Original Article

Strategies of Hepatitis B vaccine export to the Middle East and Central Asian countries

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ABSTRACT

Introduction: This paper proposes an appropriate strategy for exporting Hepatitis B vaccine, manufactured by Pasteur Institute of Iran, to other countries. **Methods:** Eeffectiveness factors and their relative variables were found out by factor analysis method in SPSS software. **Results:** We could identify 6 main factors which can extremely affect the export of this product. We evaluated manufacturer's strategic position among its competitors and the production market via SPACE model and put the obtained scores from the factor analysis method in this model matrix. **Conclusion:** We determined Iraq as the target market and identified suitable strategies for exporting the vaccine to this country.

KEYWORDS: Strategy, Hepatitis B, Vaccine, Factor analysis, SPACE model.

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[DOI: 10.18869/acadpub.vacres.2.4.45]

INTRODUCTION

One of the most important aspects of a strategic planning is to determine the necessary strategies in order to achieve the organization's goals [1]. Strategic management can be understood as a collection of decisions and actions taken by business managers, in consultation with all levels within an organization, to determine the long term activities of that organization [2, 3]. Important ways in strategy formulation can be classified in a three-step decision framework. Tools or methods presented in this framework are suitable for a variety of organizations and can help to identify, evaluate and choose the best strategic options. The first phase strategy includes Internal Factors Evaluation matrix (IFE), External Factors Evaluation matrix (EFE) and the matrix of Competition (CPM). In the first stage that is called the input stage, the main needed information to develop strategies is determined. Evaluation matrix of external factors and the matrix of competition are identified and the main external factors, the environmental opportunities and the threats are identified [4]. This provides the internal strategic information which is important for the firm [5]. In other words, stage 1 summarizes the basic input information needed to formulate the strategies [1].

In the next step, attention must be paid to the types of strategies and a balance must be established among the main sectors of domestic and foreign industries [6]. Stage 2 focuses on the generation of feasible alternative strategies by aligning key external and internal factors. Stage 2 techniques include Strength-Weaknesses-Opportunities-Threats (SWOT) matrix, Strategic Position and Action Evaluation (SPACE) matrix, Boston Consulting Group(BCG) matrix, Internal-External (IE) matrix and Grand Strategy matrix [5]. SPACE matrix analysis is based on two internal and two external dimensions [7].

External

Industry Attractiveness
Environmental Stability

Internal

Competitive Advantage
Financial Strength

By combining the ratings on each dimension on one SPACE matrix diagram, the framework guides the strategic agenda. The dimensions are combined in a way that seems strange at first but make sense because the two sets of the factors are assessed as strength (financial strength and industry strength) and are rated positively while the other two (competitive advantage and environmental stability) are assessed as potential weaknesses and are rated negatively. The logic is that the financial strength is needed to compensate for the environmental instabilities. The more difficult the future environment is thought to be, the more important it is to have strong financials [6]. Depending upon the type of a firm and its industry, a number of variables could make up each of the dimensions, represented on the axes of a typical SPACE matrix [8].

The third stage is called decision making and evaluates the strategies derived from the previous steps [6]. Stage 3 involves a technique, the Quantitative Strategic Planning matrix (QSPM). A QSPM uses input information from stage 1 to

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objectively evaluate feasible alternative strategies which were identified in stage 2 [5]. It is possible to consult with the company experts to choose appropriate strategies as opposed to using QSPM[9].

Factor analysis is one of the most commonly used methods for data reduction in the social science researches. Factor analysis assumes that underlying dimensions or factors can be used to explain complex phenomena. The goal of factor analysis is to identify the not directly- observable factors, based on a longer set of observable or measurable indicators (variables). Factor analysis is used to discover patterns of relationships amongst variables into factors combined from these variables [10].

It is appropriate to assume that it is possible to use factor analysis conclusions as the required information of entrance data in stage 2. In other words, we attempt to use factor analysis results as the necessary data of choosing suitable strategies instead of other methods such as EFE and IFE.

Along with substantial research in medical sciences, Pasteur Institute of Iran is one of the most important pharmaceutical manufacturers in the Middle East and Central Asia. The manufacturing sector of the institute produces two human vaccines, namely BCG and Hepatitis B, using modern biotechnological methods. In this study, we tried to find an appropriate niche market for Hepatitis B vaccine of this institute.

MATERIALS and METHODS

We encounter a lot of indicators in the humanities and economic issues which can affect each subject and knowing the most effective factors among them is a must. In order to achieve this goal, factor analysis was performed by SPSS software. We used this method because we were trying to survey the Hepatitis B vaccine export factors and their relatedness on one hand, and these factors effects on the sale and export trends, on the other hand. We obtained all data from 131 questionnaires distributed among the company employees. All of questionnaires were valid. Most of the questionnaires were filled by middle and upper level managers; for instance people who had majored in bachelor degrees of different disciplines such as pharmaceutics, IT, Accounting, Business Administration and Healthcare Services Management. A significant point in factor analysis is to determine the sample size. Goursuch (1983) recommended five subjects per item, with a minimum of 100 subjects, regardless of the number of items [10]. Zohreh Sarmadi's recommendation is 4-6 subjects per item [11].The questionnaire contained 26 variables; therefore, we needed 130 questionnaires and that is why we distributed 131 questionnaires. There are two techniques in factor analysis, namely oblique technique and orthogonal technique. Because of the complexity of the humanities and its related issues, it has been recommended to use oblique technique in factor analysis. However, varimax rotation in orthogonal technique has also the same results as oblique technique. We used varimax rotation and found out 6 main factors as indicated in Table 1.

Table 1. Rotated Component Matrix

	Component					
	1	2	3	4	5	6
Shipment routs	**.859**	.186	.008	.103	.175	.083
Airline routes	**.855**	.094	.118	.083	.163	.124
Railroad	**.810**	.309	.107	.093	.226	-.019
Ground routes	**.794**	.209	.134	-.097	.210	.170
Custom importer country	**.752**	.158	.355	.149	-.182	.224
Medical depending	**.724**	.240	.139	-.034	.224	-.138
Trade rate	**.689**	.329	.222	.030	.226	-.178
Custom importer country limit	**.630**	.083	.427	.125	-.164	.319
Iranian export laws	**.557**	-.227	.142	.506	.310	.111
Iranian custom laws	**.529**	-.146	.230	.433	.299	.230
Religion	.199	**.827**	.112	.107	.023	.314
Language	.206	**.827**	.065	.191	.141	.189
Cultural similarities	.198	**.759**	.266	-.084	.003	-.233
promotion(Halaal)	.414	**.576**	.202	.166	.042	.148
National income	.090	.178	**.830**	-.021	.148	.066
GNP country	.222	.237	**.828**	-.003	.184	.029
Population growth rate	.251	.142	**.660**	.395	.102	.034
Life expectancy	.366	.088	**.505**	-.023	.322	.482
Vaccine standard	-.126	.037	-.131	**.734**	-.085	-.033

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	Component					
	1	2	3	4	5	6
Vaccine package	.136	.421	.216	***.638***	.038	.113
Administrative institute affairs	.369	-.002	.027	***.536***	.476	.125
Vaccine size	.105	.408	.235	***.524***	.120	-.027
Currency assets	.203	.138	.183	.047	***.801***	.010
Institute balance sheet	.328	.029	.421	.023	***.630***	-.052
Vaccine price	.049	.151	.067	.027	-.060	***.858***
Management stability	.139	.099	.021	.108	.547	***.589***

These 6 main factors were named as:

1. Economic Development Factor, contained: 10 variables.
2. Cultural Factor, contained: 4 variables.
3. Macro Economy Factor, contained: 4 variables.
4. Vaccine Quality Factor, contained: 4variables.
5. Financial Factor, contained: 2 variables.
6. Productivity Factor, contained: 2 variables.

As David has illustrated the SPACE model in more details[9], the main SPACE criteria could be divided into some parts. For example, the governance rules are the factories trade facilitator and could be categorized as IS. From this aspect, we merged obtained factors together and made our SPACE criteria, as follows:

- IS: contained Economic Development and Productivity Factors.
- CA: contained Culture and Macro Economy Factors.
- FS: contained Financial Factor.
- ES: contained Vaccine Quality Factor.

In order to determine the appropriate strategies for the manufacturing and production position in the market, we used the average of factors and their related variables means which had been obtained by SPSS software from the filled questionnaires. In the next step FS, IS, ES and CA were calculated. The variables means are shown in Table 2.

Table 2. Variables means

	N	Range	Minimum	Maximum	Mean
	Statistic	Statistic	Statistic	Statistic	Statistic
Vaccine standard	131	40	60	100	***96.06***
Iranian export laws	129	100	0	100	***80.89***
Vaccine price	131	90	10	100	***79.01***
Iranian custom laws	129	90	10	100	***78.86***
Management stability	131	100	0	100	***78.51***
Currency assets	130	100	0	100	***74.88***
Administrative institute affairs	131	90	10	100	***74.82***
Medical depending	129	100	0	100	***73.55***
Custom importer country	131	100	0	100	***73.24***
Custom importer country limit	129	100	0	100	***72.40***
Vaccine package	130	90	10	100	***71.39***
National income	130	100	0	100	***70.85***
Population growth rate	130	100	0	100	***70.68***
Institute balance sheet	129	100	0	100	***69.42***
Trade rate	130	100	0	100	***67.55***
Airline routes	131	100	0	100	***67.37***
Life expectancy	131	100	0	100	***66.94***
GNP country	130	100	0	100	***63.68***
Vaccine size	128	100	0	100	***61.08***
Shipment routs	130	100	0	100	***60.62***
Ground routes	130	100	0	100	***59.16***
Railroad	130	100	0	100	***57.88***

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Cultural similarities	129	100	0	100	***56.57***
Promotion	126	100	0	100	***48.96***
Language	128	100	0	100	***43.56***
Religion	130	100	0	100	***42.65***
Valid N (list wise)	117				

For example, FS was measured by using the means of 2 variables of a factor (Currency Assets and Institute Balance Sheet) which were categorized in a column as it has been shown in Table 2. These indicators were categorized as financial strength factor (FS).We used Dancken method to compute the SPACE axis[12]. The means of variables were added together and the result was divided by 2 and finally, the results were multiplied by multiples of 6 (6/100).

$$FS = \frac{74.88 + 69.42}{2} = 72.15 \qquad 72.15 * \frac{6}{100} = 4.329$$

In order to compute ES and CA which are potentially negative in SPACE matrix, we deducted the result of the above operation from 6[12]. For example, we calculated CA as follows:

$$CA = \frac{70.85 + 70.68 + 66.94 + 63.68 + 56.57 + 48.96 + 43.56 + 42.65}{8} = 57.986$$

$$57.986 * \frac{6}{100} = 3.48 \qquad 3.48 - 6 = -2.52$$

Two remaining axis (IS and ES) were **4.25** and **-1.45**, respectively.
Finally, IS and CA were added together:
$IS + CA = 4.25 + (-2.52) = 1.73$
The sum of ES and FS were equal to: **4.33+ (-1.45) = 2.88**

RESULTS

In our examination, the KMO value equaled 0.833 and the P value in Bartlett's test was less than 0.001 which proved that Hepatitis B vaccine indicators are suitable for explanatory factor analysis. In other words, it means our sample size for factor analysis was adequate. Besides, the Cronbach's Alpha (Reliability test) value equaled to 0.934 and it indicated our survey questionnaire was reliable.
In order to find out the institute's strategic position, the SPACE model axis was measured and its diagram is shown in Fig.1.
As it can be seen in Fig. 1, the situation of the institute is in aggressive quadrant. In other words, the factory is placed in the best situation and is authorized to develop its market and products easily. Needless to say, this development requires choosing appropriate strategies and markets. As noted above, the company is in aggressive situation, meaning the manufacturer managers can use a wide range of strategies such as market penetration, market development, product development, forward and backward integration and diversification. In order to determine a certain and accurate strategy for exporting this product and to choose the target market, some required information were collected. These data were about the different aspects of the Middle East and Central Asia as follows:

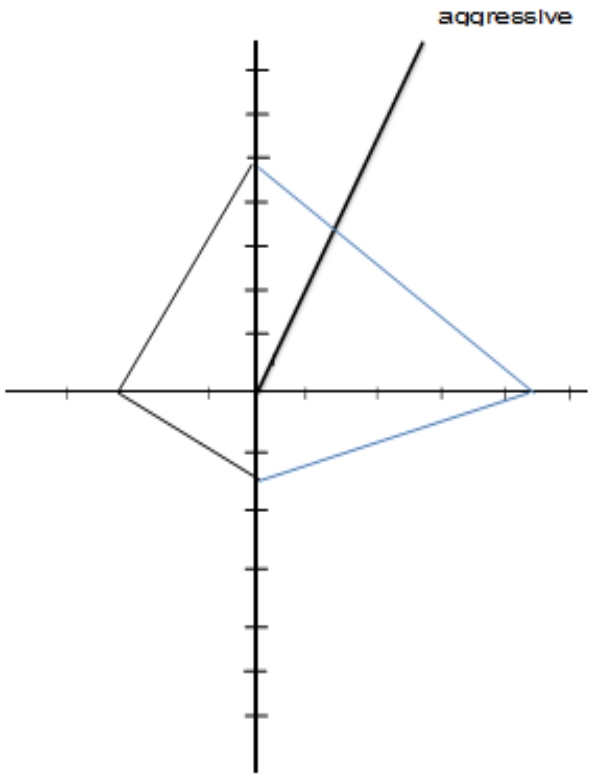

Fig. 1. **Pasteur Institute of Iran strategic position**

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Airports with paved runways

Table 3. Airport ranking in the Middle East and Central Asia

Row	Country	WORLD RANKING	Number of Airports
1	Pakistan	14	32
2	Iran	15	26
3	Saudi Arabia	17	23
4	Kazakhstan	24	16
5	Azerbaijan	28	15
6	Iraq	53	5
7	Armenia	53	5
8	Afghanistan	85	2
9	Turkey	85	2
10	Bahrain	101	1
11	Lebanon	101	1
12	Kuwait	101	1
13	Qatar	101	1
14	UAE	101	1

As shown in Table 3, the majority of Iran's neighbors have a sufficient number of airports whereas other countries do not have such facilities [13].

The routes

Table 4. Comparison of routes in the Middle East and Central Asian Countries

Row	Country	Routes(Kilometer)	World ranking
1	Turkey	313151	13
2	Pakistan	172827	16
3	Iran	125908	21
4	Kazakhstan	84100	29
5	Turkmenistan	47577	50
6	Saudi Arabia	47529	51
7	Iraq	37851	57
8	Azerbaijan	29210	63
9	Syria	19490	70
10	Afghanistan	12350	81
11	Lebanon	6198	102
12	Kuwait	4887	111
13	UAE	4080	119
14	Bahrain	3121	128
15	Qatar	1107	155

Table 4 indicates the majority of Iran's neighbors have qualified and standard routes[13].

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Trade rate

Table 5. Trade rate between Iran and the Middle East and Central Asian countries

Year	Country	Export(Dollar)	Import(Dollar)	Currency Trading(Dollar)	Trade Balance(Dollar)
2011	Pakistan	659518915	272639344	932,158,259	386,879,570
2011	Azerbaijan	464410161	37494287	501,904,448	426,915,874
2011	Armenia	107713572	32610262	140,323,834	75,103,310
2011	Afghanistan	2253063589	10280069	2,263,343,658	2,242,783,520
2011	EUA	4508964529	19722857312	24,231,821,841	-15,213,892,783
2011	Bahrain	7929914	16435109	24,365,023	-8,505,195
2011	Tajikistan	194964008	18947365	213,911,373	176,016,643
2011	Turkmenistan	532382890	136358158	668,741,048	396,024,733
2011	Turkey	1431099210	136358158	1,567,457,368	1,294,741,053
2011	Syria	372982770	26226218	399,208,989	346,756,552
2011	Iraq	5179407948	124493624	5,303,901,572	5,054,914,324
2011	Saudi Arabia	107591660	135632211	243,223,870	-28,040,551
2011	Oman	100483584	499902691	600,386,276	-399,419,107
2011	Kyrgyzstan	40101798	4777287	44,879,085	35,324,511
2011	Qatar	76159612	8893763	85,053,376	67,265,849
2011	Kuwait	134762931	92560630	227,323,561	42,202,301
2011	Lebanon	77635658	43545859	121,181,518	34,089,799
2011	Yemen	28767352	15923	28,783,275	28,751,429

This table shows that Iraq is Iran's main export destination [14]. The trade balance has exceeded over 5 billion dollars. Afghanistan is in the next place with a trade balance exceeding 2 billion dollars. Turkey is in the third place with a trade balance of approximately 1.3 billion dollars. The main export of Iranian goods to Turkey is natural gas. Besides, the majority of the foreign imports to Iran are from the UAE.

Muslim populations

According to Ghatreh site report [15], the majority of the population in the Middle East and Iran's neighbors are Muslims. Table 6 shows the Muslim population and the prediction of this religion growth in these countries up to 2030:

Table 6. Muslims population in the Middle East and Central Asian countries

	Muslims Population(1990)	Percentage of Muslims Population(1990)	Muslims Population(2010)	Percentage of Muslims Population(2010)	Muslims Population(2030)	Percentage of Muslims(2030)
Afghanistan	12,551,000	99.8	29,047,000	99.8	50,527,000	99.8
Armenia	128,000	3.6	1,000	0.1	1,000	0.1
Azerbaijan	5,635,000	78.1	8,795,000	98.4	10,162,000	98.4
Bahrain	403,000	81.8	655,000	81.2	881,000	81.2
Iran	56,506,000	99.6	74,819,000	99.6	89,626,000	99.7
Iraq	17,356,000	96.0	31,108,000	98.9	48,350,000	98.9
Kazakhstan	8,391,000	50.8	8,887,000	56.4	9,728,000	56.4
Kuwait	1,966,000	91.7	2,636,000	86.4	3,692,000	86.4
Kyrgyzstan	2,449,000	55.7	4,927,000	88.8	6,140,000	93.8
Oman	1,616,000	87.7	2,547,000	87.7	3,549,000	87.7
Pakistan	112,303,000	97.0	178,097,000	96.4	256,117,000	96.4
Qatar	423,000	90.6	1,168,000	77.5	1,511,000	77.5
Saudi Arabia	16,096,000	99.0	25,493,000	97.1	35,497,000	97.1
Syria	11,067,000	87.0	20,895,000	92.8	28,374,000	92.8

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Tajikistan	4,086,000	77.1	7,006,000	99.0	9,525,000	99.0
Turkey	55,121,000	98.3	74,660,000	98.6	89,127,000	98.6
UAE	1,624,000	87.0	3,577,000	76.0	4,981,000	76.0
Yemen	12,191,000	99.0	24,023,000	99.0	38,973,000	99.0

Population growth rate

The rate of population growth in the Middle East and Central Asian countries has been indicated in Table 7. This information has been obtained from a UN [16] report.

Table 7. Population growth rate (2012)

Row	Country	Population Growth Rate
1	**Afghanistan**	3.85
2	**UAE**	2.85
3	**Kuwait**	2.44
4	**Saudi Arabia**	2.24
5	**Qatar**	2.11
6	**Oman**	1.97
7	**Pakistan**	1.84
8	**Bahrain**	1.79
9	**Tajikistan**	1.51
10	**Iran**	1.35
11	**Turkmenistan**	1.32
12	**Turkey**	1.26
13	**Kyrgyzstan**	1.1
14	**Azerbaijan**	0.75
15	**Kazakhstan**	0.71
16	**Armenia**	-0.21

Table 7 indicates the high rate of population growth in the Middle East countries. WHO has reported that despite many attempts by these countries, their growth rates are still high [17]. In addition, these youthful populations are potential markets for the Hepatitis B vaccine.

Life expectancy

The rate of life expectancy whereas child mortality rate is decreasing every day, indicating that high percentages of the population belong to an inactive sector of under 14 years of age [16].

Table 8. The rate of life expectancy in the Middle East and Central Asian countries

Row	Country	2010-2015	2015-2020
1	**UAE**	78.7	79.3
2	**Kuwait**	77.6	78.2
3	**Oman**	75.6	76.6
4	**Qatar**	75.6	76.4
5	**Bahrain**	75.6	76.4
6	**Saudi Arabia**	72.8	73.8
7	**Armenia**	72	72.7
8	**Turkey**	71.8	72.7
9	**Iran**	71	72.3
10	**Afghanistan**	68.5	69.8
11	**Kazakhstan**	67	69
12	**Tajikistan**	66.7	67.7
13	**Kyrgyzstan**	65.9	66.9
14	**Pakistan**	65.5	67.2
15	**Turkmenistan**	63.2	64.6
16	**Iraq**	59.5	65.7

Four percent of the populations in societies with low life expectancy are older than 60 years who provide a potential demand for the healthcare treatment and services. Table 7 indicates that Iraq has the lowest life expectancy among the indicated Middle East and Central Asian countries.

Hepatitis B vaccine prices

There are few manufacturers in the world which are able to produce Hepatitis B vaccine. The majority of these factories are located in the USA and the EU. India, South Korea and China are producers of this vaccine in Asia as well. As it has been shown in Table 9, the price of this product, manufactured by Pasteur Institute of Iran is reasonable [18].

Table 9. Hepatitis B vaccine prices

Product Name	volume	Price (Rupee)	Manufacture
HEPAGEN – PLUS	1ml	159.00	VHB Life Sciences
BEVAC	1ml	170.00	Biological E.
ENDIVAC HB	1 ml Inj.	170.00	Panacea Biotec
HB VAC	1ml	170.00	Zydus Cadila (VaccicareDivision)
ENIVAC HB	1ml	170.00	Panacea Biotec
LG EUVAX B	1ml	190.00	LG Life Sciences
BIOVAC – B	1ml	190.00	Wockhardt

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HEPASHIELD	1ml	222.23	Pfizer
ENIVACHB SAFSY	1ml	230.00	Panacea Biotec
GENEVAC – B	5ml	340.00	Serum Institute
ENGERIX B	1ml	345.00	Glaxo
GENEVAC – B	10ml	668.00	Serum Institute
HEPASHIELD	10ml	1925.00	Pfizer
HEPATITIS B VACCINE	5ml	1000.00	Pasteur Institute of Iran

DISCUSSION

Our results suggested that the institute is capable of performing the following actions:

- Exploiting the external opportunities
- Overcoming the internal weaknesses
- Avoiding the external threats

Therefore, some actions could be taken by Pasteur Institute of Iran such as market penetration, product development, forward and backward integration and diversification. Considering that Pasteur Institute of Iran lacks any market share on one hand and its price for the product is competitive on the other hand, the best strategy to sell its vaccine is market penetration. In addition, since the institute is not currently exporting this vaccine, using a backward integration in the short term seems impossible. On the other hand, the factory is incapable of introducing new products to the markets in the short term. Therefore, using a product development strategy is inappropriate. Besides, some cultural similarities like common religion and language can facilitate the marketing in Iran's neighbors. As Vernon Terpstra indicated in his article[19], the consumption pattern will be affected by religion. Moreover, he has emphasizes that language is the main factor to make a good communication with a strange culture. From this point of view, the majority of Iran's neighbors are Muslims and Persian is a common language with countries like Afghanistan and Tajikistan. Therefore, the target market could be one of Iran's neighbors. Our survey affirmed the culture rule in marketing and determining a suitable strategy.

Vernon Terpstra in his article[20] has studied the effects of population growth rate on international marketing as well and believes this factor can help to make a good market of healthcare products while the whole demand will decrease due to the reducing net income (NI).Our experiment confirmed his idea. A significant numbers of Iran's neighbors have a high rate of population growth. It means that the majority of them can be a good market for Iran's products. Furthermore, the life expectancy factor can intensify the effectiveness of a population growth rate. Iraq and Afghanistan have a high rate of population growth and the lowest rate of life expectancy among Iran's neighbors. This emphasizes that these two countries are good potential markets for the Iranian productions.

Other important criteria are national income and GNP. As it is inferred from the article "What is the tomorrow view while economic recession is starting in Iran?" [21], increasing GNP can affect the demands in a society. There are 3 countries that can be Iran's market, namely, Iraq, Turkey and Afghanistan. The current national incomes of these countries extracted from a World Bank report are as follows:

Turkey	**636812809240**	**Dollar**
Iraq	**33989864526**	**Dollar**
Afghanistan	**13419671262**	**Dollar**

As indicated, Turkey has the highest national income. This criterion is an index which indicates the purchasing power of the country. From this point of view, Turkey is the best market for this product. However, this country is just a buyer of Iran's natural gas. The next potential target markets can be Iraq and Afghanistan.

Iraq is the next country in terms of national income after Turkey. The trade balance with Iraq shows that this country is the final destination of the majority of the exported Iranian goods, totaling approximately 5 billion dollars, making this country a potential market for each Iranian product. On the other hand, the majority of Iraqis are Muslims. All these aspects can contribute to help Pasteur Institute of Iran to find a prosper market for its vaccine in this country.

In terms of freight, transportation of the vaccine overland is as efficient as its air transportation. Meanwhile, the delivery costs of air transportation are very high which makes the overland transportation more affordable. Besides, overland transportation is adequately rapid. Some Iranian scientists like Dr. E. Abdoli have studied freighting methods for Iranian products exports[22]. They have concluded that the cost of transportation is the most important criterion for exporting of the goods. Our survey confirmed the importance of the freight cost. Iran has joint borders with 7 countries. The lack of appropriate airports within many of Iran's neighboring countries is an adequate reason for overland exporting. Considering Iraq, the product can easily be exported through ground shipping. Other advantages of Iraq for marketing of the vaccine are low delivery costs and about 35000 Km of paved routes. Our study endorsed that the trade rate is a crucial marketing determinant as stated by Dr. J. Ebadi's in his article[23].

In this paper we attempted to use Fred David's strategy formulation framework for Pasteur Institute of Iran, as a manufacturer of Hepatitis B vaccine in the Middle East. After describing the theoretical grounds for the framework, we collected relevant data through factor analysis method as opposed to other methods such as IFE or EFE. We designed then a case study of Pasteur Institute of Iran on Hepatitis B vaccine exporting. Third, we applied the strategy formulation to the company and proposed the most suitable strategy amongst alternative ones for the company. Finally, we discussed about the target markets and ways to achieve them. In conclusion, we identified Iraq as the best country for marketing the product and determined an appropriate strategy to achieve this market.

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[DOI: 10.18869/acadpub.vacres.2.4.45]

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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[DOI: 10.18869/acadpub.vacres.2.4.45]