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MOTIVATIONAL FACTORS ON HIGH-LEVEL ENGINEERS' MIGRATION DECISION INTO THE UNITED STATES: A CASE STUDY OF IRANIAN ENGINEERS IN SOUTHERN CALIFORNIA

presented by

Armin Ahmad Zehtabchi

has been accepted towards fulfillment
of the requirements for

Ph.D. degree in Educational Administration

Major professor

Date July 23, 1993

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By

Armin Ahmad Zehtabchi

A DISSERTATION

Submitted to
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DOCTOR OF PHILOSOPHY

Department of Higher Education Administration

1993

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ABSTRACT

MOTIVATIONAL FACTORS ON HIGH-LEVEL ENGINEERS' MIGRATION DECISION INTO THE UNITED STATES: A CASE STUDY OF IRANIAN ENGINEERS IN SOUTHERN CALIFORNIA

BY

ARMIN AHMAD ZEHTABCHI

The Iranian economy has undergone a major transformation since the early 1960s, when the government began to promote rapid industrialization.

Despite the tremendous achievement and the government's commitment to industrialization, Iranian industrialization was confronted with many obstacles. Iran lacked the high-level professionals, especially the engineers, its industry required. The immediate shortage of engineers in Iran could have been minimized if the government had paid more attention to its own engineers working abroad. A lack of comprehensive educational and human resources planning and a lack of careful attention from the government intensified the problem of so called "brain drain."

The Iranian revolution of 1978-79 and especially the Iran-Iraq war in 1980, led thousands of Iranian professionals including engineers to leave the country and immigrate to the United States.

It was the purpose of this study to investigate the factors and variables which influence the Iranian engineers' decision making to stay in the United States or return to Iran.

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A research hypotheses testing was used in conducting this study. A total of 300 questionnaires and 300 follow-up letters along with second questionnaires were mailed to Iranian engineers based on a random sampling technique. A total of 123 questionnaires were completed for the study.

In this study, it was concluded that there is a large pool of high-level Iranian engineers living in the United States, specifically in Southern California. The results of this study indicated that engineers are motivated by some important factors. The potential income, suitable job opportunities, chance to obtain more professional recognition, professional challenge, unique training opportunities, and library facilities were considered to be important among those engineers who indicated that they would not desire to return to Iran. Family ties, participating in the country's development process, Iranian cultural values, patriotism, and social life in Iran were the most significant and influential factors among those Iranian engineers who indicated their willingness to return to Iran.

Dedicated to my wife and son,

Susan and Arman

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I am also indebted to the assistance and support I received from my research and doctoral program guidance committee. I would like to express my deep appreciation to Dr. Eldon Nonnamaker for his intellectual coaching and support throughout my doctoral program. A similar note of thanks is extended to Dr. Roy Wesselman. His continuing interest in my research topic has been a welcome source of inspiration.
I would also like to thank Dr. Marvin Grandstaff for serving in my research guidance committee. It was my honor to be directed and to be associated with such intellectual and great professor of law.

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I would like to take this opportunity to thank Dr. Kenneth Neff who advised and supported me for sometime. Although he is currently retired, his great and intellectual advisement will be remained unforgettable. I would like to send him my best of wishes of lucks.

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I would like to thank Mrs. Pauline Lynn who helped me with final checking and proofreading which made the completion of this work possible.

I am also thankful to all Iranian engineers who devoted their valuable time to complete and return the questionnaires.

Finally, my sincere thanks goes to my wife and my son, Susan and Arman, who graciously made sacrifices. Their continuous support through the long, silent hours of research and writing enabled me to accomplish my goal and complete my Ph.D program. I am also grateful to my brother, Mr. Parviz

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Zehtabchi, and my parents, Mr. and Mrs. Zehtabchi, who taught me the value of hard work and the value of higher education.

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INTRODUCTION

Until World War II, industrialization had extended only to a relatively small number of countries. After World War II, the process of industrialization became almost global. This global process, or as Moore (1979, p. 19) called it the "Modernization," affects every recognizable political entity -independent nations or their dependency and probably every tribe, community, or "culture."

The modernization process has been sought by the newly-developing countries as the means to raise living standards. This process has been backed by the more developed and advanced countries through international bodies such as the United Nations and World Bank and has spread to many parts of the world. The modernization process had been adopted as a goal, especially by the new governing elites to consolidate their economic growth and the development of their human resources.

The prospects of successful industrialization appear very varied on a country-by country basis. Therefore, it is possible to classify the stages of economic development for each country. Rostow (1971, p. 4) offered a clear, systematic formulation of these stages: (a) the stage of traditional society, (b) the preconditions for take-off, (c) the take-off,

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(d) the drive to maturity, (e) the age of high mass-consumption. According to Rostow, the second stage of development is the process of transition; that is, the period when the preconditions for take-off are developed. In this stage both private enterprise and the government must be willing to mobilize to "...take risks in pursuit of profit or modernization. Investment increases, notably in transport, communications, and in raw materials in which other nations may have an economic interest (Rostow, 1971, p. 6)."

Rostow in his book, Politics and the Stages of Growth, addressed the political process of this stage and mentioned that some of the nations moved through this phase into take-off, under autocratic government. According to him, the country of Iran went through this stage of development under an autocratic government. He stated (1971, p. 287) that: "...there are other subtle cases of political modernization which have gone forward on the basis of essentially autocratic government, for example, in ...Iran."

The pre-industrialization phase in Iran started at the end of the World War I, with the establishment of the Pahlavi Dynasty, headed by Reza Shah, a leader of the Russian-trained Cossack regiment (Looney, 1977). When Reza Shah came to power the economy of the country was near collapse (Lenczowski, 1978). Reza Shah's national policies had two main features: nationalism and modernization (Lenczowski, 1978). During his reign, the central government played a very active role in all spheres of the Iranian economy, particularly in the

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development of industries. The extent of this industrializing effort was to include the ill-fated attempt to set up a steel industry in Iran, late in the 1930's, and the construction of the first trans-Iranian railroad, which brought a new vitality to the troubled economy (Jacqz, 1975). The Trans-Iranian Railway linked the Caspian port of Bandar Shah with the Persian Gulf port of Bandar Shahpour, a distance of 1,394 kilometers (Lenczowski, 1978). To get the Iranian economy moving, on December 14, 1930, Reza Shah opened the eighth session of the Majles with the statement that "We wish this Majles to be known in the history of the country as the "Economic Parliament." (Floor, 1984, p. 20). From that time on "...every effort was made to make Iran as self-sufficient as possible, and the government began the task by assuming the role of the "'supreme economic organizer'"." (Wilber, 1958, p. 246). In this regard, private industry was encouraged by exemptions from customs duties and certain other taxes, by rebates and preferences, and by protective measures including tariffs, quotas, and exchange control (Lenczowski, 1978). As a result of the government's policy, a great many new factories were built in Iran over the next decade. The growth industries were sugar, cotton and woolen textiles, matches, and cement factories. A number of smaller factories - chemicals, other textiles, soap, oil processing, glass work, hosiery, leather works, rice milling, tea processing, flour mills, beer and wines - were also erected in various parts of the country, mainly by private investors (Floor, 1984).

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A review of the annual budgetary allocations in Table 1 will provide some indication of government objectives for rapid industrialization and the development of the country's infrastructure (see Table 1).

With the expansion of the industrial sector the number of people in the labor force also increased. On the basis of the available information, Table 2 illustrates the urban industrial activities and number in the increased labor force from 1914 to 1935 (see Table 2).

At the stage of preconditions, Iran made tremendous progress under its own steam without foreign financial assistance (Floor, 1984; Lenczowski, 1978). But the war and oil nationalization during 1941 and 1953, had a deeply disruptive effect on the Iranian economy (Lenczowski, 1978). On the 25th of August 1941, the Anglo-Russian army invaded Iran. Russia occupied Azerbaijan, the Caspian provinces, Northern Khorasan, and the oil-producing areas in the southwest. The invasion promptly sealed Reza Shah's fate. Within three weeks, the Shah resigned and his son became the ruler of Iran (Mofid, 1987). Although the effort to end the Russian invasion and oil nationalization in 1951 slowed the oil production, private investment in industry, agriculture, and transportation continued on a smaller scale (Lenczowski, 1978). The settlement of the oil dispute on October 29, 1954 (Amuzegar, 1971) and oil nationalization opened a new era in Iranian history.

Table 1

Government

Ministry
War
Foreign-Affai
Justice
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Education
Finance
Agricultur
Other

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Table 1

Government Budgetary Allocations: 1934-1941 (Million Rials)

Ministry	1934	1935	1936	1937	1938	1939	1940	1941
War	239	256	275	319	403	380	485	593
Foreign-Affairs	22	25	27	26	30	27	33	31
Justice	25	28	29	33	43	56	64	79
Imperial Court	14	13	14	16	16	16	16	17
Interior general	40	44	52	56	70	108	110	123
Interior-Public health	13	19	24	34	37	88	65	83
Industry & Mines	20	66	73	145	315	454	745	996
Trade	2	2	3	5	5	5	6	10
Communication	1	21	179	256	161	854	999	1092
Post, Telegraph, & Telephone	27	28	34	37	43	58	71	90
Education	47	57	68	72	81	84	132	195
Finance	127	176	197	216	275	90	146	266
Agriculture	3	17	27	34	48	54	72	122
Other	-	-	-	-	-	339	168	477
	625	752	1002	1249	1527	2613	3112	4174

Note. From *Economic development in Iran: 1900-1971* (Table 1, pp. 65-66) by J. Bharir, 1971, New York: Oxford University Press.

Table 2

Growth Of T

1914-1935

Sector
Oil industry
Textile indus
Electricity s
Cotton-ginnin
Construction/
Mining
Car transport

Note. From In

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Table 2

Growth Of The Labor Force In Modern Industry Per Sector

1914-1935

Sector	1914	1920-30	1939
Oil industry (AIOC)	7-8 000	24-30 0000	31 500
Textile industry	1 000	1 000	24 500
Electricity sector	100	200	600
Cotton-ginning	416	800	1 500
Construction/road	3 300	-	60 000
Mining	200	-	3 000
Car transport	non-existent	12 000	20 000

Note. From Industrialization in Iran: 1900-1941 (p. 29) by W. Floor, 1984, England: University of Durham, Centers for Middle Eastern and Islamic Studies.

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The oil production and revenues began to rise drastically in the period of 1954-58, and led the country's recovery. As the government received more revenues from oil exports, the investment ratio shot up and a high growth rate was achieved (Lenczowski, 1978). After going through the pre-industrialization process and economic recovery, the dream of rapid industrialization led the Shah to establish a development goal. It was then necessary to refine the strategy of development. The question immediately arises as to whether Iran was ready for the second stage of industrialization or the take-off process. Based on Rostow' economic theory (1971) the stage of take-off has the following criteria:

a. A rise in the rate of productive investment from 5% or less to over 10% of the national income.

b. The new industries expand rapidly, and in turn, stimulate growth, through their rapidly expanding requirements for factory workers.

c. The existence or quick emergence of a political, social and institutional framework which exploits the impulses to expansion in the modern sector.

d. A further expansion in urban areas and in other modern industrial plants.

e. The new class of entrepreneurs expands and it directs the enlarging flow of investment in the private sector.

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f. The economy exploits unused natural resources and methods of production.

g. Industrial workers become increasingly important and assertive members of the society.

Rostow (1971, pp. 39-40) divided the take-off process into two stages, "...the early stage when industrialization takes hold rather than the later stage when industrialization becomes a more massive and statistical more impressive phenomenon."

Iran had several advantages for the early stage of the take-off process and its attempt to industrialize. For many years Iran was the largest oil producer in the world. Until 1951, Iran was the largest oil producer outside the Soviet bloc and the United States. Although the Iranian lead was lost after oil nationalization, in 1960 Iran was the fourth largest producer of the five Organization of Petroleum of Exporting Countries (OPEC) members, and during 1971-1978 Iran was the largest producer and exporter after Saudi Arabia. As shown in Table 3, the production of Iranian crude oil increased and the country's oil revenues rose significantly after 1967 (see Table 3). According to the Iran Almanac (1964), 74% of the country's foreign exchange earnings came from only one source, and that was oil.

Table 3

Iran's Crude

Year
1954
1955
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1967
1968
1969
1970
1971
1972
1973
1974
1975
1976

Note. From T

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Table 3

Iran's Crude Oil Production And Revenues From Oil Since 1954

Year	Production('000 bbls)	Revenues Million
1954	22,400	7.4
1955	120,035	32.2
1956	198,289	53.9
1957	262,742	76.0
1958	301,526	88.3
1959	338,810	93.7
1960	390,766	101.8
1961	438,804	104.4
1962	487,084	122.3
1963	544,325	135.7
1964	626,107	172.2
1965	696,520	183.6
1966	778,109	217.2
1967	950,180	283.3
1968	1,039,367	355.6
1969	1,232,155	384.5
1970	1,397,585	462.2
1971	1,656,918	771.3
1972	1,838,455	1020.7
1973	2,152,226	4.4
1974	2,210,627	19.3
1975	1,965,380	28.5
1976	2,166,417	21.7

Note. From *Twentieth century Iran* by H. Amirsadeghi and R. W. Ferrier, 1977, New York: Holmes and Meier.

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Although the Iranian natural gas industry is relatively young, with the establishment of the National Iranian Gas Company (NIGC) in 1966, its utilization on a significant level proved to be a vital source of energy for the country's development and its export (Amuzegar, 1977). According to National Iranian Gas Company (cited in Amuzegar, 1977), the Iranian export of natural gas was 198.6 billion cubic feet in 1971, and increased significantly to 337.8 billion cubic feet in 1975. As well as oil and natural gas, Iran also has considerable mineral reserves. The following are the examples of the country's natural wealth.

Lead and Zinc

Before 1955, Iran was the 25th lead-zinc exporting country in the world. Production was stepped up rapidly after 1955. By 1964 Iran had became the 12th lead-zinc exporter in the world (Iran Almanac, 1972).

Chromite

Although the discovery date backs to 1940, its export did not begin commercially until 1952. Later discoveries showed that Iran is rich in chromite deposits.
After lead, chromite is the second largest Iranian foreign exchange earner (Iran Almanac, 1972).

Copper

Until 1967, Iran's total copper deposits were estimated at no more than a million tons. Further discoveries made in that year and in 1968 however, have proven Iran to be one of the world's leading owners of copper mines (Iran Almanac, 1972).

Other Metals

Apart from lead, zinc, copper, chromite, other metals namely iron, red oxide, manganese, antimony and magnesite, uranium, and gold are also mined in Iran on a limited scale. (Iran Almanac, 1972).

Other Non-Metal

Iran also has considerable deposits of non-metal minerals, such as coal, barite, kaolin, mica, and salt (Iran Almanac, 1972).

With the above advantages, unlike most "third world" countries, Iran had the financial resources, and so should not have needed either to borrow abroad or to squeeze the rural sector to generate capital. According to Kemp (1983, p. 5), one of the prerequisites for industrialization is leadership. He stated that "...there has to be a leadership of some kind, be it a class, or section of a class, or a party, able to take the initiative." There was a strong leadership, which professed its desire to put through an industrialization program.

Toward this goal, the basic government's policy was the encouragement of private sector investment in Iran industry.

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In addition to the private sector, the government's investment had played a very important role in the industrialization or take-off process in Iran. As Lenczowski (1978) stated, the capital investment in manufacturing and mining had been massive and accelerating.

According to the statistics released by the Central Bank of Iran, the total investment of capital, which in 1963 averaged about Rials. 24,000,000 reached Rials. 103,000,000, i.e. investment which in 1963 was equal to 7% of the Gross National Product (GNP) rose to 21% of the GNP in 1967 (cited in Iran Almanac, 1969). As was reported, during 1968, 74% of the country's foreign exchange came from oil resources, and 26% came from non-oil exports and tourism activities (Iran Almanac, 1968).

From 1969/70 to 1974/75, the rate of capital investment in selected manufacturing industries rose by 53 percent (Lenczowski, 1978). As shown in Table 4, the investment was done by both the public and private sectors.

According to Lenczowski (1978), the share of capital-intensive and technologically advanced industries, which became dominant only in the later stages of industrialization, rose sharply: chemicals from 4.6 to 6.2 percent, basic metals from 0.8 to 4.9 percent, machinery from o.6 to 5.8 percent, motor vehicles from 4.4 to 7.6 percent.

Table 4

Capital I

Period	
(year)	
Third Plar	
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1968	
1969	
1970	
1971	
1972	
Fifth Plan	
1973	
1974	

Note. From

J. W. Jacqz

Table 4

Capital Investment in Industry and Mines

Period (year)	(1) Private	(2) Government	(3) Total	(2) to (3) Percent
Third Plan	34.5	34.5	65.0	53.1
Fourth Plan	183.6	116.4	300.0	38.8
1968	22.7	16.6	39.3	42.2
1969	31.7	22.3	54.0	41.3
1970	36.2	28.5	64.7	44.0
1971	46.6	25.8	72.4	35.6
1972	46.4	23.2	69.6	33.3
Fifth Plan	507.0	339.0	846.0	40.1
1973	57.0	23.4	80.4	29.1
1974	109.0	54.6	163.6	33.3

Note. From *Iran: Past, present and future* by J. W. Jacqz, 1975, New York: Aspen Institute.

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As shown in Table 5, there was an general increase and a much faster growth of the chemical, metal, mechanical, and electrical branches than others (see Table 5).

In this stage of industrialization Iran focused on the export of industrial products based on its natural resources. Iranian gas reserves were believed to be among the largest in the world. On April 22, 1971, the National Iranian Oil Company entered into an agreement with the Soviet Union to supply natural gas at an annual rate of 6.2 billion cubic meters, increasing the rate to 10.85 billion cubic meters by 1977 (Shwadran, 1973). Although the oil was a main source of foreign exchange, Iranian government paid more attention to non-oil exports. Table 6 illustrates the extent to which the non-oil exports could help the economy and cover part of the import bill (see Table 6).

One output and sign of early industrialization, according to Rostow (1971), is urbanization. The first population census in Iran was taken in 1956, and the third in 1976. The urban population recorded an 80 percent increase from 1956 to 1966 and a 60 percent increase from 1966 to 1976, compared with a rural population growth of 18 percent from 1956 to 1966, and 12 percent from 1966 to 1976. This did not include the rural population which migrated to the cities (Iran Almanac, 1977).

Table 5

Output of Some Leading Industries

Unit	1338 1959/60	1344 1965/66	1349 1970/71	1350 1971/72	1351 1972/73	1352 1973/74	1353 1974/75

Table 5

Output of Some Leading Industries

Unit		1338 1959/60	1344 1965/66	1349 1970/71	1350 1971/72	1351 1972/73	1352 1973/74	1353 1974/75
Sugar	(000 tons)	147	225	567	581	579	514	527
Beer	(million liters)	6	13	26	30	32	39	43
Biscuits	(000 tons)	2	14	24	26	24	20	28
Vegetable Oils	(000 tons)	33	101	167	185	194	183	242
Cigarettes	(000 tons)	7.4	9.7	12.3	12.7	13.1	13.4	14.4
Cement	(000 tons)	679	1,417	2,415	2,820	3,392	3,300	4,300
Window glass	(000 tons)	___	___	22	30	49	87	79
Cotton and synthetic cloth	(million meters)	169	350	450	450	465	483	533
Steel & aluminum-sheets & shape	(000 tons)	___	29	124	183	246	246	275
Writing Paper	(000 tons)	___	___	9	17	26	31	3
Paints	(000 tons)	1	7	20	24	26	22	33
Urea	(000 tons)	___	___	56	115	179	201	201
Fertilizers	(000 tons)	___	27	79	196	322	408	414
DDB	(000 tons)	___	___	4	10	10	8	9
PVC	(000 tons)	___	___	11	11	17	18	19
Tractors	(000 units)	___	0.1	2.5	3.8	4.5	7.1	7.7
Passenger cars	(000 units)	___	2	30	39	49	50	71
Trucks & buses	(000 units)	1	5	14	15	21	28	38
Television sets	(000 units)	___	12	13	15	19	22	31
Telephones	(000 units)	___	___	60	91	66	113	186
Gas ovens	(000 units)	___	87	190	177	209	190	220
Water heaters	(000 units)	13	23	44	56	61	61	82
Electricity	(billion kwh)	0.4	3.1	6.8	8.1	9.6	12.1	14.0
Coal	(000 tons)	237	285	530	600	550	845	900
Iron Ore	(000 tons)	58	2	10	150	800	895	900
Lead	(000 tons)	131	82	200	210	220	...	...
Chromite	(000 tons)	66	241	180	180	180	...	..

Note. From *Iran under the Pahlavis* (pp. 151-52) by G. Lenczowski, 1978, Stanford, California: Hoover Institution Press.

Table 6

Ratio of

Services

Year	
1959	4
1960	4
1961	4
1962	4
1963	4.
1964	59
1965	69
1966	81
1967	101
1968	120
1969	139
1970	158
1971	200
1972	254
1973	348

Note. From

J. W Jacqz,

Table 6

Ratio of Non-oil Exports to Total Imports of Goods and Services at Current Prices (billion of rials)

Year	Total Imports	Annual Rate Growth (%)	Non-Oil Exports, Goods, & Services	Annual Rate of Growth (%)	Ratio Non-Oil Exports/ Imports
1959	48.2	--	10.7	--	0.22
1960	49.7	3.1	10.2	-4.9	0.21
1961	47.8	-4.0	10.8	5.9	0.23
1962	43.6	-9.6	10.5	-2.9	0.24
1963	41.8	-4.3	11.4	8.6	0.27
1964	59.8	43.1	13.4	14.9	0.22
1965	69.5	16.2	15.9	21.4	0.23
1966	81.5	17.3	14.7	-8.2	0.18
1967	101.1	24.0	16.9	15.0	0.17
1968	120.4	19.1	20.7	22.5	0.17
1969	139.6	15.9	22.5	8.7	0.16
1970	158.4	13.5	26.1	16.0	0.16
1971	200.8	26.8	37.2	65.3	0.19
1972	254.5	26.7	48.0	29.0	0.19
1973	348.2	36.8	67.6	40.8	0.19

Note. From Iran: Past, present, and future (p. 102) by J. W Jacqz, 1975, New York: Aspen Institute.

The results

Table 7. A

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The results of the census for 1956-1966-1976 is shown in Table 7. As shown in Table 8, during 1974 and 1975, of the 1,621,000 people who moved from one area of Iran to another, 193,000 people moved to Tehran (see Table 8).

Tehran had attracted an average of 100,000 people per year, a million in a decade. People also moved to other large cities, such as Shiraz, Tabriz, Isfehan, Meshad (Iran Almanac, 1976). The major reason for migration within the country was employment opportunities. The big increase in industrial production required greater input of labor and capital. According to the International Labor Office and Najmabadi (cited in Lenczowski, 1978), employment in manufacturing rose from 816,000 in 1956 and 1,298,000 in 1966 to 1,543,000 in 1970 and 2,013,000 in 1974. The proportional increase in factory employment, including oil, was a little over 100,000 in 1965, 200,000 in 1966, and over 400,000 by mid-1970 (Lenczowski, 1978).

The desire of the government for industrialization and its success was dependent on effective educational and development planning. As Baldwin (1967) indicated, despite the Reza Shah's effort and his educational reforms, in 1948, 95 percent of Iranians were illiterate. The regime's commitment to industrialization, educational development, and expansion of higher education was a priority.

Table 7

Population o

Year	Po
1956	18
1966	2
1976	3

Note. From

Table 7

Population of Iran: 1956, 1966, 1976 Census

Year	Total Population	Urban Population	Rural & Nomadic Population
1956	18,954,706	5,449,161	13,505,543
1966	25,788,722	9,794,246	15,994,476
1976	33,591,875	15,715,338	17,876,537

Note. From *Iran Almanac* (pp. 502 & 369), 1971. Author.

Table 8

Immigration

Region
Tehran
Other Citie
All Cities
Rural Area
Total Dome

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Table 8

Immigration In Iran, 1974-1975

Region	Emigration	Immigration	Net Change
Tehran	109,000	193,000	84,000
Other Cities	497,000	697,000	200,000
All Cities	606,000	890,000	+284,000
Rural Areas	1,015,000	731,000	-284,000
Total Domestic	1,621,000	1,621,000	+-000

Note. From *Iranian Population Growth Measurement* (Publication No. 628), Statistical Center of Iran.

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On August 7, 1968, the Shah of Iran called for reform in administration, research, and teaching activities in the Ramsar Conference. He noted that there should be coordination between higher education and the country's manpower needs (Smith, 1974). The emphasis turned, especially during the 1960's and 1970's, to producing skilled manpower to meet the needs of the country. The amount of money spent on educational development may be correlated with the perceived value education would have on the achievement of national economic goals. For example, the total expenditures in higher education increased substantially from $26.3 million in 1965 to $286.9 million in 1975. As shown in Table 9, the capital expenditures during this period increased from 17.4 percent to 43.5 percent of total expenditures (see Table 9).

As Yazdanpanah (cited in Kazerooni, 1983) reported, there were twenty-seven professional colleges in Iran which operated independently of each other and were under the Iranian Ministry of Education's supervision in 1927. All of the colleges became part of the University of Tehran which was established in 1934. There were six colleges in the University of Tehran: Medicine; Law and Political Science; Theology; Science; Arts; and Engineering. The College of Engineering had five departments--Civil, Mining, Mechanical, Electrical, and Chemical (cited in Kazerooni, 1983). Besides the University of Tehran, there were other higher education institutions in the country, Most were technical and

Table 9

Total Expenditure on Public Higher Education From 1965 Through 1975 (U.S. Million Dollars)

Year	Total		Capital		Current	
	Amount	Percent	Amount	Percent	Amount	Percent
1965	26.3	100	4.5	17.4	21.8	82.6
1966	35.4	100	10.1	28.8	25.3	71.2
1967	40.8	100	10.4	25.5	30.4	74.5
1968	62.4	100	19.9	32.0	42.4	68.0
1969	69.2	100	15.7	22.7	53.5	77.3
1970	70.5	100	21.9	25.3	52.6	74.7
1971	87.6	100	21.9	25.0	65.7	75.0
1972	101.9	100	29.0	28.5	72.8	71.5
1973	132.3	100	49.2	37.2	83.1	62.8
1974	216.4	100	83.5	38.6	132.8	61.4
1975	286.9	100	124.8	43.5	162.0	56.5

Note. From Dependency and education: An analysis of the development of Iranian education since World War II (p. 185) by E. Mashari, 1980. Doctoral dissertation, Vanderbilt University. As cited in (a) The Budget of the imperial government of Iran, for the Year 1977, Section 6 (p.19), Plan and Budget Organization (PBO), 1977), Tehran, Iran: PBO Publications; and (b) Statistical Yearbook 1978 (Table 56, p. 108), Plan and Budget Organization (PBO), 1975, Tehran, Iran: PBO Publications.

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semi-professional. The most important of these institutions were founded between 1925 and 1948, and are shown in Table 10. It was reported (Iran Almanac, 1969) that there were seven major universities in the country between 1934 and 1968. To train technical and engineering human resources for the future industrialization of the country, in 1965 the government issued an order for creation of an industrial university (Iran Almanac, 1968). Therefore, another university was added to the list of universities in the country, the Aryamehr University (University of Science & Technology), and the number of universities rose to eight as below:

1. Tehran University
2. National University, Tehran
3. Pahlavi University, Shiraz
4. Tabriz University
5. Meshad University
6. Isfehan University
7. Aryamehr University
8. Jondi shahpour University, Ahwaz

During the 1968 academic year, the number of colleges and universities began to increase rapidly. During the 1973 academic year, the country had a total of 115 institutions of higher learning (see Table 11). A rapid increase in the number of universities took place between 1972 and 1975.

Table 10

<u>Higher Education Institutes Sponsored By the Government Departments, 1925-1948</u>

Institution	Year	Founder	Purpose
1. Institute of Post	1930	The Ministry of Post	

Table 10

Higher Education Institutes Sponsored By the Government Departments, 1925-1948

Institution	Year	Founder	Purpose
1. Institute of Post Post, & Telegraph	1930	The Ministry of Post, Telegraph and Telephone	Training specialists for ministry positions (2-years)
2. Institute of Bank Melli (National- of Iran)	1932	Bank Melli Iran	Training in banking, accounting, and commercial law (2-years)
3. Police Training	1933	Police	Training in marksmanship, judicial, procedures, & other crime related subjects (2-years)
4. School of Finance	1937	Ministry of Finance	Training personnel for the ministry and affiliated departments
5. Higher Technical Institute	1925	Ministry of Defence	Training mechanical & electrical personnel (bachelor's program)
6. Institute of Military Training	1930	Ministry of Defence	Training aviation to military officers (3-years, bachelor's)
7. Institute of National Railway	1928	Ministry of Roads	Training railroad personnel for ministry & technical positions
8. School of Music	1933	Ministry of Education	Training specialists in music

Note. From *Education and social awakening in Iran: 1850-1960* (pp. 38-49) by R. Arasteh, 1962, Netherlands: Brill Leiden.

Table 11

Educational

Level
Kindergarten
Primary (1)
Guidance (2)
Secondary (3)
Technical
& Vocational
Higher Educa
Literacy
(ages 10-44)

Source: Fro

(p. 132) by

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* 1. Gra

** 2. Gra

*** 3. Gra

Table 11

Educational Targets in Fifth Plan, 1973-1978 ('000 persons)

Level	Numbers In 1973	Numbers Planned	Numbers Fifth Plan	% Increase
Kindergarten	32	580	558	2,536
Primary (1)*	3,446	5,550	2,054	60
Guidance (2)**	571	1,670	1,099	192
Secondary(3)***	617	904	287	46
Technical & Vocational	95	560	465	490
Higher Education	115	190	75	65
Literacy (ages 10-44)	8,250	15,600	7,350	89

Source: From A guide to Iranian Fifth Plan (1973-1978) (p. 132) by Kayhan Research Associated, 1973, Tehran, Iran: Kayhan Publication.

* 1. Grades 1 through 5

** 2. Grades 6 through 8

*** 3. Grades 9 through 12

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As shown in Table 12, 11 new universities were created during this rather short period (see Table 12). By the 1978-1979 academic year, Iran had a total of 244 institutions of higher education, including: 22 universities and 222 two-year and four-year colleges (see Table 13). As indicated in Table 13, the number of higher education institutions increased 481 percent during the period from 1977 to 1979, which is unprecedented in the history of Iranian higher education (see Table 13).

The expansion of higher education institutions also increased the number of students enrolled in the colleges and universities. As shown in Table 14, the enrollment increased from 46,987 in the 1967-1968 academic year to 175,675 in the 1977-1978 academic year. As shown in Table 15, the distribution of students by field of study was diverse during 1968-1970. As is evident from the Table 15, during these years social science had the highest number of students, while engineering increased from 8,602 to 11,703 in the same period.

The government attempted to revise the educational system to meet the mass education needs and to correct the educational deficiencies to meet the increasing demand for skilled human resources.

Table 12

Iranian Uni

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Razi Univers
Farah Pahlav (Former Ira College)

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Table 12

Iranian Universities Established During 1972-1975

University	No. of colleges	Location	Date Founded
Buali Sina University	4	Hamedan	1972
The Free University of Iran*	---	Tehran	1972
University of Baluchestan	3	Zahedan	1973
Teacher Training University	1	Tehran	1973
Revolutionary Corps University	4	Varamin	1973
Reza Shah University	2	Tehran	1973
Farabi University	6	Tehran	1974
University of Gilan	1	Rasht	1974
University of Kerman	3	Kerman	1974
Razi University	4	Kerman	1974
Farah Pahlavi University (Former Iranian Girl's College)	5	Tehran	1975

Note. From Systems of higher education (PP. 6-7) by International Council for Educational Development, 1978, New York. Author.

* This University was modeled on the open university concept of the United Kingdom and emphasized correspondence courses and managed through teaching centers, educational television, and computer assisted education.

Table 13

Increase in the Number of Higher Education Institutions (1967-1979)

Number of I...

Table 13

Increase in the Number of Higher Education Institutions (1967-1979)

	Number of Institutions			Percent Increase			Percent Per Year		
Year	University	College	Total	University	College	Total	University	College	Total
1967	8	34	42	—	—	—	—	—	—
1979	22	222	244	175	552.9	481	13.5	42.5	37

Note. From *Statistics of higher education in Iran* by Ministry of Science and Higher Education, 1976, Tehran, Iran: Institute for Research and Planning in Science and Education.

Britannica, Book of the year, 1980, Chicago, Illinois: University of Chicago.

Table 14

Student enr

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1967-68
1968-69
1969-70
1970-71
1971-72
1972-73
1973-74
1974-75
1975-76
1976-77
1977-78
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University

Table 14

Student enrollment (1967-1978)

Academic Year	Student Enrollment	% Increase
1967-68	46,987	---
1968-69	58,194	29
1969-70	67,268	16
1970-71	74,708	11
1971-72	97,338	30
1972-73	115,311	18
1973-74	123,114	7
1974-75	135,354	10
1975-76	151,905	12
1976-77	154,215	15
1977-78	175,675	14
Average Annual Growth Rate		14.8

Note. From Systems of higher education: Iran by International Council for Educational Development, 1978), New York.

Statistics of higher education in Iran by Ministry of Science and Higher Education, 1977, Tehran, Iran.
Britannica, Book of the year, 1981, Chicago, Illinois: University of Chicago.

Table 15

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Educational

Field of St
Social Scier
Humanities
Engineering
Medical
Natural Scie
Agriculture
Fine Arts
Training Sci
Total

Note. Iran

Table 15

Distribution of Students in Universities and Higher Educational Institutes According to their Lines of Study

Field of Study	Academic Year 1968-69	Academic Year 1969-70
Social Science	14,238	15,991
Humanities	13,426	13,305
Engineering	8,602	11,703
Medical	9,116	9,270
Natural Science	7,131	8,963
Agriculture	2,481	2,976
Fine Arts	2,331	2,809
Training Science	1,842	2,150
Total	59,168	67,268

Note. Iran Almanac (P. 555), 1972, Tehran, Iran.

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Statement Of The Problem

Despite the tremendous achievement and the government's commitment to industrialization, Iranian industrialization had encountered serious obstacles. Iran lacked the highly skilled workers, technicians, middle-level managers and engineers its industry required (International Labor Office, 1973).

The Shah's dream for industrialization was to drive relentlessly to technological maturity. In this regard his "big-push" strategy of industrialization in a short period of time, forced the Plan and Budget Organization to mobilize two of its divisions-the Planning Division and the Supervision and Coordination Division-to engage in the necessary studies for presentation to the Shah by the end of 1973-1974 fiscal year (i.e; by March 1974). It was a large mobilization of human resources, and the results were supposed to have a wide-ranging impact on the future growth strategy (Razavi and Vakil, 1984). By late March 1974, the preliminary studies were ready and one of the findings was that, "Iran could not, on the most optimistic assumption, become the world's fifth industrial power in this century" (Keddie, 1981, p. 170). This conclusion led the Shah to accuse the Plan and Budget Organization (PBO), of being pessimistic (Razavi and Vakil, 1984). At a special meeting on August 1-3, 1974, in Ramsar, a Caspian resort, the shortage of human resources and other serious problems facing Iran, were discussed (Mofid, 1987). The Shah's responses to some of the questions relating to the human resources problem was: "...if [human resource'] was short it wo

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short it would be imported." (Razavi and Vakil, 1984, p. 74). The Shah was not going to listen to what he called the pessimists. As Graham (cited in Mofid, 1987, p. 98) put it, the Shah told the assembled dignitaries at Ramsar: "'The Great Civilization' we promise you is not a Utopia either. We will reach the gates in 12 years, but in some fields we have already crossed its frontiers." But reaching the gate demanded larger human resources, and despite the significant increase in enrollment, the Iranian educational system was not able to keep pace with the human resources demand of industrialization. Despite the shift toward specialized skill areas, enrollment in some fields like humanities constituted the highest percentage up to a decade ago. Students in the humanities, law, and the fine arts together formed nearly half of the total student population in higher education (see Table 16).

According to Baldwin (1967), in 1958, Iran's stock of high-level human resources was reported to be 75,000 people. Seventy five percent of 75,000 people had had only secondary schooling with or without some specialized training, and the rest required university training such as engineering. The number of engineers was estimated to be 7,510. The three core branches of engineering (civil 2,536, mechanical 1,914, and electrical 1,414) accounted for 60 percent of the total.

Table 16

Enrollment

Of Study,

Field of St
Humanities
Education
Fine Arts
Law
Social Scien
Natural Scie
Engineering
Medical Scie
Agriculture
Total Number

Note. From

Table 16

Enrollment In Higher Education Institutions Of Iran By Field Of Study, 1956-1976 (Percentage)

Field of Study	1956	1965	1970	1976
Humanities	29.9	28.4	19.7	17.7
Education	0.0	3.6	2.6	3.4
Fine Arts	2.9	3.0	3.8	3.0
Law	17.6	12.6	24.3	1.8
Social Science	0.0	6.8		17.4
Natural Science	6.3	7.0	13.2	17.6
Engineering	5.6	11.0	18.8	22.3
Medical Science	36.3	24.0	13.4	12.4
Agriculture	4.4	3.3	4.2	4.4
Total Number Enrolled	11,928	29,074	74,708	154,215

Note. From UNESCO Statistical Yearbook, Years vary.

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As Baldwin (1967, p. 150) noted, these figures gave Iran a high-level human resource ranking "...far above sub-Sahara African countries and just below Egypt and India."

According to official statistics of the Ministry of Industry and Mines for 1961, the industrial labor force of the country was 136,419 persons, of which only 950 were technicians and engineers (cited in Iran Almanac, 1966). As Tabib (1974) indicated, the demand for engineers was 2,363 in 1960, and 3,273 in 1963, while the supply was only 546 in 1963. On September 16, 1967, the Iranian Prime Minister announced that the Fourth Plan would require 10,000 Iranian and foreign experts. The Prime Minister was referring to top quality experts. Dr. S. Rasekh, deputy head of the Central Bureau, Plan Organization, told a gathering of Iranian students from abroad that about 3,000 engineers would be required by the industry and mining sector-including building industry and electric generation (Iran Almanac, 1968).

Studies carried out by the Labor Market Bureau found that about 35% of job vacancies remained unfilled in 1970-1971. This ratio was only 20% in 1966. The published results of these studies in January, 1972 indicated that in view of the country's being industrialized, the number of Iranian qualified candidates for the positions concerned fell far short of the standards required for those specific jobs (Iran Almanac, 1972).

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As shown in Table 17, the number of job vacancies is the confirmation of the above statement.

Despite considerable progress, Iran's educational and training facilities were not able to produce sufficient skilled personnel to meet the demands of the country. Because of the shortage, Iran imported thousands of foreigners from all over, mainly the United States, the United Kingdom, West Germany, France, the Philippines, Pakistan, India, the Soviet Union, Japan, and Italy. According to Asadi (cited in Johnson, 1980), in July 1975, over 20,000 work permits had been issued to foreign nationals. This figure, based on Time magazine (cited in Johnson, 1980), was estimated to reach the 60,000 mark in 1977. Almost 26% (Iran Almanac, 1976) of these foreigners were active in fields within the government:

- Technical and vocational fields 50%
- Manufacturing and tool making 23%
- Administrative and executive 14%
- Others 13%

Table 18 has a description (cited in Iran Almanac, 1976) of the supply and demand for trained human resources in 1975-76. The data indicated that there would be total shortage of 111,000 people by 1978. Among this total human resources shortage, it was estimated that 2,700 would be engineers and related areas, 16,500 technicians, 83,000 skilled & semi-skilled workers (see Table 18).

Table 17

Supply and

Year	N Ca fo
1964-1965	7
1970-1971	5

Note. Iran

Table 17

Supply and Demand in Labor Market

Year	Number of Candidates for Jobs	Number of Vacancies	Number of Persons Given Work	Percentage of Vacancies Filled
1964-1965	71,870	34,851	24,220	69
1970-1971	51,650	32,298	23,825	73

Note. Iran Almanac (p. 301), 1972, Tehran, Iran.

Table 18

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Engineers	
Medical	
Teachers &	
Other prof	
Technician	
Skilled &	
Other work	
Total	

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Table 18

[Human Resources'] Supply and Demand By 1978

	Demand	Supply	Deficit
Engineers & allied	6,800	4,060	-2,740
Medical Personnel	8,200	6,380	-1,820
Teachers & allied	53,000	46,000	-7,000
Other professionals	51,600	52,000	+600
Technicians	31,500	15,000	-16,500
Skilled & semi-skilled	149,500	66,000	-83,000
Other workers	89,400	89,600	-40
Total	390.000	279,000	-111,000

Note. Iran Almanac (p. 326), 1976.

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The supply of high-level human resources, especially engineers, had in fact been one of the chief problems of development for Iranian government. The shortage of engineers was partly because of an insufficient supply of graduates. As Shahlapour (1978) indicated, the number of students who received master of engineering degrees was only 1127 between 1972 and 1975/76, while the needs for engineers with M.S/M.A. for the public and private sector was estimated to be 6683 in those years. The demand for high-level engineers with a doctoral degree was also estimated to be 251 in the same years, while the number of graduates was zero.
In regard to the engineering doctoral degree, Tabib (1974, p. 88) noted that "Doctorate in...engineering have not established yet. Lack of PhD's in...[engineering'] affects the system of higher education more than any other sector in the country." The country desperately needed PhD people to fill the university's faculty positions. A projection for a total shortage of 24,027 engineers (Shahlapour, 1978) and doctoral-level engineers was also estimated during 1978-82.

The government did not pay attention to the Iranian engineers abroad. According to one source, Iran was "...one of the few countries of the world most of whose university students (60%) study abroad" (Iran Almanac, 1963). There were about 4,000 Iranian students in foreign countries in 1957 (Wilber, 1958), 17,385 between 1963-64, 20,317 between 1968-69, and 21,009 between 1971-72 (Iran Almanac, 1972).

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As shown in Table 19, almost half of the Iranian students were in the United States of America in 1971-72. The list of the countries did not include those who studied in the United Kingdom and a few other countries (see Table 19).

The migration of professional and high-level human resources, especially to the United States in the last several years, and specifically from developing, has caused great concern and anxiety among nations. Iranians constitute one of the most numerous immigrant groups from the Middle East, one of the highest status foreign-born groups in the United States. The Iranian revolution of 1978 changed the pattern of the Iranian migration to the United States. The reflection of this pattern of change is particularly the case after 1980, the year immediately following the seizure of the U.S. Embassy in Iran. For example, in the period of 1950 to 1977, 34,855 Iranians migrated to the United States. That number increased dramatically in the period of 1978 to 1986, to 103,712 people. Large numbers continued to migrate, with 50,895 more entering the U.S. from 1987 to 1989 (U.S. Immigration, Annual Report, 1958-1977 and 1978-1989). Among Iranian immigrants, students are prominent among groups who eventually adjust to become permanent residents. As shown in Table 20 (Institute of International Education, 1983), among the leading 15 nations of origin of foreign students in the United States, the country of Iran had the largest number of students between 1981-1982 (see Table 20).

Table 19

Iranian Stu

Country
U.S.A.
Canada
U.S.S.R. (F
England
France
Austria
W. Germany
Italy
Switzerland
Belgium
Holland
Denmark
Sweden
Lebanon
Iraq
Turkey
Afghanistan
Pakistan
India
Japan
Syria
Jordan
Brazil
Yugoslavia
Saudi Arabia
Hungary
Taiwan
Czechoslovak
Morocco
Algeria
Ethiopia
Poland
Argentina
Philippines
Spain
Australia
Greece
Romania
Norway
Thailand
Other Countr
Total

Note. Iran

Table 19

Iranian Students Abroad

Country	1963-64	1968-69	1971-72
U.S.A.	5,716	7,236	9,768
Canada	-	246	350
U.S.S.R. (Former)	-	11	11
England	2,906	2,500	1,952
France	1,153	1,166	1,222
Austria	1,149	1,360	1,860
W. Germany	4,829	5,027	4,278
Italy	430	512	681
Switzerland	341	423	458
Belgium	101	141	131
Holland	33	41	46
Denmark	-	13	13
Sweden	-	45	67
Lebanon	150	124	89
Iraq	69	125	134
Turkey	401	1,088	1,146
Afghanistan	9	3	4
Pakistan	28	84	326
India	35	87	242
Japan	14	13	24
Syria	-	-	25
Jordan	-	-	13
Brazil	-	-	5
Yugoslavia	-	-	5
Saudi Arabia	-	-	4
Hungary	-	-	4
Taiwan	-	-	3
Czechoslovakia	-	-	2
Morocco	-	-	2
Algeria	-	-	1
Ethiopia	-	-	1
Poland	-	-	11
Argentina	-	-	5
Philippines	-	-	5
Spain	-	-	10
Australia	-	-	4
Greece	-	-	4
Romania	-	-	2
Norway	-	-	2
Thailand	-	-	1
Other Countries	522	72	?
Total	17,385	20,317	21,009

Note. *Iran Almanac* (pp. 555-556), 1972.

Table 20

The Leading 1

United States

Iran
Taiwan
Nigeria
Canada
Japan
Venezuela
India
Saudi Arabia
Malaysia
Hong Kong
South Korea
Mexico
Lebanon
Thailand
Jordan
Canada
Taiwan
India
Hong Kong
Iran
Cuba
Thailand
United Kingdom
Japan
South Korea
Philippines
Germany, Fed,
Mexico
Israel
Colombia

Note. From Op

International

Table 20

The Leading 15 Nations of Origin of Foreign Students in the United States: Absolute Number and Share of Total for Selected Years

	Students 1981/82	% of Totals
Iran	35,860	11.0
Taiwan	20,520	6.3
Nigeria	19,560	6.0
Canada	14,950	4.6
Japan	14,020	4.3
Venezuela	13,960	4.3
India	11,250	3.4
Saudi Arabia	10,220	3.1
Malaysia	9,420	2.9
Hong Kong	8,990	2.8
South Korea	8,070	2.5
Mexico	7,890	2.4
Lebanon	6,800	2.1
Thailand	6,730	2.1
Jordan	6,180	1.9
	1969/70	
Canada	13,318	9.9
Taiwan	12,029	8.9
India	11,327	8.4
Hong Kong	7,202	5.3
Iran	5,175	3.8
Cuba	4,487	3.3
Thailand	4,372	3.2
United Kingdom	4,216	3.1
Japan	4,156	3.1
South Korea	3,991	3.0
Philippines	2,782	2.1
Germany, Fed, Rep. of	2,634	2.0
Mexico	2,501	1.9
Israel	2,288	1.7
Colombia	2,045	1.5

Note. From Open doors: 1981/82 by Institute of International Education (IIE), 1983. Author.

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More than 50% of these students adjusted their status, and became permanent residents of the United States before the revolution of 1978 (U.S. Immigration, various issues).

Historically, in the post-World War II period, among High-Level human resources immigrants, engineers showed a higher incentive to migrate than other groups (Folk, 1970). A detailed survey of the professional composition of the migrants by the United Nations Conference on Trade and Development (UNCTAD), also indicated that after physicians and surgeons (58%), engineers and scientists have been the second most significant groups (United Nations Conference on Trade and Development, 1979). During the period of 1952-61, 30,373 engineers immigrated, while approximately 300,000 engineering first degrees were granted (Folk, 1970). According to Niland (1970), about a third of the approximately 3,000 engineering immigrants in 1962 came from the less developing countries. By 1967 the engineering inflow had nearly tripled, with about half the immigrants coming from the developing countries (see Table 21). Engineering has been the most prevalent field among foreigners, especially Iranian students studying abroad. According to one source, over 50% of those applying for undergraduate education said they intended to study engineering (Baldwin, 1970). In 1981/1982 a total of 35,860 Iranian students were studying in America. Given the fact that more than half of these students were in engineering, it can be concluded that about 17,930 Iranian engineers were being trained in United States.

Table 21

Professiona

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Enginee
Other T
Teacher
Nurses
Physici
Natural
Other M
Religio
Social S
Other
TOTAL

Note. From A

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Table 21

Professional/Occupational Distribution of the 1967 inflow to the U.S.Professional/Technical/Kindred Workers (PTK)

	Numbers	Percent of PTK Group
Engineers	8,822	21.2
Other Technical Fields	5,400	13.0
Teachers (non-College)	5,280	12.7
Nurses	4,944	11.9
Physicians, Surgeons, Dentists	3,557	38.5
Natural Scientists	2,976	7.1
Other Medical Fields	1,944	4.7
Religious	1,754	4.2
Social Scientists	700	1.7
Other	6,275	15.0
TOTAL	41,652	100.0

Note. From *Annual Indicator* (Chart 2) by U.S. Immigration and Naturalization Service. Author.

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As shown in Table 22, the engineering field of study was the most popular major among foreign students in the United States in selected years (see Table 22).

According to the Institute of International Education (1985) the country of Iran ranked number one among countries that produced the largest number of engineering students in the United States between 1983-84 (Figure 1). Among leading countries, Iran ranked fourth among the recipients of doctorates in engineering (Table 23, and Figure 2).

Although the exact number of Iranian engineers who are working abroad is not known, numbers are estimated to be extremely high. Time magazine, on July 6, 1981, reported that since the Revolution of 78-1979, about one million educated Iranians had left the country. This considered with information presented above represents a trend.
The brain-drain will continue at even a more rapid pace if the developing countries, particularly Iran, neglect to address the problem of competent, educated professionals leaving the country i.e. "brain drain."

Table 22

Rankings of

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1945/55
1. Engineei
2. Humanit:
3. Social !
4. Natural Life Sc
5. Health F
6. Business
7. Fine anc
8. Educatic
9. Agricult
10. Math and Compute
Other

1975/76
1. Engineer
2. Business
3. Natural Life Sc
4. Social S
5. Humaniti
6. Educatio
7. Math and
8. Fine and
9. Health P
10. Agricult
Other

Note. From C

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Table 22

Rankings of Fields of study Shares for Foreign Students in the United States: Selected Years

1945/55	Percent in	1964/65	Percent in
1. Engineering	22.3	1. Engineering	22.0
2. Humanities	16.1	2. Social Sciences	15.4
3. Social Sciences	14.7	3. Humanities	14.8
4. Natural and Life Sciences	10.7	4. Natural and Life Sciences	14.3
5. Health Professions	9.3	5. Business/Management	8.7
6. Business/Management	8.6	6. Health Professions	6.0
7. Fine and Applied Arts	5.8	7. Education	4.9
8. Education	4.3	8. Fine and Applied Arts	4.8
9. Agriculture	3.5	9. Agriculture	3.9
10. Math and Computer Sciences	1.3	10. Math and Computer Sciences	3.3
Other	3.4		1.9
	100.0		100.0

1975/76	Percent in	1981/82*	Percent in
1. Engineering	23.4	1. Engineering	23.1
2. Business/Management	16.0	2. Business/Management	18.2
3. Natural and Life Sciences	13.3	3. Social Sciences	7.7
4. Social Sciences	11.6	4. Natural and Life Sciences	7.6
5. Humanities	8.4	5. Math and Computer Sciences	6.9
6. Education	5.5	6. Fine and Applied	4.7
7. Math and	5.1	7. Humanities	3.9
8. Fine and Applied Arts	4.6	8. Education	3.8
9. Health Professions	4.0	9. Health Professions	3.6
10. Agriculture	2.9	10. Agriculture	2.7
Other	5.2	Other	17.8

Note. From Open Doors by Institute of International Education (IIE), various years.

* Adoption of a new system to classify students (IIE, 1983).

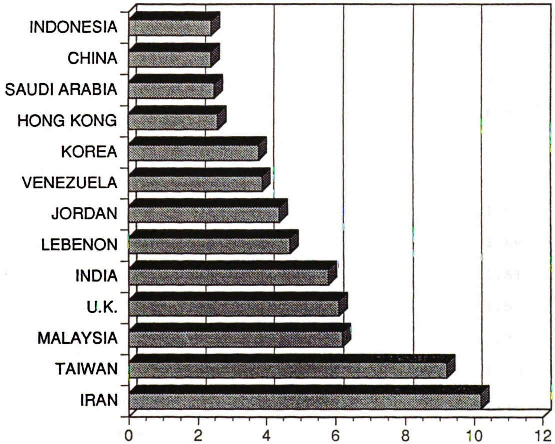

Figure 1. Countries that produced the largest number of foreign students, 1983-84.

Note. From Profiles, 1983-84 by Institute of International Education, 1985. Author.

Table 23

Leading Co

Doctorates

Country of
Taiwan
India
Korea
Iran
Turkey
Egypt
China
Greece
Nigeria
Hong Kong
Japan
Thailand
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Other Count
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Note. From

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Table 23

Leading Countries of Origin for Foreign Recipients of Doctorates in Engineering, 1985

Country of Citizenship	Number of Doctorates	% of Total
Taiwan	382	21.16
India	211	11.69
Korea	132	7.31
Iran	116	6.43
Turkey	56	3.10
Egypt	46	2.55
China	30	1.66
Greece	30	1.66
Nigeria	29	1.61
Hong Kong	27	1.50
Japan	25	1.39
Thailand	25	1.39
Total, Leading Countries	1,109	61.40
Other Countries	527	29.24
Countries not reported	169	9.36

Note. From Science and engineering doctorates 1960-85 by National Science Foundation (NSF), 1986. Author.

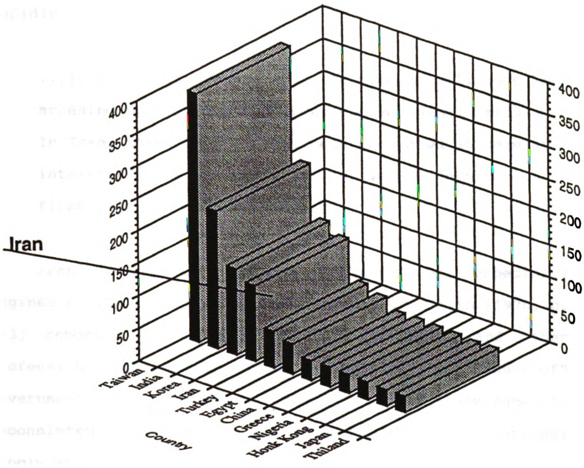

Figure 2. Leading countries of origin for foreign recipients of doctorates in engineering, 1985.

Note. From Science and engineering doctorates 1960-85 by National Science Foundation, 1986. Author.

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Need for the Study

The Iranian economy had undergone a major transformation beginning in the early 1960's, when the government began to promote rapid industrialization in a concerted manner. As Elken (1977, p. 175) stated, when a country develops very rapidly,

> ...it is usually feared that the process will soon be arrested by a shortage of people with relevant skills. In Iran, this 'doom'... has been predicted at regular intervals since the early 1960's, when modernization first began to gain momentum."

Iran lacked the skilled professionals, especially engineers, its industry required. Askari and Majin (1976, p. 123) reported that the shortage of engineers and other professional human resources was "...partially the result of" government's "inconsistent plans." The government's inconsistency was evident in mismatching the educational supply and demand, especially in the field of engineering. According to Tabib (1974), for the whole period of the Third Plan, 1962-1967, there was a demand for 5,600 engineers. However, the supply did not exceed 3,065; therefore, a shortage of 2,535 engineers resulted. The government's non-expansion educational policy in the engineering field in the Third-Plan was a major factor in this shortage.

This policy was stated in the Outline of the Third Plan, 1962-67

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1962-67, deliberately initiated with goals for higher education. The statement is: "no expansion will take place in engineering facilities; instead they will be strengthened, diversified and better equipped." (Plan Organization, 1965, p. 142). Although there should have been support for better equipment and facilities, this support may not have solved the problem of a shortage of engineers. Due to the non-expansion policy, the severe shortage of engineers appeared in the Fourth Iranian Development Plan, 1968-1972. The gap between the supply and demand for engineers, which was 2,535 in the Third Iranian Development Plan, grew bigger and reached 7,707 (Tabib, 1974). As shown in Table 24, while there was shortage of 7,707 engineers, the humanities became over supplied and reached 19,205 (see Table 24).

The shortage of engineers was clear in some branches of electronics, telecommunications, and petrochemical industries. Modern technological innovations were introduced without having enough trained engineers. This position is the predominate view expressed by the Fifth Plan. In June 1975, "a survey of the press showed that an average of 1,000 'situation vacant' advertisements appear daily in the press. Of these, about 40 percent were for engineers and technicians (Iran Economic Service, 1975, p. 10).

Table 24

Surplus and

Fourth Plan

Field
Medicine
Law
Social Scien
Humanities
Education
Natural Scie
Mathema
Agriculture
Engineering
Fine Arts
Total

Note. From

Iran (p. 140)

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Table 24

Surplus and Shortage of Higher Education Graduates in the Fourth Plan, 1968-1972

Field	Surplus	Shortage
Medicine		1,114
Law	897	
Social Science	7,486	
Humanities	19,205	
Education	1,959	
Natural Science & Mathematics	7,745	
Agriculture		4,633
Engineering		7,707
Fine Arts	1,712	
Total	38,986	13,454

Note. From Evaluation of expansion of higher education in Iran (p. 140) by T. M. Tabib, 1974, Tehran, Iran: Imperial Bureau of Inspection of Higher Education and Scientific Research.

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As shown in Table 25, 7,717 students (9.8 percent) of the total students were granted an engineering bachelor's degree in Iran between 1973-1978. According to the Plan and Budget Organization (PBO), the Office of Population and Manpower (1980) of all bachelor's earned by Iranians in schools abroad, 3,731 or 47.3 percent were in engineering (see Table 26).

The shortage of engineers could have been minimized if the government had a desire and policy implemented to reducing the engineering "brain drain." According to Baldwin (1970, p. 374), it was difficult to find anyone in Iran to show any interest in the problem of brain drain. Therefore, "no high-level-brain drain committee was ever established; none of the planned studies were ever carried out; no conference was called." Unfortunately, the government of Iran, "instead of complaining to people in foreign countries about the number of good Iranians who were working abroad, were taking pride in the number who were returning home" (Baldwin, 1970, p. 375). The loss of highly skilled engineers who are well educated and trained in a dynamic professional and technical environment abroad, both in the short run or the long run, will limit the country's national and economic progress. Engineers reported that they left because of a lack of facilities and other factors. Therefore, a policy to facilitate and ease the engineer's return might alleviate the problem. In this regard, a study of engineering brain drain and its causes,

Table 25

The Comparison of Estimated and Actual Supply of Engineers in the Fifth Plan, 1973-1978 (Iran Only)

Estimate	Total	%	Associate	%	Bachelor's	%	Master's	%	Doctors	%
Total	158,947	100	72,621	100	74,255	100	7,861	100	4,210	100
Eng.	34,832	21.9	24,506	33.7	7,927	10.7	2,399	30.5	.	.
Actual										
Total	171,127	100	79,766	100	78,574	100	6,310	100	6,477	100
Eng.	37,463	21.9	28,103	35.2	7,717	9.8	1,643	26.0	__	__

Note. From Estimate of the supply of skilled manpower at different levels of higher education during the years of the fifth development plan by Ministry of Science and Higher Education, Institute for Research and Planning in Science and Education, 1974, Tehran, Iran. Author. Output of the educational system of the country during the Fifth Plan, 1973-1978 by Plan and Budget Organization (PBO), Office of Population and Manpower, 1980, Tehran, Iran. Author.

Table 26

Iranian Graduates of Foreign Schools in the Fifth Development Plan, 1973-1978

	Total	Male	Female	Associate	%	Bachelor's	%	Master's	%	Doctors	%
Total	19,803	16,944	2,859	729	100	7,888	100	6,747	100	4,439	100
Engr	6,320	6,169	151	168	23.0	3,731	47.3	1,953	28.9	468	10.5

Note. From Output of the educational system of the country during the Fifth Plan, 1973-1978 by Plan and Budget Organization (PBO), Office of Population and Manpower 1980, Tehran, Iran. Author.

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with a recommendation for alleviating the problem, can be a contribution toward addressing the problem of brain drain.

Purpose of the Study

Adam Smith included human resources as a part of the Wealth of Nation more than 200 years ago. The development and proper utilization of human resources, especially high-level skilled professionals is essential; it is the key for a country's economic growth. To drive for national development in the developing countries means modernization. Modernization calls for better high-level skilled professionals, especially engineers and managers.

According to the Education and World Affairs (EWA) Committee, (1970), in the modernization and development process, the role of skilled professionals includes the following: (1) it constitute the intellectual bridge to the developed world, that is, it assesses and adapts relevant ideas and technologies originating elsewhere; (2) it develops, maintains and manages the productive processes, the resources, and the complex structures of modern society; (3) as the intellectual elite, it brings about the structural and institutional changes necessary if a nation is to become a modern state; and (4) as the seed corn for the future, its activities and standards heavily influence the educational and other molding institutions which shape future generations of educated persons. Without highly skilled professionals, especially engineers who combine natural leadership qualities with ski

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with skills and values conferred by education, the structure of human resources can never become an effective prime mover in modernization.

All the data presented here, is indicative of the continuing problems of the increasing shortage of engineers in Iran. Many engineers emigrated from the country, and almost half of the Iranians in the United States who had some occupational skills, obtained permanent residency (Askari, 1977). To clarify this problem further, thousands of engineers who were projected by the Fifth plan, could not graduate prior to the Revolution of 1979, due to demonstrations and riots by the students. Many universities were ineffective and virtually closed for the year prior to the revolution (Rucker, 1991). Although some colleges and universities resumed their functions briefly after the Revolution, the new government "...instituted what became known as the Cultural Revolution" (Rucker, 1991, p. 459). According to Selhoum (cited in Rucker, 1991, p. 459), the assumption of the Cultural Revolution among the government's officials were, that Iran's educational system was "westtoxicated." The new administrators in the Ministry of Education decided to close the colleges and universities in the summer of 1980 (Rucker, 1991, p. 459). The reason given for closing was to be the government wanted to "purify" the university environment. Purification meant that those students with non-Islamic ideology which might conflict with Islamic ideology had to be identified and pulled out

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regardless of their expertise and importance. Universities, therefore, were closed from 1980-1981 to fall 1983. It was assumed that "purification" took a long time, and the consequences were an interruption in the supply of highly skilled professionals, especially engineers. Iran's war with Iraq during the years 1980-88 (Rucker, 1991) also produced many educational problems. Lack of facilities and funds resulted an increased shortage of professionals and engineers. According to some observers, Iran has had tremendous progress and a "...respectable recovery since the cease-fire [August 1988'] with Iraq." (Amuzegar 1992, p. 417). To promote the development and modernization, the country needed highly qualified engineers and other educated professionals in the areas of medicine, education, defence, industrial management, banking, agriculture, and a host of other related areas. As Sarraf (1990, p. 266) indicated, if all educated Iranians, both in the country and currently working abroad, "were to be involved in the reconstruction process, their numbers would still be inadequate." As demands on Iran's educational system continued to increase, Iranian leaders called professionals including engineers to return. It remains to be seen how many engineers will stay abroad and how many will return, and what impact this will have on post-Revolutionary Iran.

It is the purpose of this study to investigate the factors and variables which influence the Iranian engineers' decision making to stay in the United States or return to

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The investigation of influential factors and variables on Iranian engineers' decision making on whether to stay or to return is sought through testing the following hypotheses at .05 level of significance (see Appendix B):

Hypothesis 1 H_o: There is no significant correlation between the age and degree of importance of the 35 factors (see Appendix E) on the Iranian engineer's migration decision.

Hypothesis 2 H_o: There is no significant correlation between the Iranian engineer's children's age and the degree of importance of the 35 factors on their desire to stay in the United States.

Hypothesis 3 H_o: There is no significant correlation between the duration of time an engineer has lived in the United States and the degree of importance of the 35 factors in the migration decision.

Hypothesis 4 H_o: There is no significant correlation between the number of times the Iranian government has contacted the engineers about their career plans and the degree of

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importance of the 35 factors on their migration decision.

Hypothesis 5 H_0: There is no significant correlation between the level of income of the engineers and the degree of importance of the 35 factors on their migration decision.

Hypothesis 6 H_0: There is no significant difference between the Iranian engineers with American citizenship and those with Iranian citizenship in regard to the degree of importance of the 35 factors on their decision to stay in the United States.

Hypothesis 7 H_0: There is no significant difference between male and female Iranian engineers in regard to the degree of importance of the 35 factors on their migration.

Hypothesis 8 H_0: There is no significant difference between the engineers married to Iranians and those married to non-Iranians in regard to the degree of importance of the 35 factors on their migration decision.

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Hypothesis 9 H_o: There is no significant difference between the married and single engineers and the degree of importance of the 35 factors on their decision to stay in the United States.

Hypothesis 10 H_o: There is no significant difference between the engineers whose spouses have a college degree or higher education and those with a high school diploma or less in regard to the degree of importance of the 35 factors on their migration decision making.

Hypothesis 11 H_o: There are no significant differences in the degree of importance of factors between the Iranian engineers who wish to settle permanently in the United States and those who are in the United States now but would consider settling in Iran.

Definition of Terms

Engineer - A person who holds an engineering-engineering technology degree at the bachelor's level or higher, awarded by an institution of higher education.

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Brain-Drain - The term is used as an expression to indicate the migration of professional, technical and kindred persons from the developing to the developed countries (Whelan, 1974).

Modernization- The process of transition from a traditional society toward one which uses advanced technology and replaces human labor with machines to increase his/her output (Adams, 1970).

Plan Organization - In February 1949, the Iranian Parliament passed a Plan Organization Act establishing the Plan Organization for the task of implementing the first Seven-year plan. (Amuzegar, 1971).

Plan & Budget Organization - In 1973, the Plan Organization was officially named the Plan and Budget Organization (Amuzegar, 1971).

Assumptions

This research study is an experimental approach, and the study will be based on certain assumptions as follows:

1. The sample is representative of the whole population of Iranian engineers who have migrated to the United States of America and reside in Southern California.

2. The subjects have answered the questions accurately and honestly.

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Limitations

Although brain drain is a global problem, this research study will be limited only to the study of Iranian engineers. This limitation is due to the fact that each country has its own unique culture, people, religion, economic condition, ethnic group, educational system, geographic location. Accordingly, the reasons and variables for migration are different. Therefore, this study will limit itself to Iranian engineers who have migrated to the United States of America either before or after the Revolution of 1978.

This study will also limit itself to a particular geographic location. The location will be Southern California. The immigration statistical fiscal year 1990-91, showed that Southern California had the largest population of Iranians. Therefore, the population for this study consists of all the Iranian engineers who reside in Southern California.

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CHAPTER II

REVIEW OF THE LITERATURE

Early History of Migration

The migration phenomenon is as old as science. From the earliest times, the search for knowledge has been associated with the human mind. The thirst for knowledge led such historic men as Adam, Prometheus, and Daedalus to emigrate because of their disagreements with the ruling powers (Dedijer, 1968). According to some historians, many lovers of knowledge migrated to Athens, where Plato established an Academy as a long lived institution of learning and research in 388 B.C. (Dedijer, 1968). Alexandria was another center of attraction for the migration of scientists and scholars. As Dedijer (1968, p. 16) pointed out, "...most of the best works in the world's science and philosophy from 300 B.C. to 500 A.D. to which our present development in these fields can be traced were done in Alexandria." As historian of science have indicated, soon after 500 A.D. the pro-Greek Persian King Khosro Anushiravan established a university at Gundi Shapour in East Persia (Dedijer, 1968), and attracted scholars as well as the philosophers who were expelled from Athens by Justinian (Dijksterhuis, 1961). Many Persian, Jewish, and Syrian scholars and artists, were attracted by the Caliph Al-Mansur from the Abbasid dynasty who erected Baghdad in 766 A.D. and promoted developing science (Dedijer, 1968). The pattern of migration can be found from time to time when the universities

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were the center for the production and transmission of science and scholarship. The European universities from the twelfth to the sixteenth century were the major origins for the development of science in 1600. In Europe, the universities of the time gathered an enormous flow of scholars and students. Despite the political fragmentation, the migration was encouraged by the unity of the intellectual culture, resting on the Latin language and the Catholic Church. The direct causes for the migration as Dedijer (1968, pp. 21-22) presented, were the "economic, the political, the social and intellectual demands for the development of knowledge in law, medicine, theology, philosophy, ...natural science, mathematics, and the humanities."

Types of Migration

The most important type of migration which history has recorded was ancient and barbaric invasion (Dollo, 1964; Fairchild, 1925), conquest (Fairchild, 1925), colonization (Keller, 1908), and immigration (Davie, 1936). Invasion in general is characterized by Fairchild (1925, pp. 13) as a hostile movement of a whole aggressive people acting as military or political units "...on a low stage of culture ....overrunning the territory of a more highly developed group." The migrations of the "...semi-barbaric tribes into the countries of southern and western Europe are classic examples" (Davie, 1936, p. 2). (for detail see Fairchild, 1925, pp. 13-15, Davie, 1936, p. 2 and Dollot, 1964, pp. 9-

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11). Conquest is almost the reverse of invasion. It occurs when a "well-developed state, full of vigor, sends its armies over the territory of less advanced peoples, imposing its political system upon them, and laying them under tribute" (Fairchild, 1925, p. 17). The historical examples of conquest are such as that of the "...hordes of Genghis Khan" (Scott, 1968, p. 3-4) who carried his vanguard into Bohemia, Hungary and Poland, and left memorable traces of his passage through Russia (Dollot, 1964); Alexander the Great who was a spreader of conquest (Fairchild, 1925), and the expansion of Islam in the "...name of religion." (Scott, 1968, p. 3-4). The third form of migration is colonization. The fundamental ideas of colonization as Keller (1908, pp. 1-2) defined are a "...movement of population and an extension of political power." It is a state enterprise, the state sending out its citizens for the purpose of the commercial advancement on a non-military plane if possible. The great colonial expansion took place in the seventeenth and eighteenth centuries (Keller, 1908). Another form of migration is immigration. Historically, it is the most recent type of migration. It is mainly a phenomenon of the nineteenth and twentieth centuries. It differs from other form of migration and is essentially a voluntary movement on the initiative of the individual. It differs from colonization in "...being a mass movement composed of individuals or families not forming a coherent association." (Davie, 1936, p. 4). In the following pages immigration as a modern phenomenon and as a distinctive movement

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Migration, Emigration, and Immigration

A distinction should be made between migration, emigration, and immigration. Migration, the broader term, includes all changes of abode, even the shifting of animals on land, in water, or in air. But emigration and immigration by their prefixes imply the existence of an organized state in which the migrant has resided or intends to reside. The words are different names for one and the same change of place, regarded from the point of view first of the state which is left and then of the state which is entered (Willcox, 1931; Davie, 1936). Many countries have defined emigrants as those who leave and immigrants as those who arrive over the sea (Willcox, 1931). Fairchild (1925, p. 30) defined immigration as a "movement of people, individually or in families, acting on their own personal initiative and responsibility,...passing from one well-developed country (usually old and thickly settled) to another well-developed country (usually new and sparsely populated) with the intention of residing there permanently." The same movement may also, as Fairchild (1925), put it, be referred to as emigration. According to Fairchild (1925), there is only one movement and one set of people, emigrating from one country and immigrating to another. The two words are, in fact, only two different ways of looking at the same thing, and may be used interchangeably, if th

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if the point of view is regarded (Fairchild, 1925). Both emigration and immigration jointly called migration, "...are the subject of permanent co-operation between international, inter-governmental, and non-governmental organizations" (The Encyclopedia of the United Nations, 1990, p. 414).

The History of Immigration into the United States: Colonial to 1900

The history of immigration into the United States of America can be divided into five periods. Fairchild (1925) stated the first period as the time between the first settlement of the North American colonies and the year 1783. In 1783 the United States signed a treaty of peace with England and ended the colonial period (Davie, 1936). The English were the original settlers in the United States during the colonial period. After the English, other immigrants such as Scotch, Dutch, German, and Irish came to the new world.

The second period, from 1783 to 1830 may be called the period of "free immigration." It is called free immigration because no "attempt was made by any governmental agency to control the movement" (Fairchild, 1925, p. 32). From 1776 to 1820 it was estimated that 250,000 immigrants arrived (Davie, 1936).

The third period began with 1830 and ended in 1882. This may be called the period of "agitation and state regulation" (Fairchild, 1925, p.32). In this period, the "push" and "pull" factors drove millions of people to immigrate to the

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United States. The "push" factors included Ireland's potato murrain, which attacked the plants in 1845 and caused an almost complete failure of the crop (Fairchild, 1925; U.S. Immigration, 1991). It also included severe political and economic crises during the German revolution of 1848, and the failure of the revolt, which pushed thousands of Germans to escape the country and immigrate to American cities, in some cases to continue their political activities (U.S. Immigration, 1991). The "pull" factors in America included the increasing opportunities for employment due to the expansion of the economy, higher wages, the promise of religious freedom, an exceptionally favorable agricultural situation, and availability of land (U.S. Immigration, 1991). During the 1840's, a system of immigration emerged. The federal legislation was directed to the improvement of the conditions of the voyage. The federal "Passenger Acts" (Act of February 22, 1847) provided "...specific regulations to safeguard passengers on merchant vessels." They were subsequently amended by the Act of March 2, 1847 expanding the allowances of passenger space" (U.S. Immigration, 1991, Appendix 1). The Act of 1855 (February 22) replaced the Passenger Acts and reaffirmed the duty of the captain of any vessel to report the arrival of alien passengers (U.S. Immigration, 1991, Appendix 1). This Act also established separate reporting to the Secretary of State distinguishing permanent and temporary immigration (U.S. Immigration, 1991, Appendix 1). During this period, a wide variety of opportunities such as railroads, mining, a

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mining, and agriculture, inspired Asians to immigrate to the United States. It was estimated that between 1861 and 1880, 200,000 Asians immigrated to the United States (U.S. Immigration, 1991). The Act of 1862 (February 19) prohibited the transportation of Chinese "coolies" on American vessels. With the passage of the Chinese Exclusion Laws of the 1880, the number of Chinese immigrants was dramatically decreased (U.S. Immigration, 1991, Appendix 1).

The fourth period, from 1882 to 1917, was marked by the passage of important series of legislation, and is called the period of "federal control and individual selection." (Fairchild, 1925, pp. 108-126). The characteristics of the immigration movement in this period were markedly different so as "...to distinguish it sharply from anything which had gone before." (Fairchild, 1925, p. 108). One of the important piece of legislation in this period was the Immigration Act of 1882 which shifted direct control over immigrants from the states to the federal Department of Treasury (for detail see Fairchild, 1925, pp. 111-112). Willcox (1931) indicated that the United States Bureau of Immigration was established in 1892 and given supervision of the general immigration service set up at that time.

The final period, from 1917 to the present may be designated the period of federal control; there was group selection and restriction (Fairchild, 1925). This period can be categorized as twentieth century immigration and can be broken into five different periods: (1) 1901 to 1920, (2) 1921 to 1

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1921 to 1940, (3) 1941 to 1960, (4) 1961 to 1980, and (5) 1981 to 1990. The 1991 Statistical Yearbook of Immigration has been selected as a main source for explaining the twentieth century immigration.

History of Immigration into the United States: 1901 to 1920

It was estimated that 8.8 million immigrants arrived in the United States between 1900 to 1910, representing nearly 12 percent of the total U.S. population in 1900. Italy, Austria-Hungary, and Russia accounted for 66 percent of total immigration to the United States between 1901-10 (U.S. Immigration, 1991). The number of Russian immigrants into the United States between 1901-20 was estimated to be more than 2.5 million. It should be noted that in this period, the American statistics did not distinguish between Great Russians, Ukrainians and White Russians, calling them all Russians. (for detail see Willcox, 1931, pp. 521-591). Among the "push" factors, religious and ethnic persecution were identified to be as two important causes of the Russian migration in this period.

History of Immigration into the United States: 1921-1940

Although, after 1914, there was a reduction in the number of immigrants to the United States due to the restrictive legislation and World War I, in 1920 immigration increased significantly and doubled in 1921. The immigration Act of 1924, changed the pattern and reduced the volume of

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immigration sharply. To control the number of entries, a special form of visa, designated as the immigration visa was used by American consular officers abroad (Fairchild, 1925). This law reduced the numbers of European immigrants to the United States. The reduction was estimated to be 85 percent for southern, eastern, and central European countries such as Italy, Poland, Greece, Russia (Germany was exception with 40 percent), and other Baltic states (U.S. Immigration, 1991). The worldwide economic depression reduced the number of immigrants significantly. The percentage of the reduction was estimated to be 90 percent during 1930 and 1933. The number of immigrants started to increase and reached 83,000 in 1939, as war began in Europe (U.S. Immigration, 1991).

History of Immigration into the United States: 1941 to 1960

The number of immigrants into the United States increased steadily after World War II. The number of immigrants was estimated to be from a low of fewer than 24,000 in 1943 to a high of 327,000 in 1957. Despite the national quotas and the debate over the role of the United States in the world, the refugee dilemma and fear of communism, resulted in pieces of legislation which allowed the entry of hundreds of thousands of refugees through the 1950's, 1960's, and 1970's. Later on, the definition of refugees and a mechanism for their acceptance was formed in the Refugee Act of 1980 (U.S. Immigration, 1991).

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History of Immigration into the United States: 1961 to 1980

The passage of two important pieces of legislation in this period changed and reversed the pattern of immigration. The elimination of the national origins quota system and its replacement with the Immigration Act of 1965 created a new preference system which "...allowed entry to relatives of U.S. citizens and permanent resident aliens, as well as to those who possessed skills needed in the U.S. economy." (U.S. Immigration, 1991, p. 27) (see Table 27). This preference system made a distinction among skill levels and gave a higher preference to professional-level workers. In this Act, the introduction of labor certification was introduced. The labor certification was designed to "...ensure that immigrants who are coming primarily as workers (not qualifying for a relative preference or refugee status) have skills which are needed in the United States" (Keely, 1975, p. 181). The Act of 1965 led to an increase in both magnitude and proportion of professional worker migration to the U.S. (Yochum, 1988; Keely, 1975). As Yochum (1988, pp. 271-272) indicated, "...engineers have been major beneficiaries of labor certification both in term of volume and percentage growth from the pre-Act period." The United Nations played a significant role in defining international migration and refugees, and finding "ways of adjusting current national statistics on international flows." (Simmons, 1987, p. 1002). The United States passed the Refugee Act of 1980, and "adopted the United Nations' definition of a refugee as

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Preference	Groups Include	Percentage and Number of Visas
First	Unmarried sons and daughters of U.S. Citizens and their children	20% or 54,000
Second	Spouses and unmarried sons and daughters of permanent resident aliens	26% or 70,200
Third	Members of the professional of exceptional ability and their spouses and children	10% or 27,000
Fourth	Married sons and daughters of U.S. citizens, their spouses and children	10% or 27,000
Fifth	Brothers and sisters of U.S. citizens (at least-21 years of age) and their spouses and children	24% or 64,800
Sixth	Workers in skilled or unskilled occupations in which laborers are in short supply in the United States their spouses and children	10% or 27,000

Note. From *Statistical yearbook from 1965 to 1990* (p. 37) by U.S. Immigration and Naturalization Services, 1991. Author.

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any person who is outside his or her country of nationality who is unable or unwilling to return to that country because of persecution or a well founded fear of persecution." (U.S. Immigration, 1991, pp. 28-29). The number of refugees was estimated to be more than 700,000 between 1961 and 1980 (U.S. Immigration, 1991, p. 29). The numbers of Vietnamese and Cuban refugees were reported to be significant between 1971-80, with 15,266 (Vietnamese) and 251,514 (Cuban) of the total refugees (U.S. Immigration, 1991).

History of Immigration into the United States: 1981-1990

According to U.S. Immigration (1991), more than 7,000,000 immigrants were granted permanent residence during 1981-90. The average annual number of immigrants admitted from 1981-90 was 3.1 immigrants per thousand U.S. residents (U.S. Immigration, 1991). The total number of admitted immigrants from all countries was reported to be more than 1,500,000 in 1990. Among the top fifteen countries in 1991, the country of Iran ranked twelfth with 24,189 immigrants. Mexico was the leading country with an overall total of 679,067. The country of El Salvador ranked second (80,173), Philippines third (63,756), Vietnam fourth (48,792), Dominican Republic fifth (42,195), Guatemala sixth (32,303), Korea seventh (32,301), China (Mainland) eighth (31,815), India ninth (30,667), Soviet Union tenth (25,524), Jamaica eleventh (25,013), Colombia thirteenth (24,189), Poland fourteenth (20,537), and Haiti fifteenth (20,324) (U.S. Immigration, 1991). As mentioned ea

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earlier, in about 171 years from 1820 to 1990, more than 57 million people immigrated to the United States. On March 3, 1991, the Immigration and Naturalization Service completed its first century of its services (U.S. Immigration, 1991).

High-level International Migrant Engineers to the United States

High-level migrants are defined by their level of education or by occupation. High-level migrants are skilled and very talented. They can be classified as "trained brain drain (or gain)" and "untrained brain drain (or gain)" (Bayer 1968). High-level trained migrants are those who tend to move frequently, for long distances and over greater periods of their lives (Myers, 1972), and high-level untrained migrants are students who study abroad and try to remain by changing their visa and temporary status to permanent. Students usually enter the United States on an F visa. By Immigration Law, the students with F visas are required to leave the country after the completion of their study. If students want to continue their education, they can easily extend their stay by updating their immigration papers. Students can also convert their F visa to an immigrant visa, by applying for the green card. As shown in Table 28, many students took advantage of the Immigration Act of 1965 and applied for the immigrant visa (see Table 28). This Act permitted an alien who was in the country with a temporary visa to apply for a permanent immigration visa based on a new visa preference

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Table 28

Adjustment of Status by Temporary Students: 1967-1973

1967	1968	1969	1970	1971	1972	1973
9,957	7,937	7,493	10,489	11,693	12,724	9,983

Note. From Effects of U.S. immigration law on manpower characteristics of immigrants (p. 188) by C. B. Keely 1975. Demography, 12 (2), Population Association of America.

system (third preference in the case of professional and scientists), and the introduction of labor certification (Keely, 1975).

According to the U.S. Immigration annual report of 1991, a total of 20,871 students from all over the world were admitted and changed their temporary status to permanent resident status in fiscal year of 1991. Among all countries, the countries of Taiwan, India, Iran, and China (mainland), were the leading countries with the highest number of students (1,732, 1,613, 1,599, and 1,568 respectively) who were adjusted to permanent resident status (U.S. Immigration, 1991). A report by the Institute of International Education (1991) indicated that in 1989/90, there were 219,710 foreign students in the United States. It was reported also by the U.S. Immigration (1991) that in 1990, more than 326,000

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foreign students entered the United States. Approximately one-fifth of both foreign undergraduate and graduate students studied engineering in 1989/90 (Institute of International Education, 1991). A little over half of the engineering students (53%) were pursuing studies at the graduate level and 44% at the undergraduate level (Institute of International Education, 1991).

Among high-level migrants, engineers and scientists are described as the most talented people. A comparison between the percentage of scientists and engineers who were migrants to the United States with the percentage of scientists and engineers in the total population of several countries, indicated that on the average scientists and engineers were ten times more likely to migrate than persons in other population (Grubel and Scott, 1966). In Table 29, some statistics have been adopted from Bromwbill (1969) to show the number of foreign engineers who arrived in the United States during the period of almost 35 years (1820 to 1855). The total of foreign arrivals in this period were estimated to be 4,462,624. Although the number of total engineers (2017) during this period (1820 to 1855) compared to the later date is relatively a small figure, it was marked as an early migration of engineers into the United States in the earlier period (see Table 29). It should be noted here that immigration records of engineers for the period 1820 through 1944 offered little relevant detail for study.

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Table 29

Foreign Engineers Arriving in the U.S.A. During 1820-1855

Year	Number	Year	Number
1820	12	1838	13
1821	7	1839	20
1822	16	1840	40
1823	11	1841	30
1824	20	1842	48
1825	24	1843	26
1826	14	1844	40
1827	30	1845	53
1828	33	1846	53
1829	28	1847	35
1830	37	1848	66
1831	8	1849	142
1832	84	1850	161
1833	41	1851	103
1834	60	1852	91
1835	61	1853	274
1836	14	1854	213
1837	19	1855	144
Total	519		1552
Total Engineers: 519 + 1552 = 2071			

Note. From *History of immigration to the United States 1819-1855* (pp. 21-171) by W. J. Bromwbil, 1969, New York: Augustus M. Kelley.

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The U.S. Immigration records showed more occupational detail after 1948 (National Science Foundation, 1962-64). In the period 1907-23, Thomas (1968) found that only 2.6 percent of the 6,905,000 immigrants to the United States were in the professional and technical grade. The total number of engineers admitted as immigrants between 1949 and 1957 accounted for 19,316; between 1958 and 1961, for 14,150 (National Science Foundation,1962). As shown in Table 30, the immigration of engineers from 12 developed countries from 1957 to 1961 is an evolution of loss of highly talented human resources over the 5-year period (cited in Grubel and Scott, 1977, p. 79). Based on the table, the country of Canada has the highest mean (45.7) and the country of France has the lowest mean (1.2), during the five year period.

Trends in migration, as well as engineers, have been studied in various ways. According to a study published by the Instituto de Tella in 1962, "Argentina in recent years has lost 5,000 engineers through emigration" (Nature,1964, p. 965). It was estimated that 23 percent of Norwegian engineers graduating between 1946 and 1960 in Norway or abroad are at present not working in Norway (Nature, 1964). According to an investigation by the U.S. Department of Labor and the U.S. National Science Foundation, during 1952-61, more than 30,000 trained engineers immigrated and settled permanently in the United States (Nature, 1964). More than 10,000 immigrant engineers were admitted to the United States between 1962-64 (National Science Foundation, 1967).

Table 30

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Table 30

Immigration of Engineers to the United States As A Percentage of First Degrees Granted in Country of Last Residence

Country	1957	1958	1959	1960	1961	Mean
Austria	16.3	9.2	15.9	8.5	3.2	10.6
France	1.5	1.3	1.3	1.3	0.8	1.2
Germany	15.2	9.4	9.8	7.1	5.8	9.5
Greece	24.4	22.3	23.1	20.8	14.0	20.9
Ireland	26.6	22.0	11.1	7.1	10.8	15.5
Italy	1.8	2.6	1.9	1.5	1.0	1.8
Netherlands	37.4	8.8	13.7	20.3	15.4	19.1
Norway	26.6	31.4	26.7	18.2	17.6	24.1
Sweden	27.4	19.3	13.8	12.1	10.4	16.6
Switzerland	33.2	23.8	19.6	21.2	14.8	22.5
United King.	25.9	21.8	11.3	13.4	10.3	16.5
Canada	60.6	45.5	47.1	44.3	31.5	45.7

Note. From The brain drain: Determinants measurement and welfare effects (p. 79) by H. G. Grubel and A. Scott, 1977, Waterloo, Canada: Wilfrid Laurier University Press.

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Table

The total number of engineers admitted as immigrants between 1965 and 1967 was 17,182 (National Science Foundation, 1969), and between 1976 and 1978 the number was 17,099 (National Science Foundation, 1980).

In regard to human capital and loss of high-level migrants, Professor Richard M. Titmuss of the London School of Economics, blamed the United States for having "absorbed and, to a certain extent, deliberately recruited 100,000 doctors, scientists and engineers from abroad" between 1949 and 1967. He added: "In about 18 years, the United States will have saved some 4 billion dollars by not having to educate and train, or train fully, this vast quantity of human capita." (cited in Iffland and Rieben, 1968, p. 59). When the United States changed its immigration law in October 3, 1965 from national origins based to one of skill based, the Act "was criticized by Third World countries as enhancing Brain Drain" (The Encyclopedia of the United Nations, 1990, p. 414). Indeed, immigration statistics almost immediately reflected an increased number of talented persons, especially engineers, entering the United States. The increased number of immigrant engineers was reflected in the data which was gathered by the U.S. Immigration and Naturalization Service, and National Science Foundation (1986). From 1966 to 1986, more than 123,000 engineers immigrated to the United States. It should be noted that this figure did not include the years 1979, 1980, and 1981 for which data were not available. As shown in Table 31, in 1986, the number of immigrant engineers almost doubled,

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doubled, compared to 1966 (National Science Foundation, 1986) (see Table 31). In the moderate growth projected for the future, the employment of engineers is expected to increase from 1.5 million in 1990 to 1.9 million in 2005 (Braddock, 1992). Despite the increased number of immigrant engineers, a study by the National Science Foundation indicated that there will be a shortage of 275,000 engineers by the year 2006, as a result of the dip in the college-age population in 1990 (American Association for the Advancement of Science, 1989). Another measure of the influence of the immigration of engineers to the United States may be seen in the post doctoral engineering positions. In engineering, non-U.S. citizens held 66 percent of the postdoctoral position (National Science Foundation, 1987). As shown in Table 32, the total number of postdoctoral appointments held by foreigners has also grown faster than the total appointment held by U.S. citizens; the difference has been about 8 percent versus 3 percent per year, respectively, since 1980 (National Science Board, 1989) (see Table 32). The PhDs earned by foreign citizens on temporary student visas accounted for a growing share of total PhDs awarded by U.S. institutions in engineering fields. In both the mathematical sciences and engineering, temporary visa-holders earned 40 to 41 percent of the PhD in 1988 (National Science Board, 1988).

Table 31

Immigrant

Note. Fro
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NA = Data

Table 31

Immigrant Engineers: 1966 - 1986 (In thousands)

Year	Engineers
1986	8.4
1985	8.1
1984	6.1
1983	6.8
1982	7.9
1981	NA
1980	NA
1979	NA
1978	6.8
1977	5.2
1976	5.1
1975	4.6
1974	3.9
1973	4.4
1972	7.4
1971	9.0
1970	9.3
1969	7.2
1968	9.3
1967	8.8
1966	4.9

Note. From Immigrant scientists and engineers (p. 5) by National Science Foundation, 1986. Author.

NA = Data Not available.

Table 32

Foreign]

Year
1988
1987
1986
1985
1984
1983
1982
1981
1980

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Table 32

Foreign Engineering Doctorates: 1980 - 1988

Year	Total Engineering	Foreign
1988	1,676	1,102
1987	1,442	946
1986	1,398	940
1985	1,347	907
1984	1,194	759
1983	1,101	691
1982	978	657
1981	1,040	709
1980	978	676

Note. From Science and engineering indicators - 1989 by National Science Board, 1989. Author.

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As shown in Table 33, there was a growing share of total foreign engineers who were on temporary visas and awarded Doctor of Philosophy degree between 1978 and 1988 (see Table 33). According to one report, faculty hiring had been highly dependent on foreign graduates; so much so that by 1985, more than half of all assistant professors in American engineering schools were foreign citizens (National Science Foundation, 1987).

Iranian and Iranian Engineers Migration into the United States

According to a report by the U.S. Immigration and Naturalization Services (1991), in 171 years, from 1820 to 1990, a total of 56,994,014 foreigners from all countries immigrated into the United States. The flow of immigrants into the United States continued to add to the size and diversity of the country's labor force. Recent "immigration laws have favored admitting a greater number of highly skilled people into the country." (Council of Economic Advisors, 1992, p. 88). In past years many highly skilled Iranians immigrated into the United States. The number of Iranian immigrants were reported to be 1,380 between 1941-60; 3,388 between 1951-60; 10,339 between 1961-70; 45,136 between 1971-80 (U.S. Immigration, 1991).

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Table 33

Engineering Doctorates of Non-U.S. Citizens, by Visa Type: 1978-88

Year	Total engineering	Non-U.S. Citizens (permanent visa)	Non-U.S. Citizens (temporary visa)
1988	4,190	366	1,723
1987	3,712	355	1,532
1986	3,376	343	1,372
1985	3,166	315	1,419
1984	2,913	274	1,269
1983	2,781	319	1,170
1982	2,646	296	1,030
1981	2,528	301	942
1980	2,479	299	851
1979	2,490	322	815
1978	2,423	325	768

Note. From Science and engineering indicators - 1989 by National Science Board, 1989. Author.

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As shown in Table 34 and Figure 3, the number of Iranian Immigrants significantly increased from 11,105 in 1981, to 24,977 in 1990 (see Table 34 and Figure 3). Out of 24,977 Iranian immigrants, 11,551 were in the occupational category; 2,610 were in the professional specialty and technical category; 2,416 were in the executive administrative and managerial category; 1,265 were in sales; 1,214 were in administrative support; 1,205 were in precision production craft and repair; 941 were in the as operator, fabricator, and laborer category; 57 were in farming, forestry and fishing; 1,843 were in service; and 13,426 were in the non-occupational category (U.S. Immigration, 1991). It is interesting to note the state of intended residency of 24,977 Iranian immigrants into the United States in the year 1990. As shown in Table 35 and Figure 4, in 1990, the leading states of intended residence for Iranian immigrants were California (14,344), New York (1,735), Texas (1,400), and Virginia (922) (U.S. Immigration, 1991, Table 16; U.S. Department of Commerce, 1992) (see Table 35, and Figure 4). Iranian refugees who were admitted into the United States, were also reported to be a high number in 1990. Among the total of 99,697 refugees in 1990, the country of Iran ranked seventh with 3,614 refugees, after the Soviet Union, Vietnam, Laos, Romania, Ethiopia, and Cuba (U.S. Immigration, 1991).

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Table 34

Iranian Immigrants Admitted Fiscal Year 1981-1990

Year	Number
1990	24,977
1989	21,243
1988	15,246
1987	14,426
1986	16,505
1985	16,071
1984	13,807
1983	11,163
1982	10,314
1981	11,105
1980	10,410

Note. From 1990 Statistical Yearbook by U.S. Immigration and Naturalization Services, 1991. Author.

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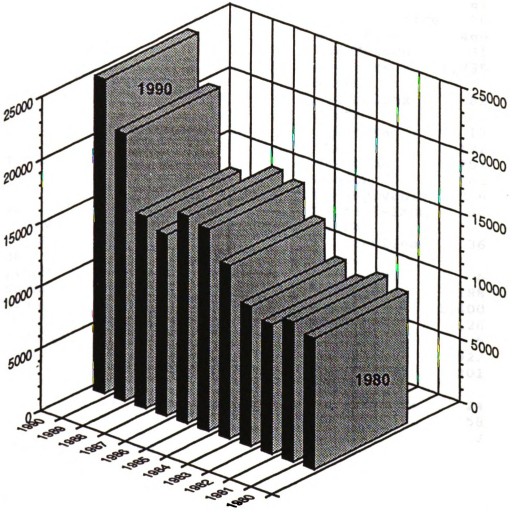

<u>Figure 3</u>. Iranian immigrants admitted fiscal year 1981-1990.

<u>Note</u>. From <u>1990 Statistical Yearbook</u> by U.S. Immigration and Naturalization Services. Author.

Table 35

Iranian Immigrants and State of Intended Residence

Fiscal Year 1990

State	Number	State	Number
Alabama	76	Montana	2
Alaska	7	Nebraska	33
Arizona	203	Nevada	81
California	14,344	New Hampshire	20
Colorado	17	New Jersey	469
Connecticut	143	New Mexico	31
Delaware	30	New York	1,735
District of Columbia	105	North Carolina	82
Florida	587	North Dakota	13
Georgia	314	Ohio	172
Hawaii	12	Oklahoma	257
Idaho	16	Oregon	141
Illinois	391	Pennsylvania	256
Indiana	57	Rhode Island	30
Iowa	29	South Carolina	36
Kansas	119	South Dakota	6
Kentucky	73	Tennessee	188
Louisiana	78	Texas	1,400
Maine	30	Utah	126
Maryland	833	Vermont	5
Massachusetts	456	Virginia	922
Michigan	172	Washington	301
Minnesota	132	West Virginia	24
Mississippi	19	Wisconsin	58
Missouri	131	Wyoming	2
US. Territories and Possessions			
Guam	1		
Puerto Rico	5		

Note. From 1990 Statistical yearbook by U.S. Immigration and Naturalization Services 1991. Author.

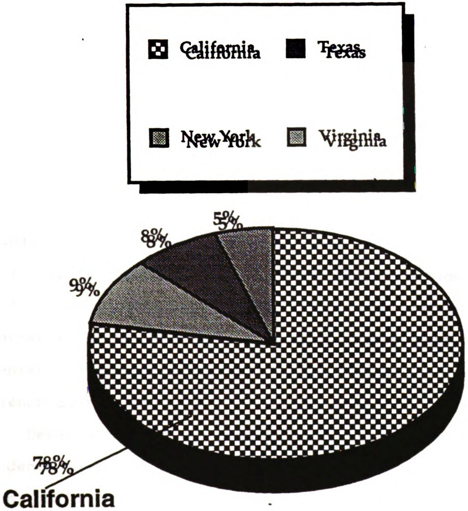

Figure 4. Iranian immigrants and leading states of intended residence fiscal year 1990.

Note. From 1990 Statistical Yearbook by U.S. Immigration and Naturalization Services, 1991. Author.

According to same source, in 1991, a total of 13,935 Iranian immigrants were admitted and granted permanent U.S. residency (U.S. Immigration, 1991). Out of 13,935 Iranian Immigrants, 6,507 were reported to be refugees and parolees (U.S. Immigration, 1991). Among Iranian immigrants, there had been an increase in the overall proportion of scientists and engineers residing and working in the United States. As Askari (1977) calculated, 14,442 Iranian professionals were admitted to the United States as immigrants between 1970 and 1975. Out of this number, more than 700 were estimated to be engineers. The report by the National Science Foundation (1988), indicated that a total of 1886 Iranian scientists and engineers immigrated into the United States between 1982 and 1984. Among 1886 scientists, 1539 were reported to be engineers in those years. In the single year 1988, 552 Iranian engineers immigrated into the United States (National Science Board, 1991).

Dates regarding the proportion and the number of foreign students provides information about the continuous problem with brain drain. From the 1960's through the 1970's increased enrollments led to more engineering programs, as well as to new and expanded graduate programs. A study by the Task Force on Agriculture and Engineering of the Committee on the Professional School and World Affairs, Education and World Affairs organization, found that a 1963 survey showed that one-fourth of all graduate students in engineering were not American citizens (cited in American Society for Engineering

Education, 1969). The total number of foreign graduate students reported by the Institute of International Education (cited in National Science Foundation, 1967) in the academic year 1964-65 totaled 35,000. About three-fourths were registered in courses of science and engineering. The increased number of foreign graduates especially engineering students had been anticipated due to the Act of 1965, which abolished national quotas (American Society for Engineering Education, 1969, p. 529). The data prepared by one federal agency and based on replies from 618 engineering groups within PhD degree-granting institutions, indicated that out of 29,751 (total graduate students covered), 7,920 enrolled for advanced degrees in the fall of 1967 were foreign students (American Society for Engineering Education, 1969). In 1978 the percentage of foreign nationals receiving graduate degrees increased from less than 9 percent to 23 percent at the Master of Science level, and from about 9 percent to over 35 percent at the doctoral level (American Society for Engineering Education, 1980). In 1982, the total number of foreign students in science and engineering was roughly estimated to be 150,000 (American Society for Engineering Education, 1982). In 1988, nearly 5 of every 10 full time engineering students in doctorate-granting institutions were non-U.S. students (National Science Board, 1989). The top twenty doctoral granting institutions ranked by the number of foreign students in science and engineering graduate enrollment in 1985, is presented in Table 36. According to the National Science

Table 36

Doctorate-Granting Institutions Ranked by Foreign Science/Engineering (S/E) Graduate Enrollment: 1985

Rank	Institution	Total grad. S/E enroll.	Foreign grad. S/E enroll.	Foreign as a percent of total	Foreign post-doctorates	S/E Ph.D.'s awarded to non-U.S. cit.
1	Univ of So Ca.	8,373	1,464	17.5	182	48
2	Univ of Cal. Berkeley	5,448	1,454	27.7	218	109
3	Univ of Wis Madison	5,229	1,441	27.6	126	115
4	Univ of Mich	4,655	1,400	30.1	99	91
5	Mass Inst of Tech	4,552	1,380	30.3	188	125
6	Ohio State U	4,944	1,280	25.9	111	100
7	Univ of ILL Urbana	4,673	1,249	26.7	120	124
8	Univ of Tex Austin	4,931	1,243	25.2	114	83
9	Univ of Minn	5,760	1,190	20.7	90	81
10	Iowa State U of S&T	2,578	1,106	42.9	41	81
11	Cornell Univ	3,313	1,020	30.8	134	100
12	Stanford U	4,135	988	23.9	198	97
13	Mich State U	3,070	982	32.0	97	60
14	Penn. State U	3,781	977	25.8	68	64
15	Purdue U	3,654	971	26.6	120	100
16	Univ of Cal. Los Ang.	4,214	956	22.7	192	3
17	Univ of Ariz	3,601	908	25.2	93	27
18	Univ of Md Coll Pk	3,439	892	25.9	0	45
19	Univ of Pittsb.	4,314	870	20.2	79	55
20	Columbia U Main Div.	3,065	865	28.2	104	64

Note. From Foreign citizens in U.S. science and engineering history, status, and outlook (p. 84) by National Science Foundation, 1987. Author.

Board (1991), there were almost 102,500 foreign students enrolled in science and engineering graduate study in 1990, up from 70,600 seven years earlier. Almost 37 percent of those students enrolled in engineering. A report by the Institute of International Education (1991), indicated that the percentages of graduate students from Iran was larger than ever before. The number of Iranian graduate students increased significantly from 20.8 percent in 1979/80 to 36.9 percent in 1989/90. Not surprisingly, the Iranian graduate students were over represented in the engineering field in 1989/90. They represented 38.2 percent, and ranked first among other Middle Eastern countries, and third among all other countries, after Lebanon with 44.9 percent, and India with 38.7 percent. The proportion of Iranian graduate students who were male in the engineering field was estimated to be 92.5%, and female were 7.5 % in 1989/90. In 1989/90, the percentage of Iranian females in the engineering field was reported to be higher (18.5%), increasing 8.1 percent from 1985/86 (Institute of International Education, 1988).

In the United States population, if one considers only those in the range that Terman termed "genius" level, "perhaps one in ten now age 30 attains the doctorate." (National Science Council, 1971, p. 3). A report by the Office of Scientific Personnel indicated that during the period 1965-1968, 72,280 people attained doctoral degrees in the United States. Foreigners comprised approximately one fifth of the recipients of doctorates in those years (National Science Council, 1971).

The number of recipients of doctorates in engineering was estimated to be more than 11,000 between 1958 and 1966 (American Society for Engineering Education, 1968), and more than 32,000 between 1978 and 1988 (National Science Board, 1989). The National Science Board (1989) estimated that more than 17,000 of recipient of doctorates between 1978 and 1988 were non-U.S. citizens, those with permanent visa, and those with temporary visas. By 1990, about 28 percent of PhD program graduates were on temporary visas; another 5 percent held permanent visas (National Science Board, 1991).

As shown in Table 37, 3743 Iranian (Non-U.S. citizens) were awarded science and engineering doctorates between 1960 and 1990 (National Science Foundation, 1991, Table 6). The number of recipients of doctorates in science was reported to be 1317 between 1980 and 1990. The number of Iranian recipients of doctorates in engineering was estimated to be 512 between 1960-79 (National Science Foundation, 1987), and 1134 between 1980 and 1990 (U.S. Department of Labor, Bureau of International Labor Affairs, 1990). As shown in Table 38, eight hundred and forty six out of 3743 were reported to be in engineering, 349 in mechanical engineering, 383 in electrical engineering, and 114 in chemical engineering (see Table 38). As shown in Table 39, among leading countries, the country of Iran ranked third, among the recipients of doctorates in engineering in 1980, '81, '82, '83, and '84, fourth in 1985, '86, and '87, and fifth in 1988, '89, and 1990 (U.S. Department of Labor, 1990) (see Figure 5).

Table 37

Iranian (Non-US. citizens) Awarded Science and Engineering Doctorates: 1960-1990

Year of Doctorate	Number
1960-1964	76
1965-1969	195
1970-1974	424
1975-1979	597
1980	205
1981	194
1982	247
1983	278
1984	287
1985	233
1986	213
1987	182
1988	172
1989	198
1990	242

Note. From Science and engineering doctorates: 1960-90 (Table 6) by National Science Foundation, 1991. Author.

Table 38

Iranian (Non-US. citizens) Awarded Engineering

Doctorates: 1960-1990

Year of Doctorate	Mechanical	Electrical	Chemical
1960-1964	6	3	7
1965-1969	10	13	7
1970-1974	32	41	20
1975-1979	57	57	20
-1980	15	11	4
-1981	12	12	9
-1982	17	20	6
-1983	22	23	10
-1984	28	31	6
-1985	23	3	2
-1986	23	28	2
-1987	23	23	2
-1988	18	26	4
-1989	25	31	7
-1990	38	33	8

Note. From Science and engineering doctorates: 1960-90 by National Science Foundation, 1991. Author.

Table 39

Leading Countries of Origin for Foreign Recipients

of Doctorates in Engineering: 1980-1990

1980		1981		1982	
India	184	Taiwan	218	Taiwan	257
Taiwan	172	India	176	India	160
Iran	79	Iran	74	Iran	99
Korea	41	Korea	50	Korea	63

1983		1984		1985*	
Taiwan	277	Taiwan	322	Taiwan	387
India	178	India	194	India	212
Iran	138	Iran	119	Korea	133
Korea	104	Korea	115	Iran	116

1986		1987		1988	
Taiwan	351	Taiwan	398	Taiwan	400
India	204	Korea	238	Korea	257
Korea	175	India	204	India	255
Iran	100	Iran	88	China, People Rep. of	133
				Iran	81

1989		1990	
Taiwan	427	Taiwan	460
Korea	308	Korea	350
India	252	India	301
China, People Rep. of	156	China, People Rep. of	280
Iran	110	Iran	130

Note. U.S. Department of Labor, Bureau of International Labor Affairs, 1990. Author.

* In 1985, the National Science Foundation reported the number of foreign recipients of doctorates for the country of Taiwan as 382, India 211, and Korea 133.

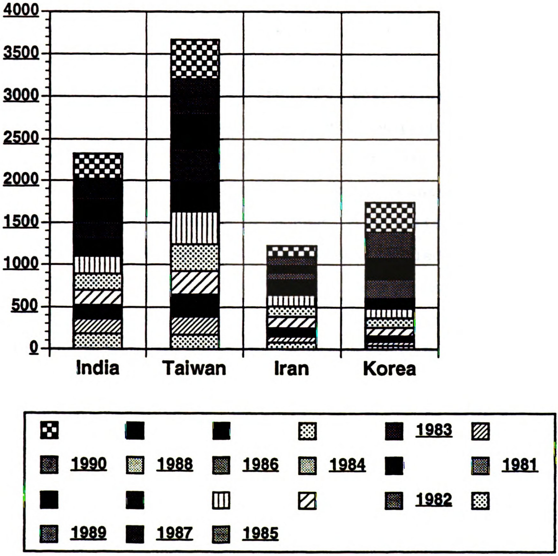

Figure 5. Leading countries of origin for foreign recipients of doctorates in engineering: 1980-1990.

Note. From U.S. Department of Labor, Bureau of International Labor Affairs, 1990. Author.

The above statistics of Iranian engineers migrating to the United States is an indication of the magnitude of human capital and the problem of brain drain.

It should be noted that the migration of Iranian engineers during the past several years was very excessive, and the problem of brain drain is magnified when it is from a country with a population of less than 60 million people. The loss of high-level human resources such as engineers, for the country of Iran is very costly, and whenever the country loses its engineers, its total value of output, its military and economic powers are reduced. Although the so called "brain drain complaint" may be regarded as a liberal and nationalistic position (Johnson, 1968, p. 70), it should be noted that "there would be no point in discussing the 'brain drain' if these national units were not a matter of concern to the individuals potentially involved in this 'drain'." (Patinkin, 1968, p. 92).

Theory of Migration

As a consequence of the rising significance of migration, interest in migration theory and research has been increased. The research on the topic has attracted the attention of geographers, demographers, sociologists, economists, and anthropologists. Although there is a large volume of literature on migration (cited in Pooley and Whyte, 1991), it is not surprising that "the level of theoretical generalization which takes place has progressed little since the work of Ravenstein in the 1880s" (Pooley and Whyte, 1991). It has long been a tradition in the literature to classify the factors of brain drain according to "push-and-pull" factors. Herberle (cited in Lewis, 1982) argued that migration is caused by a series of forces which encourage an individual to leave one place (push) and attract him/her to another (pull). Among the advocate of "Push-Pull" typology, Lee (cited in Lewis, 1982; De Jong and Gardner, 1981) hypothesized that the important factors for the decision to migrate are (1) factors associated with the area of origin, (2) factors associated with the area(s) of destination, (3) intervening obstacles, and (4) personal factors. Each origin and destination was hypothesized have a set of positive and negative factors, which attract and discourage migrants. The greater the differences among these push and pull factors, the higher the probability of migration. A number of researchers including Brinley Thomas have criticized the "Push-Pull" topology. Thomas (cited in Lewis, 1982, p. 101) argued that "Nothing is easier than to draw up a list of factors labelled "push" and "pull" and then write a descriptive account in terms of these two sets of influences." Bogue (cited in De Jong and Gardner, 1981, p. 14) also perceived the limitation of "push-pull" theory and pointed out that it "...must be replaced with a cost-benefit...approach which emphasizes the particular combination of economic and non-economic forces that the individual perceives in migration decision making." According to cost-benefit analysis or human capital approach, the current and future monetary and nonmonetary costs and benefits must be weighed in some fashion before movement will be undertaken (cited in De Jong and Gardner, 1981; Lewis, 1982; Straubhaar, 1986). In other words, "labor migration is the result of (international) differences in the present value of all the future net gains from migrating or from staying at home." (Straubhaar, 1986, p. 844). De Jong and Gardner (1981) found two major problems with the cost-benefit or human capital approach. The problems were (1) nonmonetary costs are rarely included in tests of the theory, and (2) the tests continue to utilize income differentials between states, provinces, or metropolitan areas. Many migration theories are found to be more applicable to internal migration rather than international migration. Typical examples of internal migration (cited in Lewis, 1982) are: **migration decision making theory** (Golledge and Rushto, 1976; Gold, 1980; Herbst, 1964; and Wilber, 1963), **gravity model** (Taylor, 1975; Zipf, 1946; Olsson, 1965; and Young, 1924), **stochastic approach** (Olsson, 1965; Shaw, 1975; and Rogers, 1968), **labor-force adjustment model** (Lowry, 1966, cited in De Jong and Gardner, 1981), **systems theory** (Mabogunje, 1970, cited in De Jong and Gardner, 1981), and **value-expectancy model** (Crawford, 1973, and Chemers, 1978, cited in De Jong and Gardner, 1981). The above mentioned models describe the internal movements and they "...neglect a crucial element when applied to international migration" (Straubhaar 1986, p. 852).

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Migration and Human Motivation

Migration was often viewed as economically motivated. Shaw (cited in Winchi, and Carment, 1989, p. 96) argued that a human "...is economically rational, an economic maximizer," and a human "will perceive and evaluate migration on this basis." Against this view, Pryor (cited in De Jong and Gardner, 1981, p. 43) pointed out that "There is danger in assuming that migration is always economically purposive behavior." Therefore, it is an essential to view international migration as a function of multiple motives.

In regard to the term "motive", as Morgan (1974, p. 55) introduced it motive "...comes from the Latin word meaning to move, and we can think of motivation as the mover of behavior." Although the perspectives on motives are varied, early research on motives generally defined them as (1) forces which acted to reduce a state of tension within the individual and "...to protect, satisfy, and enhance the individual and his [her'] self concept" (Fowler, 1965, p. 114), and (2) as "...a consequence of [man's natural'] desire to grow and change" (Robinson, 1979, p. 9). As Morgan put it (1974, p. 54), motivation is an interesting and frustrating subject. It is interesting because "...it lies behind everything a person does." It is also frustrating because "we never see a motive. We only see what a person does, and sometimes we understand how it is connected with goal. But the motive that impels him [her'] is hidden within." Since "...motives are never directly seen, questions of how best to measure them have not been easily settled" (Morgan, 1974, p. 61). There are many theoretical agreements and disagreements over the concept of motivation. As Krech, Crutchfield, and Livson (1969, p. 483) indicated, psychologists "...are not the only ones who have wrestled with the problem of motivation. Biologists, philosophers, theologians, statesmen, and almost all thoughtful people have also wondered and worried about the inner wellsprings of [man's behavior']." For examples, the **psychoanalytical theorists** such as Freud (cited in Zunker, 1990) considered that the individual is "...motivated by internal conflicts and that the individual is attempting to direct inherited drives toward satisfaction and subsequent achievement in a socially accepted manner." The **behaviorists** have hypothesized that motivation is learned from the environment through reinforcement. **Humanists** such as Maslow, Rogers, White, and Adler have formulated that motivation is derived from a need for self-fulfillment, competency, and accomplishment (cited in Zunker, 1990). Many psychologists, anthropologists, and scholars linked human motivation with culture. Munn (1956, p. 101) for example, remarked that human motivation is "...limited to our more restricted cultural group." He (p. 82) added that human motivation "...is influenced by human mores - by customs, traditions, or [man'] made laws." Other psychologists such as Krech, Crutchfield and Livson (1969, p. 487) stressed the importance and the influence of cultural factors on human motivation. They (p. 487) asserted that a human being, as a social product, "...not only undergoes motivational changes in response to environmental changes but also, by the same token, displays quite different motives and values in different social situations." The concept of cultural relativism as evolved by anthropologists was supported by Krech, Crutchfield and Livson. They (1969, p. 487) argued that cultural relativism "...rejects any assumption of a universal 'human nature' and holds instead that the behavior of any individual can be understood only in relation to the dominant motives of his [/her'] particular culture." It is important to understand both culture and subculture. As Tallent and Spungin (1972, p. 42) argued "we must be aware not only of the whole culture...but also of smaller units of culture called subcultures." Examples of subcultures are men and women. Unfortunately, as Glaser indicated, "Previous studies of the brain drain have, in general, been based on aggregate emigration and immigration statistics, and motivations" and cultural factors and the degree of their influences on various group "...have not usually been investigated. (Glaser, 1978, p. xviii). Glaser (1978, p. xvii) remarked "no attempt had been made to explain the different effects of the same variables [motivations and culture'] upon men and women." Barry and Wolf (1965, p. 2) also pointed out that "some authors fail to recognize that the motives they describe are culturally developed and may well represent only the group supplying them." Therefore the theory of motivation must have "applicability." (Barry and Wolf, 1965, p. 3). Most psychologists today believe that personality and culture are two sides of a coin. In other words, "...what the person becomes depends largely on the social environment in which he [/she'] developed.", or "...a person without an environment can be compared with the idea of a fish without water" (Tallent and Spungin, 1972, p. 23). Although theory of personality (for examples: Sullivan, Sheldon, Rogers, Maslow, Jung, Fromm, Freud, Horney, Erikson, Adler) can not be discussed adequately here, it is interesting and relevant to consider. In regards to motivation and personality, Nuttin (1984, p. 73) explained that "In fact motivation, behavior, and personality are interrelated." And Munn (1956, p. 161) indicated that "...there are deep-lying motives which might be thought of a synthesizing, or perhaps as utilizing to their own ends, the surface characteristics of the individual." Holland (1973), also indicated that individuals are attracted to a given career by their particular personalities. The key concept behind of Holland's theory is that the individual chooses a career to "...satisfy one's preferred personal modal orientation. Modal personal orientation "...is a developmental process established through heredity and the individual's life history of reacting to environmental demands" (cited in Zunker, 1990, pp. 40). Holland proposed that personality types can be arranged in a coded system following his/her modal-personal-orientation themes R (realistic occupation), I (investigative), A (artistic), S (social), E (enterprising), and C (conventional) (cited in

Zunker, 1990). Holland believed that personality types can be arranged according to dominant combinations of characteristics. Based on Holland's personality types and work environment (Yost and Corbishley, 1990; Zunker, 1990), engineers are in the realistic category, and tend to be practical, materialistic, and aggressive. Ann Roe as a clinical psychologist also developed her theory and asserted that occupational choice is the result of personality (Yost and Corbishley, 1990; Zunker, 1990). Roe classified occupations into eight categories as (1) service; (2) business; (3) managerial; (4) general culture; (5) arts and entertainment; (6) technology; (7) the outdoors; and (8) science. Roe's technology occupations are utilized in the Career Occupational Preference System (COPS) inventory (Educational and Industrial Testing Service, 1988). Technology occupations involve responsibility for engineering and structural design in the manufacture, construction or transportation of products or utilities. (Educational and Industrial Testing Service, 1988). Holland's and Roe's theories might have their own weaknesses and strengths, however, they relate to accepted theories of career development and occupational preference. They provide examples of how personalities may relate to career choice, e.g., the personality differences between an engineer with a teacher or other occupations. The theories discuss that how an individual such as an engineer prefers to work in a completely different environment than a nurse or similar

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occupation. Grubel and Scott (1977) compared technical occupations and engineers. They stated that technical workers and engineers have not only different personal characteristics "which tend to make [Engineers'] comparatively more mobile, but they also sell their skills in separate markets" (Grubel and Scott, 1977, p. 22). Engineers are characterized by greater intellectual capabilities as compared with other workers. Higher intelligence is expressed in a need for creativity and achievement. Due to this intelligence, it is important that their needs and motivational factors are recognized by scholar who are engaged in the study of international migration. As Pooley and Whyte (1991, p. 12) suggested, the research on migration, therefore, "must be explicitly related to motivational factors such as economic factors, social setting, political factors, cultural factors, and educational factors. Although the importance and understanding of such factors is very obvious, "few studies have taken them explicitly into account" (Pooley and Whyte, 1991, p. 12).

Causes of Migration

The United Nations Institute for Training and Research (UNITAR) conducted a multi-national comparative study the migration and return of professionals from developing countries who studied in developed countries (cited in Glaser, 1978). The questionnaires were given to between 500 and 1,600 foreign students in three industrially developed countries and betw

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between 100 and 400 foreign professionals who returned to each of eight developing countries, including the country of Iran, after being educated in a developed country. Professionals were asked to respond to a list of 29 items and to provide information about migration. The 29 items were grouped in nine clusters. Each cluster combined items that affected respondents similarly. The nine clusters were grouped in nine categories as (1) professional conditions, (2) professional needs, (3) colleagues, (4) social setting, (5) alienation and discrimination, (6) politics, (7) citizenship rights, (8) influence of others, and (9) interests of children (Glaser, 1978). The following were some of the finding of the questionnaires among some participants including 148 Iranians:

1. Working conditions. Iranian , Egyptians, Lebanese, and Turks believed that they could accomplish more abroad than their homeland.
2. Status of professions. Iranian, Turks, and some others believed that pay and prestige were sufficiently better at their home country to return.
3. Social setting. Nationalities varied in this perception of where life was more challenging, where more could be accomplished. Iranian and Turks for example, picked their homeland because the development was still at such an early stage or was rapidly developing, that much could be created.

4. Interests of spouse and children. Iranian, Egyptians, and some others seemed pessimistic about their own future prospects at home. They considered emigrating in order to facilitate the careers of their children as well as of themselves.

The National Science Foundation (1973) conducted a study of nearly eight thousand migrant scientists and engineers who came to the United States between 1964 and 1969. The study addressed the characteristics and attitudes of scientists and engineers. Among the total participants, 54 Iranians, including engineers, physical scientists and social scientists were identified. It was estimated that 78% of the Iranians were students who completed their undergraduate studies in the United States and were much less likely to have had any professional work experience before coming to the United States, 10.9% percent were exchange visitor/student, 3.6% were industrial trainees, 3.6% were temporary visitors, and 3.6% others. It was reported that the students who were on temporary visas, changed their status to become permanent residents. Among many factors, to obtain a higher standard of living, insufficient research opportunities in Iran, and to improve opportunities for children, were found to be the major factors that influenced Iranian's decision to migrate to the United States.

As indicated earlier, the number of Iranian graduates to the United States significantly increased in the last several years. Lack of educational facilities and other factors were the reasons that seemed to push Iranians to emigrate from Iran. In 1966, a questionnaire concerning the demands and priorities of Iranian university students was distributed to students at Tehran and National University (the two major universities). From the responses, it was implied that the students experienced that the two problems demanding greatest attention were inequality, injustice and the educational system (Bill, 1969).

This study previously reviewed related research in international migration. It was found that migration is an interesting phenomenon in itself but is also an important indicator of differences in the social and economic structures of different areas and regions. Extensive research has been done regarding foreign students in the United States, primarily about their experiences and adjustments, and some has dealt with whether respondents intended to migrate or return (Walton, 1967; Valipour, 1962; U.S. Advisory Commission on International Educational and Cultural Affairs, 1966; Singh, 1963; Scully, 1956; Jacqz, 1967; Dorai, 1967; Dev Sharma, 1970; and Borhanmanesh, 1965). There have also been extensive surveys of foreign students that have documented the students cross-nationally. Cross-national comparison of migration conveys a significant variation from one country to another, from engineering/technical occupations to non-technical/engineering occupations, from high-level trained migrants, to high-level untrained migrants. A thorough analysis of such variations has yet not been done. The tendency to migrate varies by the type of occupation, level of degree, level of quality of schooling, the standard variables of age, sex, and national origin. As an example, it was asserted that engineers more apt to migrate than scientists. Among many reasons, one was said to be that the "...respective occupations attract people with different sets of values; those choosing engineering rather than science are more likely to find migration necessary if they are to find a setting congenial to their value orientation, which is more material than intellectual" (Myers, 1972, p. 40).

There have been few surveys which utilized comprehensive, objective questionnaires that required information about international migration decisions. Most surveys have been focused on occupations other than engineering. They were limited in scope, and concentrated on countries other than Iran. Niland (1970, p. 100), argued that "...brain drain has been badly defined, loosely measured and generally misinterpreted in much of the literature. Its internal character so varies from one national group to another that each developing country virtually should be treated as a special case." Therefore, the absence of such specific study about the migration of Iranian high-level migrant engineers made this a special case study for investigation and research. The current study utilized a questionnaire which while based upon a previous questionnaire, was designed specifically for the Iranian Engineers in the United States who are residing in

Southern California.

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CHAPTER III

METHODOLOGY OF THE STUDY

Migration is very complex issue. The magnitude of the research topic is very broad and many scholars and scientists from different disciplines conducted research at both theoretical and the empirical levels. Consequently, "...it is not at all surprising to be confronted with a vast collection of contradictory evidence and results." (Jong and Gardner, 1981, p. 304). There is almost an absence of a general theory of migration with universal validity and applicability. According to Goldscheider (cited in Lewis, 1982, p. 4), "without adequate theories it is not clear what guidelines would be involved to determine the types of migration." Therefore, to find a general theory is a dream of those who are working on migration research. As Todaro indicated (cited in Jong, and Gardner, 1981, p. 303), many models have been demonstrated to be unrealistic in "Third World" situations. "Abstract theorizing with no basis in reality is not helpful to the policy makers of the ['Third World'']. What matters to the ['Third World''] decision makers, given the urgency of development, are the pertinent and the practicable aspects of research." (Jong, and Gardner, 1981, p. 304). Therefore it is essential to identify the needs of planners and to understand the role of researchers in helping to meet these needs. As Haenszel suggested (cited in Lewis, 1982, p. 4), the emphasis of researchers in migration research "should be placed on the design of studies to collect data not available from census and other administrative sources." With this in mind, one useful approach applicable to the "Third World" situations, specifically the country of Iran, could be elicited from original research using in-depth interview techniques or by conducting a survey focusing on motivational factors for migration. For this particular research, original research and the data collection technique (mail questionnaire) focusing on motivational factors was more appropriate to use than other techniques. In regards to the advantage of mail questionnaires, Kanuk and Berenson (1975, p. 440) indicated that "They are relatively low in cost, geographically flexible, and can reach a widely dispersed sample simultaneously without the attendant problems of interviewer access or the possible distortions of time lag." According to Boyd, Case, Frankel, Hochstim, Jahoda, and Schyberger (cited in Kanuk, and Berenson, 1975, p. 440) mail questionnaires "...are free from the costs and time consumption of interviewer bias or variability."

Research Design and Sampling

Based on the review of literature and previous questionnaires (Niland, 1970, Farjad, 1981, and Rao, 1979) used for similar purposes, an anonymous questionnaire was designed to test the research hypotheses. This was accomplished by administering a written questionnaire (see Appendix E). To determine the clarity, conciseness, content

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validity and reliability (see Appendix B for definitions) of questionnaire, it has been reviewed and approved by the researcher's chairperson, advisor, all research committee members, and specifically, by the University Committee on Research Involving Human Subjects (UCRIHS) at Michigan State University, (see Appendix C for the approved letter by Michigan State University, Office of Vice President For Research and Dean of the Graduate School). Upon approval, the questionnaire was pre-tested among a number of Iranian engineers in Southern California. The samples had been drawn from various sources: The Network of Iranian Professionals (Engineers and Architects) of Orange County (NIPOC, California), Society of Iranian engineers and Architects (Los Angeles County), California Zoroastrian's Directory of Engineers, The Iranian Blue Book (Southern California, Consultant Engineers and Architects), The Iranian Directory Yellow Pages (Southern California, Consultant Engineers and Architects), and The Iranian Directory Yellow Pages (Orange County, Engineers and Architects). The total number of Iranian engineers was estimated to be 649. To determine the size of the sample for statistical significance ($p = .05$ for this study) and correlation analysis, the "general rule, larger sample" (Borg and Gall, 1983, p. 257) were used. As Borg and Gall (p. 257) indicated, in "...correlational research it is generally desirable to have a minimum of 30 cases." Three-hundred engineers were drawn by choosing a method of random sampling (see Table of random numbers in Borg and Gall, 1983, p. 905). A random sampling was chosen because "...each [engineer'] in the defined population [could have'] an equal chance of being included." (Borg and Gall, 1983, p. 244). The study included all Iranians who came to the United States before or after the Iranian Revolution of 1978-79, and held at least a bachelor's in engineering-engineering technology degree from an institution of higher education, either from Iran or from the United States. Iranians with degrees from other foreign countries were also included. Those without a degree were not counted. Given the time span and geographic limitations of the study, it was assumed that this was nearly a 100% sample of the total possible target population in the Southern California area, included in this study (see Limitations).

The Research Instrument

Because of the long history of political problems in Iran, the revolution of 1978-79 and changes in power structure, and the sensitivity of the Iranian engineers to these problems, the research instrument was an anonymous questionnaire. As Kanuk, and Berenson (1975, p. 446) explained, anonymity, "... has generally been assumed ....encourages a high level of voluntary response; where response is mandatory, assurance of anonymity minimize invalid responses." The anonymous questionnaire was designed in two sections: the first section was concerned with the personal data such as age, marital status, number of children and their age, spouse's country of birth, citizenship, and the highest degree earned, educational background, and economic factors. The second part focused on motivational factors used to gather the required information. The motivational factors were grouped into seven categories: working conditions; professional needs; social setting; politics; choice to study in the United States; barriers to return to Iran; and motives to return to Iran. The questionnaire did not include any engineer's identification. The questionnaire was designed in nine pages including the cover letter with simple instructions. It utilized a multiple question format with closed-form, open-form (see Appendix E) response options, and comments were invited from anyone who wanted to expand upon his/her response. The questionnaire was short so as to increase the voluntary response rate. It was calculated and assumed that all the questions could be answered in less than half an hour.

Scoring

The 35 items questionnaire (motivational factors and barriers to return to Iran) could be answered on a five point rating scale. "Five-point rating scales, ...are often used in educational research and can be employed effectively." (Borg and Gall, 1983, p. 473). In five point rating scale, number "1" was represented as the "least influential factor" and number "5" as the "most influential factor." The engineers in the sample were assigned to rate motivational factors and barriers to return with regard to their importance and influence on their decision making to remain in the United States or return to Iran.

Data Collection

Data for this study was collected by mail to preserve the anonymity of the subjects. A questionnaire (see Appendix E) was sent to 300 engineers who were in the sample drawn, including a cover letter explaining the study, that the study and questionnaire had been approved by researcher's chairperson, advisor and all committee members and UCRIHS (see approval letter in Appendix C) at Michigan State University. Engineers were informed about their anonymity, their voluntary agreement to participate by completing and returning questionnaire, and about keeping their responses and obtained information confidential. A self-addressed stamped return envelop and a self-addressed card which the engineers could mail back to the researcher in case they wanted to receive a summary of the results of the study was also included in the packet. About 30 questionnaires were returned undelivered due to the change of address, and 85 questionnaires (33%) were completed and returned. As Scott (cited in Kanuk and Berenson, 1975, p. 441) called it, "...the use of follow-up [is'] the most potent technique yet discovered for increasing the response rate." Therefore, 300 follow-up letters along with second questionnaires were sent to those engineers who did not respond, either because of the mail difficulty, or other factors. Of the 300 follow-up questionnaires, 38 questionnaire (13%) were returned. Finally, out of 600 questionnaires mailed to engineers, 123 questionnaires (41%) were completed and returned. Given the situation of Iranian engineers in Southern California in terms of the absence of organized engineering associations like American Associations (for example mechanical, chemical, electrical, industrial engineering associations), unavailability of complete addresses and physical locations, 123 questionnaires (41%) was a reasonably desirable rate of return and could be used for the completion of the research.

Research Statistical Tools and Data Analyses

This research based on its methodology and procedure, had been involved and dependent on using various statistical tools for testing research hypotheses. To make this research and its data analyses more understandable, Appendix B which describes some of the statistical concepts and tools that have been used in this research, is provided.

The data obtained from the questionnaire were translated and stored and analyzed by utilizing the Statistical Package for the Social Sciences (SPSS) program.

Inferential statistics (see Appendix B) were used to "infer characteristics of a population from the characteristics of a sample." (Orpet, 1992, p. 2).

The Pearson Product-Moment Correlation Coefficient was explained by Orpet (1992, p. 9) to be appropriate for describing the relationship between two quantitative variables (interval or ratio) and when there are more than 30 samples (Orpet, p. 15). Therefore a Pearson Product-Moment Correlation Coefficient was used to determine the degree of correlation, that exists between the variables: Age (hypothesis # 1), Engineers's Children's age (hypothesis # 2), Length of time in the United States (Hypothesis # 3), Number of government's contact (hypothesis # 4), and level of income (hypothesis # 5).

The t-test (see Appendix B) has been used to compare the means of two groups, and to determine the significance differences, if any, between the Iranian engineers with American citizenship and those with Iranian citizenship (hypothesis #6), male and female (hypothesis 7), those married to Iranians and those married to non-Iranians (hypothesis # 8), married and single (hypothesis # 9), spouse's high school and college education (hypothesis # 10), those who want to settle in the United States, and those who want to settle in Iran (hypothesis # 11).

The rejection or acceptance of a null hypothesis (see Appendix B) was based upon some level of significance as a criterion. In this study type-one error (see Appendix B) and the 5 percent (.05) level of significance was used as a standard for rejection. Rejecting a null hypothesis at the .05 level indicates that "an observed value falls so far away from the population mean that it would occur by chance less than 5 times out of 100, then the conclusion would be that the tw

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two are not equal." (Smith, 1975, p. 48). The determination of degree of freedom for correlation in this study was based upon the size of the sample. As Orpet (1992, p. 15) defined, "When correlation is computed, two degrees of freedom are lost. In other word df = n - 2.

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CHAPTER IV

RESEARCH FINDINGS AND DATA ANALYSIS

This chapter is designed in four parts: (1) overview of the statistical procedure, (2) research findings and discussion, (3) other findings, and (4) summaries of the findings.

1. Overview of the Statistical Procedure

A total of 300 questionnaires were mailed to engineers based on a random sampling technique. About 30 questionnaires were returned due to a change of address, and 85 questionnaires (33%) were completed and returned. To increase the rate of response, 300 follow-up letters, along with second questionnaires were sent to engineers. Of the 300 follow-up questionnaires, 38 questionnaires (13%) were returned. Finally, out of 600 questionnaires mailed to engineers, 123 questionnaires (41%) were completed. The obtained data were translated, stored, and analyzed utilizing the Statistical Package for the Social Sciences (SPSS) program.

In this study, **t-test** and **Pearson Product-Moment Correlation** were employed as two useful techniques for testing the research hypotheses. The **Pearson Product-Moment Correlation** was employed to test the hypotheses number # 1, # 2, # 3, # 4, and # 5. The **t-test** was employed to test hypotheses number # 6, # 7, # 8, # 9, # 10, and # 11. The independent variables for this study were 35 influential (motivational) factors. The degree of importance of factors on engineers' migration decision or decision to return to their country was determined by calculating the arithmetic mean of the 35 influential factors. Type-one error and the .05 level of significance were used to reject the null hypotheses.

2. Research Findings and Discussion

Age Distribution

The characteristics and the distribution of the Iranian engineers' age and its correlation with the migration decision was an important factor in this study. Therefore the engineers were asked to respond to the age question. All engineers (N = 123) completed the age question. As shown in Table 40, the youngest Iranian engineer was found to be 25 years of age, and the oldest was 59 years of age. The calculated distribution mean was found to be 36.50. As the frequency distribution of engineers' age in Table 40 indicates, the age difference between the youngest (25) and the oldest (59) engineer is very high.

Gender Distribution

Out of a total of 123, the number of male engineers was 110 (89.4 %) and the number of female engineers was 13 (10.6 %). The finding of the high percentage of Iranian males in the engineering field was not surprising. According to the Iranian higher education statistics, the engineering field has

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Table 40

The Age Distribution of the Iranian Engineers

Age	Frequency
25	1
26	1
27	5
28	4
29	1
30	3
31	5
32	5
33	11
34	12
35	11
36	7
37	11
38	6
39	10
40	4
41	4
42	5
43	4
44	4
45	1
46	2
47	2
48	1
50	1
55	1
59	1
	TOTAL = 123

always been dominated by the males. Although the number of Iranian females pursuing engineering degrees in the United States has increased in the last several years, they are still under represented.

Marital Status, Number of Children, and the Children's Age

Of those who reported their marital status, 66 (53.7 %) were married and 57 (46.3 %) were single. Only 20 engineers were married before coming to the United States compared to 52 who said they were married after coming to the United States. It should be noted that some of those who reported they were married before or after coming to the United States, described their marital status as single parents.

Only 55 engineers indicated having children. Twenty-two reported having one child, twenty-nine had two children, three had three children, and one had four children.

Out of a total of 55 engineers, 43 reported having children from one to 12 years of age, ten people indicated having children 13 to 18 years of age, and two people reported having children 19 years of age or older.

Spouse's Country of Birth, Citizenship, and Highest Degree Earned

Of those who responded, 59 male engineers reported the country of Iran and six engineers reported the United States as their spouse's country of birth.

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In response to the <u>spouse's country of citizenship</u>, 48 male engineers indicated the country of Iran and 14 indicated the United States as their spouses' country of citizenship. Among the 13 female engineers, five indicated that they were married. Out of a total of five married female engineers, only one reported the United States as her spouse's country of citizenship, compared to the other four who said that their spouses carry the Iranian citizenship.

There were a total of 64 male and four female engineers who reported their <u>spouses's highest degree earned</u>. Sixteen males stated the high school diploma as their spouses's highest degree earned, 32 reported a bachelor's degree, 14 reported a master's degree, and two indicated a doctoral degree as their spouses's highest degree earned. The four female engineers reported their spouses's highest degree earned as: one doctoral degree, two master's degree, and one bachelor's degree.

<u>Engineers and Their Type of Visa Entry</u>

All 123 Iranian engineers replied regarding their visa status and when they entered to the United States. One-hundred and five (85.4%) engineers indicated that they obtained F-1 visas, four (3.2 %) indicated that their visas were J type, six (4.9%) said that they were granted immigrant visas, and eight (6.5%) engineers stated that they were issued other types of visas. According to the above statistics, the majority (85%) of the Iranian engineers came to the United States on an F-1 visas, and a much smaller group entered the United States on a J visas (exchange visitors) or other type of visas.

A brief explanation of the different types of visas may clarify their implication for the immigrating engineers.
F-1 visas can only be obtained by international students. If the F-1 visas holder is married, the second party (husband or wife) is eligible to acquire an F-2 visas. The F-2 visas allows the second non-student party to stay legally in the country as long as the other party maintains his/her status as student. The F-2 visa holder can also convert his/her visa status to an F-1 visa by being admitted to a college or university. In this case, if both husband and wife wish to carry F-1 visas, they are entitled to stay in that status.

There are some students who enter the United States on a J visa. The distinction between F-1 and J visas is that the F visa holder can extend his/her stay by converting to an immigrant visa, but the J visa holder does not have that privilege and can hardly acquire such a waiver of the exit requirement. The re-entry visas is granted if the J visa holder departs and remains out of the country for at least two years. There are other types of entry visas such as H-1, H-2, and H-3. The H-1 visas applies to alien(s) of distinguished merit and ability in terms of level of education (Bachelor's degree or higher) and occupation to perform services of an exceptional nature. The company files a petition with the local district offices of the U.S. Immigration and

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Naturalization Services along with the alien's documentation. If the petition is approved, the alien is then able to apply for the H-1 visas at a designated American consulate abroad. The H-1 visa is valid for one full year and can be extended annually as long as the employee's services are necessary by the company. The H-2 visas may be given to alien(s) who petition for temporary services or labor. The H-3 visa will be issued to an alien who seeks to come to the United States to be trained. A company may petition for such an alien who is interested in training for a limited time, generally not more than two years. The kind of training, the proportion of time that will be devoted to productive employment, the number of hours in the classroom, in on-the-job training, should be described by the company in the petition.

Engineers and Their Current Visas

As was explained in the previous chapters, many students took advantage of the Immigration Act of 1965 and applied for immigrant visas. The Act permitted those aliens who were temporary U.S. residents, and professionals, for example engineers and scientists, to apply for a permanent immigration visas based on a new visas preference system (third preference). Many Iranian engineers went through this immigration law and adjusted their temporary visas to permanent residency.

As was also mentioned earlier, 105 (85.4%) of the Iranian engineers entered the Untied States on a F-1 visas. Of these, 97 (78.9%) engineers indicated that they changed their F-1 visas to an immigrant visas. Of those who remained, two (1.6%) reported that they are currently holding an F-1 visas, nine (7.3%) stated that they carry J visas, and 15 (12.2%) said that they hold other types of visas. It should be noted that some of those who obtained a green card became citizens of the United States. Those with U.S. citizenship will be discussed in the following section.

Engineers' Country of Birth and Country of Citizenship

All 123 Iranian engineers indicated that they were born in Iran.

One-hundred and twenty-one responded to the question of citizenship, 111 males and 10 females. Of those male engineers, eighty-eight had an Iranian citizenship, 21 had an American citizenship, one had a Canadian citizenship, and one had dual citizenship (United Kingdom and Iran). Out of 10 female engineers, seven had an Iranian citizenship and three had an American citizenship.

Engineers and Their Length of Stay in the United States

As shown in Table 41, the engineers' length of stay in the United States varied. The range of months' stay was from 13 (one-year and one month) to 300 (25 years); the mean stay was 162.41 (13 years and four months).

Table 41

Engineers' Length of Stay in the United States

Month	Frequency	Month	Frequency
13	1	186	1
20	1	190	1
36	1	192	7
60	1	200	1
69	1	204	3
72	2	205	1
81	1	206	1
84	2	210	1
86	2	211	1
89	1	212	3
90	1	216	3
96	1	225	1
96	2	227	1
98	1	230	1
100	1	240	4
101	1	288	1
118	2	300	1
120	9		
131	1		
132	2		
144	1		
150	4		
154	1		
156	4		
158	1		
159	1		
160	3		
162	2		
163	1		
165	3		
167	1		
168	4		
170	3		
172	2		
174	2		
175	1		
179	1		
180	15		
182	2		
185	1		

Total = 123

The Distribution of the Engineers' Highest Degree Earned and the Country While Earning Degree

Out of a total of 123 reporting, 36 (29.3%) engineers indicated that they have a bachelor's degree, 66 (53.7%) indicated they have a master's degree, and 21 (17%) stated they have a doctoral degree.

One-hundred and eight engineers reported the country they lived in while earning their bachelor's degree. Thirty-one received their bachelor's degree from Iranian universities, 72 indicated that they obtained their degree from American universities, three showed earning their degree from the United Kingdom, and two engineers obtained their bachelor's degree from the countries of Turkey and Germany.

Eighty-five engineers indicated the country they lived in while earning a master's degree. Four engineers received their master's degree from Iranian universities, 77 reported that they obtained their master's from American universities, two people acquired their master's from British/United Kingdom universities, one from a Canadian university and one from Japanese university.

Out of a total of 21 engineers with a doctoral degree, 19 engineers received their degrees from American universities, one received a doctorate from a British university, and one from a Japanese university.

The Number of Years Taken to Receive a Bachelor's, Master's, or Doctoral Degree

One-hundred and two of the engineers reported the length of time it took them to receive a bachelor's degree. As shown in Table 42, the minimum and maximum number of years to receive a bachelor's degree was three and 14 years. The calculated mean was 4.85 years.

Although the traditional length of time to receive a bachelor's degree is four years, more than 15 percent of the Iranians took more than six years to finish. One reason for taking a long time for those who finished their bachelor's degree in more than the normal expected time could be financial difficulties. Many Iranian students abroad were supported financially by the Iranian government before the revolution. Those students who received financial support were obligated to pursue a field of study based on the country's needs, but there was no control in this regard before the Iranian revolution of 1978-79. After the 1978-79 revolution, the new government revised the policy of financial support, and acknowledged its new rules and regulations. Under the new government's policy, the specific fields of study were identified and recognized. Those students who studied and needed financial support were forced to comply with the government's new policy. The students were obligated to report their transcripts every quarter or semester. Those who did not comply with the government's policy were not eligible to receive financial support.

Table 42

Number of Years Taken to Receive a Bachelor's Degree

Number of Years	Frequency		Percent
3.0	4		3.3
3.5	2		1.6
4.0	42		34.1
4.5	6		4.9
5.0	29		23.6
5.5	2		1.6
6.0	12		9.8
7.0	1		.8
8.0	1		.8
10.0	1		.8
14.0	2		1.6
Missing	21		17.1
TOTAL	123		100.0
Valid Cases	102	Missing Cases	21

Many students perceived this policy as too limiting for them in pursuing their educational goals and interests. Therefore, those who did not like the policy or did not want to comply with the policy, gave up the government's financial assistance, and tried to finance themselves.

Seventy-one engineers reported the length of time it took to receive a master's degree. As shown in Table 43, a majority (49) of engineers received their master's degree in a traditional amount of time, two years of study. The minimum and the maximum number of years to receive a master's degree was one and nine years respectively and the mean number of years was 2.15.

Twenty engineers indicated the length of time of their study to obtain a doctoral degree. As indicated in Table 44, the minimum and maximum length of time was two and 7.5 years respectively and the mean number of years was 4.60.

<u>Engineers' Major Field of Study (Bachelor's)</u>

One-hundred and eighteen engineers specified their major field of study. As shown in Table 45, the major field of study for the majority (33) of the engineers was **Civil Engineering**. After civil, **Electrical Engineering** (22) and **Mechanical Engineering** (19) were the major fields of study.

Table 43

Number of Years Taken to Receive a Master's Degree

Number of Years	Frequency		Percent
1.0	8		6.5
1.4	1		.8
1.5	3		2.4
2.0	45		36.6
2.5	2		1.6
3.0	9		7.3
4.0	2		1.6
9.0	1		.8
Missing	52		42.3
TOTAL	123		100.0
Valid Cases	71	Missing Cases	52

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Table 44

Number of Years Taken to Receive a Doctoral Degree

Number of Years	Frequency		Percent
2.0	1		.8
3.0	2		1.6
3.5	2		1.6
4.0	5		4.1
4.5	1		.8
5.0	4		3.3
6.0	3		2.4
7.0	1		.8
7.5	1		.8
Missing	103		83.7
TOTAL	123		100.0
Valid Cases	20	Missing Cases	103

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Table 45

Engineers' Major Field of Study (Bachelor's)

Major Field of Study	Frequency	Percent
Aeronautical	1	.8
Agricultural	9	7.3
Chemical	6	4.9
Civil	33	26.8
Computer	3	2.4
Electrical	22	17.9
Electronics	11	8.9
Industrial	5	4.1
Manufacturing	1	.8
Mechanical	19	15.4
Mechanics	1	.8
Engineering Science	1	.8
Engineering General	2	1.6
Engineering Other/ Engineering Technology	4	3.3
Missing	5	4.1
Total	123	100.0

Valid Cases 118 Missing Cases 5

Engineers' Major Field of Study (Master's)

As indicated in Table 46, out of a total of 88, 23 engineers with a master's degree reported their major as **Civil Engineering**, 14 indicated their major as **Electrical Engineering**, and an other 14 engineers noted their major as **Mechanical Engineering**.

The above frequency distribution illustrates a consistency between the engineers' bachelor's and masters's major fields of study. Many engineers continued their undergraduate major field of study (civil, electrical, and mechanical) for their master's degree. **Industrial Engineering** and **Material Science** were also majors of interest among doctoral candidates.

Engineers Major Field of Study (Doctorate)

Eighteen engineers with a doctoral degree reported their major fields of study (see Table 47). **Civil Engineering** (four people) and **Mechanical Engineering** (three people) were the predominant major fields of study.

Engineers and Employment

When engineers were asked to respond to the question of whether they were employed or not, only four (3.3%) engineers said that they do not hold a job, compared to 119 (96.7%) engineers who indicated that they are currently employed.

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Table 46

Engineers' Major Field of Study (Master's)

Major Field of Study		Frequency	Percent
Agricultural		3	2.4
Architectural		6	4.9
Chemical		4	3.3
Civil		23	18.7
Construction		1	.8
Computer		2	1.6
Electrical		14	11.4
Electronics		3	2.4
Environmental		3	2.4
Industrial		4	3.3
Manufacturing		2	1.6
Mechanical		14	11.4
Material Science		1	.8
Engineering Science		2	1.6
Engineering General		1	.8
Engineering Other		5	4.1
Missing		35	28.5
	Total	123	100.0
Valid Cases 88	Missing Cases	35	

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Table 47

Engineers' Major Field of Study (Doctorate)

Major Field of Study	Frequency	Percent
Agricultural	1	.8
Chemical	1	.8
Civil	4	3.3
Computer	1	.8
Electrical	1	.8
Environmental	1	.8
Geophysical	1	.8
Industrial	2	1.6
Mechanical	3	2.4
Mechanics	1	.8
Material Science	2	1.6
Missing	105	85.4
Total	123	100.0

Valid Cases 18 Missing Cases 105

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As shown in Table 48, out of a total of 119 employed engineers, 97 (78.9) stated that they have a regular engineering position, 14 engineers said that their job is not connected with their studies or engineering profession, and eight people mentioned that their current job is connected with research or teaching at a school or institution of higher education.

Engineers and Their Work Setting

As illustrated in Table 49, 93 engineers reported business/industry as their main work setting. Sixteen stated that they work for the government, and ten people said they are connected with research institutions.

Engineers and Their Work Hours

As indicated in Table 50, 75 engineers reported that they work 40 to 49 hours, 19 noted their working hours as 50 and more, 16 said they work 30 to 39 hours, and 10 people mentioned that they work less than 30 hours. Those engineers whose work is not related to research or teaching and who indicated their work hours was less than 30 hours, might currently be students working toward their advanced degree.

Engineers and Their Salaries

One-hundred and twenty engineers responded to the monthly salary question.

Table 48

Engineers and Employment

Type of Work	Frequency	Percent
Engineering	97	78.9
Non-Engineering	141	1.4
Research/Institution	8	6.5
Missing	4	3.3
Total	123	100.0

Valid Cases	119	Missing Cases	4

Table 49

Engineers and Their Work Setting

Work Setting		Frequency	Percent
Business/Industry		93	75.6
Education/Institution		10	8.1
Government		16	13.0
Missing		4	3.3
	Total	123	100.0
Valid Cases 119	Missing Cases	4	

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Table 50

Engineers and Their Work Hours

Weekly Work Hours		Frequency	Percent
1-29 Hours		10	8.1
30-39 Hours		16	13.0
40-49 Hours		75	61.0
50 Hours or More		19	15.4
Missing		3	2.4
	Total	123	100.0
Valid Cases 120	Missing Cases	3	

As shown in Table 51, only 16 people showed their monthly salary as less than $2,000. Twenty-seven engineers said they make $2,000 to $3,000, twenty-three engineers indicated that their monthly salary is $3,000 to $4,000, twenty-one engineers stated that they make $4,000 to $5,000, and thirty-three engineers mentioned earning $5,000 or more.

Engineers and Their Expected Salary to Return to Iran

Out of a total of 111 cases, 37 people said they would return to Iran if they were given a salary around $2,000 to $3,000 a month. Twenty-three engineers asked for a range of salary between $3,000 to $4,000, 15 indicated their preferred salary range as $4,000 to $5,000, and the rest (36) expected a salary of $5,000 or more to return to Iran (see Table 52).

Although the engineers' salary expectation for return might look unrealistic with the current Iranian economic situation, it should be recognized by the policy makers as an important factor.

Engineers and Their Job Locations

As was expected, a majority of engineers (73) indicated that their jobs are located in the County of Los Angeles, 45 engineers stated that they work in the County of Orange, and one reported a County other than Orange and Los Angeles County (see Table 53).

Table 51

Engineers and Their Salaries

Monthly Salary	Frequency	Percent
$5,00 -1,000	6	4.9
$1,000-1,500	4	3.3
$1,500-2,000	6	4.9
$2,000-2,500	8	6.5
$2,500-3,000	19	15.4
$3,000-4,000	23	18.7
$4,000-5,000	21	17.1
$5,000 & MORE	33	26.8
Missing	3	2.4
Total	123	100.0

Valid Cases 120 Missing Cases 3

Table 52

Engineers and Their Expected Salary To Return to Iran

Monthly Salary	Frequency	Percent
$2,000-3,000	37	30.1
$3,000-4,000	23	18.7
$4,000-5,000	15	12.2
$5,000 & MORE	36	29.3
Missing	12	9.8
Total	123	100.0

Valid Cases 111 Missing Cases 12

Table 53

Engineers and Their Job Locations

County	Frequency	Percent
Los Angeles	73	59.3
Orange County	45	36.6
Other	1	.8
Missing	4	3.3
Total	123	100.0

Valid Cases 119 Missing Cases 4

Universities Where Engineers Received Their Bachelor's Degree

As shown in Table 54, the colleges and universities where the Iranians received their bachelor's degrees are very diverse. It was found that more than 30 percent of the engineers graduated from institutions of higher education in California. More than 23 percent of the Iranian engineers obtained their bachelor's degree from Iranian colleges and universities. Because of the excellent research facilities and the flexibility of the American educational system in terms of the number of the colleges and universities, the number of programs, research, and teaching assistant positions, many Iranian graduates, especially engineers, choose the United States to pursue an advanced academic program.

The number of engineers who graduated from colleges and universities located in the eastern part of the United States was interesting. More than 16 percent of the engineers with a bachelor's degree were found to be from schools in that part of the country. The reasons that they are currently residing in the State of California are varied. Two common reasons might be the relatively better climate and better job opportunities. Although at the present time job opportunities in the State of California are limited due to an economy in recession, the state was a pioneer in creating technical jobs for professionals, specifically in the areas of aerospace (electrical, mechanical, and civil engineering).

Table 54

Name of the Major Universities Where Engineers Received Their Bachelor's Degree

Institution	Frequency	Percent
Abadan University (Iran)	1	.8
Aryamehr (Science & Technology, Iran)*	7	5.7
Bradley University	1	.8
Bristol University (United Kingdom)	1	.8
Buffalo, State University of New York	1	.8
California State University, Fullerton	4	3.3
California State University, Los Angeles	3	2.4
California State University, Long Beach	14	11.4
California State University, Northridge	1	.8
California Polytechnic U, SanLuisObispo	1	.8
California Polytechnic University, Pomona	3	2.4
Durham University (England)	1	.8
Eastern Washington University	1	.8
Eastern Michigan University	1	.8
Florida State University	1	.8
Frankfort University (Germany)	1	.8
Georgia Tech	1	.8
Karaj University (Iran)	1	.8

Table 54 (cont'd)

Institution	Frequency	Percent
Louisiana State University	1	.8
Literature College (Iran)	1	.8
Michigan State University	3	2.4
Middle-East Polytech., U (United-King.)	1	.8
National University (Tehran, Iran)	2	1.6
Northrop University	1	.8
Nottinghham University (England)	1	.8
Oklahoma State University	1	.8
Pars College (Iran)	1	.8
Pennsylvania State University	2	1.6
Polytechnic University (Tehran, Iran)	2	1.6
Purdue University	1	.8
Rolier Williams College	1	.8
San Francisco State University	1	.8
Seattle University	1	.8
Shiraz University (Shiraz, Iran)	2	1.6
State University Of New York	1	.8
Tehran University (Iran)	12	9.8
University of California, Los Angeles	3	2.4
University of California, Santa Barbara	2	1.6
University of Southern California	8	6.5

Table 54 (cont'd)

Institution	Frequency	Percent
University of Texas	3	2.4
University of Utah	1	.8
University of Wisconsin	4	3.3
University of Illinois	1	.8
University of Michigan	1	.8
United States International University	1	.8
Washington State University	1	.8
Western Michigan University	3	2.4
Missing	16	13.0
TOTAL	123	100.0

Valid Cases 107 Missing Cases 16

* This university was named "Sharif University" after the Iranian Revolution of 1978-79.

Many Iranians picked the same university for their master's degree. The universities which the Iranian engineers received their doctorate degrees were identified and shown in Table 55. As is evident in the table, the universities in California such as Berkeley, Davis, Irvine, Santa Barbara, Stanford, and the University of Southern California were the major institutions where the majority of the Iranian engineers obtained their doctorates.

Engineers and Iranian Government Contacts

As shown in Table 56, all the engineers responded to the question of the government contacts. Although some Iranian engineers (18) acknowledged that they were contacted by the government, they can be considered as a very small number compared to 105 other engineers who denied any government contacts. It should be noted that some of the engineers have been living in the United States for many years. They came to the United States several years before the Iranian Revolution of 1978-79. In this regard, those who were finished with school before the Iranian Revolution and stated that they were contacted by the government, did not mention whether they were contacted by the old government (Shah) or the new government, the Islamic Republic of Iran.

Table 55

Name of the Major Universities Where Engineers Received Their Master's or Doctoral Degree

Institutions of Higher Education	PhD*
California State University, Fullerton	
California State University, Los Angeles	
California State University, Long Beach	
California Polytechnic, Pomona	
City University of New York	
Columbia University	
Eastern Washington University	
Easter Michigan University	
Kyoto-University (Japan)	1
Louisiana State University	1
McGill University (Canada)	
Michigan State University	1
Northwestern University	1
Ohio State University	1
Oklahoma State University	
Pennsylvania State University	
Purdue University	

Table 55 (cont'd)

Institutions of Higher Education	PhD*
Santa Clara University (CA)	
State University of New York	
Stanford University	1
State University of New York	
Tehran University	
University of California, Berkeley	2
University of California, Davis	1
University of South Florida	
University of California, Irvine	
University of California, Santa Barbara	1
University of Colorado	
University of Missouri	
University of Southern California	3
University of Pennsylvania	1
University of Illinois	
University of Michigan	
University of Texas	
University of Utah	
University of Washington	
University of Wisconsin	1
University of Wales (Britain)	1

Table 55 (cont'd)

Institutions of Higher Education	PhD*
United States International University	1
University of Texas	
Washington University	
Washington State University	
Western Michigan University	
	Total = 17

* The major universities where the Iranian engineers received their doctorates are identified.

Table 56

Engineers and Iranian Government Contacts

Number of Contacts		Frequency	Percent
Once		12	9.8
Twice		1	.8
Three Times		5	4.1
Zero/None		105	85.4
	Total	123	100.0

Valid Cases 123 Missing Cases 0

It is important who contacted the Iranian engineers. It should be emphasized here that whenever government officials contact their own high-level professionals working abroad, their policy should be consistent with their "supply and demand" and the country's national development policy. This means all professionals, especially those with technical expertise who are in demand should be equally contacted and be consulted.

Testing Hypotheses

In order to test each hypothesis, the degree of importance of the 35 factors on Iranian migration decision or their willingness to return was calculated in the following ways:

1. Calculating the degree of importance of arithmetic mean of the 35 factors for each hypothesis.
2. Dividing the 35 factors into seven groups of factors and then calculating the degree of importance of the seven groups on Iranian engineers' migration decision or their willingness to return to Iran. The seven groups of factors in the questionnaire were: working conditions; professional needs; social setting; politics; choice to study in the United States; barriers to return to Iran; and motives to return to Iran.
3. Calculating the degree of importance of each individual factor (35 individual factors) on the engineers' migration decision or their willingness to return.

In the following the above method of calculation was employed to test each hypothesis.

Hypothesis 1 H_0: There is no significant correlation between the engineers' age and degree of importance of the 35 factors (see Appendix E) on the Iranian engineer's migration decision.

Findings

This Hypothesis was not rejected. The level of significance was calculated at the .05.

Discussion

The correlation between the engineers' age and degree of importance of the 35 factors was tested and it was found that no correlation was statistically significant ($r = -.0624$, $P = .246 > .05$).

The correlation between the engineers' age and each groups of factors was tested separately. As shown in Table 57, positive significant correlations were found between the engineers' age and "Group 3" - social setting ($r = .3071$, $P = .001$) and between the engineers' age and "Group 6" - barriers to return to Iran ($r = .1923$, $P = .023$).

When the correlation between each single factor and the engineers' age was tested, significant negative correlations were found in "Factor 6" - continued engineering educational opportunity ($r = -.3346$, $P = .044$), and "Factor 31" - family ties ($r = -.3635$, $P = .031$). A table with details of the correlations of the 35 factors is in the appendix. (see Appendix A, Table 1).

Table 57

Correlations (r) Between the Engineers' Ages and the Seven Groups of Factors

Groups-of Factors	Correlation (r)	Level of Significance (P)	Results
1. Working Conditions	r = -.1140	P = .119	N (No Significant)
2. Professional Needs	r= -.1303	P = .088	N
3. Social Setting	r = .3071	P = .001	S (Significant)
4. Politics	r = .0196	P = .420	N
5. Choice to Study in the United States	r = -.0535	P = .290	N
6. Barriers to Return to Iran	r = .1923	P = .023	S
7. Motives to Return to Iran	r = -.0318	P = .371	N

Hypothesis 2 H_o: There is no significant correlation between the Iranian engineers' children's ages (one year to ten years old) and the degree of importance of the 35 factors on their desire to stay in the United States.

Findings

This hypothesis was not rejected.

Discussion

The scores of the engineers whose children were ages one year to ten years old and ages 11 years and up were compared to the groups of factors. A negative correlation (r = -.1330, P = .204) was found for ages one year to ten years old, and (r = -.1017, P = .322) for ages 11 years old and up. Therefore, the null hypothesis was not rejected.

No significant correlation between any of the seven groups of factors and engineers' children age (all ages) was found (see Table 58 and 59).

All 35 single factors were tested for ages one year to ten years old and significant correlation were found. The findings are: "Factor 6" - continued engineering educational opportunity (r = -.4521, P = .039), "Factor 8" - skilled assistance in my specialty (r = -.4428, P = .043), "Factor 9" - professional challenge (r = -.5851, P = .009), "Factor 15" - effect of recent trip to Iran (r = .6465. P = .009), "Factor 18" - freedom (.7680, P = 000),

Table 58

Correlations (r) Between the Engineers' Children's Ages and the Seven Groups of Factors (age = 1 year to 10 years old)

Groups-of Factors	Correlation (r)	Level of Significance (P)	Results
1. Working Conditions	r = .1410	P = .323	N
2. Professional Needs	r = -.2376	P = .217	N
3. Social Setting	r = .928	P = .381	N
4. Politics	r = .0257	P = .467	N
5. Choice to Study in the United States	r = -.4025	P = .086	N
6. Barriers to Return to Iran	r = .1590	P = .302	N
7. Motives to Return to Iran	r = -.2911	P = .167	N

Table 59

Correlations (r) Between the Engineers' Children's Ages and the Seven Groups of Factors (age = 11 years old and up)

Groups-of Factors	Correlation (r)	Level of Significance (P)	Results
1. Working Conditions	r = .1488	P = .314	N
2. Professional Needs	r = -.2135	P = .242	N
3. Social Setting	r = -.1093	P = .361	N
4. Politics	r = .1775	P = .281	N
5. Choice to Study in the United States	r = .3398	P = .128	N
6. Barriers to Return to Iran	r = -.1650	P = .295	N
7. Motives to Return to Iran	r = -.0766	P = .402	N

"Factor 21" - unique training opportunity in the United States (r = -.6173, P = .005), "Factor 22" - willingness to immigrate (r = -.4976, P = .025), "Factor 31" - family ties (r = -.4578, P = .037). A table with details of the correlations of the 35 factors is in the appendix. (see Appendix A, Table 2).

Significant negative correlations were found between engineers' children's ages 11 years old and up and "Factor 24" - family influence (r = -.6867, P = .030), "Factor 25" - readjusting to the tempo & style of life (r = -.7510, P = .016), "Factor 28" - not being able to use skills and knowledge acquired abroad. A table with details of the correlations of the 35 factors is in the appendix. (see Appendix A, Table 3).

The negative significant correlation indicates that the higher the children's age, the less influential and less important become some of the factors (24, 25, 28) on the engineers' migration decision.

Hypothesis 3 H_0: There is no significant correlation between the duration of time an engineer has lived in the United States and the degree of importance of the 35 factors in the migration decision.

Findings

This hypothesis was rejected.

Discussion

A positive significant correlation (r = .1503, P = .049) was found between the duration of time an engineer has lived in the United States and the degree of importance of the 35 factors.

As indicated in Table 60, positive correlations were found between the duration of time an engineer has lived in the United States and four groups of factors. The groups of factors were: "Group 2" - professional needs (r = .1593, P = .049), "Group 3" - social setting (r = .2210, P = .010), "Group 6" - barriers to return to Iran (r = .2900, P = .001), "Group 7" - motives to return to Iran (r = .1720, P = .037).

Among the single factors, "Factor 1, 2, 3, 11, 23, 25, and 32" were found to have a significant positive correlation with the engineers' length of stay in the United States. As stated in Table 61, the correlation and the level of significance for each factor are: "Factor 1" - potential income and living standard (r = .3690, P = .029), "Factor 2" - suitable job opportunities (r = .4502, P = .009), "Factor 3" - chance to gain professional recognition (r = .5399, P = .002), "Factor 11" - culture and character of people in the United States (r = .3638, P = .031), "Factor 23" - prestige of foreign education (r = .4243, P = .014), "Factor 25" - readjusting to the tempo and style of life (r = .5237, P = .003), and "Factor 32" - patriotism (r = .3424, P = .040).

Table 60

<u>Correlations (r) Between the Engineers' Length of Stay and the Seven Groups of Factors</u>

Groups-of Factors	Correlation (r)	Level of Significance (P)	Results
1. Working Conditions	r = .1393	P = .074	N
2. Professional Needs	r = .1593	P = .049	S
3. Social Setting	r = .2210	P = .010	S
4. Politics	r = .1427	P = .069	N
5. Choice to Study in the United States	r = .0122	P = .450	N
6. Barriers to Return to Iran	r = .2900	P = .001	S
7. Motives to Return to Iran	r = .1720	P = .037	S

Table 61

Correlations (r) Between the Engineers' Length of Stay in the United States and the 35 Factors

Factor	Correlation (r)	Level of Significance (P)	Results
1. Poten- ial Income	r = .3690	P = .029	S
2. Suitable Job...	r = .4502	P = .009	S
3. Chance to Gain...	r = .5399	P = .002	S
4. Living Standards...	r = .0235	P = .454	N
5. Favorit- ism...	r = .2553	P = .099	N
6. Continu- ed Engineering...	r = .1087	P = .295	N
7. Library Facilities	r = .2951	P = .068	N
8. Skilled assistance...	r = -.0067	P = .487	N
9. Profess- ional Challenge	r = .0862	P = .335	N
10. Colleag- ues's Influence	r = .3215	P = .051	N
11. Culture & Character...	r = .3638	P = .031	S
12. Family Obligations	r = .2622	P = .093	N
13. Spouse's Feelings	r = .2159	P = .140	N
14. Children 's Education	r = .2010	P = .157	N

Table 61 (cont'd)

Factor	Correlation (r)	Level of Significance (P)	Results
15.Effect of Recent Trip	r = .2662	P = .090	N
16.Opportu-nity for Leisure	r = .1410	P = .242	N
17.Politics	r = .1245	P = .268	N
18.Freedom	r = -.0984	P = .313	N
19.Trust In Establishment	r = .1278	P = .263	N
20.Avail-ability of Scholarship	r = -.0912	P = .325	N
21.Unique Training	r = .1957	P = .164	N
22.Willing to Immigrate	r = .2416	P = .112	N
23.Prestige of Foreign Education	r = .4243	P = .014	S
24.Family Influence	r = .2493	P = .105	N
25.Readjust-ing to Tempo...	r = .5237	P = .003	S
26.Readjust-ment For Spouse...	r = .0468	P = .408	N
27.Finding A Suitable Job	r = .0410	P = .420	N
28.Not Being Able to...	r = -.0395	P = .422	N
29.Re-Estab-lish. Friendships	r = .3158	P = .054	N

Table 61 (cont'd)

Factor	Correlation (r)	Level of Significance (P)	Results
30.Re-Establishing Business	r = .0349	P = .431	N
31.Family Ties	r = .2111	P = .145	N
32.Patriotism	r = .3424	P = .040	S
33.Commitment to the Country...	r = .2414	P = .113	N
34.Cultural Values	r = .1495	P = .228	N
35.Social Life	r = .0652	P = .373	N

As discussed earlier, engineers are a group of professionals who have their own personal characteristics. The above motivational factors must be recognized as important factors by those government official who are involved in the recruitment of people working abroad. The above findings indicated that the longer an engineer has lived in the United States, the more important and influential have become some of the factors on his/her migration decision and the likelihood of his/her return is reduced.

The following comments which were made by number of engineers provide insight into the reasons they left Iran and the reasons they are still in the United States:

> "I need a place to have security (not job security), a place to grow and have a comfortable living."

> "I do not plan to go back to Iran for a job. It is not the job that keeps me in the USA, it is the living atmosphere."

> "The openness and friendliness of Americans toward foreigners makes living in the U.S.A very attractive to us (Iranians)."

Hypothesis 4 H_0: There is no significant correlation between the number of times the Iranian government has contacted the engineers about their career plans and the degree of importance of the 35 factors on their migration decision.

Findings

This hypothesis was not rejected.

Discussion

When this hypothesis was tested, no significant correlation (r = .2944, P = .118) was found between the number of the Iranian government contacts and the degree of importance of the 35 factors.

When the seven groups of factors were tested, no significant correlations were found (see Table 62). However, when the 35 factors were tested, a positive significant correlation was found in "Factor 20" - availability of scholarships (r = .8047, P = .008). A table with details of the correlations of the 35 factors is in the appendix. (see Appendix A, Table 4). This indicates that the government can influence an engineer's decision to return by the number of its contacts; for example by offering financial incentives.

Table 62

Correlations (r) Between the Number of the Government Contacts and the Degree of Importance of the Seven Groups of Factors on Engineers' Migration Decision

Groups-of Factors	Correlation (r)	Level of Significance (P)	Results
1. Working Conditions	r = .2106	P = .226	N
2. Professional Needs	r = -.0000	P = .500	N
3. Social Setting	r = .2040	P = .233	N
4. Politics	r = .1546	P = .291	N
5. Choice to Study in the United States	r = .0432	P = .439	N
6. Barriers to Return to Iran	r = -.0384	P = .446	N
7. Motives to Return to Iran	r = .3828	P = .080	N

Hypothesis 5 H_o: There is no significant correlation between the level of income of the engineers and the degree of importance of the 35 factors on their migration decision.

Findings

This hypothesis was not rejected.

Discussion

The correlation for this hypothesis was greater (r = .1277, P = .081) than the accepted level of significance. Therefore, the hypothesis was not rejected. When the seven groups of factors were tested, however, significant positive correlations were found in four groups of factors. The groups of factors were: "Group 1" - working conditions (r = .1762, P = .035); "Group 3" - social setting (r = .3042, P = .001); "Group 4" - politics (r = .3057, P = .001); and "Group 6" - barriers to return to Iran (r = .3767, P = .000) (see Table 63).

When each of the 35 factors was tested individually, positive significant correlations were found in four of the factors. These were: "Factor 1" - potential income and living standard (r = .3884, P = .023); "Factor 13" - spouse's feelings (r = .4234, P = .014); "Factor 16 - opportunity for leisure (r = .3886, P = .023); and "Factor 30 - re-establishing business and/or professional ties (r = .4541, P = .009).

Table 63

Correlations (r) Between the Engineers' Level of Income and the Degree of Importance of the Seven Groups of Factors

Groups- of Factors	Correlation (r)	Level of Significance (P)	Results
1. Working Conditions	r = .1762	P = .035	S
2. Professional Needs	r = .0052	P = .479	N
3. Social Setting	r = .3042	P = .001	S
4. Politics	r = .3057	P = .001	S
5. Choice to Study in the United States	r = .0256	P = .397	N
6. Barriers to Return to Iran	r = .3767	P = .000	S
7. Motives to Return to Iran	r = .1045	P = .142	N

A table with details of the correlations of the 35 factors is in the appendix. (see Appendix A, Table 5).

Hypothesis 6 H_0: There is no significant difference between the Iranian engineers with American citizenship and those with Iranian citizenship in regard to the degree of importance of the 35 factors on their decision to stay in the United States.

Findings

This hypothesis was not rejected.

Discussion

The t-test was employed to test this hypothesis. No significant differences were found in the degree of importance of the arithmetic mean of the 35 factors between the engineers with Iranian citizenship and those with American citizenship (see Table 64).

When the seven groups of factors were tested, significant differences were found in four of the groups of factors. These were: "Group 1" - working conditions ($t = -3.20$; $P = .002$), "Group 3" - social setting ($t = -3.17$, $P = .002$); "Group 4" - politics ($t = -3.39$, $P = .001$); and "Group 7" - motives to return to Iran ($t = 4.08$, $P = .000$) (see Table 65).

As shown in Table 66, some significant differences were found between the two groups on the 35 factors.

Table 64

Comparison of the Degree of Importance of the Arithmetic Mean of the 35 Factors Between the Engineers With Iranian Citizenship and Those With American Citizenship

Group	N	Mean	SD	t	P	Results
Iranian Citizenship	95	2.8189	.501	-.31	.754	N
American Citizenship	23	2.8565	.574			

Table 65

Comparison of the Degree of Importance of the Seven Groups of Factors Between the Engineers With Iranian Citizenship and Those With American Citizenship

Groups of Factors	N	Mean	SD	t	P	Results
1. Working Condit..	Iran95 USA23	3.0537 3.6261	.782 .712	-3.20	.002	S
2. Professional Needs	93 22	2.8011 2.7000	.849 1.029	.48	.631	N
3. Social Setting	95 22	2.3168 3.0000	.895 .981	-3.17	.002	S
4. Politics	94 23	3.5638 4.1783	.986 .720	-3.39	.001	S
5. Choice to Study in the U.S.A.	90 21	2.3022 2.4762	.934 1.054	- .75	.455	N
6. Barriers to Return to Iran	95 21	2.7432 3.0286	.882 .935	-1.33	.187	N
7. Motives to Return to Iran	93 21	3.5581 2.6095	.902 1.199	4.08	.000	S

Table 66

Comparison of the Degree of Importance of the 35 Factors Between the Engineers With Iranian Citizenship and Those With American Citizenship

Factors	N	Mean	SD	t	P	Results
1. Potential Iran	93	3.6989	1.061	-2.45	.019	S
Income....USA	23	4.2609	.964			
2. Suitable	92	3.3587	1.263	-1.33	.186	N
Job....	23	3.7391	1.054			
3. Chance To	94	3.0106	1.348	-1.53	.129	N
Gain...	23	3.4783	1.163			
4. Living	94	3.5000	1.134	-3.76	.000	S
Standards..	23	4.4348	.728			
5. Favoritism...	85	2.0118	1.230	-1.30	.197	N
	21	2.4286	1.630			
6. Continued	84	3.0833	1.224	.86	.389	N
Engineering..	21	2.8095	1.569			
7. Library	87	3.2874	1.160	1.45	.150	N
Facilities	22	2.8636	1.457			
8. Skilled	90	3.1778	1.232	1.19	.237	N
Assistance..	21	2.8095	1.470			
9. Professional	88	2.1364	1.116	-1.07	.287	N
Challenge	21	2.4286	1.165			
10. Colleagues'	92	3.3261	1.140	1.35	.181	N
Influence	22	2.9545	1.253			
11. Culture &	91	2.5824	1.193	-2.41	.022	S
Character..	22	3.2273	1.110			
12. Family	85	3.2353	1.342	-1.92	.058	N
Obligations	21	3.8571	1.276			

Table 66 (cont'd)

Factors	N	Mean	SD	t	P	Results
13. Spouse's	65	3.3077	1.236	-3.30	.002	S
Feelings	17	4.1765	.883			
14. Children's	58	3.6724	1.330	-1.99	.055	N
Education	16	4.2500	.931			
15. Effect Of	39	2.5385	1.253	- .27	.788	N
Recent Trip..	9	2.6667	1.414			
16. Opport. For	92	3.1304	1.215	-1.72	. 88	N
Leisure	22	3.6364	1.329			
17. Politics	91	3.5604	1.128	-4.12	.000	S
	23	4.3913	.783			
18. Freedom	92	3.9674	1.124	-1.64	.103	N
	23	4.3913	1.033			
19. Trust In	92	3.3370	1.160	-1.85	.072	N
Establish.	23	3.7826	.998			
20. Availability	55	2.9273	1.501	-1.43	.157	N
of Scholar.	14	2.2857	1.490			
21. Unique	82	3.6341	1.025	1.41	.161	N
Training	20	3.2500	1.333			
22. Willingness	55	2.4909	1.103	1.27	.208	N
to Immigrate	14	2.9286	1.328			
23. Prestige	82	2.8537	1.044	.04	.967	N
Of Foreign..	19	2.8421	1.302			
24. Family	81	2.5309	1.013	-2.64	.010	S
Influence	21	3.2381	1.375			
25. Readjusting	93	3.2903	1.138	- .31	.756	N
To..Tempo..	21	3.3810	1.465			
26. Readjustment	64	3.3438	1.312	- .90	.371	N
For Spouse..	16	3.6875	1.580			

Table 66 (con'd)

Factors	N	Mean	SD	t	P	Results
27. Finding A Suitable Job	91 21	3.1978 3.9048	1.293 1.136	-2.50	.017	S
28. Not Being Able To...	93 19	2.8602 2.5263	1.282 1.429	1.01	.312	N
29. Re-Establish. Friendships	90 20	2.5222 2.8000	1.201 1.436	- .90	.369	N
30. Re-Establish. Business...	90 19	2.9222 3.4211	1.317 1.387	-1.49	.140	N
31. Family Ties	92 20	3.6848 2.7500	1.317 1.650	2.74	.007	S
32. Patriotism	90 19	3.2444 2.6842	1.221 1.565	1.73	.087	N
33. Commitment to the Country	92 19	3.8261 2.8421	1.145 1.385	3.29	.001	S
34. Cultural Values	93 19	3.8495 3.4211	1.215 1.346	1.37	.172	N
35. Social Life	92 19	3.4674 2.5263	1.448 1.349	2.61	.010	S

These were: "Factor 1" - potential income and living standard ($t = -2.45$, $P = .019$); "Factor 4" - living standards and satisfactory housing ($t = -3.76$, $P = .000$); "Factor 11" - culture and character of people in the U.S.A. ($t = -2.41$, $P = .022$), "Factor 13" - spouse's feelings ($t = -3.30$, $P = .002$), "Factor 17" - stability ($t = -4.12$, $P = .000$), "Factor 24" - family influence ($t = -2.64$, $P = .010$), "Factor 27" - finding a suitable job ($t = -2.50$, $P = .017$), "Factor 31" - family ties ($t = 2.74$, $P = .007$), "Factor 33" - commitment to the country's progress ($t = 3.29$, $P = .001$), and "Factor 35" - social life ($t = 2.61$, $P = .010$).

An analysis of the above data indicates that the potential income and living standards, living standards and satisfactory housing, culture and character of people in the U.S.A., spouse's feelings, stability, family influence, and finding a suitable job in Iran were factors which have influenced the engineers with American citizenship to stay in the United States. On the other hand, the family ties, commitment to the country's progress, and social life in Iran were found to be more important factors to the engineers with Iranian citizenship (group 1) than those engineers with American citizenship (group 2).

Hypothesis 7 H_o: There is no significant difference between male and female Iranian engineers in regard to the degree of importance of the 35 factors on their migration.

Findings

This hypothesis was not rejected.

Discussion

As shown in Table 67, no significant differences (t = .43, P = .666) were found between the two groups (male and female).

The only significant difference found between the two groups was in "Group 7" - motives to return to Iran (t = 2.06, P = .041). The male engineers had more desire to return to Iran than did the female engineers (see Table 68).

When the individual factors were tested, significant differences were found between the two groups in "Factor 2" - suitable job opportunities (t = -3.00, P = .003), "Factor 12" - family obligation (t = -2.34, P = .034), "Factor 24" - family influence (t = -2.40, P = .018), "Factor 25" - readjusting to the tempo and style of life (t = -1.98, P = .050), "Factor 28" - not being able to use skills and knowledge acquired abroad (t = -2.52, P = .025), "Factor 32" -patriotism (t = .78, P = .042). A table with details of the comparisons of the degree of importance of the 35 factors is in appendix. (see Appendix A, Table 6).

Table 67

Comparison of the Degree of Importance of the Arithmetic Mean of the 35 Factors Between the Iranian Male Engineers and the Iranian Female Engineers

Group	N	Mean	SD	t	P	Results
Males	109	2.8257	.534	-.43	.666	N
Females	13	2.8923	.429			

Table 68

Comparison of the Degree of Importance of the Seven Groups of Factors Between Iranian Male Engineers and Iranian Female Engineers

Groups of Factors	Gender N	Mean	SD	t	P	Results
1. Working Conditions	M*109 F**13	3.1514 3.4769	.797 .843	-1.38	.169	N
2. Professional Needs	106 13	2.7292 3.0923	.922 .922	-1.34	.183	N
3. Social Settings	108 13	2.4222 2.4308	.945 .796	- .03	.975	N
4. Politics	108 13	3.6713 3.9615	.959 1.088	-1.02	-. 92	N
5. Choice to Study in the U.S.A.	101 13	2.3743 2.1385	1.004 .645	.82	.412	N
6. Barriers to Return to Iran	107 13	2.7757 3.0692	.861 1.084	-1.13	.262	N
7. Motives to Return to Iran	107 11	3.4682 2.8182	.991 1.029	2.06	.041	S

* Males
** Females

The differences between the Iranian male engineers and female engineers imply that the Iranian females feel more secure in the United States than in the country of Iran. They find themselves viewed as equals and as individuals who can utilize their skills without any restriction, even with some respect. They get acquainted with the environment and appear to become more acculturated than the Iranian males. These highly qualified females can be invited to participate in the Iranian's infrastructure and country's economic development only if they see improvements in the government's policy in terms of women's issues such as equal employment opportunities, educational opportunities, and other issues.

Hypothesis 8 H_0: There is no significant difference between the engineers married to Iranians and those married to non-Iranians in regard to the degree of importance of the 35 factors on their migration decision.

Findings

This hypothesis was not rejected.

Discussion

There was no significant difference (t = .12, P = .909) between the engineers married to Iranians and those married to non-Iranians in regard to the degree of importance of the 35 factors on their migration decision (see Table 69). Very few of the married engineers had spouses who were non-Iranian, and

Table 69

Comparison of the Degree of Importance of the Arithmetic Mean of the 35 Factors Between Iranian Engineers Married to Iranians and Those Married to Non-Iranians

Group	N	Mean	SD	t	P	Results
Married to Iranians	62	2.9097	.552	.12	.909	N
Married to Non-Iranians	6	2.8833	.232			

the extremely small sample size was a serious limitation in data analysis.

When the seven groups of factors were tested, there were found to be no significant differences between the two groups (see Table 70).

No significant differences were found between the two groups on the individual factors. A table with details of the comparison of the degree of importance of the 35 factors is in the appendix. (see Appendix A, Table 7).

Hypothesis 9 H_0: There is no significant difference between the married and single engineers and the degree of importance of the 35 factors on their decision to stay in the United States.

Findings

This hypothesis was not rejected.

Discussion

No significant difference ($t = -1.41$, $P = .161$) between the Iranian single engineers and the Iranian married engineers was found (see Table 71).

As indicated in Table 72, significant differences were found between the two groups in "Group 2" - professional needs ($t = 2.27$, $P = .025$), "Group 3" - social setting ($t = -6.13$, $P = .000$), and "Group 6" - barriers to return to Iran ($t = -2.00$, $P = .048$).

Table 70

Comparison of the Degree of Importance of the Seven Groups of Factors Between Iranian Engineers Married to Iranians and Those Married to Non-Iranians

Groups of Factors	N	Mean	SD	t	P	Results
1. Working Conditions	62* 6**	3.1661 3.6000	.946 .506	-1.10	.274	N
2. Professional Needs	61 6	2.5656 2.7333	.984 .450	- .41	.682	N
3. Social Settings	62 6	2.8935 2.4167	.812 .945	1.36	.180	N
4. Politics	62 6	3.7500 3.6500	.991 .622	.24	.810	N
5. Choice to Study in the U.S.A.	58 6	2.3172 2.3000	.984 .616	.04	.967	N
6. Barriers to Return to Iran	62 6	2.9403 3.1667	.834 .501	- .65	.518	N
7. Motives to Return to Iran	60 6	3.3617 3.8333	1.040 .367	-1.10	.277	N

* Married to Iranians
** Married to Non-Iranians

Table 71

Comparison of the Degree of Importance of the Arithmetic Mean of the 35 Factors Between Single and Married Iranian Engineers

Group	N	Mean	SD	t	P	Results
Single	55	2.7600	.457	-1.41	.161	N
Married	68	2.8926	.563			

Table 72

Comparison of the Degree of Importance of the Seven Groups of Factors Between Single and Married Iranian Engineers

Groups of Factors	N	Mean	SD	t	P	Results
1. Working Conditions	55* 68**	3.2000 3.1838	.680 .896	.11	.912	N
2. Professional Needs	53 67	2.9774 2.6045	.845 .951	2.27	.025	S
3. Social Settings	54 68	1.9259 2.8441	.816 .826	-6.13	.000	S
4. Politics	54 68	3.6574 3.7382	.948 .991	- .46	.649	N
5. Choice to Study in the U.S.A.	51 64	2.3059 2.3688	1.033 .921	- .34	.731	N
6. Barriers to Return to Iran	54 67	2.6407 2.9627	.876 .886	-2.00	.048	S
7. Motives to Return to Iran	54 65	3.4222 3.3523	1.023 1.054	.36	.716	N

* Single
** Married

When the individual factors were tested, significant differences were found between the two groups in "Factor 7" - library facilities ($t = 2.12$, $P = .036$), and "Factor 9" - professional challenge ($t = 2.04$, $P = .044$). A table with details of the comparison of the degree of importance of the 35 factors is in the appendix. (see Appendix A, Table 8).

The differences between the two group could indicate that Iranian married engineers feel more responsible because they have family obligations. Therefore, the married engineers look for an environment such as the United States which seems more likely to support the family's prosperity. On the other hand, the Iranian single engineers without any family obligations, selected the professional challenge and library facilities as their priorities. The library facilities were especially important for those engineers with a doctoral degree who are engaged in some type of research for the universities or other institutions. It is not surprising to see why some of these engineers seem attached to the United States' library system and facilities. According to the Chronicle of Higher Education (1993), some of the universities located in the State of California have holdings in their research libraries that were reported to be among the best 50 universities in the United States and probably in the world. The number of books and volumes which some of these universities hold is remarkable. The University of California at Berkeley which was ranked number two, was reported holding 7,854,630 volumes of books in 1991-92. Some of the other

universities were the University of California at Los Angeles which ranked number four with 6,247,320 volumes of books; Stanford University ranked seventh with 6,127,388 volumes; the University of California at Davis ranked 23rd with 2,588,728 volumes; the University of California at San Diego ranked 31st with 2,188,722 volumes; and the University of Southern California ranked 35th with 2,764,865 volumes of books. The University of Iowa, and Michigan State University were also reported to be among the best 50 university libraries located in the mid-west part of the United States.

Although the two countries, the United States and Iran can not be compared in terms of their library facilities, the level and the type of research activities, type of industry, and engineering population, it is important to recognize the Iranian engineers' priorities. It is in the best interest of the Iranian government for them to pay attention to research activities and the expansion of the library facilities.

Hypothesis 10 H_o: There is no significant difference between the engineers whose spouses have a college degree or higher education and those with a high school diploma or less in regard to the degree of importance of the 35 factors.

Findings

This Hypothesis was not rejected.

Discussion

There was no significant difference ($t = .51$, $P = .614$) between the Iranian engineers whose spouses have a high school diploma and those with a college degree or higher education (see Table 73).

When the degree of importance of the seven groups were tested, there were no significant differences between the two groups (see Table 74).

The degree of importance of the 35 factors were tested and significant differences were found between the two groups in "Factor 1" - potential income and living standards ($t = 2.27$, $P = .029$), "Factor 17" - stability ($t = 2.11$, $P = .040$), "Factor 18" - freedom ($t = 2.31$, $P = .025$), and "Factor 26" - readjustment for spouse and/or children ($t = 2.57$, $P = .014$). A table with details of the comparison of the degree of importance of the 35 factors is in the appendix. (see Appendix A, Table 9). In regard to freedom and stability the following examples were found to be valuable for those who value the human resources and their freedom of their expressions.

"I have stayed in the United States due to political situation in home country."

"Instability of the Iranian political system makes Iran less desirable. Also corruption in the government and the lack of the recognition of honest work are

Table 73

Comparison of the Degree of Importance of the Arithmetic Mean of the 35 Factors Between the Engineers Whose Spouses Have a College Degree and Those With A High School Diploma

Group	N	Mean	SD	t	P	Results
Spouses With High School Degree	16	2.9438	.472	.51	.614	N
Spouses With College Degree	33	2.8758	.424			

Table 74

Comparison of the Degree of Importance of the Seven Groups of Factors Between the Engineers Whose Spouses Have a College Degree and Those With A High School Diploma

Group	N	Mean	SD	t	P	Results
1. Working Conditions	16* 33**	3.3500 3.1152	.875 .929	.85	.402	N
2. Professional Needs	16 32	2.4250 2.6156	.988 .917	-.66	.511	N
3. Social Settings	16 33	2.8375 2.9273	.966 .562	-.41	.683	N
4. Politics	16 33	4.0250 3.6424	1.062 .855	1.36	.182	N
5. Choice to Study in the U.S.A	15 32	2.5467 2.1000	.877 .937	1.55	.127	N
6. Barriers to Return to Iran	16 32	2.9938 2.8781	.775 .687	.53	.601	N
7. Motives to Return to Iran	16 32	3.5250 3.4125	.955 1.058	.36	.722	N

* Spouses with high school degree
** Spouses with college degree

barriers to return to Iran."

It seems that the Iranian engineers whose spouses have a high school diploma are more influenced by some of the factors than those engineers whose spouses have a college degree. Better educational opportunities and a more flexible educational system were attractive to the engineers. Iran does not have these educational opportunities. The engineers and their families often chose to stay in the United States to obtain schooling and did not return to Iran.

Hypothesis 11 H_o: There are no significant differences in the degree of importance of the 35 factors between the Iranian engineers who desire to stay in the United States permanently and those who are in the United States now but would consider living permanently in Iran.

Findings

This Hypothesis was not rejected.

Discussion

There was no significant difference ($t = -1.00$, $P = .320$) between the two groups (see Table 75).

When the degree of importance of the seven groups were tested, no significance differences were found between the

Table 75

Comparison of the Degree of Importance of the Arithmetic Mean of the 35 Factors Between Iranian Engineers Who Desire to Stay Permanently in the United States and Those Who Do Not

Group	N	Mean	SD	t	P	Results
Stay in the United States	48	2.7958	.589	-1.00	.320	N
Return to Iran	15	2.9600	.412			

two groups (see Table 76).

As shown in Table 77, significant differences were found between the Iranian engineers who desired to stay in the United States (group 1) and those who desired to return to Iran (group 2) on "Factor 8" - skilled assistance in my specialty ($t = -2.39$, $P = .022$), "Factor 31" - family ties ($t = 2.36$, $P = .025$), "Factor 32" - patriotism ($t = -2.68$, $P = .012$), "Factor 33" - commitment to the country's progress ($t = -4.73$, $P = .000$), and "Factor 34" - cultural values ($t = -3.82$, $P = .000$).

As shown in Table 78, the number of the engineers who indicated that they would desire to stay in the United States was found to be 48 compared to 15 engineers who had decided to return to Iran.

When these two groups are compared, it seems that the second group of engineers who indicated that they desire to return feel more responsible about their country's development and progress than the group of engineers who indicated that they prefer to stay in the United States. Family ties, patriotism and cultural values were also more important factors to those engineers who desired to return than those who desired not to return.

In addition to these two groups, there was another group of 58 engineers who were undecided and were not sure whether they would stay in the United States permanently or return to Iran (see Table 78).

Table 76

Comparison of the Degree of Importance of the Seven Groups of Factors Between Iranian Engineers Who Desire to Stay Permanently in the United States and Those Who Do Not

Groups	N	Mean	SD	t	P	Results
1. Working Conditions	48* 15**	3.4333 3.0667	.926 .743	1.40	.167	N
2. Professional Needs	45 15	2.6889 2.8000	1.083 1.174	- .34	.737	N
3. Social Settings	48 15	2.5688 2.4800	1.071 .678	.30	.764	N
4. Politics	48 15	3.8854 3.7267	.932 .731	.60	.549	N
5. Choice to Study in the U.S.A.	46 15	2.4217 2.1600	1.006 1.122	.85	.398	N
6. Barriers to Return to Iran	47 15	2.8681 2.6667	.923 .907	.74	.464	N
7. Motives to Return to Iran	44 15	2.7545 3.8600	1.045 .686	-3.81	.000	N

* Stay in the United States
** Return to Iran

Table 77

Comparison of the Degree of Importance of the 35 Factors Between Iranian Engineers Who Desire to Stay Permanently in the United States and Those Who Do Not

Factors	N	Mean	SD	t	P	Results
1. Potential Income..	47* 15**	4.0426 3.4667	1.103 1.125	1.75	.85	N
2. Suitable Job..	47 15	3.7660 3.5333	1.237 1.506	.60	.550	N
3. Chance To Gain..	48 15	3.4792 3.2000	1.353 1.320	.70	.486	N
4. Living Standards..	48 15	3.7917 3.7333	1.237 .961	.17	.868	N
5. Favoritism..	45 13	2.3556 1.7692	1.510 .832	1.34	.187	N
6. Continued Engineering..	41 13	3.0244 3.6154	1.491 1.121	-1.31	.195	N
7. Library Facilities	43 13	3.0233 3.4615	1.354 1.198	-1.05	.299	N
8. Skilled Assistance	42 14	2.9524 3.7857	1.497 .975	-2.39	.022	S
9. Professional Challenge	41 13	2.0976 2.2308	1.158 .927	- .38	.707	N
10. Colleagues's Influence	45 15	3.1778 3.6667	1.403 1.047	-1.24	.221	N
11. Culture & Character..	47 14	2.8511 2.2143	1.383 1.251	1.54	.128	N
12. Family Obligations	45 14	3.3111 3.1429	1.564 1.460	.36	.723	N

Table 77 (cont'd)

Factors	N	Mean	SD	t	P	Results
13. Spouse's Feelings	38 13	3.4211 3.4615	1.348 .967	- .10	.921	N
14. Children's Education	33 12	3.6970 4.1667	1.425 .835	-1.07	.290	N
15. Effect of Recent Trip.	22 6	2.4545 2.3333	1.335 1.211	.20	.843	N
16. Opport. For Leisure	46 15	3.2174 3.1333	1.298 1.302	.22	.828	N
17. Stability	47 15	3.9787 3.8667	1.073 1.125	.35	.729	N
18. Freedom	47 15	4.2553 4.0000	1.132 .845	.80	.425	N
19. Trust In Establish.	48 15	3.4792 3.3333	1.185 .976	.43	.667	N
20. Availability Of Scholar..	34 8	2.6765 2.2500	1.408 1.581	.75	.455	N
21. Unique Training..	41 14	3.5854 3.4286	1.161 1.222	.43	.669	N
22. Willingness To Immigrate	36 9	2.6389 2.7778	1.175 1.394	- .31	.761	N
23. Prestige Of Foreign..	38 14	2.9474 2.7143	1.089 1.139	.68	.502	N
24. Family Influence	41 13	2.6341 2.4615	1.220 .776	.48	.634	N
25. Readjusting To..Tempo..	47 15	3.5106 2.8667	1.214 1.246	1.78	.80	N
26. Readjustment For Spouse..	36 11	3.0556 3.7273	1.453 1.272	-1.38	.175	N

Table 77 (cont'd)

Factors	N	Mean	SD	t	P	Results
27. Finding A Suitable Job	47 14	3.4255 2.8571	1.441 1.167	1.35	.183	N
28. Not Being Able To..	45 15	2.8222 2.6000	1.482 1.183	.53	.600	N
29. Re-Establish. Friendships	45 14	2.6000 2.7143	1.468 1.267	- .26	.794	N
30. Re-Establish. Business..	44 14	3.0682 2.7857	1.516 1.528	.61	.547	N
31. Family Ties	44 15	2.8636 3.8000	1.488 1.265	-2.36	.025	S
32. Patriotism	42 15	2.5952 3.6000	1.415 1.183	-2.68	.012	S
33. Commitment to the Country.	43 15	3.0930 4.4000	1.461 .632	-4.73	.000	S
34. Cultural Values	42 15	3.0238 4.4667	1.370 .834	-3.82	.000	S
35. Social Life	42 15	2.6667 2.9333	1.476 1.534	- .59	.555	N

* Stay in the United States
** Return to Iran

Table 78

Frequency Distribution of the Iranian Engineers Who Would Desire to Stay in the United States, Return To Iran, or Were Undecided

Group	Frequency		Percent
Stay in the United States	48		39.0
Return to Iran	15		12.2
Undecided	58		47.2
Missing	2		1.6
Total	123		100.0
Valid Cases	121	Missing Cases	2

3. Other Findings

Engineers and the U.S. Government Regulations

The engineers were asked to give their opinion about whether the U.S. Government should make it easier or harder for foreign engineers to stay after they finish their studies? All engineers responded to the question. Only four engineers said that the law should become harder, compared to 48 engineers who indicated that the U.S. government should make the law easier for foreign engineers to stay after they complete their studies. In addition to the above groups, there were two other groups of engineers who were either undecided (36) or preferred to leave the current law unchanged (42) (see Table 79).

Engineers and their Time Spent Filling Out the Questionnaire

In order to increase the rate of response, the questionnaire for this particular study was formed in simplest form and as short as possible to be consistent with the objectives of the study. The engineers were asked to report how much time they spent completing the questionnaire. The minimum time spent on the questionnaire was five minutes and the maximum time spent was 45 minutes.

As shown in Table 80 and Figure 6, more than 69 percent of the engineers completed the questionnaire in five to 15 minutes. The engineers appeared to be comfortable with the length and the format of the questionnaire.

Table 79

Frequency Distribution of the Iranian Engineers' Reaction to: Whether the U.S. Government Should Make it Easier or Harder for Foreign Engineers to Stay After They Finish Their Studies?

Group	Frequency	Percent
Easier	41	33.3
Harder	4	3.3
Unchanged	36	29.3
Not Sure	42	34.1
Total	123	100.0

Table 80

Frequency Distribution of the Engineers' Time Spent Filling out the Questionnaire

Minutes	Frequency	Percent
5	3	2.4
6	3	2.4
7	3	2.4
8	11	8.9
10	32	26.0
11	1	.8
12	7	5.7
13	1	.8
14	1	.8
15	24	19.5
16	2	1.6
17	2	1.6
20	15	12.2
25	3	2.4
30	10	8.1
35	2	1.6
38	1	.8
40	1	.8
45	1	.8
Total	123	100.0

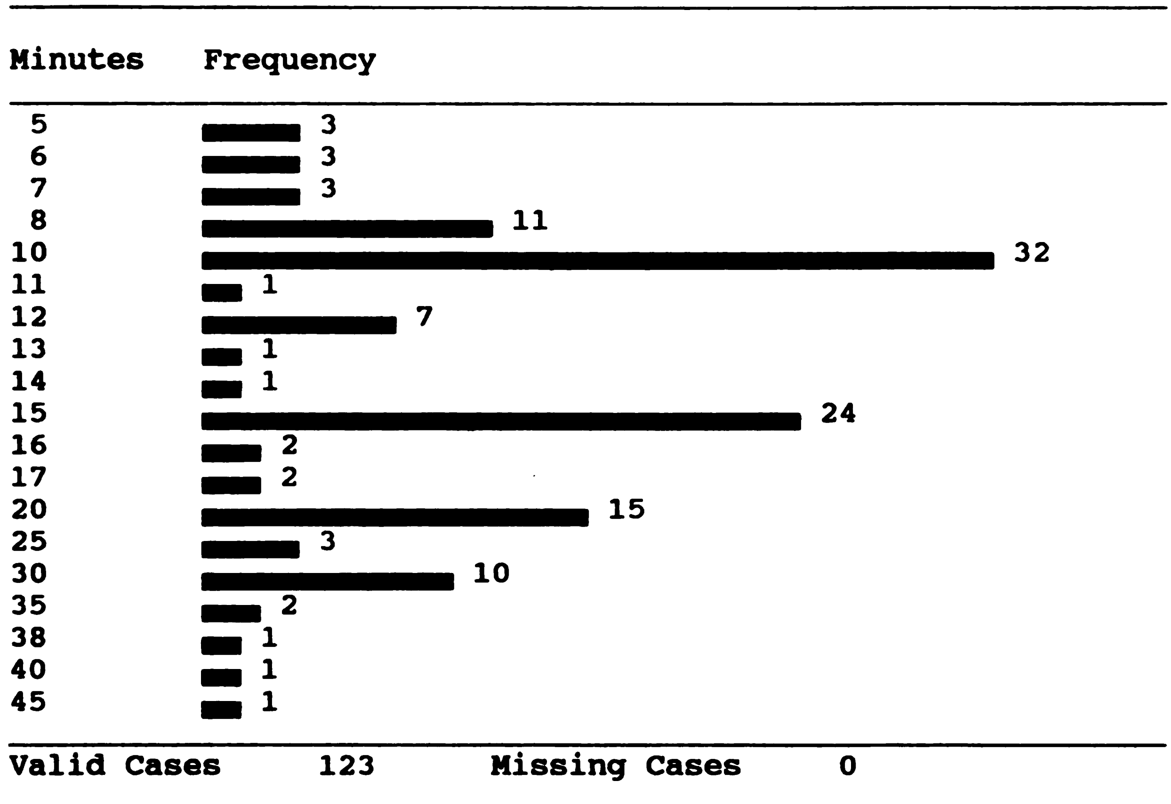

Figure 6. Engineers' Time Spent Filling out the Questionnaire

The Open - Form of the Questionnaire and the Engineers' Free Responses

The engineers were furnished with the Open - Form or unrestricted type of questions for their free responses. As was indicated earlier, many engineers made comments about their migration decision or they discussed their point of view regarding the current situation in Iran. Their comments provide insight into the reasons they left Iran and the reasons they are still in the United States. The information is of paramount important to those in Iran who seek ways to stop the loss of their bright professional people.

Summary of the Iranian Engineers' Comments About Their Migration Decision or Their Comments About Returning

"I need a place to have security (not job security), a place to grow and have a comfortable living."

"As long as all the Iranian engineers and other educated professionals stay out of Iran, no changes are expected there."

"I have stayed in the United States due to political situation in home country."

"I wish I could work in Iran, but I have a problem with the present Iranian government."

"Iran needs an engineer and I need Iran, but it is not easy to start my life from zero."

"There is no freedom for my children's education in Iran. At the present time, it is very tough for the Iranian people to get education or go to the university. Why should I create problems for my children."

"I was looking to get more education in Iran but I did not have the chance."

"The openness and friendliness of Americans toward foreigners makes living in the USA very attractive to us (Iranians)."

"Instability of the Iranian political system makes Iran less desirable. Also corruption in the government and the lack of the recognition of honest work are barriers to return to Iran."

"I always wanted to go back and teach at the university and I was proud to be an Iranian. Now, I am proud only as far as the nationality goes and not what Iran presents to world."

"I do not plan to go back to Iran for a job. It is not the job that keeps me in the U.S.A, it is the living atmosphere."

"Obviously if our government is not trying to compete for our return, then regretfully most educated people will stay."

"The main reason for being in the U.S.A is the present situation in Iran."

"The United States is better than Iran for me, but I am better for Iran than the United States. I think I will be more helpful to Iran than the United States."

"As a foreign student coming to this country with no experience of culture and language and the lack of the financial support, I have had lots of hard time in my first six years in the United States. Now, I am at the level that feels comfortable over problem solving and challenging the life. I will not give these up for less. But I would love to go back to my own country because I know I could contribute to my people. I would like to create an environment which be able to help under-privileged children in areas such as education, social, physical activities. I would volunteer myself to help kids in any level (elementary schools, high school,..). I will try to encourage these kids for a better education and a healthy life."

Summaries of the Findings

In this study, it was found that some of the reasons for engineers' staying in the United States were related to working conditions in the United States, their professional needs, living standards, suitable job opportunities, chance to obtain more professional recognition, the culture and character of people in the United States, and the prestige of American education. These engineers also indicated that they hesitated to go back to Iran due to the difficulty and readjusting to the tempo and the current Iranian style of life. Some other factors such as professional challenge, unique training opportunities in the United States, freedom, trust in establishment, opportunity for leisure, and library facilities were considered to be important to engineers.

In this study, a group of engineers was found who indicated that they desire to return to Iran. Their reasons found in their family ties and participation in the country's development process and progress. To these engineers, factors such as the Iranian cultural values, patriotism, and the social life in Iran were the most important factors in their decision to return to Iran.

In this study, in addition to these two groups of engineer, another group of engineers was found who were undecided and were not sure whether they would stay in the

United States permanently or return to Iran.

In the following, the summaries of the research findings are presented as follows: (1) the demographic characteristics of the Iranian engineers who are currently residing in Southern California are shown in Table 81, (2) the correlation between the importance of the arithmetic mean of the 35 factors and independent variables (hypotheses 1 through 5) which was tested with Pearson - Product Moment calculation are stated in Table 82, (3) the comparison between the importance of the arithmetic mean of the 35 factors and independent variables (hypotheses 6 through 11) which was tested with t-test procedures are presented in Table 83, (4) the comparison of the degree of importance of the 35 factors between the Iranian engineers who desire to stay permanently in the United States and those who do not which was tested with t - test procedures are shown in Table 84, and (5) the results and the ranking order of the single factors are shown in Table 85.

Table 81

Characteristics of the Iranian Engineers Residing in Southern California

Gender	Male	110	89.4%
	Female	13	10.6%
Marital Status	Single	57	46.3%
	Married	66	53.7%
Spouse's Country of Birth	Iran	59	90.8%
	United States	6	9.2%
Spouse's Country of Citizenship	Iran	48	77.4%
	United States	14	22.6%
Spouse's Highest Degree	High Schools Diploma	16	25.0%
	Bachelor's	32	50.0%
	Master's	14	21.9%
	Doctorate	2	3.1%
Visas Entry	F-1	105	85.4%
	J Visas	4	3.2%
	Immigrant Visas	6	4.9%
	Other	8	6.5%
Current Visas	Immigrant	97	78.9%
	F-1	2	1.6%
	J Visas	9	7.3%
	Other	15	12.2%
Engineers' Highest Degree	Bachelor's	36	29.3%
	Master's	66	53.7%
	Doctorate	21	17.0%

Table 81 (cont'd)

Major Fields of Study (Bachelor's)	Civil Engineering	33	26.8%
	Electrical Eng.	22	17.9%
	Mechanical Eng.	19	15.4%
	Other	44	39.9%
Major Fields of Study (Master's)	Civil Engineering	23	18.7%
	Electrical Eng.	14	11.4%
	Mechanical Eng.	14	11.4%
	Other	51	58.5%
Major Fields of Study (Doctorate)	Civil Engineering	4	22.2%
	Mechanical Eng.	3	16.7%
	Industrial Eng.	2	11.1%
	Material Science	2	11.1%
	Other	7	38.9%
Job Sector	Business/Industry	93	78.2%
	Government	16	13.4%
	Research/Teaching	10	8.4%
Job Location	Los Angeles County	73	61.3%
	Orange County	45	37.8%
	Other	1	0.9%
Government	Once	12	9.8%
	Twice	1	.8%
	Three Times	3	4.1%
	Zero/None	105	85.4%
Engineers' Country of Birth	Iran	123	100.0%
Engineers' Citizenship	Iran	88	79.3%
	United States	21	18.9%
	Canada	1	0.9%
	Dual Citizenship (Iran & United Kingdom)	1	0.9%

Table 82

<u>The Results of the Research Hypotheses: The Correlations of Importance of the Arithmetic Mean of the 35 Factors and Independent Variables (Hypotheses One through Five)</u>

Hypothesis	Correlation (r)	Level of Significance (P)	Results
1. (Engineers' age)	r = - .0624	P = .246	N
2. (Children's age)	r = - .1330	P = .204	N
3. (Duration of Time Living in the United State)	r = .1503	P = .049	S
4. (Government Contacts)	r = .2944	P = .118	N
5. (Level of Income)	r = .1277	P = .081	N

Table 83

The Results of the Research Hypotheses: The Comparison of Importance of the Arithmetic Mean of the 35 Factors and Independent Variables (Hypotheses Five through 11)

Hypothesis	t - Value	Level of Significance (P)	Results
6. (Citizenship)	t = .31	P = .754	N
7. (Male and Female)	t = .43	P = .666	N
8. (Married to Iranians or Non-Iranians)	t = .12	P = .909	N
9. (Married and Single)	t = - 1.41	P = .161	N
10.0 (Spouse's Education)	t = .51	P = .614	N
11. (Desire to Stay in the USA or Return To Iran)	t = -1.00	P = .320	N

Table 84

The Significant Results of the Comparison of the Degree of Importance of the 35 Factors Between the Iranian Engineers Who Desire to Stay Permanently in the United States and Those Who Desire to Return to Iran

Factors	t Value	P	Results
8. Skilled Assistance	-2.39	.022	S
31. Family Ties	-2.36	.025	S
32. Patriotism	-2.38	.012	S
33. Commitment to the Country	-4.73	.000	S
34. Cultural Values	-3.82	.000	S

Note. The above findings were found to be important and significant for the Iranian engineers who indicated that they desire to return to Iran.

Table 85

Rank Order of the Significance of the 35 Single Factors

	Factors	Level of Significant (P)
4.	Living Standards and Satisfactory...	P = .000
13.	Spouse's Feelings	P = .000
18.	Freedom	P = .000
33.	Commitment to..Country's..(..to Return)	P = .000
34.	Cultural Values (Motive to Return)	P = .000
3.	Chance to Gain Professional..	P = .002
2.	Suitable Job Opportunities	P = .003
15.	Effect of Recent Trip To Iran	P = .003
21.	Unique Training Opportunity....U.S.	P = .005
31.	Family Ties (Motive to Return)	P = .007
20.	Availability of Scholarship	P = .008
9.	Professional Challenge	P = .009
30.	Re-Establishing Business (Barrier)	P = .009
24.	Family Influence	P = .010
35.	Social Life (Motive to Return)	P = .010
32.	Patriotism	P = .012
23.	Prestige of Foreign Education	P = .014
26.	Readjustment for Spouse...& Children	P = .014

Table 85 (cont'd)

	Factors	Level of Significant (P)
25.	Readjust..to..Style of Life (Barrier)	P = .016
27.	Finding a Suitable Job (Barrier)	P = .017
1.	Trust in Establishment	P = .019
8.	Skilled Assistance in My Specialty	P = .022
11.	Culture & Character of People...U.S.A	P = .022
16.	Opportunity for Leisure	P = .023
28.	Not Being Able ...Use Skills (Barrier)	P = .024
22.	Willingness to Immigrate	P = .025
12.	Family Obligations	P = .034
7.	Library Facilities	P = .036
6.	Continued Engineering...Opportunity	P = .039
17.	Stability	P = .040

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

SUMMARY

The phase of pre-industrialization in Iran started at the end of the World War I, with the establishment of the Pahlavi Dynasty, headed by the Reza Shah. During this era, Reza Shah made some progressive economic changes and development. Reza Shah's active role in all areas of the Iranian economy, particularly in the development of industries was remarkable. The establishment of the steel industry, the construction of the trans-Iranian railroad, and the growth of many new industries such as sugar, cotton and woolen textiles, matches, cements, soap, oil processing, tea processing, steel industry, were some examples of the government's commitment to development of the country's infrastructure.

Although Iran made tremendous progress in the pre-industrialization stage, the country could not move to an early stage of industrialization until after October 29, 1954. This date has been recorded as the settlement of the Iranian oil dispute. The oil nationalization opened a new chapter in Iranian history. Production of oil as a vital resource and its revenues, plus other mineral resources such as lead and zinc, chromite, copper, other non-metal such as coal, barite, kaolin, mica, salt and other natural resources led the new leadership to be confident and played a very important role in

the early stage of industrialization or take-off process in Iran.

Despite the tremendous achievement and the government's commitment to industrialization, the Iranian industrialization was confronted with many obstacles. Iran lacked high-level professionals, especially the engineers, its industry required. Despite the expansion of higher education institutions and significant improvement of the educational system, Iran's educational and training facilities could not keep up with the fast pace of the country's development. The supply and demand for engineers were not matched. There were many job vacancies for qualified engineers, but many vacancies remained unfilled due to the inadequate number of engineers. The shortage of engineers was partially the result of the government's inability to meet the demand for more engineers. For the period of the Third Iranian Plan, 1962-1967, there was a demand for 5,600 engineers. However, the supply was only 3,065 and a shortage of 2,535 engineers resulted.

Opportunities for advanced degrees were limited. It was estimated by government officials that there would be a need for 6683 engineers with master's degrees for both public and private sectors between 1972 and 1975/76. The supply of graduates with master's degrees did not reach more than 1127 in those years. There were also a demand for 251 engineers with doctoral degrees in the same years. Unfortunately, the supply of engineers with doctoral degrees remained zero because of an absence of an engineering doctoral program in those years.

The immediate shortage of engineers in Iran could have been minimized if the government had paid more attention to its own engineers working abroad. There were thousands of qualified and enthusiastic Iranian graduate engineers working abroad who were willing to return and put their significant effort into the country's progress and its rapid industrialization. A lack of comprehensive educational and human resources planning and a lack of careful attention by the government intensified the problem of so called "brain drain."

The pattern of the migration of the Iranian professionals, specifically engineers to the United States, was significant after the Iranian revolution of 1978-79. The change in the power structure, political instability, economic crises, and especially the Iran - Iraq war in 1980, led thousands of Iranian professionals including engineers, to leave the country and immigrate to the United States. Those professionals, including engineers, who were already in the United States, felt that their return would place them in danger and in risk. Therefore, those with no immigrant visa looked for alternatives to stay legally. Although the exact number of Iranian immigrant engineers in the United States is not known, it has been estimated to be high. According to the U.S. Immigration annual reports, the number of Iranian immigrant engineers were estimated to be more than 700 between 1970 and 1975 and 1539 between 1982 and 1984. In the single

year 1988, 552 Iranian engineers immigrated into the United States.

In the year 1990, more than 24,000 Iranians were admitted into the United Stated as immigrants. Out of these many, more than 11,000, were in the occupational category; more than 2,000 were in the professional specialty and technical category. The number of Iranian engineers in the United States with engineering doctoral degrees was amazing. A report by the National Science Foundation (1987), indicated that there were 1134 Iranians who were granted engineering doctoral degrees between 1980 and 1990. Many of those who acquired an engineering doctoral degree concentrated in three important branches of the engineering field which were mechanical, electrical, and chemical engineering. While these distinguished, talented, high-level engineers can be seen as excellent representatives of a small country in terms of its population and should be praised by its people, the country of Iran should regret losing this "gold mine" of human resources.

These individuals were attracted to engineering fields by their unique personalities and characteristics. They were characterized by greater intellectual capabilities compared to other workers. Their greater intelligence was expressed in a need for creativity and higher achievement.

Unfortunately, there has not been any research about the causes of the migration of these talented high-level engineers. Research on causes of the migration of this particular nationality and professional population was especially important after the Iranian revolution of 1978-79.

The absence of such a specific study about the migration of the Iranian high-level migrant engineers led to this case study to investigate the problem. This study limited itself to a particular geographical location, Southern California. The study covered Iranian engineers who came to the United States before or after the Iranian revolution of 1978-79, and held a bachelor's or higher degree in engineering/engineering technology from an accredited institution of higher education, in Iran, in the United States, or in other foreign countries.

Out of 300 questionnaires, about 30 questionnaires were returned undelivered due to a change of address, and 85 questionnaires (33%) were completed and returned. To increase the rate of response, 300 follow-up letters, along with second questionnaires were sent to engineers. Of the 300 follow-up questionnaires, 38 questionnaires (13%) were returned. Finally, out of 600 questionnaires mailed to engineers, 123 questionnaires (41%) were completed. Given the situation of Iranian engineers in Southern California in terms of absence of organized engineering associations like American Associations (for example mechanical, chemical, electrical, industrial, manufacturing engineering association), unavailability of complete addresses and physical locations, 123 questionnaires (41%) was a reasonably desirable rate of return and could be used for the completion of the study. The obtained data were stored, transformed, and analyzed utilizing the <u>Statistical Package for the Social Sciences (SPSS)</u>

program.

This particular study tested eleven research hypotheses (for details of eleven hypotheses see Purpose of the Study, pp. 57-59). The t-test and Pearson Product-Moment Correlation (see Appendix B) were employed as two useful techniques for testing the research hypotheses. The Pearson Product-Moment Correlation was employed to test the hypotheses number # 1, # 2, # 3, # 4, and # 5. The t-test was employed to test hypotheses number # 6, # 7, # 8, # 9, # 10, and # 11. The independent variables for this study were the 35 influential (motivational) factors (for details of the 35 factors see Questionnaire in Appendix E). The degree of importance of factors on Iranian engineers' migration decision making on whether to stay or return to Iran was determined by calculating the arithmetic mean of the 35 motivational factors. Type-one error and the .05 level of significance were used to reject the null hypotheses (for definitions see Appendix B).

When the eleven null hypotheses were tested, only one null hypothesis was rejected, compared to ten null hypotheses not rejected (see Table 86). The rejected hypothesis was hypothesis number three which stated that:

> H_0: There is no significant correlation between the duration of time an engineer has lived in the United States and the degree of importance of the 35 factors in the migration decision.

Table 86

<u>The Results of the Research Hypotheses: The Correlations and Comparison of Importance of the Arithmetic Mean of the 35 Factors and Independent Variables (Hypotheses One through Eleven)</u>

Hypothesis	Correlation (r)	Level of Significance (P)	Results
1. (Engineers' age)	r = - .0624	P = .246	N
2. (Children's age)	r = - .1330	P = .204	N
3. (Duration of Time Living in the United State)	r = .1503	P = .049	S
4. (Government Contacts)	r = .2944	P = .118	N
5. (Level of Income)	r = .1277	P = .081	N

Hypothesis	t - Value	Level of Significance	Results
6. (Citizenship)	t = .31	P = .754	N
7. (Male and Female)	t = .43	P = .666	N
8. (Married to Iranians or Non-Iranians)	t = .12	P = .909	N
9. (Married and Single)	t = - 1.41	P = .161	N
10. (Spouse's Education)	t = .51	P = .614	N
11. (Desire to Stay in the USA or Return To Iran)	t = -1.00	P = .320	N

The findings for the hypothesis # 3 was a positive significant correlation (r = .1503, P = .049) between the duration of time an engineer has lived in the United States and the degree of importance of the 35 motivational factors. Many Iranians who are now engineers in the United States, immigrated before the Iranian revolution of 1978-79. Out of a total of 123 engineers in the current study, more than 100 indicated that they came before the revolution of 1978-79. This means that many engineers have been living in the United States more than 13 years.

When the correlations (hypotheses one through five) of the degree of importance of the seven groups of factors (for details of the groups of factors see Questionnaire in Appendix E) were tested, the significant correlations were found between **"engineers' age" (hypothesis** 1) and "Group 3" - social setting (P = .001), and "Group 6" - barriers to return to Iran, between **"duration of time an engineer has lived in the United States" (hypothesis** 3) and "Group 2" - professional needs (P = .049), "Group 3" - social setting (P = .010), "Group 6" - barriers to return to Iran, and "Group 7" - motives to return to Iran, between **"engineer's level of income" (hypothesis** 5) and "Group 1" - working conditions (P = .035), "Group 3" - social setting (P = .001), "Group 4) - politics (P = .001), and "Group 6" - barriers to return to Iran (P = .000) (for details of research hypotheses see Purpose of the Study, pp. 57-59).

When the degree of importance of the seven groups of factors were tested (hypothesis six through eleven), significant differences were found (hypothesis 6) between the Iranian engineers with American citizenship and those with Iranian citizenship in "Group 1"- working conditions (P = .002), "Group 3" - social setting (P = .002), "Group 4" - politics (P = .001), and "Group 7" - motives to return to Iran (P = .000), between male and female (hypothesis 7) in "Group 7" - motives to return to Iran (P = .041), between married and single (hypothesis 9) in "Group 2" - professional needs (P = .025), "Group 3" - social setting (P = .000), and "Group 6" - barriers to return to Iran.

The National Science Foundation (1973), and Glaser (1978) found that Iranian engineers tend to stay in the United States to obtain a higher standard of living, and to improve opportunities for their children. This study found the similar results and supports the above findings.

In this study, it was found that some of the reasons for engineers' staying in the United States were related to groups of factors such as working conditions in the United States, their professional needs, the social setting, and politics. When individual factors were tested, significance differences were found between two groups of Iranian engineers. The groups were Iranian engineers with Iranian citizenship (group 1) and Iranian engineers with Iranian citizenship (group 2). The motivational factors which influenced Iranian engineers with American citizenship (group 1) to migrate were found in "Factor 1" - potential income and living standard in the

United States, "Factor 4" - living standards and satisfactory housing, "Factor 11" - culture & character of people in the U.S.A, "Factor 13" - spouse's feeling, "Factor 17" - politics, "Factor 24" - family influence, and "Factor 27" - finding a suitable job in Iran (barrier to return). Engineers with Iranian citizenship (group 2) indicated that they are willing to return to Iran. The motivational factors which influenced their decision were found in "Factor 31" - family ties (P = .007), "Factor 33" -commitment to the country's progress (P = .001), and "Factor 35" - social life in Iran (P = .010).

This study found significant differences between Iranian male engineers (group 1) and Iranian female engineers (group 2) in "Factor 2" - suitable job opportunities (P = .003), "Factor 12" - family obligations, "Factor 24" - family influence (P = .018), "Factor 25" - readjusting to the tempo & style of life in Iran (barrier to return to Iran) (P = .050), "Factor 28" - not being able to use skills and knowledge acquired abroad (barrier to return to Iran)) (P = .025), and "Factor 32" - patriotism (motive to return to Iran) (P = .042).

In this study, no significant difference (t = .12, P = .909) was found between engineers married to Iranians (group 1) and those married to non-Iranians in regard to the degree of importance of 35 factors on their migration decision.

When two groups of engineers (married and single) were compared, significant differences were found between the two groups in "Factor 7" - library facilities (P = .036), and

"Factor 9" - professional challenge (P = .044).

There were two groups of married engineers in this study. The first group was engineers whose spouses had a high school diploma, and the second group was those engineers whose spouses had a college degree or higher education. When two groups were compared, significant differences were found between the two groups in "Factor 1" potential income and living standards (P = .029), "Factor 17" - stability (P = .040), "Factor 18" - freedom (P = .025), and "Factor 26" - readjustment for spouse and/or children (P = .014).

This study found significant differences between two groups of Iranian engineers in the degree of importance of the 35 motivational factors on their migration decision or decision to return to Iran. The two groups were engineers who desired to stay in the United States (group 1) and those desired to return to Iran (group 2). The significant differences were found between the two groups in "Factor 8" - skilled assistance in my specialty (P = .022), "Factor 31" - family ties (P = .025), "Factor 32" - patriotism (P = .012), "Factor 33" - commitment to the country's progress (P = .000), and "Factor 34" - cultural values in Iran (P = .000).

CONCLUSIONS

The migration phenomenon is as old as science and recorded history. The most important types of migration in the past were identified as ancient and barbaric invasion, conquest, colonization, and the most recent and modern type of migration was immigration. Immigration is mainly a phenomenon of the nineteenth and twentieth centuries. It differs from other form of migration and is essentially a voluntary movement on the initiative of the individual.

Although many countries such as Canada, Australia, and South Africa admitted immigrants worldwide, the history of immigration into the United States and its commitment is beyond comparison and is a matter of the greatest interest for study. For more than a century, the United States played a significant role in admitting million of immigrants. A report by the U.S. Department of Commerce, Bureau of the Census (1992) estimated the total population of the United States (including the Armed Forces overseas) as approximately 255,414,000 on July 1, 1992. Out of this figure, more than one-fifth, nearly 57 million, were identified by the U.S. Immigration as immigrants who have come to the United States since 1820.

The history of immigration into the United States of America can be divided in five periods, i.e., colonial period, free immigration, agitation and state regulation, federal control, and finally the twentieth century immigration

(Fairchild, 1925). Throughout these five periods, many important pieces of federal legislation were developed in the area of immigration and naturalization in the United States. Each piece of legislation had its own purposes and importance. For example, the Act of 1875 excluded criminals and prostitutes from entry into the United States, or the Act of 1924 which was established to accomplish two purposes: (1) to reduce the number of immigrants for all countries except the designated countries in the Western hemisphere, and (2) to select immigrants by nationality by providing a fixed number of each nationality. The passage of different Acts and the repeatedly modified immigration laws have directly contributed to attracting high-level foreign professionals, especially engineers, into the United States. The elimination of nationality and the national origin quota system and its replacement with the Immigration Act of 1965, created a preference system which opened a new chapter in the history of immigration into the United states. In this Act, preference was given to those immigrants who were coming to the United States as workers who had skills which were needed in the United States. This preference system led to an increase in both magnitude and proportion of professionals and a migration of engineers to the United States. Although throughout the early centuries of immigration to the United States thousands of professionals (including engineers) migrated there, immigration of engineers into the United States increased significantly after the development of the Act of 1965 and well-known "third preferential quota."

Reports by the National Science Foundation and the U.S. Immigration indicate that at the present time more than a million professional foreign born or foreign trained scientists and engineers are employed and engaged in the American economy. In the moderate growth projected for the future, the employment of engineers (American and foreigners) is expected to increase from 1.5 million in 1990 to 1.9 million in 2005. Despite the increased number of immigrant engineers, a study by the National Science Foundation indicated that there will be a shortage of 275,000 engineers in the United States by the year 2006.

The contribution of the foreign engineers and scientists with doctoral degrees in the United States is also very significant. A report by the National Science Foundation (1986) indicated that more than 110,000 non-U.S. citizens were awarded science and engineering doctoral degrees between 1960 and 1985. More than 40,000 foreign citizens who received science and engineering doctoral degrees were reported to be from the countries located in East Asia and West Asia. According to the same report, in 1985, most foreign doctoral recipients (93% of engineering doctorates) on permanent visas reported that they plan to stay in the United States (National Science Foundation, 1986).

The review of the literature (National Academy of Sciences, 1988) indicated that the foreign high-level professionals, specifically engineers, have provided a transfusion of talent in the history of the United States. A large proportion of these enterprising individuals remain in the United States and are becoming an increasingly important component of the U.S. engineering work force. It must be mentioned that the absence of these professional would create many obstacles in the U.S. economy, especially in the area of academe. The increasing dependence on talent from other countries in academe is indicated by the fact that the proportion of foreign assistant professors of engineering, age 35 years or younger has increased from 10 percent in 1972 to over 50 percent during the period of 1983-1985 (National Academy of Science, 1988). The proportion of foreign professors will increase due to the early retirement option. A survey of faculty demand by the American Council on Education (1988) found that 23 percent of all institutions reported shortages in engineering. American schools would have difficulty functioning effectively without the participation of these gifted individuals. American schools would be unable to provide the educational and research programs that are currently supported. The role of these engineers is especially significant in some industrial research and development (R & D), particularly in critical fields such as nonlinear optics and the associated manifold applications of laser technologies.

All available evidence and labor demand predictions suggest that the migration of engineers to the United States will continue due to the future labor shortage. Therefore, as before, the immigration laws and regulation in the United States will be set up to persuade, select and accept these urgently needed high-level professionals, specifically the engineers and scientists. The United States, a greater economic and political power, will expand its demand for new types of skills and that will set up a demand for the high-level human resources from the developing and underdeveloped countries.

The problem of brain drain and the recruitment of high-level engineers and other professionals by the United states has been criticized by various international groups, individuals, and developing countries. Many international organizations have attempted to stop brain drain in the past. For example, international organizations such as the United Nations (UN), the United Nations Educational, Scientific, and Cultural Organization (UNESCO), the Organization for Economic Cooperation and Development (OECD), the United Nations Institute for Training and Development (UNITAR) have tried to deal with the brain drain issue. They have conducted various surveys and have gathered the needed information. The data were analyzed and no practical solutions have been determined. The issue of brain drain can not be seen as an isolated phenomenon. It is an inherent issue of the world wide capitalism system. It is a gap between developed and underdeveloped countries. As long as there is an unequal power in terms of economics and politics, the problem of brain drain will exist.

It would be very simplistic and unrealistic to require the super powers to stop brain drain. Some scholars who see themselves as experts on the brain drain issue propose the use of "force" or "appropriate force" on advanced industrialized countries for ending the problem of brain drain. There have been other proposals which would put restrictions on the freedom of individuals to move across national boundaries.

The former Soviet Union, as well as other eastern block countries, has attempted to prohibit scientists and high-level professionals from leaving the country. The results of this approach have been negative and useless. Damaging human freedom, ignoring human dignity, and use of force are some examples of the international migration restriction approaches. For many years the restrictions on emigration from the Soviet Union resulted in keeping the high-level professionals in "prison." A huge number of engineers and scientists were kept in captivity by the government. The engineers and other professionals were sometimes unable to find jobs related to their careers that paid salaries sufficient to support them. According to an unpublished report (Fall, 1992) entitled "America is not that bad: Reflection after visiting Russia and Czechoslovakia" by Dr. John Sikula, Dean of the College of Education at California State University, Long Beach, many individuals in Russia left "...medical and engineering careers to work in tourism in order to earn an adequate wage." The collapse of the Soviet system was partly due to violations of human rights and other factors. Many engineers and scientists left the country partly because of the inadequate job opportunities and partly because of the lack of human freedom and free movement. The Soviet's crumbling economy, and the lack of the financial support for scientists provided an excellent opportunity for American Universities to recruit brilliant Russian scientists and mathematicians. Michigan State University, Pennsylvania State University, Princeton, Rutgers, Yale University, and the Massachusetts Institute of Technology, just to name a few, have all attracted Russian scientists to their faculties.

The general question that might be raised here is, what would be the best solution for solving the brain drain problem? The answer to this question is that the problem of brain drain can be minimized to a certain extent if the underdeveloped countries start to close the gap between underdevelopment and development and gain economic power. Although closing the gap might be the ultimate goal of underdeveloped countries, the struggle against brain drain and the effort to minimize the problem need not be put off until these countries have reached the level of today's industrialized nations. The underdeveloped and developing countries need to form a "united front" and consult with international organizations to minimize the problem of brain drain. Despite their poor record of achievements, the international organizations are the appropriate channels to provide some solution concerning the problem of brain drain.

The shortage of professionals and the brain drain problem takes on an added dimension in the case of Iran. Unfortunately, Iran has been beset with problems and a huge number of unsatisfied demands. The war with Iraq cost Iran billions of dollars. The broad range of damages, including human damages and economic damages, have been particularly devastating for Iranian production. The human damage included the lives of millions of people who were killed or disabled. The human damage, unfortunately, occurred among the most productive young Iranians (Amirahmadi, 1988). In addition to human loss and damages, thousands of factories and industries became inefficient and stopped production because of damages and the lack of spare parts. At the present time, many factories are not operating at their highest level of capacity due to the shortage of raw materials, electricity and parts for machinery, shortage of trained managers, skilled personnel, and poor labor relations.

Critical shortages in Iran have especially been felt in activities where engineers are needed. Thousands of professionals, including engineers, migrated to advanced developed countries such as the United States in the past several years. The loss of high-level professionals--the so-called "brain-drain"--became a serious problem. Some Iranian leaders have realized the importance of technical human resources in the country's infrastructure. The Mayor of the city of Tehran, Gholam Hussein Karbaschi, for example, indicated (Iran Business Monitor, 1993, p. 10) that "The lack of....skilled human resources delays the country's development." Karbaschi emphasized that "The technical resources and skills of Iranians living all over the world, especially in the United States, should pour inside our country." He urged the government to make a policy to attract Iranian professionals living abroad.

How to attract or reduce the migration of high-level "brains", must take into consideration the motivational factors for which engineers are admitted to developed countries including the United States. Throughout this study the importance of motivational factors on migration decision has been emphasized. In this study, it was found that motivation can be seen as the mover of behavior. It was found that motivation is an interesting subject because it lies behind everything a person does, and a frustrating subject because the motive can not be seen. Psychologists are not the only ones who have wrestled with the problem of motivation. Biologists, philosophers, theologians, statesmen, and almost all thoughtful people have also been challenged with theories of motivation and human behavior. In this study, it was also found that many psychologists, anthropologists, and scholars link human motivation with culture. Anthropologists, for an example, argue that the behavior of any individual can be understood only in relation to the dominant motives of his/her particular culture. Personality has been given importance as it relates to motivation. Psychologists, for example, believe that motivation, behavior, and personality are interrelated. Career theorists have also emphasized personality. Holland

(1973), for example, indicated that individuals are attracted to a given career by their particular personalities, and Ann Roe (Zunker, 1990), asserted that occupational choice is the result of personality.

In this study, it is concluded that there is a large pool of high-level Iranian engineers living in the United States, specifically in Southern California (see Chapter II, Review of the Literature). It was also concluded that Iranian engineers who are currently residing in southern California have their own personal characteristics such as age. In this study, it was found that Iranians leave the country when they are young. The lack of educational opportunities in Iran push young Iranian males and females come to the United states of America to study, and after finishing their academic study, they intend to stay and not to return. The following comment which was made by an engineer in open-form questionnaire was used to show the importance of education as one of the influential factors on engineer's migration decision:

> "I was looking to get more education in Iran but I did not have the chance."

In this study, it was found a significant correlation ($r = .1503$, $P = .049$) between the duration of time an engineer has lived in the United States and the degree of importance of the 35 motivational factors. This implied that the longer an engineer has lived in the United States, the more important and influential have become some of the factors on his/her migration decision and the likelihood of his/her return is reduced.

In this study, it was concluded that some of the reasons for engineers' staying in the United states were related to groups of factors such as working conditions in the United states, professional needs, the social setting, and politics. Specifically, potential income and living standard in the united states, satisfactory housing in the United States, culture and character of people in the United States, spouse's feeling, politics, and family influence were considered to be important among those engineers who indicated that they would not desire to return to Iran. In regard to living atmosphere, and character of American people, the following comments have been made by those engineers who were indicated that they desired to stay in the United States:

> "It is not the job that keeps me in the U.S.A, it is the living atmosphere."
> "The openness and friendliness of Americans toward foreigners makes living in the U.S.A very attractive to us [Iranians']."

Family ties, participating in the country's development process and progress, Iranian cultural values, patriotism, and the social life in Iran were the most significant and influential factors among those Iranian engineers who indicated their willingness to return to Iran.

In this study, it was concluded that the male engineers had more desire to return to Iran than did the female engineers. The suitable job opportunities in the United States, family obligations, family influence, readjusting to the tempo and style of life in Iran (barrier to return), not being able to use skills and knowledge acquired abroad, were more important to Iranian females than Iranian males.

The difference between the Iranian male engineers and female engineers implied that the Iranian females feel more secure in the United States than in the country of Iran. They find themselves viewed as equals and as individuals who can utilize their skills without any restriction, even with some respect. They get acquainted with the environment and appear to become more acculturated than the Iranian males.

In this study, it was found significant differences in groups of factors between the Iranian single engineers and the Iranian married engineers. The groups of factors such as social setting in the United States, and the barriers to return to Iran were more important to the Iranian married engineers than the Iranian single engineers. This implied that the Iranian married engineers feel more responsible because they have family obligations. Therefore, the married engineers look for an environment such as the United States which seems more likely to support the family's prosperity. The following comment provide insight into the reasons such as freedom and children's education that some engineers are still in the United States:

> "There is no freedom for my children's education in Iran. At the present time, it is very tough for the Iranian people to get education or go to the university. Why should I create problems for my children."

In this study, the importance of motivational factors on engineers' migration decision was emphasized. It was concluded that the implementation of national policy on brain drain needs to address the reasons that the high-level professionals migrate. It was also concluded that Iran's development and modernization dependent on highly qualified engineers and other professionals.

In this study, it was concluded that the engineers may be viewed as a part of the "Wealth of a Nation." The development and proper utilization of these talented professionals is the key for a country's economic growth. Without highly skilled professionals, especially engineers who combine natural leadership qualities with skills and values conferred by education, human resources can never become an effective prime mover in modernization.

The loss of highly skilled engineers who are well educated and trained in a dynamic professional and technical environment abroad, both in the short run or the long run, will limit Iran's national and economic progress. In the past, the import of technical human resources helped run the factories, however, this policy has proved not to be a long-term remedy to the bottleneck of the shortage of the human resources supply. The extensive migration of Iranian engineers during the last several years calls for a national policy on brain drain.

RECOMMENDATIONS

The Iranian Presidential election for 1994-98 is underway. In addition to Ali Akbar Hashemi Rafsanjani, three other candidates have been named and added in the presidential election race. The reelection of Rafsanjani as president for four more years has been projected by some observers and political analysts. Unlike some leaders who have been opposed to adopting new technology and to making a closer relationship with the West, especially the United States, Rafsajani's approach has been moderate in this regard since his election. With his new administration, Rafsanjani's efforts have been toward the strengthening of Iran's infrastructure and a return to a market-driven economy and modernization.

The modernization and economic development is an imperative for developing countries such as Iran, regardless of their type of government and characters of their leaders. Modernization and technological innovation is not the monopoly of east or west; technology and modernization is neutral. The output of modernization is enormous, regardless of where it applies, in capitalist societies, or in non-capitalist societies.

Successful strategies for development in Iran mean a strong push toward expansion of output in industrial and manufacturing sectors. This requires adopting new and sophisticated foreign technology such as robotics, machine vision, computer integrated manufacturing, computer aided design, computer aided manufacturing, computer aided engineering, laser technology, biotechnology, microelectronics and some other sophisticated technologies. The adoption of new technology depends heavily upon highly trained Iranian professionals, especially engineers. Because of the shortage of engineers in Iran, the government should turn its attention to its own engineers living abroad, especially in the United States. As this study concluded, there is a huge pool of Iranian engineers living in the United states. Some of these engineers have strong technical knowledge with extensive training and working experience. There are engineers at the PhD level with outstanding research capabilities. Most of these engineers acquired their U.S. permanent residency (green card) through their competency and technical skills. Return of these high-level "brains," to Iran is the key to accomplishing development and to move forward the industrialization plans.

As a result of the literature review, this study found numerous publications which have proposed ways and methods for decreasing the problem of brain drain. Although some of these proposals contained valuable ideas, they are limited in scope, and concentrate only on general solutions. Therefore, the following specific recommendations are designed to reduce or modify the brain drain of engineers from Iran. The recommendations are based on some assumptions such as: (1) the new government's policy would be the adoption of new technology and moving toward modernization, (2) the new government would value its human resources, especially engineers, as prime mover of development (3) the new government would work toward the elimination of some barriers which prevent the engineers not to return.

<u>Recommendation 1</u>.

Temporary Appointments

There are engineers who have considerable work experience with significant achievements in their professions who are undecided about whether to stay in the United States permanently. These engineers are motivated or influenced by factors such as family ties, cultural values and patriotism. Therefore, temporary teaching or research assignments (one-year) would allow engineers to have the opportunity to make a decision about their stay in the country. The temporary appointments would encourage the return of highly trained engineers who desire to get involved with the country's infrastructure. A reasonable compensation such as round trip air tickets, allowances for house rentals, and competitive salaries, would have an impact on their decision to stay.

<u>Recommendation 2</u>.

Housing Facilities

In this study, it was found that one of the major obstacle for those who think of returning is lack of affordable housing in Iran. It would be wise if each major university with a large student body construct its own housing

facilities. The engineers who return to engage in teaching or research activities could be provided with free or inexpensive university housing. This would attract those engineers who are afraid to return because of the expensive and unaffordable housing. The government and private sectors could also put forth a joint effort to give financial assistance to those who would like to purchase a house or apartment.

Recommendation 3.

High Quality Bilingual (English-Persian) Elementary and Secondary Schools

In this study, it was found that the Iranian married engineers feel more responsible because they have family obligations. Among many factors, children's education and their freedom were found to be the most important factors which influenced their decision to stay in the United States. Some engineers indicated that they would desire to return to Iran, but they have children who can barely read and write Persian. This makes it very difficult for them to return. Although there are some bilingual schools which have currently been operating in Iran, the numbers are not sufficient and the tuition is very expensive. To facilitate or ease the problem, the development of high quality and inexpensive bilingual elementary and secondary schools should be very encouraged.

Recommendation 4.

Expansion of Library Facilities

Among the motivational factors, library facilities were identified to be especially important to those Iranian engineers with doctoral degrees who are engaged in some type of research in the American universities or other institutions. Although reaching the level of American university libraries in terms of their facilities, volume of books, level of expenditures, is the supreme interest of developing countries such as Iran, the efforts toward the expansion need not be stopped. It is in the best interest of the Iranian government for them to pay more attention to research activities and the expansion of the library facilities.

The major Iranian university libraries should subscribe to important scientific engineering journals and magazines, and substantial investments should be made in purchasing new engineering books, the latest computer technology, major scientific computer software, and other needed materials. As an example, the libraries could be linked to European Association of Research Networks (EARN) through electronic mail (E-Mail).

REFLECTIONS

The following recommendations might not be directly related to the study but they might be prove to be important or helpful to the policy makers.

<u>Recommendation 1</u>.

The Network of Iranian Repatriated Engineers (NIRE, (U.S.A)

All Iranian engineers could be organized in an organization called the "NIRE (U.S.A)" which stands for The Network of Iranian Repatriated Engineers in the United States. This organization would be supported by the Iranian government as a non-profit organization with no political or religious affiliation. There would be several objectives of the "NIRE (U.S.A)" such as: (1) to organize and recognize all Iranian repatriated engineers currently living in the United States as resources for future shortage of engineers in Iran, (2) to develop networking activities among engineers, (3) to upgrade engineers' scientific knowledge through a monthly or quarterly engineering journal or magazine (general engineering subjects), (4) to promote research activities and publications among engineers, (5) to conduct seminars, and conferences throughout the United States, (6) to promote public relations and communication, and (7) to act as liaison between the Iranian government and engineers. The "NIRE (U.S.A)" like any other professional organization will have its own president and board of directors who can be elected annually through a free election by its members. There would be a reasonable membership fee to compensate for some the organizational expenses. Membership would be open to all engineers who hold a bachelor's degree or higher from an accredited institution. All member information such as degree, year of the degree, specialization, level of training, number of years of experience would be compiled and stored in a computer data base. The NIRE would have many chapters throughout the United States. Each state would have its own chapter located in a major city.

This organization can also partially be supported by some non-profit organization or foundations in the United States.

<u>Recommendation 2</u>.

Consulting Opportunities

The role of the government should be to recruit American-trained Iranian engineers as university professors and consultants. These talented individuals could play a significant role and make great contributions in improving the Iranian universities with their engineering programs. The consulting opportunities could have an impact on their decision making to return to Iran.

<u>Recommendation 3</u>.

Travel Allowances, Moving Expenses

The government could help engineers with their moving expenses through a contract with Iranian moving companies in the United States. The moving companies could facilitate the moving process and provide excellent services to engineers. Air travel allowances should also be provided to the returning engineers.

<u>Recommendation 4</u>.

Salary Adjustment

It is obvious that high-level engineers are always in demand on the international market. Due to the high skill, engineers could easily sell in any market. Despite this fact, there are engineers who would be willing to return and commit themselves to the country's progress and development if some effort were made to arrange their salaries in a way that is comparable to present Iranian living expenses and overall salary structure.

<u>Recommendation 5</u>.

Small Business Administration (SBA)

The government could assist those engineers who wish to establish a small business in Iran. Priority should be given to those small businesses which agree to engage in design or manufacture of a product which is currently needed and can not be found in the country. The government could assist applicants in obtaining loans, production locations and facilities, and the import of machinery if needed. To attract engineers and to encourage the investments, the loan interest rate should be kept to a minimum.

Recommendation 6.

Expansion of Research Centers and Facilities

There has been a belief that Iranian educated professionals such as engineers and scientists are not capable or not strong enough to conduct the domestic research and development (R & D) projects. Iranian researchers have not received recognition and their participation in the country's infrastructure has not been what it should be. This mentality influenced many Iranian leaders to recruit other than Iranian researchers in critical development projects. Many projects have been contracted with foreigners in the past. This approach caused many problems and brought disappointment among the Iranian professionals.

The government should take an innovative, revolutionary approach by inviting and empowering repatriate engineers who have doctoral degrees, research experience (at least two years), and are capable, to establish a research and development center in Iran. The repatriate engineers could be seen as agents of international technology transfer who will upgrade Iran's science and technology.

The government should encourage and allow the participation of private sectors in research and development. The role of private sectors should be to recruit American-trained Iranian scientists and engineers to conduct research and develop technologies such as telecommunication, computer, biotechnology and any other technologies. The researcher should be given key leadership positions with optimum research autonomy. Their research efforts and efficiency would be dependent on a full government support. This means that they should be provided with a laboratory, research facilities, and support staff. To increase the status of the returnees, they should be provided with an excellent package of compensations which may include good salary, moving expenses, free housing, subsidized educational costs for children, free tax on exported car, subsidies for local automobile and any other benefits.

Recommendation 7.

Sabbatical Leave System (SLS)

A Sabbatical Leave System (SLS) could be developed and introduced to returnees. The SLS allow researchers to take a one-year leave for every four years of continuous commitments. The researchers could take a one-year off to go to the United States which holds world leadership in some areas of engineering sciences. The purpose of the SLS is: (1) to encourage those returnees who desire to gain practical and applied knowledge, (2) the need for people specially trained in science and technology, and (3) the development of a national scientific community.

SUGGESTIONS FOR FURTHER RESEARCH

The absence of specific study about the causes of the migration of the Iranian high-level engineers into the United States led to this case study to investigate the problem. This study limited itself to a particular geographical location, Southern California. Time limitation and the scope of the study did not allow the researcher to investigate many related issues and subjects, some of which are presented in this section.

1. Further research on the causes of migration of Iranian engineers into the United States, specifically the migration of engineers after the Iranian revolution of 1978-79 without any geographical location could produce useful results for the policy makers of developing countries such as Iran.

2. All evidence and governmental reports indicate that the United States has been the magnet of pulling foreign engineers and scientists compared to other industrialized developed countries. The investigation of the important role of the United States and the reasons for its attractiveness for foreign engineers, specifically Iranian engineers, would be an interesting research area for those interested in immigration.

3. In this study, a group of engineers was found who indicated that they desire to return to Iran. An in-depth-interview with a number of engineers about their reasons and motivations to return could produce valuable results.

4. In this study, it was also found a group of engineers who indicated that they are undecided and are not sure whether they would stay in the United States permanently or return to Iran. Further research on factors which would influence them to make their final decision about whether to return or stay could be an interesting topic of investigation. Designing specific questionnaires different from questionnaires on motivational factors used in this study for this particular population is highly recommended.

APPENDIX A

Tables

Table 1

Correlations (r) Between the Engineers' Age and the 35 Factors

Factor	Correlation (r)	Level of Significance (P)	Results
1. Potential Income	r = .3190	P = .052	N*
2. Suitable Job...	r = .0268	P = .447	N
3. Chance to Gain...	r = -.0022	P = .496	N
4. Living Standards..	r = .1297	P = .260	N
5. Favoritism...	r = .0030	P = .494	N
6. Continued Engineering...	r = -.3346	P = .044	S**
7. Library Facilities	r = -.0680	P = .368	N
8. Skilled Assistance...	r = -.2414	P = .113	N
9. Professional Challenge	r = -.1692	P = .199	N
10. Colleagues's Influence	r = .1101	P = .292	N
11. Culture & Character...	r = .0676	P = .369	N
12. Family Obligations	r = -.0747	P = .356	N
13. Spouse's Feelings	r = -.2309	P = .123	N
14. Children's Education	r = .0948	P = .319	N

Table 1 (cont'd)

Factor	Correlation (r)	Level of Significance (P)	Results
15.Effect of Recent Trip...	r = .1539	P = .222	N
16.Opportu- nity for Leisure	r = -.0386	P = .424	N
17.Politics	r = .1020	P = .306	N
18.Freedom	r = .0464	P = .409	N
19.Trust In Establishment	r = -.2311	P = .123	N
20.Avail- ability of Scholarship	r = -.0899	P = .328	N
21.Unique Training	r = -.1729	P = .194	N
22.Willing- ness to Immigrate	r = .0947	P = .319	N
23.Prestige of Foreign Education	r = .1277	P = .263	N
24.Family Influence	r = .0270	P = .447	N
25.Readjust- ing to Tempo...	r = .0276	P = .446	N
26.Readjust- ment For Spouse...	r = -.0721	P = .360	N
27.Finding A Suitable Job	r = -.0484	P = .405	N
28.Not Being Able to...	r = -.2761	P = .082	N
29.Re-Estab- lish. Friendships	r = -.0076	P = .485	N

Table 1 (cont'd)

Factor	Correlation (r)	Level of Significance (P)	Results
30.Re-Establishing Business	r = .2735	P = .084	N
31.Family Ties	r = -.3635	P = .031	S
32.Patriotism	r = -.0613	P = .381	N
33.Commitment to the Country...	r = -.2348	P = .119	N
34.Cultural Values	r = -.1733	P = .194	N
35.Social Life	r = -.1095	P = .293	N

* N = No significant
** S = Significant

Table 2

Correlations (r) Between the Engineers' Children's Ages and the 35 Factors (age = 1 year to 10 years)

Factor	Correlation (r)	Level of Significance (P)	Results
1. Potent- ial Income	r = .3098	P = .121	N
2. Suitable Job	r = -.0151	P = .478	N
3. Chance to Gain	r = -.0449	P = .434	N
4. Living Standards..	r = .3372	P = .101	N
5. Favorit- ism...	r = .0321	P = .453	N
6. Continu- ed Engineering...	r = -.4521	P = .039	S
7. Library Facilities	r = -.2806	P = .146	N
8. Skilled Assistance...	r = -.4428	P = .043	S
9. Profess- ional Challenge	r = -.5851	P = .009	S
10. Colleag- ues's Influence	r = -.1208	P = .328	N
11. Culture & Character...	r = .0539	P = .421	N
12. Family Obligations	r = -.0930	P = .366	N
13. Spouse's Feelings	r = -.0889	P = .372	N
14. Children 's Education	r = .2081	P = .220	N

Table 2 (cont'd)

Factor	Correlation (r)	Level of Significance (P)	Results
15.Effect of Recent Trip...	r = .6465	P = .003	S
16.Opportu-nity for Leisure	r = .1886	P = .242	N
17.Politics	r = .3334	P = .103	N
18.Freedom	r = .7680	P = .000	S
19.Trust In Establishment	r = .1009	P = .355	N
20.Avail-ability of Scholarship	r = -.2092	P = .218	N
21.Unique Training	r = -.6173	P = .005	S
22.Willing-ness to Immigrate	r = .4976	P = .025	S
23.Prestige of Foreign Education	r = .0017	P = .497	N
24.Family Influence	r = .1923	P = .238	N
25.Readjust ing to Tempo...	r = .1742	P = .259	N
26.Readjust-ment For Spouse...	r = .3765	P = .075	N
27.Finding A Suitable Job	r = .1265	P = .320	N
28.Not Being Able to...	r = .0680	P = .401	N
29.Re-Estab-lish. Friendships	r = .0566	P = .418	N

Table 2 (cont'd)

Factor	Correlation (r)	Level of Significance (P)	Results
30. Re-Establishing Business	r = .2833	P = .144	N
31. Family Ties	r = -.4578	P = .037	S
32. Patriotism	r = .1003	P = .356	N
33. Commitment to the Country...	r = .1191	P = .330	N
34. Cultural Values	r = .0933	P = .365	N
35. Social Life	r = -.3064	P = .124	N

Table 3

Correlations (r) Between the Engineers' Children's Ages and the 35 Factors (age = 11 years & up)

Factor	Correlation (r)	Level of Significance (P)	Results
1. Potenial Income	r = -.0341	P = .468	N
2. Suitable Job...	r = -.2895	P = .243	N
3. Chance to Gain...	r = -.5101	P = .098	N
4. Living Standards...	r = .1206	P = .388	N
5. Favoritism...	r = -.3235	P = .217	N
6. Continued Engineering...	r = -.5709	P = .070	N
7. Library Facilities	r = -.5188	P = .094	N
8. Skilled Assistance	r = -.6667	P = .035	S
9. Professional Challenge	r = -.0000	P = .500	N
10. Colleagues's Influence	r = -.2605	P = .267	N
11. Culture & Character	r = .1383	P = .372	N
12. Family Obligations	r = .0288	P = .473	N
13. Spouse's Feelings	r = -.2426	P = .281	N
14. Children's Education	r = .3835	P = .174	N

Table 3 (cont'd)

Factor	Correlation (r)	Level of Significance (P)	Results
15. Effect of Recent Trip...	r = -.3826	P = .175	N
16. Opportunity for Leisure	r = .1804	P = .334	N
17. Politics	r = .0968	P = .410	N
18. Freedom	r = .0654	P = .439	N
19. Trust In Establishment	r = .1289	P = .381	N
20. Availability of Scholarship	r = -.0682	P = .436	N
21. Unique Training	r = -.5283	P = .089	N
22. Willingness to Immigrate	r = .2172	P = .303	N
23. Prestige of Foreign Education	r = .0311	P = .471	N
24. Family Influence	r = -.6867	P = .030	S
25. Readjusting to Tempo...	r = -.7510	P = .016	S
26. Readjustment For Spouse...	r = .2059	P = .312	N
27. Finding A Suitable Job	r = .3175	P = .222	N
28. Not Being Able to...	r = -.7121	P = .024	S
29. Re-Establish. Friendships	r = -.3789	P = .177	N

Table 3 (cont'd)

Factor	Correlation (r)	Level of Significance (P)	Results
30. Re-Establishing Business	r = .2360	P = .287	N
31. Family Ties	r = -.4838	P = .112	N
32. Patriotism	r = -.5232	P = .092	N
33. Commitment to the Country...	r = -.2616	P = .266	N
34. Cultural Values	r = -.0233	P = .478	N
35. Social Life	r = -.3316	P = .211	N

Table 4

Correlations (r) Between the Number of the Government Contacts and the Degree of Importance of the 35 Factors on the Engineers' Migration Decision

Factor	Correlation (r)	Level of Significance (P)	Results
1. Potential Income	r = .3333	P = .210	N
2. Suitable Job...	r = .6124	P = .053	N
3. Chance to Gain...	r = .3111	P = .227	N
4. Living Standards...	r = -.2289	P = .293	N
5. Favoritism	r = -.0483	P = .455	N
6. Continued Engineering...	r = -.1949	P = .322	N
7. Library Facilities	r = -.0727	P = .432	N
8. Skilled Assistance...	r = -.3586	P = .192	N
9. Professional Challenge	r = .2056	P = .313	N
10. Colleagues's Influence	r = .3333	P = .210	N
11. Culture & Character...	r = .4402	P = .138	N
12. Family Obligations	r = .1925	P = .324	N
13. Spouse's Feelings	r = .3982	P = .164	N

Table 4 (cont'd)

Factor	Correlation (r)	Level of Significance (P)	Results
14.Children 's Education	r = .0529	P = .450	N
15.Effect of Recent Trip...	r = -.1537	P = .358	N
16.Opportn-nity for Leisure	r = .3333	P = .210	N
17.Politics	r = .0976	P = .409	N
18.Freedom	r = .0842	P = .421	N
19.Trust In Establishment	r = .0000	P = .500	N
20.Avail-ability of Scholarship	r = .8047	P = .008	S
21.Unique Training	r = .1111	P = .397	N
22.Willing ness to Immigrate	r = .1644	P = .349	N
23.Prestige of Foreign Education	r = .0483	P = .455	N
24.Family Influence	r = -.0685	P = .436	N
25.Readjust-ing to Tempo	r = .2740	P = .256	N
26.Readjust-ment For Spouse...	r = -.0650	P = .439	N
27.Finding A Suitable Job	r = .0000	P = .500	N
28.Not Being Able to...	r = -.2182	P = .302	N

Table 4 (cont'd)

Factor	Correlation (r)	Level of Significance (P)	Results
29. Re-Establish. Friendships	r = .0619	P = .442	N
30. Re-Establishing Business	r = -.4472	P = .133	N
31. Family Ties	r = .3482	P = .199	N
32. Patriotism	r = .0000	P = .500	N
33. Commitment to the Country...	r = .4364	P = .140	N
34. Cultural Values	r = .1537	P = .358	N
35. Social Life	r = .4801	P = .114	N

Table 5

Correlations (r) Between the Engineers' Level of Income and the Degree of Importance of the 35 Factors

Factor	Correlation (r)	Level of Significance (P)	Results
1. Potential Income	r = .3884	P = .023	S
2. Suitable Job...	r = .1817	P = .182	N
3. Chance to Gain...	r = .1741	P = .193	N
4. Living Standards	r = .1444	P = .236	N
5. Favoritism...	r = -.0778	P = .350	N
6. Continued Engineering	r = -.1326	P = .255	N
7. Library Facilities	r = -.0664	P = .371	N
8. Skilled Assistance...	r = -.0572	P = .389	N
9. Professional Challenge	r = -.0093	P = .482	N
10. Colleagues's Influence	r = -.0906	P = .326	N
11. Culture & Character...	r = .1990	P = .160	N
12. Family Obligations	r = -.0853	P = .336	N
13. Spouse's Feelings	r = .4234	P = .014	S
14. Children's Education	r = -.0964	P = .316	N

Table 5 (cont'd)

Factor	Correlation (r)	Level of Significance (P)	Results
15.Effect of Recent Trip...	r = .3123	P = .056	N
16.Opportunity for Leisure	r = .3886	P = .023	S
17.Politics	r = .2396	P = .114	N
18.Freedom	r = .1011	P = .308	N
19.Trust In Establishment	r = -.0558	P = .391	N
20.Availability of Scholarship	r = .3026	P = .062	N
21.Unique Training	r = .1037	P = .303	N
22.Willingness to Immigrate	r = -.2628	P = .093	N
23.Prestige of Foreign Education	r = -.0648	P = .374	N
24.Family Influence	r = -.1673	P = .202	N
25.Readjusting to Tempo...	r = -.0718	P = .361	N
26.Readjustment For Spouse	r = .1491	P = .229	N
27.Finding A Suitable Job	r = .2738	P = .083	N
28.Not Being Able to...	r = -.0406	P = .420	N
29.Re-Establish. Friendships	r = .1697	P = .199	N

Table 5 (cont'd)

Factor	Correlation (r)	Level of Significance (P)	Results
30. Re-Establishing Business	r = .4541	P = .009	S
31. Family Ties	r = -.0882	P = .331	N
32. Patriotism	r = .2812	P = .078	N
33. Commitment to the Country...	r = .1036	P = .303	N
34. Cultural Values	r = .0845	P = .338	N
35. Social Life	r = .1435	P = .238	N

Table 6

Comparison of the Degree of Importance of the 35 Factors Between Iranian Male Engineers and Iranian Female Engineers

Factors	Gender N	Mean	SD	t	P	Results
1. Potential Income....	M*107 F**13	3.8318 3.8462	1.086 .899	- .05	.964	N
2. Suitable Job....	106 13	3.3396 4.3846	1.226 .768	-3.00	.003	S
3. Chance To Gain...	108 13	3.1296 3.3846	1.326 1.387	- .65	.516	N
4. Living Standards..	108 13	3.6389 3.9231	1.164 .862	- .85	.396	N
5. Favoritism...	99 11	2.1010 2.1818	1.344 1.601	- .19	.853	N
6. Continued Engineering..	97 11	2.9794 3.3636	1.307 1.362	- .92	.359	N
7. Library Facilities	99 13	3.1616 3.6923	1.226 1.316	-1.45	.149	N
8. Skilled Assistance..	101 13	3.0990 3.1538	1.308 1.345	- .14	.887	N
9. Professional Challenge	99 13	2.1515 2.4615	1.119 1.127	- .94	.350	N
10. Colleagues' Influence	105 13	3.2286 3.3077	1.203 1.316	- .22	.825	N
11. Culture & Character..	104 13	2.6827 2.8462	1.176 1.345	- .46	.643	N
12. Family Obligations	98 11	3.2245 4.0000	1.374 1.000	-2.34	.034	S

Table 6 (cont'd)

Factors		Gender N	Mean	SD	t	P	Results
13.	Spouse's Feelings	78 7	3.5128 3.4286	1.192 1.512	.18	.861	N
14.	Children's Education	72 4	3.7361 4.7500	1.267 .500	-1.59	.117	N
15.	Effect Of Recent Trip..	44 6	2.5682 2.5000	1.301 1.225	.12	.904	N
16.	Opport. For Leisure	105 13	3.1524 3.7692	1.239 1.235	-1.69	.093	N
17.	Politics	106 23	3.6981 4.3913	1.123 .783	-1.84	.086	N
18.	Freedom	106 13	4.0094 4.4615	1.134 .776	-1.87	.077	N
19.	Trust In Establish.	107 12	3.4019 3.8333	1.156 .937	-1.25	.215	N
20.	Availability of Scholar.	66 5	2.8788 2.6000	1.494 1.673	.40	.691	N
21.	Unique Training	92 12	3.5652 3.9167	1.092 .900	-1.07	.289	N
22.	Willingness To Immigrate	69 4	2.5797 2.2500	1.168 .957	.55	.582	N
23.	Prestige Of Foreign..	92 11	2.9022 3.0000	1.110 1.000	- .28	.781	N
24.	Family Influence	93 11	2.5269 3.3636	1.089 1.120	-2.40	.018	S
25.	Readjusting To..Tempo..	105 13	3.2381 3.9231	1.181 1.115	-1.98	.050	S
26.	Readjustment For Spouse..	74 9	3.4595 3.0000	1.357 1.581	.94	.349	N

Table 6 (con'd)

Factors	Gender N	Mean	SD	t	P	Results
27. Finding A Suitable Job	103 13	3.2718 3.8462	1.292 1.281	-1.51	.134	N
28. Not Being Able To...	105 11	2.7238 3.6364	1.334 1.120	-2.52	.025	S
29. Re-Establish. Friendships	103 11	2.5437 3.2727	1.227 1.489	-1.83	.069	N
30. Re-Establish. Business...	102 11	3.0196 3.1818	1.320 1.601	- .38	.705	N
31. Family Ties	106 11	3.5377 3.1818	1.422 1.662	.78	.438	N
32. Patriotism	105 9	3.2476 2.3333	1.284 1.225	2.06	.042	S
33. Commitment to the Country	107 9	3.6636 3.4444	1.266 1.130	.50	.616	N
34. Cultural Values	106 10	3.7925 3.5000	1.255 1.434	.70	.488	N
35. Social Life	105 11	3.3429 3.0000	1.466 1.612	.73	.466	N

* Males
** Females

Table 7

Comparison of the Degree of Importance of the 35 Factors Between Iranian Engineers Married to Iranians and Those Married to Non-Iranians

Factors	N	Mean	SD	t	P	Results
1. Potential	60*	3.9333	1.1133	- .14	.889	N
Income....	6**	4.0000	.894			
2. Suitable	60	3.3500	1.313	- .57	.569	N
Job....	6	3.6667	1.033			
3. Chance To	62	3.1774	1.409	- .54	.588	N
Gain...	6	3.5000	1.049			
4. Living	61	3.6721	1.207	- .65	.521	N
Standards..	6	4.0000	.894			
5. Favoritism..	56	2.0357	1.401	-1.30	.199	N
	6	2.8333	1.722			
6. Continued	56	2.8036	1.341	-1.25	.215	N
Engineering..	6	2.5000	.548			
7. Library	56	2.9464	1.313	- .40	.689	N
Facilities	6	3.1667	.753			
8. Skilled	58	2.9828	1.331	.26	.794	N
Assistance..	6	2.8333	1.329			
9. Professional	56	2.0179	1.053	No Variance		N
Challenge	6	2.0000	.000			
10. Colleagues'	60	3.2333	1.254	1.38	.172	N
Influence	6	2.5000	1.049			
11. Culture &	58	2.5862	1.271	- .15	.880	N
Character..	6	2.6667	.816			
12. Family	60	3.4500	1.358	1.32	.190	N
Obligations	6	2.6667	1.633			

Table 7 (cont'd)

Factors	N	Mean	SD	t	P	Results
13. Spouse's	61	3.6066	1.144	-1.12	.268	N
Feelings	5	4.2000	1.095			
14. Children's	56	3.8571	1.271	- .19	.849	N
Education	3	4.0000	1.000			
15. Effect Of	34	2.4706	1.354	.12	.904	N
Recent Trip..	2	3.0000	.000	No Variance		
16. Opport. For	61	3.1475	1.302	- .09	.931	N
Leisure	5	3.2000	1.095			
17. Politics	60	3.8500	1.147	.72	.476	N
	23	4.3913	.783			
18. Freedom	61	4.0820	1.069	- .19	.853	N
	6	4.1667	.983			
19. Trust In	61	3.4098	1.174	.16	..877	N
Establish.	6	3.3333	.816			
20. Availability	40	2.6250	1.409	- .51	.614	N
of Scholar.	4	3.0000	1.414			
21. Unique	53	3.6038	1.182	.88	.382	N
Training	6	3.1667	.753			
22. Willingness	38	2.5000	1.059	.44	.661	N
To Immigrate	4	2.2500	1.258			
23. Prestige	53	2.8302	1.172	1.02	.312	N
Of Foreign..	6	2.3333	.516			
24. Family	51	2.6667	1.211	.33	.745	N
Influence	6	2.5000	.837			
25. Readjusting	61	3.3607	1.239	1.02	.312	N
To..Tempo..	6	2.8333	.753			
26. Readjustment	61	3.4590	1.373	-1.51	.135	N
For Spouse..	5	4.4000	.548			

Table 7 (con'd)

Factors	N	Mean	SD	t	P	Results
27. Finding A Suitable Job	60	3.2000	1.363	-1.12	.269	N
	6	3.8333	.753			
28. Not Being Able To...	60	2.7500	1.422	.14	.889	N
	6	2.6667	1.033			
29. Re-Establish. Friendships	60	2.4333	1.155	- .48	.636	N
	6	2.6667	1.033			
30. Re-Establish. Business...	59	2.9492	1.382	- .67	.504	N
	6	3.3333	.516			
31. Family Ties	60	3.3500	1.538	- .75	.455	N
	6	3.8333	.983			
32. Patriotism	59	3.1695	1.275	- .91	.364	N
	6	3.6667	1.211			
33. Commitment to the Country	60	3.4833	1.347	-1.53	.132	N
	6	4.3333	.516			
34. Cultural Values	60	3.6833	1.347	-1.17	.248	N
	6	4.3333	.516			
35. Social Life	59	3.2203	1.598	.33	.745	N
	6	3.0000	1.265			

* Married to Iranians
** Married to Non-Iranians

Table 8

Comparison of the Degree of Importance of the 35 Factors Between Single and Married Iranian Engineers

Factors	N	Mean	SD	t	P	Results
1. Potential Income..	54* 67*	3.7778 3.8955	1.040 1.089	- .60	.548	N
2. Suitable Job..	53 67	3.5283 3.4030	1.170 1.268	.56	.579	N
3. Chance To Gain..	54 68	3.1852 3.1176	1.260 1.388	.28	.782	N
4. Living Standards..	55 67	3.6545 3.7015	1.092 1.181	- .23	.822	N
5. Favoritism..	49 62	2.2653 2.0000	1.381 1.343	1.02	.310	N
6. Continued Engineering..	46 63	3.1522 2.8889	1.333 1.309	1.03	.306	N
7. Library Facilities	50 63	3.4800 2.9841	1.216 1.251	2.12	.036	S
8. Skilled Assistance	51 64	3.3137 2.9531	1.273 1.315	1.48	.141	N
9. Professional Challenge	51 62	2.4510 2.0161	1.301 .967	2.04	.044	S
10. Colleagues's Influence	52 67	3.3654 3.1343	1.121 1.266	1.04	.302	N
11. Culture & Character..	52 66	2.8846 2.5909	1.215 1.189	1.32	.190	N
12. Family Obligations	43 67	3.2326 3.3731	1.377 1.358	- .53	.599	N

Table 8 (cont'd)

Factors		N	Mean	SD	t	P	Results
13.	Spouse's Feelings	20 66	3.3500 3.5758	1.309 1.190	- .73	.470	N
14.	Children's Education	18 59	3.6111 3.8644	1.290 1.252	- .75	.458	N
15.	Effect of Recent Trip.	13 37	2.9231 2.4324	1.256 1.281	1.19	.238	N
16.	Opport. For Leisure	53 66	3.4717 3.0455	1.203 1.270	1.86	.065	N
17.	Stability	52 67	3.6923 3.8060	1.076 1.145	- .55	.582	N
18.	Freedom	52 68	4.0769 4.0588	1.100 1.118	.09	.930	N
19.	Trust In Establish.	53 67	3.3962 3.4627	1.149 1.146	- .32	.753	N
20.	Availability Of Scholar..	28 44	3.1429 2.6364	1.604 1.416	1.41	.164	N
21.	Unique Training..	44 61	3.5682 3.5902	1.043 1.146	- .10	.920	N
22.	Willingness To Immigrate	28 45	2.7500 2.4444	1.295 1.056	1.10	.275	N
23.	Prestige Of Foreign..	45 59	3.0000 2.8136	1.000 1.181	.85	.397	N
24.	Family Influence	48 57	2.6042 2.6667	1.125 1.155	- .28	.780	N
25.	Readjusting To..Tempo..	52 67	3.4038 3.2687	1.176 1.213	.61	.542	N
26.	Readjustment For Spouse..	19 65	2.9474 3.5692	1.433 1.346	-1.75	.85	N

Table 8 (cont'd)

Factors	N	Mean	SD	t	P	Results
27. Finding A	53	3.4151	1.232	.62	.536	N
Suitable Job	64	3.2656	1.348			
28. Not Being	51	2.9216	1.294	.65	.516	N
Able To..	66	2.7576	1.393			
29. Re-Establish.	51	2.8431	1.377	1.73	.087	N
Friendships	64	2.4375	1.139			
30. Re-Establish.	51	3.1373	1.371	.67	.505	N
Business..	63	2.9683	1.319			
31. Family Ties	53	3.6604	1.315	1.07	.289	N
	64	3.3750	1.538			
32. Patriotism	50	3.2200	1.314	.32	.748	N
	64	3.1406	1.296			
33. Commitment to	51	3.7647	1.193	.90	.371	N
the Country.	65	3.5538	1.299			
34. Cultural	52	3.8462	1.161	.65	.515	N
Values	65	3.6923	1.345			
35. Social Life	52	3.4615	1.379	.99	.322	N
	64	3.1875	1.552			

* Single
** Married

Table 9

Comparison of the Degree of Importance of the 35 Factors Between the Engineers Whose Spouses Have a College Degree and Those With A High School Diploma

Factors	N	Mean	SD	t	P	Results
1. Potential Income	15*	4.4000	.828	2.27	.029	S
	33**	3.7576	1.062			
2. Suitable Job..	16	3.8125	1.109	1.67	.101	N
	32	3.2188	1.184			
3. Chance To Gain..	16	3.3750	1.147	.70	.485	N
	33	3.0909	1.400			
4. Living Standards..	15	3.9333	1.033	1.16	.250	N
	33	3.5152	1.202			
5. Favoritism..	13	2.1538	1.725	.13	.896	N
	33	2.0909	1.355			
6. Continued Engineering..	14	2.6429	1.447	- .56	.580	N
	30	2.8667	1.137			
7. Library Facilities	14	2.6429	1.336	-1.26	.215	N
	30	3.1667	1.262			
8. Skilled Assistance	15	2.8667	1.552	- .01	.992	N
	31	2.8710	1.231			
9. Professional Challenge	15	1.8000	.862	- .98	.331	N
	31	2.1290	1.147			
10. Colleagues Influence	16	3.2500	1.342	- .02	.984	N
	31	3.2581	1.264			
11. Culture & Character..	14	2.7857	.975	.43	.669	N
	32	2.6250	1.238			
12. Family Obligations	15	3.4667	1.727	.03	.978	N
	33	3.4545	1.201			

Table 9 (cont'd)

Factors	N	Mean	SD	t	P	Results
13. Spouse's	15	3.8667	1.187	.97	.337	N
Feelings	33	3.5455	1.003			
14. Children's	14	4.1429	1.231	.95	.348	N
Education	29	3.7931	1.082			
15. Effect of	8	2.6250	1.408	.53	.599	N
Recent Trip..	18	2.3333	1.237			
16. Opport.	14	3.1429	1.512	- .57	.574	N
For Leisure	33	3.3636	1.084			
17. Stability	15	4.4000	.910	2.11	.040	S
	33	3.6970	1.132			
18. Freedom	16	4.5000	.894	2.31	.025	S
	33	3.8485	.939			
19. Trust In	15	3.6667	1.345	.74	.465	N
Establish.	33	3.4242	.902			
20. Availability	12	2.9167	1.564	.91	.373	N
Of Scholar..	17	2.4118	1.417			
21. Unique	14	3.6429	.842	.99	.330	N
Training	28	3.2857	1.213			
22. Willingness	12	2.2500	.866	- .89	.379	N
To Immigrate	19	2.5789	1.071			
23. Prestige	15	3.0667	1.223	.96	.344	N
Of Foreign..	30	2.7000	1.208			
24. Family	13	2.4615	1.266	- .48	.632	N
Influence	29	2.6552	1.173			
25. Readjusting	16	3.3750	1.258	.42	.675	N
To..Tempo..	31	3.2258	1.087			
26. Readjustment	14	4.2143	1.251	2.57	.014	S
For Spouse..	32	3.1563	1.298			

Table 9 (cont'd)

Factors	N	Mean	SD	t	P	Results
27. Finding A	15	3.7333	1.163	1.67	1.02	N
Suitable Job	32	3.0938	1.254			
28. Not Being	15	2.5333	1.407	.54	.594	N
Able To..	31	2.3226	1.166			
29. Re-Establish.	15	2.3333	1.113	- .30	.765	N
Friendships	32	2.4375	1.105			
30. Re-Establish.	15	3.0667	1.335	.08	.933	N
Business..	32	3.0313	1.332			
31. Family Ties	16	3.5000	1.549	.35	.730	N
	32	3.3438	1.428			
32. Patriotism	15	3.4000	1.352	.30	.769	N
	32	3.2813	1.250			
33. Commitment to	16	3.6875	1.302	.37	.710	N
the Country	32	3.5313	1.391			
34. Cultural	16	4.2500	1.065	1.69	.097	N
Values	32	3.5625	1.435			
35. Social Life	16	3.0000	1.713	- .56	.579	N
	32	3.2813	1.611			

APPENDIX B

Statistical Terms and Meaning

Inferential Statistics

Inference statistics are used to make inferences from sample statistics to the population parameters (Borg and Gall, 1983). Whenever conclusions are inferred from a sample to a larger population, there is always a risk of making an error (Orpet, 1992).

Statistical Hypotheses Testing

The **hypotheses testing** is defined by Johnson (1973, p. 197) as "... a procedure by which we will decide to agree or disagree with a claim." The hypotheses that lends itself to being tested as either being accepted or rejected is the **Null Hypotheses** (H_0). The **Null Hypotheses** assumes there is no difference between or among the Means of the various treatment groups (Orpet, 1992). The opposite of the null hypotheses is **Alternative Hypotheses** (H_A).

Non-Directional Hypotheses (two-tailed hypotheses) and Directional Hypotheses (one-tailed hypotheses)

As the name implies, **Non-Directional Hypotheses** does not specify the direction of the difference between the two or more population Means. An example is when it is stated that two population Means would not be equal. The non-directional hypothesis is sometimes referred to as a **Two-Tailed Hypotheses** (Orpet, 1992). A **Directional Hypotheses** is a **One-Tailed Hypotheses** that uses only one tail of the distribution in determining the critical value needed in order to reject the null hypothesis (Orpet, 1992).

Two Kinds of Possible Errors: Type I and Type II

When a null hypothesis is tested, two types of errors **Type I and II** are possible. A **Type I Error** is made when a null hypothesis is rejected that should have been rejected (Orpet, 1992). It is customary to call the probability of the type I error (alpha): p (type 1 error) = (alpha) (Johnson, 1973). A **Type II Error** is made when a null hypothesis is not reject when it should have not been rejected (Orpet, 1992). The probability of committing a type II error is assigned a name, (beta): p (type II error) = (beta) (Johnson, 1973). The researcher has direct control in selecting the amount of risk she or he is willing to take with a type I error (Orpet, 1991). The probability of making this kind of error is determined when the alpha level or level of significance is selected (Orpet, 1992). The two most frequently used levels of significance are $p = .05$ and $p = .01$ (p for probability of the statistical result occurring by chance).

Independent and Dependent Variables

In statistics, variables are classified as being **Independent** or **Dependent**. An **Independent Variable** is a treatment or stimulus variable selected by the researcher. **Dependent Variables** are ones that are measured to determined the effect of the independent variable (Orpet, 1992).

Scale of Measurement

Measurement is usually accomplished by assigning specific values or numbers to varying attributes of the individuals, objects, or events being investigated. Four different levels of measurement identified by Orpet (1992) are: (1) **Nominal** (used to label) is a qualitative response such as defective or non-defective (Johnson 1973), (2) **Ordinal Scale** which refers to rank order (low or high) and "...no quantitative value is assigned." (Johnson, p. 378), (3) **Interval** (quantitative), and (4) **Ratio** (quantitative).

Correlation and Correlation Coefficients

When two events tend to occur together, there is an indication of a relationship between the two events. In other words, they are **Correlated**. A statistic that is used to describe the relationship between two variables (X and Y) is the **Correlation Coefficient** (Orpet, 1992). The correlation coefficient is a single number that can range from a low of zero (0) to a high of 1.00 (plus and minus). The nearer the correlation coefficient is to plus and minus 1, the stronger the interrelationship between the two variables (Orpet, 1992).

Pearson Product - Moment Correlation Coefficient

The **Pearson Product - Moment Correlation**, symbolized as r, is appropriate for describing the relationship between two quantitative variables that are measured at the interval or ratio level of measurement. Pearson r shows the degree of linear relationship between the two variables (Orpet, 1992). Pearson r can be calculated for any two variables, no matter how they have been measured (Borg, and Gall, 1983).

t-Ratio or t-Test

The purpose of the **t-Ratio**, which is also called **t-Test** or **Student's t**, is to determine whether the Mean of one group is significantly different from the Mean of another group. The closer the Means are to each other, the more likely it is that the null hypothesis would be rejected (Orpet, 1992). The t-Test is only appropriate when there are two groups.

Closed and Open - Form

Questionnaires that call for short, check responses are known as the **Restricted**, or **Closed - Form**. (Best, 1981, and Kerlinger, 1986).

The **Open - Form**, or **Unrestricted**, type of questionnaire calls for a free response in the respondent's own words. (Best, 1981, and Kerlinger, 1986).

Content Validity and Reliability

In general, a test is valid to the extent that is measures what it claims to measure. A synonym for validity is accuracy. **Content Validity** is the representativeness or sampling adequacy of the content the substance, the matter, the topic--of a measuring instrument. (Best, 1981, Bohrnstedt and Knoke, 1982, and Kerlinger, 1986).

Reliability is the accuracy or precision of a measuring instrument. It is the quality of consistency that the instrument or procedure demonstrates over a period of time. It is the proportion of error variance to the total variance yielded by a measuring instrument subtracted from 1.00, the index 1.00 indicating perfect reliability. (Best, 1981, and Kerlinger, 1986).

APPENDIX C

Michigan State University

University Committee on Research Involving

Human Subjects (UCRIHS)

Letter of Permission

MICHIGAN STATE UNIVERSITY

OFFICE OF VICE PRESIDENT FOR RESEARCH
AND DEAN OF THE GRADUATE SCHOOL

EAST LANSING • MICHIGAN • 48824-1046

June 25, 1992

Armin Ahmad Zehtabchi
25 Hollwglen
Irvine, CA 92714

RE: THE MIGRATION OF ENGINEERS: THE IRANIAN CASE, IRB #92-306

Dear Mr. Zehtabchi:

The above project is exempt from full UCRIHS review. The proposed research protocol has been reviewed by a member of the UCRIHS committee. The rights and welfare of human subjects appear to be protected and you have approval to conduct the research.

You are reminded that UCRIHS approval is valid for one calendar year. If you plan to continue this project beyond one year, please make provisions for obtaining appropriate UCRIHS approval one month prior to June 19, 1993.

Any changes in procedures involving human subjects must be reviewed by UCRIHS prior to initiation of the change. UCRIHS must also be notifed promptly of any problems (unexpected side effects, complaints, etc.) involving human subjects during the course of the work.

Thank you for bringing this project to my attention. If I can be of any future help, please do not hesitate to let me know.

Sincerely,

David E. Wright, Ph.D., Chair
University Committee on Research Involving
Human Subjects (UCRIHS)

DEW/pjm

cc: Dr. Louis Hekhuis

APPENDIX D

Cover Letter

Dear Engineer:

I, Armin A. Zehtabchi, need your assistance and participation in a study of the causes of the migration of Iranian Engineers to the United States.

I am pursuing this study for my doctoral dissertation in the field of Administration of Higher Education at the Michigan State University, College of Education, Department of College and University Administration.

The purpose of this study is to investigate the significant factors and variables that influence the decision and cause the migration of Iranian Engineers to the United States. The results of this study will provide further information on the problem of brain drain in Iran, and it is hoped, make a contribution in solving or minimize the problem of the brain drain. Your response is very important in this study.

This study is conducted on a personal basis and has absolutely no connection with neither Iranian nor American Governmental agencies. I know how important your anonymity is here, and hence I do not ask for name or other identifying information. I especially request that you do not indicate it anywhere.

If you have any questions about this study and your rights, you may contact with Dr. Louis Hekhuis, Research Chair at 517-353-5979.

The questionnaire is designed as to be convenient for you and can be completed in less than an hour. I encourage and invite your comment wherever you would like to explain or expand your response. Please complete and return the enclosed questionnaire as soon as possible in the self-addressed paid envelope.

With sincere thanks for your time, effort, and cooperation.

Sincerely,

Armin A. Zehtabchi

Enclosure

APPENDIX E

Questionnaire

QUESTIONNAIRE ON THE MIGRATION OF IRANIAN ENGINEERS TO THE UNITED STATES

PERSONAL DATA:

AGE(__)	MALE (__) FEMALE (__)	SINGLE (__) MARRIED (__)	COUNTRY OF BIRTH (______) COUNTRY OF CITIZENSHIP(______)
MARRIED BEFORE COMING TO THE UNITED STATES (__) MARRIED AFTER COMING TO THE UNITED STATES (__)			NUMBER OF CHILDREN 1 (_) 2 (_) 3 (_) 4( )
CHILDREN'S AGE (__) (__) (__) (__)	SPOUSE'S COUNTRY OF BIRTH (________) SPOUSE'S COUNTRY OF CITIZENSHIP(________)		
SPOUSE'S HIGHEST DEGREE EARNED HIGH SCHOOL DIPLOMA (__) BS/BA (__) MS/MA(__) PH.D (__)			
HOW LONG HAVE YOU BEEN IN THE UNITED STATES? PLEASE EXPRESS THIS FIGURE IN MONTH. (_____________)MONTH(S)			
ON WHAT TYPE OF VISA DID YOU ENTER THE UNITED STATES? F VISA (__) J VISA (__) IMMIGRANT VISA (__) OTHER VISA (__)			
WHICH TYPE OF VISA DO YOU NOW HOLD? F VISA (__) J VISA (__) IMMIGRANT VISA (__) OTHER VISA (__)			
DO YOU INTEND TO GET IMMIGRANT VISA? YES (__) NO (__)			
DO YOU THINK YOU WILL ULTIMATELY TAKE OUT AMERICAN CITIZENSHIP YES (__) NO (__) NOT SURE (__)			

EDUCATIONAL BACKGROUND:

WHAT DEGREE DO YOU HOLD? PLEASE WRITE THESE IN TERMS OF THE UNITED STATES EQUIVALENT: BACHELOR'S (B.S/B.A), MASTER'S (M.S/MA), DOCTORATE (PH.D).

DEGREE	UNIVERSITY	YEAR	COUNTRY YOU LIVED IN WHILE TAKING DEGREE	YEARS TAKEN FOR DEGREE
________	________	________	________	________
________	________	________	________	________
________	________	________	________	________
________	________	________	________	________
________	________	________	________	________

WHAT IS YOUR CURRENT ACADEMIC STATUS?

1. _________MASTER'S DEGREE CANDIDATE.
2. _________DOCTORAL DEGREE CANDIDATE, COURSE WORK NOT YET COMPLETED.
3. _________DOCTORAL DEGREE CANDIDATE, COURSE WORK COMPLETED.
4. _________POST DOCTORAL WORK.
5. _________OTHER (PLEASE SPECIFY).

IN THE FOLLOWING, PLEASE SELECT AN APPROPRIATE CODE NUMBER TO INDICATE YOUR OWN MAJOR FIELD OF STUDY.

1._____________UNDERGRADUATE 2._____________WHEN FIRST IN GRADUATE SCHOOL

3._____________CURRENT GRADUATE SCHOOL

1. AERONAUTICAL	11. ELECTRONICS	21. PETROLEUM
2. AGRICULTURAL	12. ENVIRONMENTAL	22. ENGINEERING PHYSICS
3. ARCHITECTURAL	13. GEOPHYSICAL	23. TRANSPORTATION
4. AUTOMOTIVE	14. GEOLOGICAL	24. TEXTILE
5. BIOMEDICAL ENGINEERING	15. INDUSTRIAL	25. ENGINEERING SCIENCE
6. CHEMICAL	16. MANUFACTURING	26. ENGINEERING GENERAL
7. CIVIL	17. MECHANICAL	27. ENGINEERING OTHER/ ENGINEERING- TECHNOLOGY
8. CONSTRUCTION	18. MECHANICS	
9. COMPUTER	19. MATERIAL SCIENCE	
10. ELECTRICAL	20. METALLURGICAL	

ECONOMIC FACTORS:

DO YOU CURRENTLY HAVE A JOB FOR PAY IN UNITED STATES? PLEASE CHECK ALL THAT APPLY.

__________ NO

__________ YES, JOB(S)NOT CONNECTED WITH MY STUDIES OR PROFESSION, JUST TO MAKE A LIVING.

__________ YES, RESEARCH AT SCHOOL-OR AT ANOTHER INSTITUTION OF HIGHER LEARNING-PAYING SOME MONEY.

__________ YES, A REGULAR ENGINEERING JOB.

HOW MANY HOURS A WEEK DO YOU WORK?

1-29 HOURS(__) 30-39 HOURS(__) 40-49 HOURS(__) 50 HOURS OR MORE(__)

WHAT IS YOUR AVERAGE MONTHLY SALARY IN U.S. DOLLARS?

$5,00-$1,000(__) $1,000-$1,500(__) $1,500-$2,000(__) $2,000-$2,500(__)
$2,500-$3,000(__) $3,000-$4,000(__) $4,000-$5,000(__) $5,000 + MORE(__)

WHAT PERCENTAGE (%) OF YOUR SALARY DO YOU SAVE?

1-2%(__) 2-3%(__) 3-4%(__) 4-5%(__) 5-6%(__) 6-7%(__) 7-8%(__)
8-9%(__) 10% AND MORE(__)

WHAT WOULD BE A MONTHLY INCOME, IF YOU WERE OFFERED A JOB IN IRAN, THAT WOULD INFLUENCE YOUR RETURN TO IRAN?

$2,000-$3,000(__) $3,000-$4,000(__) $4,000-$5,000(__) $5,000 & MORE(__)

PLEASE DESCRIBE THE TYPE OF JOBS, AND EMPLOYERS THAT YOU HAVE HAD ALREADY OR THAT YOU EXPECT TO HAVE IN THE FUTURE.

	TITLE OF JOB	CITY	BUSINESS/ INDUSTRY	EDUCATION/ INSTITUTION	GOVERNMENT	OTHER
CURRENT JOB						
JOB YOU EXPECT TO HAVE						

MOTIVATIONAL FACTORS:

PLEASE ASSIGN A NUMBER (1 THROUGH 5)(1=LEAST INFLUENTIAL, 5 = MOST INFLUENTIAL), FOR EACH OF THE FOLLOWING FACTORS LISTED BELOW WITH REGARD TO THEIR INFLUENCE ON YOUR DECISION TO REMAIN IN THE UNITED STATES, OR RETURN TO IRAN (N/A MEANS NOT APPLICABLE).

WORKING CONDITIONS (U.S.A):

	DEGREE OF IMPORTANCE (1 THROUGH 5)	N/A
1. POTENTIAL INCOME AND LIVING STANDARD		
2. SUITABLE JOB OPPORTUNITIES		
3. CHANCE TO GAIN PROFESSIONAL RECOGNITION		
4. LIVING STANDARDS AND SATISFACTORY HOUSING		
5. FAVORITISM/BEING PROMOTED ON THE BASIS OF CONNECTION		

COMMENTS:

PROFESSIONAL NEEDS (U.S.A):

6. CONTINUED ENGINEERING EDUCATION OPPORTUNITY		
7. LIBRARY FACILITIES		
8. SKILLED ASSISTANCE IN MY SPECIALTY		
9. PROFESSIONAL CHALLENGE		
10. COLLEAGUES' INFLUENCE		

COMMENTS:

SOCIAL SETTING (U.S.A):

11. CULTURE & CHARACTER OF PEOPLE IN THE U.S.A		
12. FAMILY OBLIGATIONS		
13. SPOUSE'S FEELINGS		
14. CHILDREN'S EDUCATION		
15. EFFECT OF RECENT TRIP TO IRAN		
16. OPPORTUNITIES FOR LEISURE		

COMMENTS:

POLITICS (U.S.A):

17. STABILITY		
18. FREEDOM		
19. TRUST IN ESTABLISHMENT		

COMMENTS:

YOUR CHOICE TO STUDY IN THE U.S.:

20. AVAILABILITY OF SCHOLARSHIP		
21. UNIQUE TRAINING OPPORTUNITY IN THE U.S.		
22. WILLINGNESS TO IMMIGRATE		
23. PRESTIGE OF FOREIGN EDUCATION		
24. FAMILY INFLUENCE		

COMMENTS:

BARRIERS TO RETURN TO IRAN:

25. READJUSTING TO THE TEMPO & STYLE OF LIFE		
26. READJUSTMENT FOR SPOUSE AND/OR CHILDREN		
27. FINDING A SUITABLE JOB		
28. NOT BEING ABLE TO USE SKILLS AND KNOWLEDGE ACQUIRED ABROAD		
29. RE-ESTABLISHING FRIENDSHIPS AND/OR POLITICAL CONNECTION		
30. RE-ESTABLISHING BUSINESS AND/OR PROFESSIONAL TIES		

COMMENTS:

MOTIVES TO RETURN TO IRAN:

31. FAMILY TIES		
32. PATRIOTISM		
33. COMMITMENT TO THE COUNTRY'S PROGRESS		
34. CULTURAL VALUES		
35. SOCIAL LIFE		

COMMENTS:

MISCELLANEOUS:

SINCE GRADUATING FROM ENGINEERING/TECHNOLOGY SCHOOL, HOW OFTEN HAS THE IRANIAN GOVERNMENT CONTACTED YOU ABOUT YOUR CAREER PLANS?

(______) (_______) (________)

DO YOU THINK THE U.S. GOVERNMENT SHOULD MAKE IT EASIER OR HARDER FOR FOREIGN ENGINEERS TO STAY AFTER THEY FINISH THEIR STUDIES?

EASIER(__) HARDER(__) LEAVE UNCHANGED(__) NOT SURE(__)

WOULD YOU DESIRE TO STAY IN THE UNITED STATES?

1. (___)YES 2. (___)NO 3. (___)NOT SURE

COMMENTS:

HOW LONG HAS IT TAKEN YOU TO ANSWER THE QUESTIONNAIRE?_______MINUTES

Once again, I would like to thank you for your time and effort you have devoted to answering the questionnaire.

APPENDIX F

Follow - Up Letter

Dear Engineer:

Several weeks ago I sent you an introductory letter and a questionnaire seeking information for my study of the causes of the migration of Iranian engineers to the United State. The questionnaire was distributed to the engineers on an anonymous basis, and as the questionnaire does not contain any entry name on it, I do not know whether you have already responded to my request.

The purpose of this study is to investigate the significant factors and variables that influence the decision and cause the migration of Iranian engineers to the United States. The results of this study will provide further information on the problem of brain drain in Iran. Co-operation of engineers like you is crucial for the completion of this study.

If you have already filled in and returned the questionnaire, please ignore this letter. If you have not yet returned the questionnaire, would you please complete and return the enclose questionnaire as soon as possible in the self-addressed paid envelope.

Thank you for your time, effort, and cooperation.

Sincerely,

Armin A. Zehtabchi

Enclosure

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BIBLIOGRAPHY

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