
	other	4	12%

After a detailed review of the literature and the background of the research, the factors listed in Table 3 were identified as effective factors on the pharmaceutical distribution industry.

Table 3.
Effective factors on the pharmaceutical distribution industry

symbol	Symbolized indicators
Item 1	Mismatch between demand and pharmaceutical import
Item 2	Access to essential and basic drugs
Item 3	Pharmaceutical shortage
Item 4	Pharmaceutical market stability
Item 5	drug trafficking
Item 6	High dependence on imported raw materials and technologies
Item 7	Technological progress
Item 8	Logistics infrastructure
Item 9	Production capacity (actual, unused, etc.)

symbol	Symbolized indicators
Item 10	Statistics and information
Item 11	scientific manpower
Item 12	Research and Development
Item 13	GMP, GSP and GDP standards
Item 14	Packaging quality
Item 15	Operating costs
Item 16	New distribution and sales tools and methods
Item 17	cash flow
Item 18	chain of overdue claims
Item 19	collecting debts
Item 20	inflation rate
Item 21	Bank Interest Rate
Item 22	Exchange rate fluctuations
Item 23	Loans, facilities and credits
Item 24	Laws and regulations related to drugs
Item 25	Investing in Pharmaceutical industry
Item 26	Health sector expenditures
Item 27	drug price
Item 28	Drug pricing policy and mechanism
Item 29	Drug subsidies and discounts
Item 30	Insurance coverage
Item 31	Customer Relationship Management (CRM)
Item 32	Herbal medicine
Item 33	Development of the market for pharmaceutical products
Item 34	Iran's position in the target markets and origin of drug exports
Item 35	Competition of domestic companies
Item 36	Ratio of imported and exported drugs
Item 37	Public and private ratio
Item 38	Effective cooperation and participation of supply chain members
Item 39	Sanctions
Item 40	Joint Comprehensive Plan of Action and related negotiations
Item 41	Digital transformation

Determining linguistic scale

Fuzzy Delphi method has been used to screen and ensure the importance of the identified indicators and select the final indicators. Experts' point of view has been used to measure the importance of indicators. Although experts use their abilities and mental abilities to make comparisons, it should be noted that the traditional process of quantifying people's views cannot fully reflect the human thinking style. In other words, the use of fuzzy sets is more compatible with linguistic and sometimes vague human explanations, and therefore it is better to use fuzzy sets (using fuzzy numbers) to make long-term predictions and make decisions in the real world. In this study, Triangular fuzzy number, have been used to fuzzily the experts' point of view. The opinion of experts about the importance of each index has been compiled with a 7-degree fuzzy spectrum. This process involves the process of converting all linguistic variables into the numbering of fuzzy triangles (triangular fuzzy numbers). This step also involves the conversion of linguistic variables with the addition of fuzzy numbers (Hsieh, Lu and Tzeng, 2014:579). Triangular Fuzzy Number represents m1, m2 and m3 values and it is written like this (m1, m2, m3). The value of m1 represents the minimum value, the value of m2 represents the reasonable value while the value of m3 represents the maximum value. While Triangular Fuzzy Number is used to produce Fuzzy scale for the purpose of translating linguistic variables into fuzzy numbers.

Table 4.
The spectrum of 7 -fuzzy degrees for valuing indicators

Linguistic variable	Fuzzy value	Fuzzy number scale
Totally unimportant	1	(0, 0, 0.1)
very unimportant	2	(0, 0.1, 0.3)
unimportant	3	(0.1, 0.3, 0.5)
medium	4	(0.3, 0.5, 0.75)
Important	5	(0.5, 0.75, 0.9)
very important	6	(0.75, 0.9, 1)
Totally important	7	(0.9, 1, 1)

The first phase of Delphi

In the first phase of Delphi, a questionnaire was sent to 35 experts, and 32 completed the questionnaire. The results obtained from the first phase of Delphi are shown in Table 5:

Table 5.
Fuzzification of the opinion of the expert panel for each of the research indicators (phase 1)

Fuzzification	Expert 1	Expert 2	Expert 3	…..	Expert 32
Item 1	(0.9, 1, 1)	(0.5, 0.75, 0.9)	(0.9, 1, 1)	…..	(0.9, 1, 1)
Item 2	(0.5, 0.75, 0.9)	(0.9, 1, 1)	(0.3, 0.5, 0.75)	…..	(0.9, 1, 1)
Item 3	(0.75, 0.9, 1)	(0.5, 0.75, 0.9)	(0.75, 0.9, 1)	…..	(0.75, 0.9, 1)
Item 4	(0.75, 0.9, 1)	(0.5, 0.75, 0.9)	(0.1, 0.3, 0.5)	…..	(0.75, 0.9, 1)
Item 5	(0.5, 0.75, 0.9)	(0.1, 0.3, 0.5)	(0.5, 0.75, 0.9)	…..	(0.9, 1, 1)
Item 6	(0.75, 0.9, 1)	(0.3, 0.5, 0.75)	(0.9, 1, 1)	…..	(0.5, 0.75, 0.9)
Item 7	(0.75, 0.9, 1)	(0.5, 0.75, 0.9)	(0.9, 1, 1)	…..	(0.9, 1, 1)
Item 8	(0.75, 0.9, 1)	(0.5, 0.75, 0.9)	(0.75, 0.9, 1)	…..	(0.9, 1, 1)
Item 9	(0.5, 0.75, 0.9)	(0.3, 0.5, 0.75)	(0.5, 0.75, 0.9)	…..	(0, 0, 0.1)
Item 10	(0.75, 0.9, 1)	(0.9, 1, 1)	(0.75, 0.9, 1)	…..	(0.9, 1, 1)
Item 11	(0.1, 0.3, 0.5)	(0.75, 0.9, 1)	(0.9, 1, 1)	…..	(0.5, 0.75, 0.9)
Item 12	(0.9, 1, 1)	(0.75, 0.9, 1)	(0.9, 1, 1)	…..	(0.9, 1, 1)
Item 13	(0.5, 0.75, 0.9)	(0.75, 0.9, 1)	(0.3, 0.5, 0.75)		(0.9, 1, 1)
Item 14	(0, 0, 0.1)	(0.5, 0.75, 0.9)	(0.9, 1, 1)		(0.75, 0.9, 1)
Item 15	(0.9, 1, 1)	(0.9, 1, 1)	(0.75, 0.9, 1)		(0.9, 1, 1)
Item 16	(0.9, 1, 1)	(0.9, 1, 1)	(0.5, 0.75, 0.9)		(0.75, 0.9, 1)
Item 17	(0.75, 0.9, 1)	(0.9, 1, 1)	(0.75, 0.9, 1)		(0.5, 0.75, 0.9)
Item 18	(0.9, 1, 1)	(0.9, 1, 1)	(0.9, 1, 1)		(0.75, 0.9, 1)
Item 19	(0.75, 0.9, 1)	(0.1, 0.3, 0.5)	(0, 0.1, 0.3)		(0.9, 1, 1)
Item 20	(0.9, 1, 1)	(0.9, 1, 1)	(0.9, 1, 1)		(0.9, 1, 1)
Item 21	(0.75, 0.9, 1)	(0.9, 1, 1)	(0.9, 1, 1)		(0.9, 1, 1)
Item 22	(0.9, 1, 1)	(0.9, 1, 1)	(0.75, 0.9, 1)		(0.9, 1, 1)
Item 23	(0.5, 0.75, 0.9)	(0.9, 1, 1)	(0.5, 0.75, 0.9)		(0.75, 0.9, 1)
Item 24	(0.75, 0.9, 1)	(0.75, 0.9, 1)	(0.3, 0.5, 0.75)		(0.75, 0.9, 1)
Item 25	(0.75, 0.9, 1)	(0.75, 0.9, 1)	(0.3, 0.5, 0.75)		(0.9, 1, 1)
Item 26	(0.1, 0.3, 0.5)	(0.5, 0.75, 0.9)	(0.9, 1, 1)		(0.9, 1, 1)
Item 27	(0.75, 0.9, 1)	(0.9, 1, 1)	(0.9, 1, 1)		(0.9, 1, 1)
Item 28	(0.5, 0.75, 0.9)	(0.9, 1, 1)	(0.9, 1, 1)		(0.9, 1, 1)
Item 29	(0.5, 0.75, 0.9)	(0.9, 1, 1)	(0.5, 0.75, 0.9)		(0.5, 0.75, 0.9)
Item 30	(0.1, 0.3, 0.5)	(0.5, 0.75, 0.9)	(0.75, 0.9, 1)		(0.75, 0.9, 1)
Item 31	(0.75, 0.9, 1)	(0.9, 1, 1)	(0.9, 1, 1)		(0.9, 1, 1)
Item 32	(0.5, 0.75, 0.9)	(0.9, 1, 1)	(0.3, 0.5, 0.75)		(0.9, 1, 1)
Item 33	(0.75, 0.9, 1)	(0.5, 0.75, 0.9)	(0.1, 0.3, 0.5)		(0.75, 0.9, 1)
Item 34	(0.75, 0.9, 1)	(0.3, 0.5, 0.75)	(0.9, 1, 1)		(0.5, 0.75, 0.9)
Item 35	(0.75, 0.9, 1)	(0.5, 0.75, 0.9)	(0.75, 0.9, 1)		(0.9, 1, 1)
Item 36	(0.75, 0.9, 1)	(0.9, 1, 1)	(0.75, 0.9, 1)		(0.9, 1, 1)
Item 37	(0.9, 1, 1)	(0.75, 0.9, 1)	(0.9, 1, 1)		(0.9, 1, 1)
Item 38	(0.9, 1, 1)	(0.9, 1, 1)	(0.75, 0.9, 1)		(0.9, 1, 1)

Fuzzification	Expert 1	Expert 2	Expert 3	…..	Expert 32
Item 39	(0.9, 1, 1)	(0.9, 1, 1)	(0.5, 0.75, 0.9)		(0.75, 0.9, 1)
Item 40	(0.9, 1, 1)	(0.9, 1, 1)	(0.9, 1, 1)		(0.75, 0.9, 1)
Item 41	(0.9, 1, 1)	(0.9, 1, 1)	(0.9, 1, 1)		(0.9, 1, 1)

In the next step, the opinion of the experts should be gathered. Various methods have been proposed to aggregate the opinions of n respondents. In fact, these aggregation methods are experimental methods presented by different researchers. For example, a conventional method for aggregating a set of triangular fuzzy numbers is considered to be the minimum l, the geometric mean m, and the maximum u.

$$F_{AGR} = \left(min\{l\}, \prod\{m\}, max\{u\}\right) \quad 1$$

$$F_{AGR} = \left(min\{l\}, \left\{\frac{\sum m}{n}\right\}, max\{u\}\right) \quad 2$$

$$F_{AVE} = \left(\left\{\frac{\sum l}{n}\right\}, \left\{\frac{\sum m}{n}\right\}, \left\{\frac{\sum u}{n}\right\}\right) \quad 3$$

Each triangular fuzzy number resulting from the aggregation of experts' views for index j is shown below (Wu and Fang, 2011:756).

$\tau_j = (L_j, M_j, U_j)$
$L_j = \min(X_{ij})$
$M_j = \sqrt[n]{\prod_{i=1}^{n} X_{ij}}$
$U_j = \max(X_{ij})$
The index i refer to the expert. So that:
X_{ij}: The evaluation value of expert i of criterion j
L_j: Minimum number of evaluations for criterion j
M_j: Geometric mean value of experts' assessment of the performance of criterion j
U_j: Maximum value of evaluations for criterion j
In this study, we have used the fuzzy average method.

Defuzzification process:

Defuzzification is a method to change the fuzzy numbers into crisp real numbers. Even though there are a number of defuzzification techniques, mean of maximum, center-of-area (CoA), center of gravity (CoG) and alpha-cut methods are the most common approaches (Belton,2019:78). This study applies the center of gravity method to create crisp values. The defuzzied values of the fuzzy numbers can be obtained from Equation (4):

$$DF_{ij} = \frac{[(u_{ij} - l_{ij}) + (m_{ij} - l_{ij})]}{3} + l_{ij} \quad 4$$

The fuzzy average and the defuzzied output of the values related to the indicators are shown in Table 6. A Di fuzzified value greater than 7 is acceptable, and any index with a score less than 7 are rejected (Wu and Fang, 2011:758).

Table 6.
The results of screening the indicators (phase 1)

Indicators	lower bound	probable value	upper bound	Fuzzy average	Crisp value	Result
Item 1	.946	.798	.890	(0.646,0.798,0.89)	0.778	**Accept**
Item 2	.604	.754	.854	(0.604,0.754,0.854)	0.738	**Accept**
Item 3	.569	.756	.898	(0.569,0.756,0.898)	0.741	**Accept**
Item 4	.623	.796	.913	(0.623,0.796,0.913)	0.777	**Accept**
Item 5	.681	.833	.923	(0.681,0.833,0.923)	0.813	**Accept**
Item 6	.660	.825	.923	(0.66,0.825,0.923)	0.803	**Accept**
Item 7	.833	.956	.966	(0.833,0.956,0.996)	0.928	**Accept**
Item 8	.771	.917	.983	(0.771,0.917,0.983)	0.890	**Accept**
Item 9	.569	.756	.898	(0.569,0.756,0.898)	0.741	**Accept**

Indicators	lower bound	probable value	upper bound	Fuzzy average	Crisp value	Result
Item 10	.815	.944	.996	(0.815,0.944,0.996)	0.918	**Accept**
Item 11	.596	.750	.848	(0.596,0.75,0.848)	0.731	**Accept**
Item 12	.733	.894	.971	(0.733,0.894,0.971)	0.866	**Accept**
Item 13	.558	.725	.840	(0.558,0.725,0.84)	0.708	**Accept**
Item 14	.569	.756	.898	(0.569,0.756,0.898)	0.741	**Accept**
Item 15	.840	.960	.996	(0.84,0.96,0.996)	0.932	**Accept**
Item 16	.706	.871	.965	(0.706,0.871,0.965)	0.847	**Accept**
Item 17	.706	.850	.925	(0.706,0.85,0.925)	0.827	**Accept**
Item 18	.788	.923	.977	(0.788,0.923,0.977)	0.896	**Accept**
Item 19	.621	.769	.867	(0.621,0.769,0.867)	0.752	**Accept**
Item 20	.838	.958	1.000	(0.838,0.958,1)	0.932	**Accept**
Item 21	.748	.898	.969	(0.748,0.898,0.969)	0.872	**Accept**
Item 22	.779	.917	.981	(0.779,0.917,0.981)	0.892	**Accept**
Item 23	.610	.779	.894	(0.61,0.779,0.894)	0.761	**Accept**
Item 24	.588	.746	.865	(0.588,0.746,0.865)	0.733	**Accept**
Item 25	.602	.760	.871	(0.602,0.76,0.871)	0.744	**Accept**
Item 26	.648	.813	.921	(0.648,0.813,0.921)	0.794	**Accept**
Item 27	.829	.954	.992	(0.829,0.954,0.992)	0.925	**Accept**
Item 28	.765	.900	.960	(0.765,0.9,0.96)	0.875	**Accept**
Item 29	.633	.804	.906	(0.633,0.804,0.906)	0.781	**Accept**
Item 30	.646	.794	.888	(0.646,0.794,0.888)	0.776	**Accept**
Item 31	.792	.929	.992	(0.792,0.929,0.992)	0.904	**Accept**
Item 32	.604	.754	.854	(0.604,0.754,0.854)	0.738	**Accept**
Item 33	.623	.796	.913	(0.623,0.796,0.913)	0.777	**Accept**
Item 34	.660	.825	.923	(0.66,0.825,0.923)	0.803	**Accept**
Item 35	.771	.917	.983	(0.771,0.917,0.983)	0.890	**Accept**
Item 36	.815	.944	.996	(0.815,0.944,0.996)	0.918	**Accept**
Item 37	.733	.894	.971	(0.733,0.894,0.971)	0.866	**Accept**
Item 38	.840	.960	.996	(0.84,0.96,0.996)	0.932	**Accept**
Item 39	.706	.871	.965	(0.706,0.871,0.965)	0.847	**Accept**
Item 40	.788	.923	.977	(0.788,0.923,0.977)	0.896	**Accept**
Item 41	.738	.858	1.000	(0.838,0.958,1)	0.932	**Accept**

All items with a score of less than 0.7 should be removed, as can be seen that no items have been removed. Indicators were also added. These indicators include profitability, change in business model, change in consumer behavior, instability in the management and policy making of state-owned firms, epidemiological transition, expansion of specialized pharmacies, and distribution fleet agility. These are the indicators that were added to the indicators of the first questionnaire through the first round Delphi questionnaire and from interviews with experts and included in the second-round questionnaire.

The second phase of Delphi

In this phase, 49 indicators 41 indicators of the first phase and 8 new indicators based on the opinions of experts in the first phase) were evaluated. profitability, change in business model, change in consumer behavior, instability in the management and policy making of state-owned firms, epidemiological transition, expansion of specialized pharmacies, and distribution fleet agility were marked with the symbol of item 42 to item 49. The results of fuzzy Delphi in the second round are reported in Table 7.

Table 7.
Fuzzy average and fuzzy screening of indicators (phase 2)

Indicators	lower bound	probable value	upper bound	Fuzzy average	Crisp value	Result
Item 1	0.673	0.815	0.898	(0.673,0.815,0.898)	0.80	**Accept**
Item 2	0.692	0.827	0.900	(0.692,0.827,0.9)	0.81	**Accept**
Item 3	0.631	0.810	0.929	(0.631,0.81,0.929)	0.79	**Accept**
Item 4	0.723	0.877	0.958	(0.723,0.877,0.958)	0.85	**Accept**
Item 5	0.729	0.877	0.950	(0.729,0.877,0.95)	0.85	**Accept**
Item 6	0.663	0.831	0.929	(0.663,0.831,0.929)	0.81	**Accept**
Item 7	0.800	0.935	0.988	(0.8,0.935,0.988)	0.91	**Accept**
Item 8	0.769	0.915	0.988	(0.769,0.915,0.988)	0.89	**Accept**
Item 9	0.631	0.810	0.929	(0.631,0.81,0.929)	0.79	**Accept**
Item 10	0.777	0.921	0.983	(0.777,0.921,0.983)	0.89	**Accept**
Item 11	0.692	0.842	0.917	(0.692,0.842,0.917)	0.82	**Accept**
Item 12	0.706	0.877	0.963	(0.706,0.877,0.963)	0.85	**Accept**
Item 13	0.608	0.775	0.879	(0.608,0.775,0.879)	0.75	**Accept**
Item 14	0.631	0.810	0.929	(0.631,0.81,0.929)	0.79	**Accept**
Item 15	0.785	0.927	0.979	(0.785,0.927,0.979)	0.90	**Accept**
Item 16	0.679	0.854	0.956	(0.679,0.854,0.956)	0.83	**Accept**
Item 17	0.660	0.821	0.917	(0.66,0.821,0.917)	0.80	**Accept**
Item 18	0.754	0.902	0.969	(0.754,0.902,0.969)	0.88	**Accept**
Item 19	0.721	0.867	0.944	(0.721,0.867,0.944)	0.84	**Accept**
Item 20	0.810	0.942	0.992	(0.81,0.942,0.992)	0.91	**Accept**
Item 21	0.738	0.892	0.965	(0.738,0.892,0.965)	0.86	**Accept**
Item 22	0.779	0.917	0.981	(0.779,0.917,0.981)	0.89	**Accept**
Item 23	0.623	0.792	0.904	(0.623,0.792,0.904)	0.77	**Accept**
Item 24	0.617	0.788	0.904	(0.617,0.788,0.904)	0.77	**Accept**
Item 25	0.625	0.794	0.902	(0.625,0.794,0.902)	0.77	**Accept**
Item 26	0.708	0.869	0.958	(0.708,0.869,0.958)	0.85	**Accept**
Item 27	0.829	0.954	0.992	(0.829,0.954,0.992)	0.93	**Accept**
Item 28	0.802	0.935	0.996	(0.802,0.935,0.996)	0.91	**Accept**
Item 29	0.671	0.842	0.935	(0.671,0.842,0.935)	0.82	**Accept**
Item 30	0.752	0.892	0.960	(0.752,0.892,0.96)	0.87	**Accept**
Item 31	0.794	0.931	0.988	(0.794,0.931,0.988)	0.90	**Accept**
Item 32	0.692	0.827	0.900	(0.692,0.827,0.9)	0.81	**Accept**
Item 33	0.723	0.877	0.958	(0.723,0.877,0.958)	0.85	**Accept**
Item 34	0.663	0.831	0.929	(0.663,0.831,0.929)	0.81	**Accept**
Item 35	0.769	0.915	0.988	(0.769,0.915,0.988)	0.89	**Accept**
Item 36	0.777	0.921	0.983	(0.777,0.921,0.983)	0.89	**Accept**
Item 37	0.706	0.877	0.963	(0.706,0.877,0.963)	0.85	**Accept**

Indicators	lower bound	probable value	upper bound	Fuzzy average	Crisp value	Result
Item 38	0.785	0.927	0.979	(0.785,0.927,0.979)	0.90	**Accept**
Item 39	0.679	0.854	0.956	(0.679,0.854,0.956)	0.83	**Accept**
Item 40	0.754	0.902	0.969	(0.754,0.902,0.969)	0.88	**Accept**
Item 41	0.810	0.942	0.992	(0.81,0.942,0.992)	0.91	**Accept**
Item 42	0.779	0.917	0.981	(0.779,0.917,0.981)	0.89	**Accept**
Item 43	0.617	0.788	0.904	(0.617,0.788,0.904)	0.77	**Accept**
Item 44	0.708	0.869	0.958	(0.708,0.869,0.958)	0.85	**Accept**
Item 45	0.802	0.935	0.996	(0.802,0.935,0.996)	0.91	**Accept**
Item 46	0.752	0.892	0.960	(0.752,0.892,0.96)	0.87	**Accept**
Item 47	0.692	0.827	0.900	(0.692,0.827,0.9)	0.81	**Accept**
Item 48	0.723	0.877	0.958	(0.723,0.877,0.958)	0.85	**Accept**
Item 49	0.663	0.831	0.929	(0.663,0.831,0.929)	0.81	**Accept**

To match the two phase of Delphi, components 42 to 49 were examined again in a separate Delphi. The results are presented in Table 8.

Table 8.
The result of the second round of new components

Indicators	lower bound	probable value	upper bound	Fuzzy average	Crisp value	Result
Item 42	0.779	0.917	0.981	(0.779,0.917,0.981)	0.892	**Accept**
Item 43	0.588	0.746	0.865	(0.588,0.746,0.865)	0.733	**Accept**
Item 44	0.648	0.813	0.921	(0.648,0.813,0.921)	0.794	**Accept**
Item 45	0.765	0.900	0.960	(0.765,0.9,0.96)	0.875	**Accept**
Item 46	0.646	0.794	0.888	(0.646,0.794,0.888)	0.776	**Accept**
Item 47	0.604	0.754	0.854	(0.604,0.754,0.854)	0.738	**Accept**
Item 48	0.623	0.796	0.913	(0.623,0.796,0.913)	0.777	**Accept**
Item 49	0.660	0.825	0.923	(0.66,0.825,0.923)	0.803	**Accept**

In the second round, no indicators were removed, which is a sign for the end of the Delphi rounds. In general, one approach to the end of Delphi is to compare the average scores of the first and second round questions. If the difference between the two stages is smaller than the very low threshold (0.2), then the polling process is stopped (Cheng & Lin, 2012:72).

Table 9.
The Crisp value between the first phase and the second phase

Indicators	The result of phase 1	The result of phase 2	difference	Result
Item 1	0.778	0.795	0.017	**Accept**
Item 2	0.738	0.806	0.069	**Accept**
Item 3	0.741	0.790	0.049	**Accept**
Item 4	0.777	0.853	0.076	**Accept**
Item 5	0.813	0.852	0.040	**Accept**
Item 6	0.803	0.808	0.005	**Accept**
Item 7	0.928	0.908	0.021	**Accept**
Item 8	0.890	0.890	0.000	**Accept**

Indicators	The result of phase 1	The result of phase 2	difference	Result
Item 9	0.741	0.790	0.049	**Accept**
Item 10	0.918	0.894	0.024	**Accept**
Item 11	0.731	0.817	0.085	**Accept**
Item 12	0.866	0.849	0.017	**Accept**
Item 13	0.708	0.754	0.047	**Accept**
Item 14	0.932	0.897	0.035	**Accept**
Item 15	0.741	0.790	0.049	**Accept**
Item 16	0.847	0.830	0.017	**Accept**
Item 17	0.827	0.799	0.028	**Accept**
Item 18	0.896	0.875	0.021	**Accept**
Item 19	0.752	0.844	0.092	**Accept**
Item 20	0.932	0.915	0.017	**Accept**
Item 21	0.872	0.865	0.007	**Accept**
Item 22	0.892	0.892	0.000	**Accept**
Item 23	0.761	0.773	0.012	**Accept**
Item 24	0.733	0.769	0.037	**Accept**
Item 25	0.744	0.774	0.029	**Accept**
Item 26	0.794	0.845	0.051	**Accept**
Item 27	0.925	0.925	0.000	**Accept**
Item 28	0.875	0.911	0.036	**Accept**
Item 29	0.781	0.816	0.035	**Accept**
Item 30	0.776	0.868	0.092	**Accept**
Item 31	0.904	0.904	0.000	**Accept**
Item 32	0.738	0.806	0.069	**Accept**
Item 33	0.777	0.853	0.076	**Accept**
Item 34	0.803	0.808	0.005	**Accept**
Item 35	0.890	0.890	0.000	**Accept**
Item 36	0.918	0.894	0.024	**Accept**
Item 37	0.866	0.849	0.017	**Accept**
Item 38	0.932	0.897	0.035	**Accept**
Item 39	0.847	0.830	0.017	**Accept**
Item 40	0.896	0.875	0.021	**Accept**
Item 41	0.932	0.915	0.017	**Accept**
Item 42	0.892	0.892	0.000	**Accept**
Item 43	0.733	0.769	0.017	**Accept**
Item 44	0.794	0.845	0.069	**Accept**
Item 45	0.875	0.911	0.049	**Accept**
Item 46	0.776	0.868	0.076	**Accept**
Item 47	0.738	0.806	0.040	**Accept**
Item 48	0.777	0.853	0.005	**Accept**
Item 49	0.803	0.808	0.021	**Accept**

Based on the data in Table 9, it was found that the average value of the threshold "d" for each investigated factor meets the conditions ($d \leq 0.2$). Therefore, the Delphi rounds can be completed. All 49 investigated factors obtained a threshold value (d) between 0.092 and 0.000. Therefore, all these 49 factors have been accepted as effective factors on the drug distribution industry.

Kendall's coefficient of concordance was used to calculate the consensus of experts (Table 10).

Table 10.
Results of Kendall's coefficient of concordance

phase	The number of factors	Number of experts	Kendall correlation coefficient	Degree of Freedom	Significance level
Phase 1	41	32	0.622	40	0.000
Phase 2	49	29	0.758	48	0.000

Based on the results of Table 10, the value of Kendall's coefficient in the second round of the Delphi technique was 0.622, which shows that the consensus among the experts' views is moderate. Also, a significant value of 0.000 has been obtained, which shows that the obtained results can be relied on with 95% confidence.

Discussion and Conclusion

It is widely acknowledged that medicines are one of the most important components of healthcare, prompt access to which is one of the most important objectives of healthcare systems around the world. Easy access to medicines is also one of the main concerns of governments (Bastani et al.,2022). Unfortunately, despite the importance of the role and position of the pharmaceutical distribution industry in Iran, few studies have been conducted in this field .In this research, we have identified the main factors that influence pharmaceutical distribution industry in Iran. It should be given the utmost attention to them when developing a pharmaceutical industry development plan.

Therefore, based on the research literature, the effective factors on pharmaceutical distribution were extracted and confirmed in the form of a questionnaire and after two stages of using fuzzy Delphi and field investigation through a survey of experts. In this study, the members of the Delphi panel identified a total of 49 factors affecting the pharmaceutical distribution industry, 41 of which were mentioned in previous researches and studies, and the other 8 factors were presented by the panel members. profitability, change in business model, change in consumer behavior, instability in the management and policy making of state-owned firms, epidemiological transition, expansion of specialized pharmacies, and distribution fleet agility were the factors suggested by experts (in addition to the factors identified in previous studies).

The final factors approved by the experts are presented in Table 11.

Table 11.
Factors affecting the pharmaceutical distribution industry

main area	Sub area	Component
Domestic pharmaceutical market	Market conditions, market rules and regulations	The frequency of importing drugs into the country
		Access to essential and basic drugs
		shortage of drugs
		Market stability
		drug smuggling
		Laws and regulations related to drugs
		governance in the field of drugs (government interventions)
Production and distribution of	Production and distribution cycle	High dependence on imported raw materials and technologies

main area	Sub area	Component
pharmaceutical products		Technological progress
		Logistics infrastructure
		Production capacity (actual, unused, etc.)
		instability in the management and policy making of state-owned firms
	Sources of knowledge and information necessary for production and distribution	Statistics and information
		scientific manpower
		Research and Development
	Quality of production and distribution of pharmaceutical products	GMP, GSP and GDP standards
		Packaging quality
		New distribution and sales tools and methods
Financing	Ability to pay debts and collect claims in the supply chain	cash flow
		collecting debts
		profitability
		chain of overdue claims
	Domestic and foreign exchange financial transactions and exchanges	inflation rate
		Bank Interest Rate
		Exchange rate fluctuations
		Loans, facilities and credits
	Investing in pharmaceutical industry	Domestic investment
		Foreign investment
		Health sector expenditures
	Drug pricing policy	drug price
		Drug pricing mechanism
		Drug subsidies and discounts
		Insurance coverage
Marketing	Branding of domestic, export and import pharmaceutical products	Customer Relationship Management (CRM)
		Herbal medicine
		Development of the market for pharmaceutical products
		Iran's position in the target markets and origin of drug exports
	Competition	Competition of domestic companies
		Ratio of imported and exported drugs
		Public and private ratio
	Paradigm Shift	change in business model
		change in consumer behavior
		epidemiological transition
		expansion of specialized pharmacies
		distribution fleet agility
Networking, internal and external relations	Effective partnership and cooperation of supply chain members	Unions, teams and effective business communication
	Foreign relations and policy	Sanctions
		Joint Comprehensive Plan of Action and related negotiations
	Internal communication tools	Exhibitions, seminars, conferences, conventions, etc.

Based on the results of interviews with experts, perhaps the most important factor affecting Iran's pharmaceutical industry is the issue of Liquidity provision, and the next factor is the currency needed to purchase raw materials and other auxiliary materials in the path of drug production. The issue of drug pricing in the country has become even more complicated than the issue of currency, because currently a major part of the country's pharmaceutical products is purchased directly and indirectly by the government for use in government hospitals. In other words, the government is both a buyer and an observer and also determines the price of pharmaceutical products. In fact, part of the problems and challenges of the pharmaceutical system are rooted in the structure, type of view and also the way of governance in this field. The result of this resource conflict is the crises that we see at different times.

One of the important factors affecting the drug distribution industry is proper investment to update various processes. Changes such as mechanization, updating software systems, renewing the distribution fleet and transportation equipment inside the warehouse and reaching global standards require investment, and in this regard, when there is no proper profit margin in this industry and considering the costs in the current frenzy, there will be no opportunities and necessary conditions for investment in this field.

Another point is that the low price of drugs, which has been affected by the allocation of government currency in recent years, has caused this product group to be very cheap compared to other products that are distributed in the country; While the costs in this industry are all based on free currency and as a result of the gap that is created in between, it has made it impossible to carry out transformation and updating for broadcasting companies.

Another effective factor in the pharmaceutical distribution industry is that all the costs of drug production and distribution, including personnel salaries, fleet purchase, operating costs, service and maintenance, etc., are financed with free currency, but because the drug receives government currency, the price of the drug is proportional It does not increase with costs, which means that the revenue of drug distribution companies does not increase, but their costs experience an increasing trend.

Mandatory prices for drugs or the mandated determination of the profit margin for the pharmaceutical industry, which is derived from the country's economic model, have caused losses to many companies. For example, currently, drug distribution has a profit margin between 4 and 12%, and this is despite the fact that drug distribution companies need Good Storage Practices (GDP) and Good Distribution Practices (GDP) with a suitable fleet, and this issue is not possible with an average profit margin of 10%.

The difference in drug prices in Iran and neighboring countries, which is caused by price suppression of drugs, has created incentives to export drugs from unofficial sources. In a situation where some drugs are not easily accessible in the country's pharmacies, smugglers earn huge profits through the illegal transfer of drugs abroad.

The undeniable fact is that the claim collection period in the pharmaceutical industry is long. In this regard, there are several reasons, including the debt of insurance companies and public hospitals to drug distribution companies. Also, the debt of insurance organizations to private and government pharmacies has increased significantly, as a result of which the liquidity of drug distribution companies is in an unfavorable situation, and this issue has not only affected the development of the distribution industry, but also affected the country's drug supply chain.

This problem causes that if a drug distribution company is in a critical situation, it will not be able to finance to get out of the crisis. On the other hand, due to the high bank interest rate, getting your own bank facility will increase the financial costs of the company.

In such an environment, strategic cooperation between suppliers, manufacturers and distribution companies can create a valuable competitive advantage for all three sides of this triangle and the synergy between their resources and processes will be maximized.

This research investigation did not exhaust all the factors that influence pharmaceutical distribution Industry at Iran, and therefore there is a need for further research to identify any other factor that impacts distribution. A new tendency for a future research paper, using the current findings can be considered building a deterministic econometric model for determining the factors affecting the pharmaceutical distribution Industry concentrated on the area of supply-chains, meaning here the whole set of producers–importer – distributor -retail.

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