STRATEGIC PLAN FOR A NEW RESEARCH AND EDUCATION INSTITUTION IN THE MIDDLE EAST

by

MAY NASRALLAH [rec'd degree FEB 1994]
S.B., Economics
S.B., Political Science
Massachusetts Institute of Technology, 1993

&

SAMER SALTY
B.S., Electronic Engineering
California Polytechnic State University, 1986

Submitted to the Sloan School of Management in Partial Fulfillment
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Massachusetts Institute of Technology
June 1993

Signature of Author Signature redacted

Signature of Author Signature redacted

Certified by Signature redacted
Franco Modigliani, Institute Professor Emeritus,
Sloan School of Management

Certified by Signature redacted
D. Eleanor Westney, Associate Professor in Int'l Management,
Sloan School of Management

Signature redacted

Accepted by
Jeffery Barks, Associate Dean, Sloan Master's and Bachelors Programs

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ABSTRACT

The objective of this thesis is to develop a strategic plan for a research and education institution in the Middle East. Currently, there is a lack of research institutions in the Middle East, specifically those that focus on technology and management. Industrialization and development are highly dependent on the region's ability to develop indigenous research capabilities in these two fields. The proposed institution will act as a base for technological and managerial research and education in the Middle East. The institution's technology structure and advanced telecommunications capabilities will allow it to be in constant touch with international institutions and businesses to exchange information and keep the institution updated with the latest developments and advancements in technology. Moreover, it will act as a bridge between the institutions and businesses of the different Middle East countries. One main goal will be to serve the industries of the region with the objective of supporting them in producing products or services that are competitive in international standards. This plan is not meant to be static but rather a dynamic one that changes in response to the factors influencing the establishment and the quality research of the institution.

Thesis Supervisors:

Professor Franco Modigliani, Institute Professor Emeritus
Professor D. Eleanor Westney, Associate Professor in International Management
Professor Nazli Choucri, Professor of Political Science

To our fathers, Souheil Salty and Fawzi Nasrallah,
who valued their children's higher education more than anything else

Acknowledgments

In the beginning it seemed as though we had an impossible task ahead of us. But through perseverance and excellent supervision, this project was successfully completed. It is our hope that it will be used as a resource base for future projects.

A number of special people have contributed to this thesis and we would like to acknowledge their support. First, we would like to thank our thesis supervisors for their invaluable help, support and recommendations which we continuously received despite their incredibly busy schedules:

We would like to extend our deepest gratitude to Professor Franco Modigliani for his deep insight, wise council, and kindness. We are extremely honoured to have had the opportunity to have him as a supervisor.

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Furthermore, we owe a great deal to Professor Nazli Choucri who was an invaluable source of information and guidance in structuring this project. Professor Choucri's combined expertise in the Middle East and technology policy is unique and we feel very privileged to have had her as a supervisor.

In addition, we would like to thank all those who responded to our questionnaires and allowed us to interview them. They were an invaluable source of information that provided us with a wealth of ideas, and a wide range of perspectives that helped us shape this thesis.

Finally, we would like to thank our parents for their continuous support and encouragement, without which we would not be where we are today.

May Nasrallah

Samer Salty

Then said a teacher, Speak to us of Teaching.

And he said:

No man can reveal to you aught but rather that which already lies half asleep in the dawning of your knowledge.

The teacher who walks in the shadow of the temple, among his followers, gives not his wisdom but rather his faith and his lovingness.

If he is indeed wise he does not bid you enter the house of his wisdom, but rather leads you to the threshold of your own mind.

The astronomer may speak to you of his understanding of space, but he cannot give you his understanding.

The musician may sing to you of the rhythm which is in all space, but he cannot give you the ear which arrests the rhythm nor the voice that echoes it.

And he who is versed in the science of numbers can tell of the regions of weight and measure but cannot conduct you thither.

For the vision of one man lends not its wings to another man.

And even as each one of you stands alone in God's knowledge, so must each one of you be alone in his knowledge of god and his understanding of the earth.

Gibran Khalil Gibran

"The Prophet"

1923

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INTRODUCTION

Technology traditionally has had a strong and traditional role in Arab society. This is illustrated by the enormous number of ancient technologies still in use throughout the Arab world and the archaeological remains of past civilizations that remain reminders of successful mastery of the different areas of science and technology[1]. Examples include the design of the dhow, the technology of fishing, the breeding of horses and camels -- all were admirable solutions to technical problems that existed in the region. Different forms of technologies were discovered, analyzed, learned and transferred, constituting the basis of a healthy economy that conducted a great deal of trade within its boundaries and internationally. This was the case until the fifteenth century when the innovative technologies began to shrivel down. This lead to the huge scientific and technological gap between the West and Middle East countries, and placed the region in a dependent position.[2]

This gap between the West and Middle East countries continued to widen in the nineteenth century. It became so large that efforts by Arab leaders to prevent economic, political and military domination failed. The Ottoman Sultans realized the military and economic implications of their technological backwardness, which led to their downfall. Arab rulers to this day are no less aware and their countries no less exposed to external military threat and occupation. Consequently they have become preoccupied with defense, through which they became more keenly aware of science and technology. However, this is not to say that defense is the only area in the Middle East that is in need for technological improvement.

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[1] Zahlan, A.B. [1980]; *Science and Science Policy In The Arab World.* Introduction, pg. 11.
[2] Ibid.

In almost every other sector there is room and need for innovations and advancements. These include agriculture, science, medicine, technology, management, and higher education. The region will benefit from research in all of, or any one of these fields. Currently, the Middle East faces serious technological and managerial problems and backwardness, and unless these are adequately dealt with, the Middle East will never be able to achieve true sovereignty, independence, and competitiveness. In fact, management is one field that has constantly been ignored or undermined in the Middle East. Acquiring the managerial tools and techniques means that the technological and research advancements made in the region can be adequately and efficiently infiltrated into the local industries. Effective management is essential to improving and advancing the activities of organizations whether private or public, business oriented or government.

Inadequacies in technology and management are directly related to current establishments in the region and their mission toward solving these deficiencies. Institutions for research and higher education in the Middle East have not generally been well established. Most countries in the region remain to this very day dependent on outsiders to meet their technological needs in all the sectors mentioned. There has been no link established within the "technology triangle" between governments, institutions and industries[3]. The past few decades, there has been a considerable effort on the part of many Middle Eastern countries in developing methods for planning and managing scientific and technological activity.

The most basic challenge for the developing countries is to absorb, operate, maintain and manage imported technology. Beyond this, effort is directed in some countries, and should be directed in the rest of them, towards building the institutions and

[3] To be discussed in more detail later in chapter 3.

infrastructure needed to adapt and modify existing technologies, develop new technologies, and then to manage them efficiently and effectively. No matter what the particular development objective or level of technological sophistication of the country, there is a continuous need to improve and expand education and research activities.[4]

The purpose of this thesis is to look at these issues that face and challenge the Middle East nations, and to propose a structure for a research and education institution that addresses management and technology issues in the Middle East. In Part I, the thesis begins with a definition of the Middle East followed by political, and socio-economic overviews of the region. An examination is then made of the current research institutions that already exist in the Middle East to illustrate the inadequate provision of research and education institutions, particularly in the fields of technology and management.

In Part II we examine technology and management in the Middle East. Specifically, we look at the importance of, and benefits that could be attained from technology and management. The technology gap that currently exists between the Middle East and the industrialized world, and the efforts on part of Middle Eastern individuals and governments to acquire the advanced technologies are examined. However, technology trade and transfer in its current form has not served to bridge this gap, and the problems inhibiting technology absorption in the Middle East are addressed. Furthermore, there is a substantial gap in the managerial practices between the Middle East and the West. These are examined as are the choices and issues facing businesses in the Middle East. The need for a research and education institution focusing on the domains of technology and management is subsequently given as a means for meeting the technology and management needs in the Middle East.

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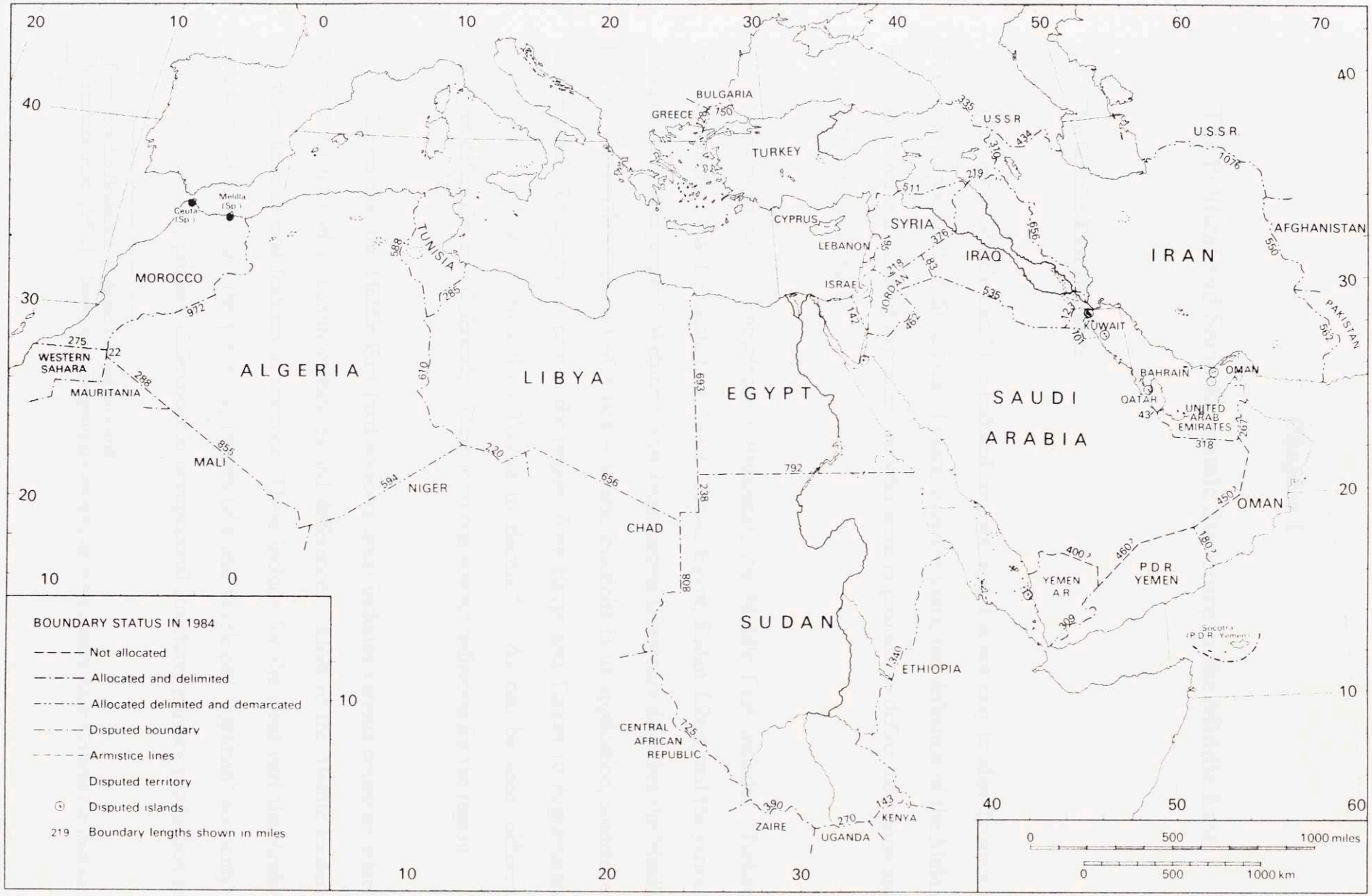
[4] Shannon, Clark. [1992]; *Arab Higher Education and Research Institutions: Their Role In Technological Development.* pg. 3.

The case for the institution is backed by the results of a questionnaire distributed to a number of academicians and business professionals. A comprehensive analysis is given in Part III of these questionnaires and personal interviews that were conducted. Following this, the structure and finances of MIT are examined and used as a quasi-model for the proposed institution. Finally, the structure of the proposed institution is given. This section focuses on the major issues domains that have to be addressed in the organization of the institution.

PART I:

THE MIDDLE EAST

Figure 1: Regional Map



Source: The Cambridge Atlas of the Middle East

Chapter 1

The Political and Socio-Economic Structure in the Middle East

1.1. The Middle East Defined:

The term "Middle East" is a political concept, and it is not easy to identify since it was never a specifically defined area. In fact, over the years, the definition of the Middle East has varied and changed depending on who were in position to define the region and their purpose for defining it:

According to the Encyclopedia Britanica[5], the Middle East includes "Turkey, Greece, Cyprus, Syria, Lebanon, Iraq, Israel, Jordan, Egypt, Sudan, Libya, and the various states of the Arabia proper." Webster's New International Dictionary describes the Middle East as "The northeastern part of Africa -- a term indefinite in its application, sometimes covering only the region, or part of the region, from Egypt and Turkey to Afghanistan, sometimes including countries from Tunisia to Burma." As can be seen, different resources define the term differently. There is no one correct definition for the region.

Essentially, the Middle East (and adjacent area) includes various countries which have among themselves common features and differences. Most of the Middle Eastern countries have several features in common. These include for the most part the Arabic language and Islam, and the prevailing system of a less developed "agrarian" economy[6]. There are, however, primary differences in occupational structure, primary production as

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[5] Encyclopedia Britanica, Volume 15, pg. 407-408.

[6] Maasarani, Aly. [1971]; *American Management Consultants in the Middle East: Criteria For Success.* pg. 2.

well as economic development. The difference has primarily emerged due to the natural resource of oil found in some areas of the Middle East and not others.

For the purpose of our project, we have defined the Middle East to include the following countries: Algeria, Bahrain, Egypt, Iraq, Iran, Israel[7], Jordan, Kuwait, Lebanon, Libya, Morocco, Occupied Territories, Qatar, Saudi Arabia, Sudan, Syria, Tunisia, Turkey, United Arab Emirates, and Yemen. These countries, as mentioned above, share common regional and cultural ties, and have a background of historical trade routes well established between one another. A map for the region is provided Figure 1.

We would like to point out that Israel is often not included in the various discussions regarding the problems faced by the majority of the countries in the defined Middle East area. The reason is simply because it is at a later, more advanced stage of development, different from the rest of the Middle Eastern countries. Moreover, the absence of interactive political and social ties with the Arab countries in the Middle East at the current time, make it difficult to include Israel in the generalizations made of the rest of the Middle East. One main reason why Israel was included in our definition of the Middle East is that it is our hope that at the time when the institution is formed, there would be ties established with Israel by the rest of the Middle East, so that exchange of ideas and technological capabilities could take place. Our objective is to have Israel contributing to and benefiting from the institution along side with its Middle Eastern neighbours.

[7] Although Israel is part of the Middle East, its prospective involvement in the proposed research institution will predominantly depend on the political situation at the time of implementation of the project and the laws in Lebanon and other Middle East countries that would allow for or inhibit Israel's participation in such a project.

1.2. Politics in the Middle East:

The Middle East today is known for its turbulent nature, and the region has become analogous to political instability and turmoil as compared to the industrialized world. The other thing the Middle East is internationally famous for is its natural resources, namely oil. Most countries in the region are still at the stage of exporting raw materials and importing most of their manufactured goods.

Most countries of the Middle East did not gain their independence until the 1950s, and the governments that took over, have since embarked upon the task of developing their countries to standards of Western countries. The Middle East nations have great religious, cultural and social identities that they heavily associate themselves with. This has made a never ending internal debate as to whether the countries should modernize or retain their traditional values and concepts.

World attention turned to the Middle East, first when the Jewish state of Israel was established after WWII on what was then Palestinian land. The Arab states would not accept this *fait accompli* and attempted to gain back Palestine through waging three different wars against Israel and its allies. Despite the large physical scale of the Arab armies, they were no match for the high-tech war machines of the West. All three wars were lost and led to a more or less restrained enmity of the Arab World against Israel, and a pseudo resentful torch to be held against the US. The Palestinians in the Occupied Territories in the late eighties started a revolt or "intifadah" against the Israeli occupiers in a desperate attempt to gain some sort of independence. Despite the various attempts made by the international community to put an end to this long lasting feud, and the more recent peace negotiation talks taking place between the Arabs and Israel, the problem has still not been solved and the Palestinians remain landless.

The Middle East remained turbulent in its internal affairs: one country after another faced its share of internal conflict and hostility. The seventies and eighties recaptured world attention through a number of events that took place throughout the region. To begin with, there was the "oil shock" bought about by the great increase in the oil prices organized by OPEC (the Organization of Petroleum Exporting Countries) which is formed by a large part of the Middle Eastern oil-rich countries. OPEC essentially ceased all exports of oil with the aim of raising the prices of oil to an "acceptable level" in their view. Then there was the Iranian revolution and the overthrow of the Shah of Iran to be replaced by Ayatollah Khomeini, and giving rise to the Islamic Republic of Iran. The fundamentalist movement stirred up fears among the neighbouring countries that similar revolutions might be encouraged. The result was the start of the Iraq-Iran war that went on for seven years.

The war and civil unrest in Lebanon started in 1975, and went on for about 15 years with the fighting escalating to new levels as different countries sought to fight their proxy wars on Lebanese lands through funding and supporting different Lebanese groups and militias. In 1982 Israel invaded Lebanon under the pretext of driving away Palestinian guerrillas from conducting attacks on Israeli territory. When Israel later withdrew from the bulk of Lebanon (as a result of the fierce opposition and fighting it faced from the part of Muslim sects in Lebanon) its troops remained in South Lebanon occupying it as their self-declared "Security Zone".

In Egypt, the assassination of President Sadat was the start of the more Islamic fundamentalist movement that until today brings skepticism and fear this movement dominating the country. Sudan has also experienced a long trauma of civil war that has

been taking place for many years between the North and South. The reason behind this go as far back as the way the borders were drawn by the Western colonialists after WWI.

We could in fact go on for pages and pages in describing all the different events that have taken place in the Middle East over the past few decades. One particular event that dominated world attention and involvement, more than any other event in recent history was the Iraqi invasion of Kuwait and the subsequent international response to it. Operation "Desert Shield" and subsequently "Desert Storm" that liberated Kuwait must have been the most heavily advertised and recorded war in history. This event was another illustration of the volatile nature of the Middle East.

Despite past impression that Middle East problems are largely local affairs, superpower action has been known to be prevalent in this "strategic" region. This was particularly the case when the "Cold War" was at its peak, and the Middle East displayed a region that was too important for American international policy to let the Russians dominate it. Today, even after the fall of the Soviet Union and communism, the US maintains its need for presence and influence in the region to both protect its interests in the huge oil reserves concentrated in the Arabian Gulf, and to protect Israel, its greatest ally in the region. For these reasons, the actions of Middle Eastern countries will continue to be of considerable interest to the rest of the world.

1.3. Socio-Economic Structure of the Middle East:

Despite their similarities, there exist a lot of variation and differences among the Middle East countries. Some countries are monarchies, some are socialist, and others republics. There is variation in their legal heritage: some follow the model of the

Napoleonic Code, some that of the Ottoman Empire, and some the British Common Law. Moreover, with a possible exception of two countries, mainly Lebanon and Israel, all are influenced by Islam.[8] In addition, the Middle East is not a homogeneous area either in terms of oil wealth or government policies. In fact, the Middle East encompasses a group of nations that vary a great deal in their richness and level of well-being. Some countries are extremely rich with oil and have hence gained immense material riches and money that they invested in their countries. Other countries are lacking natural resources and so have historically been very poor. The oil-rich country of Kuwait, for example, has some of the best provisions in the continent of free medical services, public schooling, and is even noted to having one of the best road systems in the world. Sudan on the other hand does not have any oil, and very little natural resources that they can export, and consequently has very little such provisions. However, there are a number of distinctive cultural features that give the region a strange form of unity and justify the term Middle East. In general, these similarities "take the form of similar constellations of subcultures across the area consisting of urban networks with their agrarian and pastoral hinterlands".[9]

One characteristic of all Middle Eastern countries is the extent of government activity in economic decision making, though this activity can vary from considerable government ownership as in Iraq, Kuwait, Libya, Syria and Egypt, to the more private enterprise-oriented economies of UAE and Lebanon. For the most part, Middle Eastern countries are determined to modernize quickly. Consequently, the region has amongst the world's highest economic growth rates along with East Asia and the Pacific, though its consumption rate per capita has surpassed that of the other regions. The Gulf region of the Middle East, in addition, is characterized by having per capita GNP amongst the

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[8] Erdener Kaynak, Editor. [1986]; *International Business in the Middle East.* Erdener Kaynak: pg. 4.
[9] Ibid.

highest in the world along with a total population that is among the lowest in the world. Figure 1.1 illustrates this distribution[10].

Figure 1.2 shows the economic structure of the population in the region. This figure shows two aspects of the labour force of the region: the proportion of the total population defined as "economically active" is indicated by shading; the distribution of the economically active among the three major sectors of the economy - agriculture, industry and services - is depicted by the pie diagrams. It is important to note that the proportion of any national population which is economically active depends on a variety of factors including demographic, economic and social factors (for example, the socio-cultural matter of the attitude towards the employment of women).

Given the different classification systems used in the various countries, the most important distinction is that between agriculture and non-agricultural employment. It becomes readily apparent that, in terms of the employment which it provides, agriculture remains a major element in the economies of most of the countries in the region, particularly those with the largest populations: around 40% of the economically active are still employed in the agricultural sector in Morocco, Egypt, Sudan, Iran Iraq, Turkey, Saudi Arabia, Oman and Yemen. At the other end of the scale, agricultural employment is particularly low in countries with well developed commercial activities, such as Israel and Lebanon, and the oil-rich states with very limited agricultural activities such as Libya, Bahrain, Kuwait and UAE.[11]

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[10] For 1982 data.

[11] Blake; Dewdney; Mitchell, [1984]; *The Cambridge Atlas of the Middle East and North Africa*. pg. 55.

The allocation of non-agricultural employment to the industrial and service sectors has been increasing immensely over the past few decades reflecting the development of more sophisticated economies throughout most of the region. The low figure for Sudan reflects the lack of industrial and other development in that country, but this is not the case for Turkey, which has one of the most highly developed and varied industrial sectors in the region. Oil-rich countries have a high proportion of people employed in the service sector, as do Israel, Jordan and Lebanon.[12] All this illustrate the extent of diversity that exists in the Middle East.

Furthermore, diversity is what characterizes the patterns of education and culture in the Middle East. It is evident in different levels of social and economic development, as well as the quantity and quality of resources, both physical and human, available for educational purposes. Such differences in their turn, reflect diversity in the cultural traditions of the Middle Eastern societies. Throughout the region education is expanding at all levels. This expansion has been a goal and precondition of modernization. Countries such as Egypt, Turkey, Syria and Lebanon have had a much longer experience of this than others such as Saudi Arabia or the Gulf states. Figure 1.3 illustrates literacy and learning in the Middle East, according to 1984 data.[13]

From Table 1.1 we can also see that the adult literacy rate of ages 15+ in 1985 was an average of around 65% in the Middle East as opposed to 99% in industrialized countries. Moreover, this number varies immensely amongst the different Middle East countries: from 24% in Sudan to 95% in Israel. The mean years of schooling in the majority of the Middle Eastern countries is extremely low, averaging around 3.5 in 1980.

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[12] Ibid.
[13] Ibid. pg. 44.

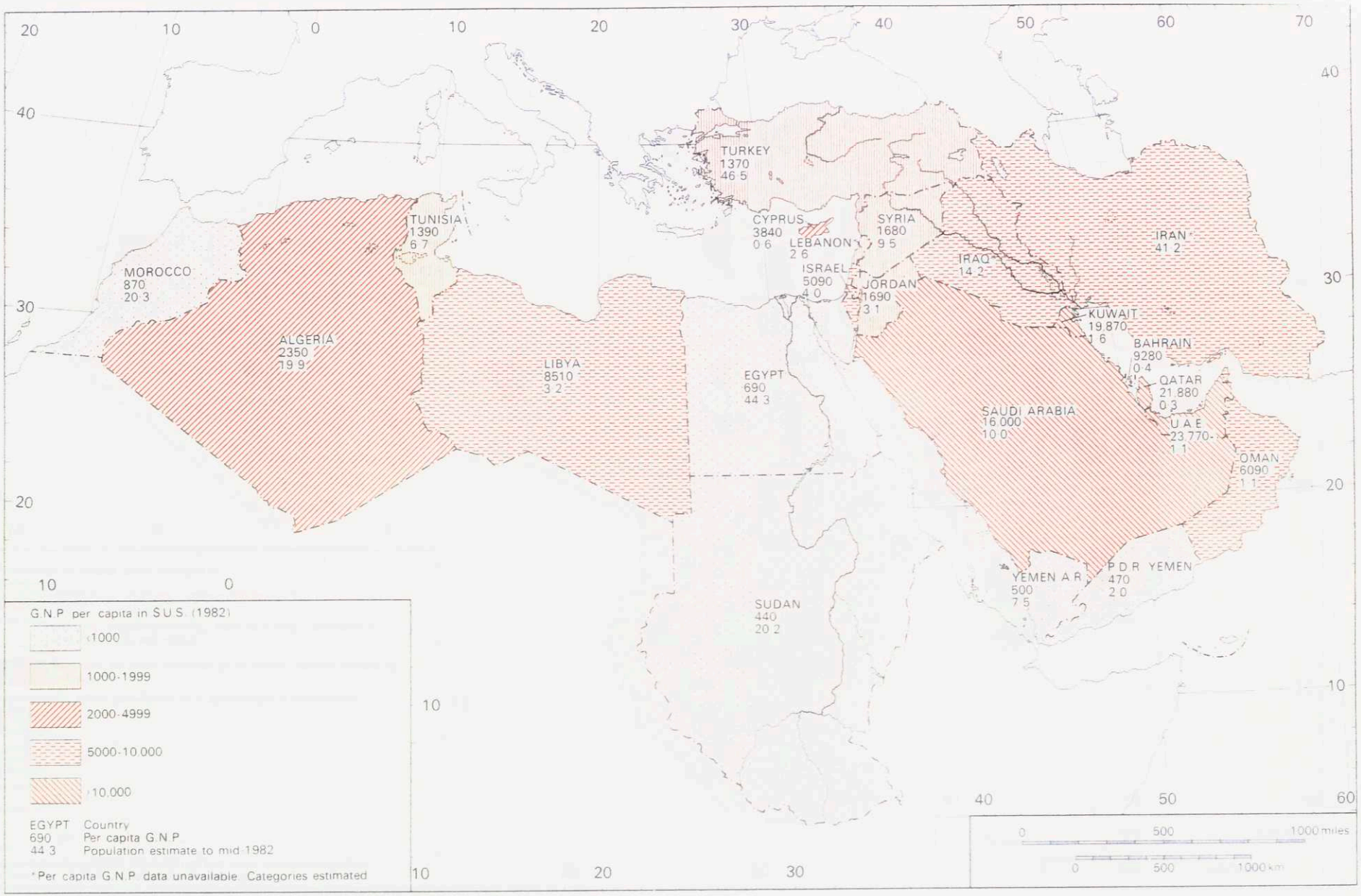
This number has increased since that date but not nearly as much as it should have, particularly when we compare it to the West.

Table 1.2 illustrates some of the important features and inadequacies of the Middle East. A first glance at the table might give the impression that the Middle East has a large number of science and technology graduates as a percentage of total graduates. However, on closer examination, this number is actually extremely low in absolute terms since the number of university graduates as a percentage of the corresponding age group is extremely low, averaging around 2.5% between 1986 and 1988. The corresponding figure is 15.5%, which means that the Middle East countries on average graduate one sixth the percentage of university graduates in the US.

These are all macro-level issues faced by the Middle Eastern countries that help describe overall picture of the position of these countries. On an industry level, local businesses in the Middle East have found it very difficult to compete with international corporations because they lack the technological base, development and skilled labour to acquire a productive edge in finished products. Moreover, they lack the managerial skills to put acquired technology into efficient and effective use.

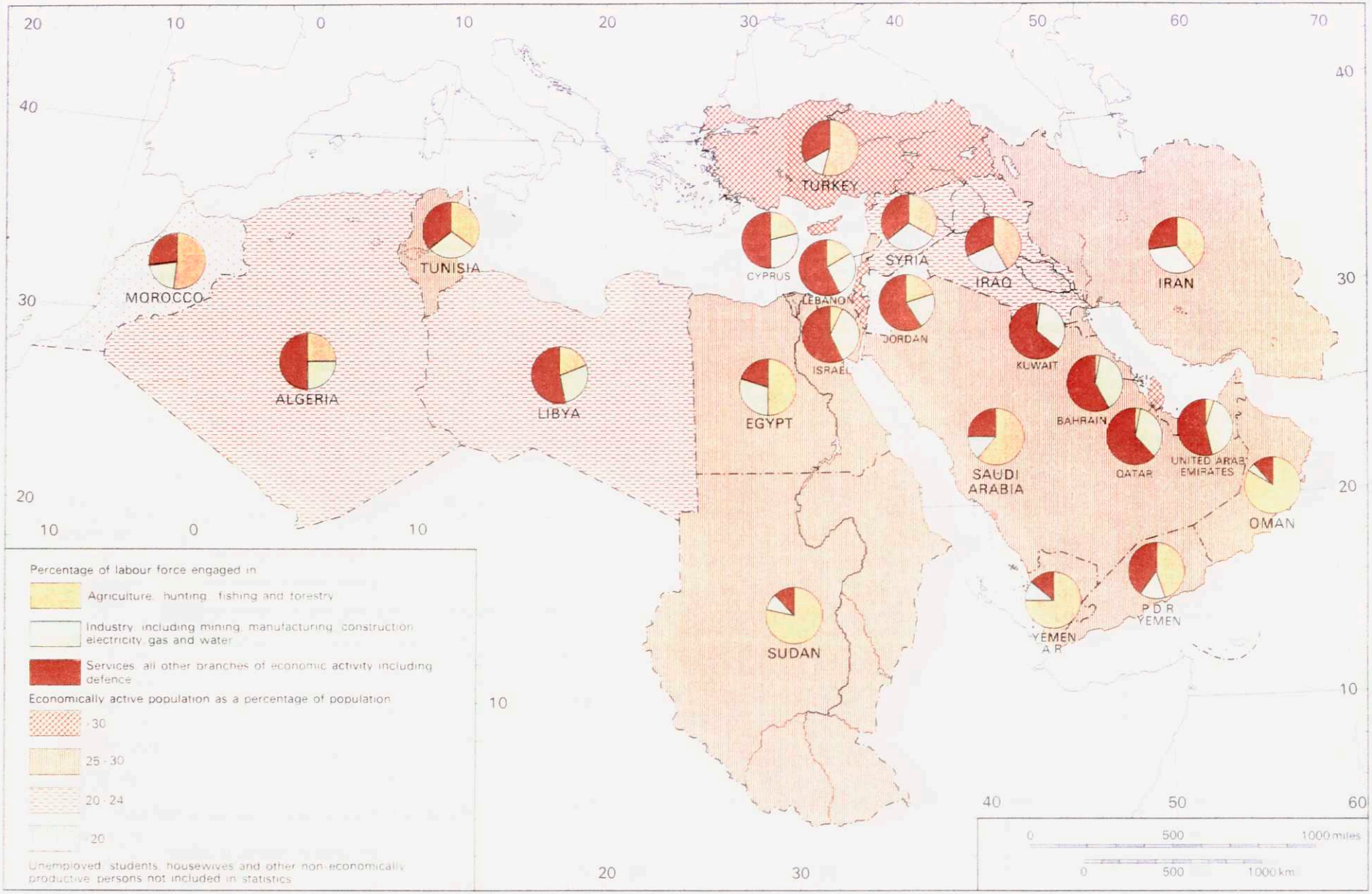
In order to be able to better understand this lack of capability and skills, it is imperative to first examine the research institutions and universities throughout the Middle East. With this, a more accurate picture is given as to where the Middle East lies today in terms of general, as well as technological and managerial research and education in the region.

Figure 1.1: Gross National Product



Source: The Cambridge Atlas of the Middle East

Figure 1.2: Economic Structure of the Population



Source: The Cambridge Atlas of the Middle East

Figure 1.3: Literacy and Learning

Source: The Cambridge Atlas of the Middle East

Table 1.1: Country Profile

Source: World Bank and UNDP data

		Estimated Population (Thousands)	GNP 1988	Life Expec-tancy At Birth	Adult Literacy Rate (15+) 1985	Mean Years Of Schooling 1980	Primary Or Secondary (Millions) 1990	Literacy Rate (%15+) 1985
1	Algeria	24,960	2,450	65.1	48.6	1.3	1.5	49
2	Bahrain	516	6,610	71.0	72.9	2.0	0.0	73
3	Egypt	52,426	640	60.3	44.6	1.7	2.9	45
4	Iran	54,607	..	66.2	47.7	3.5	3.0	48
5	Iraq	18,920	..	65.0	52.4	4.0	1.5	52
6	Israel	4,600	8,650	75.9	95.0	8.8		
7	Jordan	4,009	1,500	66.9	74.2	5.0	..	74
8	Kuwait	2,039	13,670	73.4	70.6	4.5	0.1	71
9	Lebanon	2,701	..	66.1	76.8	4.4	0.1	77
10	Libya	4,545	5,410	61.8	56.5	2.7	..	57
11	Morocco	25,061	830	62.0	41.7	1.8	3.7	42
12	Oman	1,502	5,070	65.9	30.0	0.5	0.1	30
13	Qatar	368	..	69.2	75.7	4.5	..	76
14	Saudi Arabia	14,134	6,200	64.5	57.9	2.7	1.7	58
15	Sudan	25,203	480	50.8	24.4	0.7	4.9	24
16	Syria	12,530	1,670	66.1	59.1	3.0	0.5	59
17	Tunisia	8,180	1,230	66.7	57.6	1.8	0.5	58
18	Turkey	55,868	1,280	65.1	76.0	2.8	3.2	76
19	UAE	1,589	15,720	70.5	60.0	3.1	0.1	..
20	Yemen	11,687	1,050	51.5	32.4	0.8	..	32
	United Kingdor	57,237	12,830	75.7	99.0	10.8	..	..
	USA	249,224	19,870	75.9	99.0	12.2	..	..

Table 1.2: Country Profile

Source: World Bank and UNDP data

		Scientists And Technicians Per 1,000 People 80-88	Tertiary Graduate Ratio (As % Of Corresponding Age Group) 86-88	Science Graduates As % Of Total graduates 86-88	Public Education Expenditure As % Of GNP 1960	1986	Public Expenditure On Education As % Of Total Public Expend. 87-88
1	Algeria	..	2.2	42	5.6	6.1	27.0
2	Bahrain	43.4	2.3	30	..	5.4	10.3
3	Egypt	..	3.8	22	4.1	5.5	9.4
4	Iran	8.2	0.9	52	2.4	4.6	18.1
5	Iraq	3.6	..	..	5.8	3.7	6.4
6	Israel	..	4.9	38	..	8.2	..
7	Jordan	..	5.6	28	3.0	6.5	7.6
8	Kuwait	62.9	4.2	22	..	5.1	12.1
9	Lebanon	..	2.9	26	..	..	16.8
10	Libya	11.6	..	..	2.8	10.1	20.8
11	Morocco	..	1.1	26	3.1	5.0	25.5
12	Oman	..	..	..	..	5.3	14.9
13	Qatar	41.5	4.3	46	..	5.6	7.2
14	Saudi Arabia	..	2.5	13	3.2	10.6	13.6
15	Sudan	0.4	0.4	24	1.9	4.0	9.1
16	Syria	3.6	4.0	41	2.0	2.9	14.0
17	Tunisia	1.4	0.9	44	3.3	5.4	14.8
18	Turkey	27.7	2.1	34	2.6	2.8	10.5
19	UAE	..	1.7	11	..	2.2	14.2
20	Yemen	..	0.2	11	..	5.6	22.6
	United Kingdor	..	10.4	47	..	..	..
	USA	55	15.5	30	..	..	..

Chapter 2

Research and Education Institutions in the Middle East

2.1. History of Intellectual Heritage in the Middle East:

Although the roots of Western thought can be traced to Greece, it is in fact through the writings of Muslim scholars that much of the Greek philosophy was preserved and transmitted to the West. Moreover, while Europe languished in the phase of the Dark Ages, the Middle East was thriving in fostering intellectual thought and exchange of ideas, and served as a repository of Greek thought on which they carried out many debates and critiques. Examples of the great intellectual and cultural innovations that originated in the Middle East include the development of Algebra (the name comes from the Arabic word, *al-jabr*), and fundamental developments and advances in the sciences of optics and medicine. In addition, concepts from Asia and the Far East were brought to the Middle East and used in Middle Eastern intellectual and cultural patterns. The numerical system used in English today actually originated from "Arabic" numerals. These numbers, the decimal system and the use of zero, were originally brought to the Middle East from India and paved the way to profound advances in quantitative thinking. The Middle East also historically played a formidable role in trade and conquest that portrayed its influence on other societies and cultures.[14]

However, this heritage of intellectualism was reversed as more 'barbaric" invaders controlled the Middle East starting around the thirteenth century. Furthermore, the four hundred years of Ottoman rule did not help the region in terms of educational and

[14] Andersen, Seibert & Wagner, [1990]; *Politics and Change in the Middle East: Sources of Conflict and Accommodation.* Introduction. pg. 1.

intellectual development. Many of the libraries and centers for intellectual thought and exchange of ideas were destroyed by the Ottomans in the early years of their domination. Industrialization in the Middle East was slowed tremendously as a direct result of this past. Nonetheless, since the turn of the century there has been a strong effort on the side of Middle Eastern countries to promote higher level education. In the next section we look at current research and education institutions in the Middle East to develop a better understanding of existing institutions that perform research and provide higher level education.

2.2. Current Research and Education Institutions in the Middle East:

As shown in Exhibit A and Exhibit B, we have developed a database that lists all the universities in the Middle East as well as colleges and research institutions of technology and management. We have sorted the data by country in Exhibit A and by the year during which the institution was founded in Exhibit B. The data set includes information on the library volumes present in the universities and institutions, the number of students and faculty present in the institutions, the student-to-faculty ratio, the language of instruction, and whether the institution is state run or privately held. Furthermore, under the technology and management columns, we have identified the universities that offer academic course work in technology or management. One thing to note is that this identification does not indicate if the institution is performing research in those areas.

Analysis of this data set has provided us with valuable information and insight that best illustrate what is already out there in terms of universities and research institutions and consequently, we are able to pin point the areas or domains in which the Middle East

lacks. Moreover, we are better able to build the case for the institution proposed in this thesis. A number of interesting findings are discussed below:

2.2.1. Historical Trends of Education and Research:

Before the 1900s there were only 11 institutions for higher education throughout the Middle East. The very first university established in the Middle East is in fact the oldest existing university in the World: it is Al-Azhar University, founded in 970 in Egypt as a religious university. The language in which education is conducted is Arabic, and today students total 90,000 with a student-to-faculty (s/f) ratio of 25 to 1. Al-Azhar was reputed as the center for Islamic thought and intellect, and exchange of ideas that took place within its three colleges of Theology, Muslim Law and Arabic. It is worth noting here that Al-Azhar has since 1961 been undergoing modernization by the addition of five new colleges of Medicine, Engineering, Agriculture, Administration and a Women's College. The next university did not get established until 1200 - Universite Quaraouyine in Morocco.

Six of the eleven universities were located in Turkey, and teachings were predominantly done in Turkish with some emphasis on English, and all but one were state owned. Moreover, it is apparent that Turkish institutions highly value student-faculty interaction since all their institutions have relatively low s/f ratios, averaging around 12 to 1. Lebanon's two most well reputed universities were established in this time period: the American University of Beirut and Universite Saint Joseph - both are private institutions, and more detailed accounts will be given later. And lastly, there is the Universite D' Algiers founded in 1879 by the Algerian state and the languages of instruction are both Arabic and French. It was the first state university established in the Arab World.

Generally speaking, historical and political events were influential on the establishment of institutions for higher education and research. The Ottoman Empire that occupied the region for 400 years, as mentioned above had a direct effect on inhibiting and destroying a lot of the libraries and intellectual centers in the Middle East. It was an extremely depressive period for the intellectuals and scientists of the region. Although no state universities (except Universite D' Algiers) were opened prior to the 1920s in the then Arab Provinces of the Ottoman Empire, there were a few professional colleges established in the nineteenth and early twentieth centuries in Egypt, and later in Syria and Iraq. The aim behind establishing schools of medicine, pharmacy, engineering and agriculture in Egypt was basically in an attempt to create a modern army and administration so that they could withstand the increasingly aggressive moves of Western powers.[15]

Many of such nineteenth century schools were closed once or twice, only to be reopened because of need. Although they generally came under the jurisdiction of the Ministry of Education, they did not constitute a university, but were run individually. Moreover, the number of students in them were limited: the six schools still existing in 1892 had a total of 229 students. It was this lack of facilities to students, and the tight control on Egyptian finances of the then British occupying forces in Egypt, together with the inadequate financial provision made for education by the authorities, that led a group of Egyptian leaders to found the private Egyptian University in 1908. The university only lasted eighteen years, and had established a Department of Arts (Arabic, English, French and History), and sections for social sciences, economics, and criminal law.[16] In the rest of the Ottoman Empire, although higher professional schools and universities were

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[15] Nader; Zahlan, editors, [1969]; *Science and Technology In Developing Countries.* Metta Akrawi: "University and Government". pg. 337.
[16] Ibid.

founded in Istanbul in the nineteenth century, it was not until the 1903 that a School of Medicine was founded in Damascus (this was later made part of the University of Damascus). Also in the first decade of the twentieth century, a School of Law was established in Baghdad, and later in the second decade, another School of Law was established in Beirut. During World War One (WWI) the Medical School continued to function but the two law schools closed down.

It took the countries of the Middle East a long time after the Ottoman empire was terminated following WWI to move back into officially planning the establishments of centers for higher education on a larger scale to encompass the increasing populations of the nations. The governments of the different countries have been highly influential and participative in this quest. Since gaining their independence, they often tried to bridge the gap they found themselves in relative to the West by funding the establishments of schools and centers for education in general.

One thing to note about the institutions in the region, starting from the few universities that were established in this time period, is that they were always highly independent in nature. In other words, they did not seek to establish inter-university links with other institutions in the region. There were rarely any exchanges of ideas or faculty or students. Moreover, until this day, the faculty member acts as an individual on his/her own in a large number of universities and colleges of the Middle East. He/she does not have adequate institutional support. "Academic institutions in such a rudimentary state cannot respond effectively to the needs of the area, and cannot secure the amount of public support essential for their well being."[17] Part of the problem is that most colleges and universities in the Arab world have been founded by missionaries, social reformers and

[17] Nader; Zahlan, editors, [1969]; *Science and Technology In Developing Countries.* A.B Zahlan: "Manpower and Development" pg. 329.

political leaders but not academicians. This brings about the pertinent need, and the challenge of the academic community for the institutional development of the universities and colleges.[18]

2.2.2. Analysis of Current Universities and Research Centers:

In total, we have identified 33 research institutions and 43 colleges of technology and management as well as 151 universities in 21 countries. After examining this data, we found several interesting observations.

2.2.2.1. Universities:

Out of the 151 universities in the Middle East, we noted that over half were founded in the 1970s and 1980s, as can be seen from Exhibit A1. In fact, the breakdown is as follows:[19]

Year of Establishment	Number of Universities	Percentage of Total	Cumulative Percentage
>1900	11 universities	7.3%	7.3%
1900-1944	11 universities	7.3%	14.6%
1945-1959	26 universities	17.2%	31.8%
1960-1969	20 universities	13.2%	45.0%
1970-1979	49 universities	32.5%	77.5%
1980-1993	34 universities	22.5%	100%

[18] Ibid.
[19] Europa Publications Limited [1992]; *The World Of Learning*.

In general, these numbers show how much the region lacked higher education until as late as the nineteen seventies and the eighties. In addition, only 22 universities existed before WWI. Moreover, over 55% of the universities have been founded in the seventies and eighties. This phenomenal growth of universities is a sign that the Middle Eastern countries have realized that higher education institutions are critical to their growth and advancement. Furthermore, it is worthy to note that the fact that most of these universities are state controlled is an indicator that higher education is viewed as a government function in the region, and that is merely the responsibility of their respective governments to meet this need.

Certain statistics provide insightful information as to the extent of what is already out there and how the different universities and institutions compare across the different countries in the region. It is worth noting that there was a lot of variation between the standards of universities across the different countries. One can generalize, to an extent, that a relatively low student/faculty ratio allows better teaching, and closer student -to-faculty interaction and relations. Moreover, a higher library volume means there are more resources available for research and promotion of ideas and information. In the Middle East, different countries and different universities within countries display a variation in these statistics. Israel, for example, seems to have the universities with the highest and lowest library volumes in the universities and institutions examined in the Middle East: Hebrew University of Jerusalem, founded in 1918 has the highest library volume - four million, and a good student/faculty ratio of 14.6. Open University of Israel on the other hand has the lowest library volume in the region - 4,500 and the s/f ratio is extremely high, 88.9. Weizeman Institute of Science, founded in 1949, also in Israel, has the lowest s/f ratio of 2.2, and library volume of 216,675.

The university with the highest s/f ratio in the region is Al-Quds Open University in Jordan, founded in 1985 and has 30,000 students taught by a faculty of 95. The ratio is consequently 315.8, with an extremely low library volume of 6,000. There are a few universities in the Arab countries with library volumes over one million (MIT library volume is about 2,200,000 and has a s/f ratio of 8.5. In addition, MIT has a large staff dedicated towards research (who are not included in the above ratio) -- they are neither faculty nor students, they are merely researchers contracted to carry out the vast number of research activities continuously conducted and pursued at MIT). These universities include University of Qatar with volume of 2,860,000 (and a s/f ratio of 11.7 and 5,281 students -- it is worth noting that this is the only university in Qatar and was founded as late as 1973); Cairo University with 1,057,000 (with a s/f ratio of 17.1, and 76,794 students); and King Saud University in Saudi Arabia with volume of one million, and a s/f ratio of 11.7 and 32,000 students. All have good s/f ratios as well as high library volume.

Next we examined the presence of technology and management in the prevailing universities examined. Essentially, we looked at the universities that have electrical and mechanical engineering, and computer science as a sign of the presence of technology in the institution. As for management, it was the presence of managerial teaching efforts and capabilities. The data set showed that the number of universities that offered management studies were relatively small compared to the total. In fact if we look at the ratio of number of universities that offer management studies over the total number of universities in the area, we find that the ratio to equal 41/151. Considering the size of the Middle East, 41 management programs cannot satisfy the region's managerial needs. Furthermore, the level and extent of management education in these programs are not known, or whether the teachings are on an undergraduate or graduate level. We perceive that the number of students that actually graduate with the business degree are low compared to the size of the region and the need for such skills within the labour force.

The ratio of universities offering technical studies is 89/151. However, the extent of actual technology taught and conducted here are not accurately known. Moreover, this figure does not indicate the actual research of technology that takes place. We suspect that few universities actually conduct research using their own facilities and people, besides Israel and Turkey.

Another interesting point to note is that English predominantly was not the primary language in which research was performed or education taught in some of the most prominent of the universities in the Middle East. In Israel, Hebrew was the main language used in the research activities performed. The universities there have excellent capabilities of translating all the research done and books written outside of Israel on the relevant topics to the Israeli educational system, and research departments. Further advances in the research are done in Hebrew and then translated to English for presentation in the international arena.

After examining this data set, it became apparent that most of the successful institutions in the Middle East are privately held, with the obvious exception of METU. Despite their scarcity, they have proved to be more strict in their pursuit of acquiring and teaching knowledge. In Lebanon, the universities with the highest standards and prestige are privately held and inspired or initiated by foreigners. The American University of Beirut (AUB) was founded in 1866 by American Protestant missionaries. Initially, it was founded as the "Syrian Protestant College", and was declared a university, AUB, in 1920. AUB gained international recognition and was ranked highly in world standards for universities. However, the fifteen year war of Lebanon has left its mark on AUB which lost a lot of its faculty and resources as a consequence. It is worth noting that AUB does not have the resources to conduct "high-tech" research within its buildings. However, a lot of books and articles have been published by its faculty. A common means through

which research was actually done is by AUB giving grants to finance professors' trips abroad for sabbatical. Essentially, they spend a year or two in a foreign university, usually in the US, and it is there that they actually do the research, utilizing the resources of that university. Within AUB, some research is conducted, particularly those related to local issues -- such as political and economic implications of regional affairs.

Another example in Lebanon is the Universite St. Joseph. This university was founded in 1881, by French Catholic-Jesuit missionaries, and was influenced by the French and the French educational system, particularly during the later period in which they colonized Lebanon. The language taught in the university is predominantly French but some subjects are taught in English and Arabic. The standards of St. Joseph are quite high. Lebanon's most successful and influential people were amongst the graduates of these two institutions, as were numerous other Arab nationals currently in high-ranking positions.

In Israel, almost all the universities and research institutions in the country are privately held. Examples are Tel Aviv University, Technion (-Israel Institute Of Technology), University if Haifa, Hebrew University of Jerusalem, etc. In all of them, the language of instruction is Hebrew. Moreover, each one of these universities has a formidable number of research centers and institutes affiliated with it where the actual conduction of different subjects researched are pursued. For example, Hebrew University of Jerusalem, the largest university in Israel has over 85 such centers. Their research varies from Edelstein Center for Studies in the History and Philosophy of Science, Technology and Medicine, to Gal-Edd Center for Industrial Development. Other examples include the attached research institutes of Tel Aviv University with research and studies varying from the Nahal Soreq center for Nuclear Research to the Institute for Nature Preservation

Research. All are once again privately held, though some are collaborative efforts with the government, or are partially funded by the government.

2.2.2.2. Technology and Management Colleges:

Exhibit A2 illustrates the "colleges" of technology and management currently prevailing in the Middle East. The meaning of the term college varied across countries: In some countries it meant a lower education level than the one in the university; in other countries it meant an equal level of education. [In general, the colleges in areas that were once under French influence performed higher educational activities than those in other countries. The reason is that the French term "ecole" connotes a higher status than its analogue in other nations.] In particular, the Arab-French countries such as Algeria, Tunisia and Morocco, have post graduate studies in their colleges or ecoles. In Iraq, the data set shows there are 10 technology or management colleges, however, on careful examination it was noted that nearly all of these institutes belonged under one big umbrella organization, the Technical Institute -- they were all part of one institute but the different colleges were named as such because they were located in different cities or regions. For example, there was the Technical Institute In Mosul, the Technical Institute In Kirkuk, the Technical Institute in Najif, etc. It is our prediction that each one of these institutes performed more or less the exact same functions and taught the exact same subjects and degrees only to different students living in different regions of the country. In total we found 43 of these colleges with the main concentration on education and very little research if any.

2.2.2.3. Technology and Management Research Institutions:

In addition to the 151 universities observed above, there are institutions that are basically research centers that specified for the "promotion and conduction of research in various fields and domains". There is a perceived total of 33 technology and management institutions that fit this description, as can be seen from Exhibit A3. Most of these centers are government owned or controlled and the kind of research conducted were dictated by the prevailing governments mainly to deal with national matters. For example, there was a lot of research done in the domain of petroleum and energy which are of concern to many governments in the region. Other domains are proclaimed to being related to promoting science and technology research and exchange. However, after careful examination of the description of the context of "research" that these institutions were involved in, it became apparent that many of these centers are essentially government bodies that actually served to promote awareness of certain fields but without actually doing research work in the specified field. A typical example is the following description of the function of one institution: "Government body to *promote* long-term R&D." Nevertheless, they are called "research institutions" by title. In fact, few of these centers actually have the capabilities for conducting research in the true definition of the word. Exception to this rule include institutions in Israel, Turkey, and some in Egypt.

Egypt itself actually is documented to have around 10 research institutions that mainly focus on energy related research: petroleum and nuclear, as well as textile industry related research. Egypt is the Arab country with the most research and educational centers in the region. Next come the centers in Iraq. However, there is no information available as to the exact functions and capabilities of the centers there. What is known, however, is that the government controls all the centers there and dictates what actually is

taught and researched in these institutions. Information on these functions is not public and is withheld by the government authorities.

The current research centers do not specifically contribute to the regional management and technology research: Israel is currently isolated in the region, and no exchange of information or facilities are made. The Middle East Technical University (METU) is a state controlled one which means that other governments of other countries cannot use the facilities of METU -- it is essentially private to the Turkish government and cannot be contracted out. Moreover, even if the possibility exists, the Turkish government maintains the right to ask for the program to be stopped, delayed or altered. This lack of guarantees and instability means that other countries are discouraged from associating and dealing with that institute, and hence most other countries are left without any high level university with a research capability. This would not be a major issue if there were independent research institutions to compensate for this lack. However, as shown in the table for technology or management research institutions, there are only 33 such centers. Moreover, at least eight of them are policy making institutions without applied research. Furthermore, five are energy related institutions serving the petroleum industry and three centers are for textile research in Egypt. With this in perspective, there are only 17 research institutions that concentrate on technology (including science research) and management in the Middle East. In fact, Management research is virtually non-existent and the only noted dedicated institution for management science is the Sadat Academy For Management Science.

2.2.3. Summary:

After building this data base, and carefully analyzing the information it pertained, it became clear that the region is still lacking in high quality education and research institutions. The fact that most institutions were formed in the seventies and eighties illustrate that these countries have come to realize the importance of higher education and research to the future growth and development of their countries. Most current institutions are state controlled which limits industry cooperation with these institutions on research projects, even if they wanted to. A private research university with emphasis on applied research would complement the current existing large education base of higher learning.

The need arises from the lack of this particular type of institution, one that is able to provide the resources needed to conduct technological and management research and higher education, and one that actively pursues the link between industry, governments, and institutions. For the Middle East countries to develop as technologically advanced nations, it is crucial to be able to perform applied research. The future growth and development of these countries depend on investing now into the establishment of such centers and institutions. This is especially so in the fields of technology and management which are of critical importance to the Middle East as shown in the following sections.

PART II:

TECHNOLOGY AND MANAGEMENT IN THE MIDDLE EAST

Chapter 3

Issues of Concern in the Middle East

3.1. General Problems Plaguing Most Middle Eastern Countries:

Since the end of World War II, education has gained prominence throughout the world, both as a basic human right and as one of the main pre-requisites to economic prosperity. Education at all levels is extremely important to all societies, and it is a basic obligation of all states to ensure these needs are met one way or another. The Middle East has a high level requirement for the development of their societies. The Middle Eastern countries, like many developing countries, are characterized by:[20]

1. A higher percentage of illiteracy on average.
2. A high need and concern for transfer of science and technology.
3. An imbalance in the educational outlook and choices available.
4. A shortage of para-professionals and technicians.
5. An unequal distribution of educational facilities among the different socio-economic groups and geographic regions.
6. A large number of high school graduates with limited opportunity to attend higher education institutions.
7. A discordance between the type of higher education offered and the type of education and training needed by the labour market.
8. A deficiency in the ability to keep up with the rapid growth of knowledge, science and technology.

All these factors indicate the need for the Middle East to invest in knowledge teaching, dissemination, and research. A country's most important asset is its people; consequently,

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[20] Bashur, Munir, editor, [1982]; *The Role Of University In Extension Education.* Adnan Badran: "How Relevant Is Extension Education To Universities In The Middle East."

it is extremely important to provide them with the means to acquire the necessary skills and knowledge in order to be able to perform a particular skill-related job well.

In the Middle East in particular we find that managerial skills and technological innovations are lacking. In the current state of the region, it is impossible for local firms to compete on a global basis. They simply will not be able to provide superior products at competitive prices compared with those supplied by the companies in the Western World. In order to get to that competitive level, technology and technological innovation has to be encouraged and adapted in the Middle East, and managerial models and techniques have to be developed and promoted. This is an integral part of transforming the economies of the region into high growth and productive countries.

3.2. The Brain Drain:

It is an obvious and exhausted issue that the Middle East is in dire need of a more skilled and highly educated labour force. However, different Middle Eastern countries have gone about it differently. Israel saw the need to invest into acquiring local training centers and institutions by heavily attracting scholars from abroad to come to the country and participate in the teaching programs. Today, it has institutions that rank high by international standards, and the skill level within the country has immensely increased to surpass all other Middle East nations. Other countries in the Middle East all too often chose to better educate their people by financing their expenditure to get higher education abroad, be it Europe or America. The idea is to send the promising new generation of students to learn from the experience, expertise resources and knowledge of the foreign institutions, and then, on completing the education, to return to their home country to help

infiltrate the ideas learned abroad into the home country. This was especially the policy after WWII and in some areas it was the case long before that.

However, there have been too many examples of young people traveling abroad and staying abroad once they get used to or "spoilt" by the lifestyles of these foreign countries that are so different to those ones at home. They are all too often enticed to remain in the foreign country where opportunities are so much more abundant and diverse than back in their home country. Moreover, those who do go back are mostly disgruntled and dissatisfied with the way things are done and operated in the home country. They become disappointed with the inefficient business practices and the poor working conditions and pay. Consequently, a lot of them end up traveling abroad once again, but this time to work and with the notion of remaining abroad for a long time. This has become a major issue of concern to Middle Eastern countries.

The "brain drain" has meant that many of the most qualified nationals have more or less permanently left the home country resulting in a less than otherwise could be highly educated and affluent labour force. Through the promotion and advocacy of more technical and rigorous working environments competitive with those of the West that many of these individuals can be enticed to return to the Middle East.

3.3. The Technology Triangle:

Technological development is imperative for developing countries. Moreover, this should be regarded within the context of an integrated strategy for expanding the whole technological arena. In examining this, it is imperative to look at the 'technology triangle"[21]. This is termed as the linking of research institutions, industry and government. This linkage is as fundamental for developing countries as it is for industrial societies. Conscientious effort has to be put in place in order to develop a robust triangle such as to drive technological innovation and application.

'The necessity for the triangle stems from the reality that the planet's intellectual, organizational, and managerial assets are limited relative to the tasks at hand. Therefore, an asset deployment strategy that reduces redundancies, enhances efficiency, and brings those that innovate close to those that use the innovations is not simply just business sense, it is also good sense from the perspective of public policy."[22] The whole concept of the technology triangle is to provide this kind of interrelationship and link that provides benefit to all the parties involved.

The technology triangle becomes important when one examines the different factors involved, the relationships between them and the implications of the different links that exist between all three. Figure 3.3.1 illustrates this very issue: The triangle represents the whole concept with the parties at each corner; the arrows illustrate the relationships that exist between the different parties; and the comments provided alongside the arrows illustrate the type of relationships that can exist between the R&D institutions, the industry

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[21] Choukri, Nazli [1991]; "The Technology Frontier, Responses To Environmental Challenges." pg. 18.
[22] Ibid.

and the government. The institution can provide the industry with the technical people and expertise, research output, and can act as a resource base for industrial needs. The same is true for the institution in meeting governmental needs. At the same time, the relationship is reciprocated through the industry's provision of funding and projects for the institution. In addition to this, the government can further provide the institution with the right environment (stable, and relaxed), regulations and infrastructure to enable research, development, and education to take place. Likewise, the government would provide similar incentives to the industries to allow them to conduct their businesses in an adaptive environment. Lastly, the industry could provide a link with the government through promoting the different industries to world class level, and that would in turn give the government stance on the international arena. Moreover, industry could provide work for the citizens of a country, thus easing political pressure on government to provide jobs for people.

To illustrate how this relationship can fit together, consider the following example: The government funds the regional research institution to conduct research in the telecommunications field to come up with an efficient advanced system for the country to use. Given the funding, good researchers and appropriate facilities, the local institution develops a new product to meet the government's requirements. Instead of allowing the businesses to get the telecommunications system from abroad, the government can then choose to advocate the local invention by providing incentives in terms of subsidies in order to assist the growth of local infant industry to produce and use the local technology. With this, the government can supply more jobs to locals, and help the growth of local industries, thus gaining politically; the industries can develop and grow their indigenous capabilities, thus gaining support for infant industry growth as well as possible market share; and the research institution benefits from the opportunity to be able to conduct more research for the region. It is important to note here that only when there is a known

self-interest recognized by each of the above parties will collaborative activities be effective in the manner promoted here.

This relationship is not always or necessarily explicit in all countries and all environments that advocate and encourage research. However, it is often implicit in the structure of different countries and indirectly provide the necessary infrastructure and environments for an innovative and technically rich society with strong industries.

The basis for the technology triangle is largely in place in developed countries, and most so in the United States.[23] MIT is a good illustration of the linkage of all three poles -- the institute is connected to government and industry -- and the functions it has performed up to today illustrate the "power of effective deployment of intellectual and scientific assets."[24] Japan, on the other hand, has only one link established: that between government and industry, while the other two links are weak. However, Japan is a different case altogether, since they follow a different sort of model that advocates innovations within industries per se, without usually using independent research institutions. Japan hence illustrates a different model that works for its society and environment. In addition, similar weak relationships can be seen in some European countries such as Italy. However, in others, such as Germany and France, these links are very strong.

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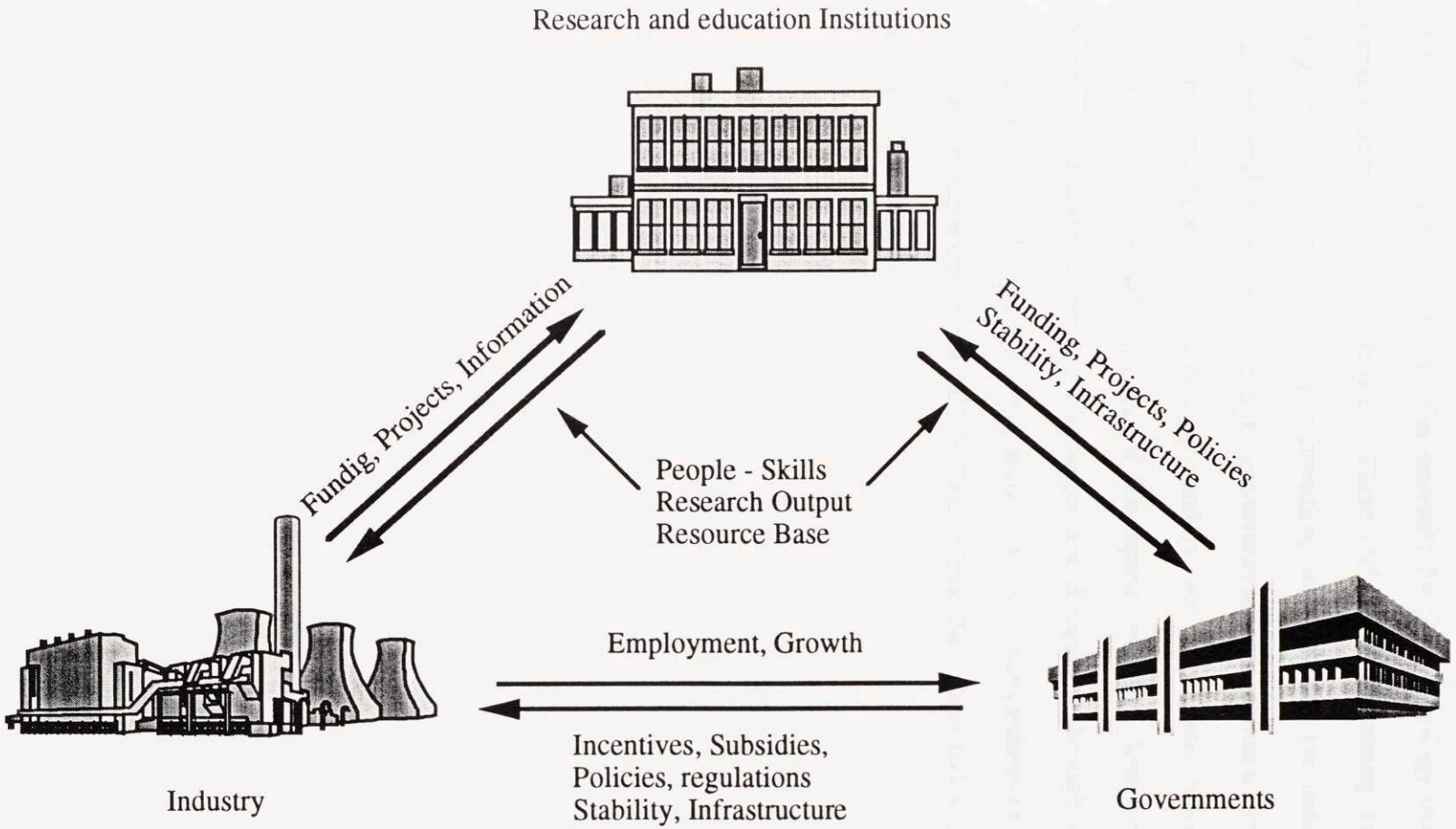
[23] Ibid.
[24] Ibid.

Figure 3.3.1: The Technology Triangle



Source: The concenpt of technology triangle was adapted from Choucri [1991] and is expanded upon by Nasrallah and Salty [1993]

In the developing countries, and the Middle East in particular, these links are not well established in any combination. The necessity for the technology triangle is to serve certain needs distinctive of the region: These include strengthening local capabilities, facilitating access to new technology information, strengthening the nation's position to deal with external agencies - foreign governments, international institutions, non-governmental organizations, technology vendors etc.[25] These links become very important in the industrialization process of developing countries. Improving the domains of technology and management are two important disciplines through which achieving such links can be attained. The following sections provide comprehensive examinations of technology and management in the Middle East, where they stand today and prospects of how they could be improved.

[25] Ibid.

Chapter 4

Technology In The Middle East

4.1. What Do We Mean By Technology?

The Macmillan dictionary (1979) defines technology as 'the application of scientific knowledge and advances to practical purposes, especially in the field of industry. Technology is also defined as the body of methods, processes, and devices derived or resulting from such application. In practice, technology is the specific application of scientific and technical knowledge to the production of goods and services."

For the purpose of this thesis, then, technology is defined as the knowledge and skills needed to design, create or implement a production process or the services related to the process. With this in mind, we can see that technological development involves much more than simply importing advanced machinery "off the shelf" and hiring someone from abroad to implement the technology and run it. It is the process through which individuals learn the process and develop expertise to be able to adapt the technology in question to suit the particular local needs, while maintaining the know-how of understanding the technology and knowing how to fix it in case something went wrong with the process. Consequently, technology should be seen as taking a variety of forms such as plant design, feasibility study, process, production, marketing and a number of other skills. Technological progress is a complex procedure that involves the combined social, political and economic capabilities of individuals, firms and nations.

4.2. Why Do We Need Technology?

Technological advance is essentially the motor that enables industrialization to take place, and through this, the well being of both individuals and states are improved. Technological proficiency and industrial capacity are regarded as major elements in development strategies of countries. Historically, industrialized countries have pursued the building of a technological base as a means to advancement and improvement in the living standards of their people. Developing countries must regard technological advancement similarly if they are to bridge the gaps between themselves and the industrialized world.

Furthermore, in order to acquire industrial capacity in the future, and to control it, a developing country will need to rely more and more on its own capacity: "to make policy decisions on technology; to generate technology critical for national development; and to evaluate, absorb and improve imported technology for national use."[26] For a country to acquire the development capacity necessary for the technological advance there should be a general awareness on the part of the policy makers and people of the countries as to the necessary steps and procedures that should be taken to reach that goal. A most important aspect in this process is the recognition of the need for technically literate and trained workforce that can and will support technology acquisition activities.

We have already said the Middle East has been experiencing extremely rapid economic growth, and coupled with this is the growth of the belief that there is an urgent need to expand capacities for making technical choices that are directed towards meeting and enhancing national needs and objectives. The issue faced by the countries of the

[26] TDP; MIT, [Summer 1985]; *Technology and Development,* Journal.

Middle East is the need or ability to "leap-frog" into the age and level of advanced technology practiced in the industrialized world, without actually going through the gradual steps of development and industrial revolution experienced by their Western counterparts.[27] A popular view emerging among Middle Eastern countries is the crucial need for a strong scientific and technological base that would enable the appropriate decision-making that would effect the economic and social development in the region.

4.3. The Technology Gap:

The Technology Gap refers to the discrepancies between the Middle East and the industrialized nations as well as among Middle Eastern countries themselves not only in the technologies used, but also the ability to adapt technology and to obtain the flexibility to innovate. This gap takes a variety of forms and dimensions: both institutional and structural. The bridging of such gaps are made even more difficult by the discrepancies between the declared government policies of seeking to bridge the gaps, and the scientific and research institutions existing in these countries that do not have the means and facilities to meet these objectives. This makes it difficult to establish the scientists, engineers and academics needed within each of the Middle Eastern countries. Moreover, the nationals that acquire such skills abroad are given very little incentives and opportunities to return to their home countries.[28]

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[27] MIT, [1985]; *Proceedings of the Roundtable on Science, Technology, and Development in the Arab World.*
[28] Ibid.

An examination of the concept and process of technology transfer into the Middle East is necessary here to see what has already been done, and the position that the Middle East exists in today in terms of technological means and capabilities.

4.4. Technology Transfer to the Middle East:[29]

Technology transfer can be defined as the process involving a supplier and recipient whereby the recipient attains, as a result, an improved capability to operate an industrial production capability to operate an industrial production facility or service system. It is essentially a commercial one and not a formalized institutional one. Moreover, technology trade, which includes international sales of industrial rights, equipment , technical services and training and plans and documents, is only one part of technology transfer. Technology utilization or absorption by the recipient is a critical part of technology transfer.

Consequently, though technological transfer occurs through technological trade, it should nevertheless be distinguished from it. If the recipient merely purchases equipment but is unable to use it, technology trade has occurred. In this case, only part of the technology transfer has been completed. As the recipient absorbs the technology more fully and extensively, then the capability to operate the technology and maintain it is developed. Moreover, when the technology is more fully mastered or absorbed, the recipient develops the ability to design and produce new products based on various different adaptations of the technology. Depending on expatriate workers to operate and maintain the technological facility means that technology absorption is limited.

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[29] *Technology Transfer to the Middle East* (Washington, D.C.: US Congress, Office of Technology Assessment, OTA-ISC-173, September 1984).

Middle Eastern countries have been rapidly expanding their imports of advanced civilian equipment and technologies. Whereas the figure of total such exports from industrial countries to 15 Islamic states in the Middle East was around $5.5 billion in 1970, it increased to $100 billion by 1982[30], and today that figure is phenomenally higher. The major suppliers to the region have been the United States, Japan and the West European countries. A large proportion of the imports were engineering products: machinery, equipment, and instruments; while at the same time technical and managerial services have been increasingly important exports from the industrial world to the Middle East.

Although technology trade in the Middle East has increased rapidly, the Office of Technology Assessment's (OTA)[31] research indicated that technology transfers have been limited. The extent of absorption of a technology depends on the type and extent of capability developed by the indigenous personnel in a particular firm or industrial sector, as described above. OTA's research shows that it is much easier to trade technology from one country to another than it is for the recipient country to absorb the technology.

4.5. Problems Inhibiting Technology Absorption:

There are a number of factors that constrain technology absorption in the Middle East. The main factor relating all these issues is the fact that there exists a huge technological gap between the donor and the recipient countries. Furthermore, there is a lot of disparity between the human and financial resources within different countries in the

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[30] Ibid. "Principal Findings" pg. 62.
[31] Ibid.

region. For example, though the Gulf countries such as Kuwait, Saudi Arabia and UAE are extremely rich financially due to their natural resource of oil, they have a vast shortage in human resources, particularly in technical and managerial personnel. Egypt on the other hand, has comparatively an extensive technological infrastructure and vast human resources in general. However, the problem with Egypt as well as a number of other Middle Eastern countries is the fact that many of their most highly qualified people have traveled abroad, to the US or Europe mainly, in search for adequate work.

4.6. Analyzing Technology Trade and Transfer:

The effect of technology transfer on recipient countries can vary a great deal from one country to another, and can be used to achieve a variety of different goals: Successful technology transfers promise economic growth, improved living conditions, manpower development, and even enhanced national prestige and influence. Technology transfer can lead to better quality of life through provision of higher quality medical services; improvements in agricultural needs through the introduction of better irrigation systems; foreign exchange revenues through the establishment of manufacturing facilities that produce goods for export. These are but few examples of what benefits technology transfer can have on the recipient country. When the technology works in the way we are advocating, the recipient develops a greater capability to operate a production process or a service system, and the suppliers can benefit financially. However, there is a constant implicit worry from the part of both the suppliers and the recipients, individually as well as collectively, over the potential negative consequences of technology transfers that fail to

result in the anticipated changes intended through the transfer.[32] This poses a threat or an obstacle, as well as a reluctance for the continuous flow of technology transfer.

Technology transfer is mostly done in the context of a trade: The supplier provides the recipient country with the technology it needs in return for a prearranged gain for the supplier. It is a major concern for the US. government that technology transfers involve fair exchanges in which US. firms and organizations are appropriately compensated. Moreover the aim is for the transfers to actually add value to the recipient country, improving its capability and consequently reinforce international relations between the two nations that mutually benefits both. However, in practice there have been conflicts between economic and political interest with regards to US. policies with the Middle East. The trade has not tended to be a smooth transfer, but is overridden with a number of security and other political issues. Middle Eastern countries have consequently not found it easy to get the kinds of technologies they might need for their own economic and political prosperity.[33]

Given the vast scale of demand for technology trade and transfer in to the region, there is a lot of competition between supplier agencies to get contracts for the trade and transfer to countries in the region. Middle East countries require not only the willingness of firms to provide state of the art technology at a reasonable price, but to also provide the maintenance services and training for the use of the technology as well as marketing it. However, the technologies have not usually actually been absorbed into the country. This is mostly the fault of the recipient country and industry for not having the capabilities for absorption in place, the indigenous technical expertise or the supportive facilities for absorption.

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[32] Ibid. Chapter 2, pg. 78.
[33] Ibid.

In addition, there is a great deal of variety in the technology transfer stages across Middle Eastern countries. This immense discrepancy between one country and another in resources and resource utilization gives a lot of room for cooperation and exchange of ideas and comparative advantages from one economy to another.

The process of importing technology from foreigners, along with the expatriate workers for maintenance and services, costs a substantial sum of money. Few companies or industries can actually maintain this scale of heavy continuous expense. A one time payment to import the technology does not mean that the technology will be used correctly or effectively. Consequently more money has to be dedicated towards getting the whole package of the physical technology as well as the people who will install it and service it.

In addition, even if a company is blessed with the financial means to actually afford such an investment, the company will not always continue to have the huge finances necessary to continue maintaining and updating the technology. The fact that recipients do not have the means and facilities to be self-sufficient in effectively handling the technology also means that they cannot on their own solve any problems associated with it.

There are many sectors currently contracting technology transfers to different nations in the Middle East. The following are examples of a few industries and the problems Middle East countries are facing in this process[34] :

[34] Ibid. pg. 65.

-Telecommunications Systems:

Telecommunications systems are regarded as a high priority among the Middle Eastern countries. They are important component systems of the national infrastructure needed for the growth of different industries and services within any particular country. Efficient and effective telecommunication systems have extremely favourable effects on industries: a lot of time and money is saved through good communication channels. Problems arise from inconsistent policies pursued in the different Middle Eastern countries: Kuwait and Saudi Arabia have the money to install such systems but do not have the indigenous technical workers needed to maintain them; Egypt on the other hand does not have the adequate incentives for technical personnel to work in the state owned telecommunications industry. Numerous problems hence surround this crucial sector of the economy.

-Commercial Aircraft Support Services:

Commercial Aircraft support services represent the sector that has over the years had the most extensive technology transfer and absorption in the Middle East. The main reason for why the aircrafts in the Middle East are very comparable to the major international airlines in the western world is because the airline system and operational procedures have become extremely standardized with well defined standards of training and performances. It is often the physical shortages in local workforce that results in reliance on foreign expatriate workers to meet the demand for technicians and operators.

-Medical Services:

Medical services represent the sector that has been coined "of highest importance and cruciality to the Middle Eastern countries and governments". Improved medical services serve to improve the health conditions and life expectancies of the endogenous population. Such improvements have a trickle down effect of many more improvements:

for example, better health care means the local population has better health and energy to work more days of every year (less sick leaves are taken per year). This increases the productivity level of a country and subsequently the national income of the country.

The oil-rich gulf countries have been reputed over the years to have invested heavily into acquiring the best and highest quality medical equipment from the West, particularly the US. However, once again the problem of insufficiently trained indigenous manpower limits the extent of local ability and capability to absorb the technology available. Most hospitals have people who have been given explicit instructions as to how to operate the machines but not how to understand the internal operating procedures of the machines. The problem essentially is that Middle East countries in general do not have the internal capabilities and technical skills to manufacture the hospital equipment themselves, and moreover they do not have the technically capable personnel to operate or fix the equipment.

-The Petrochemical Industry:

The Petrochemical industry is a major industry in the Middle East, particularly amongst the oil rich states where petrochemical industry has become a primary export industry. Countries such as Kuwait, Saudi Arabia, Qatar, UAE and Bahrain have financed the complete production of these capital-intensive facilities. However, they are still dependent on foreign technological import and assistance, despite the fact much of this technology has become fairly standardized. One common way in which Petrochemical technology is transferred is in packages, which actually makes the recipient countries heavily reliable on expatriate managers and technicians to run the technologies efficiently. More recently, foreign involvement has been in the form of joint ventures, licensers of technology and contractors. For these countries it was essential that they have the highest quality of technology available , and so they offered their contracts accordingly.

There are in addition problems that arise from petrochemical technology transfers from the part of the suppliers. A growth in volume and sophistication of the petrochemical industry in the Middle East raises concern from the part of Western industrialized countries that are afraid of the competition that would come from the Middle East. Protectionist barriers might grow as a result. Petrochemical technology transfers to the Middle East therefore give warning signs of structural adjustment for the industrialized countries, and particularly for Japan and the USA.

4.7. Where We Are Today:

The capabilities of the local work force indicates the ability of the recipient country to effectively utilize the imported technologies over and above the level of sophistication of the equipment in the country. Moreover, as indicated by the OTA research[35], the level of absorption of the technology differ from one country to another and across the different sectors in a country, as summarized above. Generally speaking, the countries of the Middle East examined have developed capabilities for transporting the technology to the country, operating it and maintaining it where possible. However, the capabilities to completely absorb the imported technology, to modify the equipment or appropriately adapt it are lacking for the most part within the majority of the Middle Eastern countries.

Technology absorption has been most absent in areas where the technology is complicated and requires long studies to be able to understand it, and the technology is not easily and visibly usable within the economy. However, in cases where the technology

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[35] Ibid.

and its equipment are used for the production of local goods and services and are visibly used by the society, then technology absorption has tended to be more successful. The commercial airline maintenance industry is an example of this. In addition, it is worth noting that in sectors where industries are forced to compete directly with foreign firms from countries providing the technology to the recipient country then there is more reluctance on the part of the supplier to provide all the capabilities to help the recipient absorb the technology. This is not to say that the recipient has the capability to actually absorb that technology. The point here is merely that there can be a clear conflict of interest between suppliers and recipients in areas where there is fear of competition emerging from the recipient country once it becomes sufficiently efficient and capable in producing the product or service in question. Such has been the case for the petrochemical industry.

Chapter 5

Management in the Middle East

5.1. Management Practices in the Middle East:

Many examples can be given to illustrate the managerial issues and problems that have plagued the different operations and distributions of goods in the Middle East. One noteworthy case is that of the agricultural sector in Jordan: An inadequate irrigation system for the farm lands that resulted in a much lower harvest than the land was capable of producing. The government consequently embarked upon a large scale costly program to implement a massive irrigation scheme (using foreign technical aid, of coarse). When the program was completed, the harvest yield was increased phenomenally, and produced more than was needed in the local market. However, there was no coordination between the farmers as to who should grow what and in what quantities. Consequently, a lot of the same products were grown by different farmers (for example, there was an over abundance of tomatoes). Due to this lack of coordination as well as the lack of proper marketing schemes on the part of the farmers, they ended up losing a great deal of money. As a result, the government intervened and allocated quotas as to the types and quantities of products that should be grown by the various farmers. However, once again the plan did not work: the government organization had made no plans or considerations as to where and how they should sell the products. Marketing was perceived not to be an important issue. In fact, no party or organization took it upon itself to organize the marketing of the agricultural products which ended up rotting in storage.[36] Had there been efficient and well organized managerial capabilities and decisions made, this problem

[36] Vice President for Academic Affairs, AUB. Interview on August 10, 1992.

would not have occurred. There are many more examples of such managerial incapabilities in the Middle East, such as water management, health management, engineering management, etc. Businesses as a consequence continuously face a lot of problems every day in their respective fields.

Managerial behaviour is known to be affected by the cultural and social backgrounds of the managers as well as by behavioural and economic factors. The family structure and the relationship between different family members, the degree of acceptance of authority in the society, economic conditions and the overall standard of living, as well as personal and behaviour characteristics of managers contribute to differences in their management styles in different nations.[37]

The Middle East represents a unique area of management practice. When one examines businesses in the Middle East, it becomes apparent that their practices are highly personalized, relying more on "cultivation of individual customers than on media advertising and other sales techniques commonly used in the West. Organizational design is highly bureaucratic and over centralized with power and authority resting at the top.[38]" The relationships between the staff and line are extremely vague, and in general, there is an unpredictable and ambiguous organizational environment. Employees tend to relate to each other tightly and specifically in organizations, and chain of command must be followed rigidly. In addition, management methods employed in the Middle East in general tend to be more old and outmoded in terms of Western practices and techniques.

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[37] Erdener Kaynak, editor, [1986]; *International Business in the Middle East*. Uger Yucelt " Managerial Practices in the Middle East" pg. 113.
[38] Ibid. pg. 12.

Middle Eastern countries have distinguishing economic, cultural, social and behavioural characteristics. Differences in behaviours and motivations in the various cultures of the Middle East help to explain the differences in management styles between these nations and Westerners. For example, Middle Easterners tend to be highly sensitive to face-to-face criticism, and they place a great value on personal friendship[39]. Moreover, a study made by Daniels and Ogram in 1982, stated that Saudi Arabians tend to do things at a leisurely pace and are unmindful of interruptions, whereas Westerners set time standards and objectives for completion of tasks.

Similar to other nations, Middle Eastern managers tend to work to satisfy their basic needs for goods, clothing and shelter. In terms of satisfying higher needs, Middle Eastern managers rank self actualization as most important, followed by social need, esteem and autonomy. However, amongst the greatest managerial dissatisfaction of the Middle Eastern managers are in the areas of autonomy and self-actualization. The most typical management style in the Middle East is stated to be authoritarianism. Managers here believe that authority will produce both higher morale and productivity in the work place, while low moral and low productivity will be the result of applying participatory management systems. In addition, there is a prevailing belief among Middle Eastern managers that subordinates are incompetent and cannot be trusted to perform their jobs independently in a satisfactory manner. This consequently use as a valid reason to defend centralization of authority and insist that their subordinates must be closely supervised and directed in the work place.[40]

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[39] Ibid.

[40] Ibid. Chapter 1: "International Business In the Middle East." pg. 13.

It is interesting here to note a study conducted by Uger Yuselt on the managerial style in the Middle East using Turkey as a case example[41]: The study , which consisted of responses from 59 Turkish executives indicated that in traditional state owned organizations, managers tend to be more authoritative, while in private organizations, management style tends to lean towards more participative styles. Through the study, it became apparent that the decision making of more young and well educated Turkish managers tend to have a participatory character rather than an authoritative one. Moreover, Yuselt contends that in the Middle East, it is necessary to introduce participative managerial systems in the classroom and train prospective managers before they assume "on-the-job managerial responsibility." However, this does not suggest that the managers change their social values, culture, family structure, and individual pride. It rather proposes to narrow the gap between the management styles of Western culture and that of the Middle East nations.

5.2. Managerial Gaps Between the Middle East and the West:

The following table makes a generalized comparison between Middle Eastern and Western style of management:

[41] Ibid.

Table 5.2.1

Comparison Between the Middle Eastern and Western Management Styles

Implications	Middle Eastern Management	Western Management
Decentralization	Limited	Widespread
Authority	Executive only	Dispersed
Delegation of Authority	Rare	Frequent
Superior/Subordinate Relationship	Formal	Highly Personal
Leadership	Based upon domination	Based upon experience, and judgment
Trust in Subordinates	Non existent or minimal	Great
Team Work and Cooperation	Non-existent or minimal	Great
Accountability	Demanded from all subordinates	Determined according to job
Control	Oral and through use of accounting information	Written and through performance appraisal
Planning	Short-term	Long-term
Written Reports	Brief and uninformative	Long and informative
Staffing	Contingent upon affiliation, friendship, and right of birth	Contingent upon qualification, training and experience.
Learning	Memorization	Analytical methods and problem solving
Profit Objectives	Short-term	Long-term
New Ideas	Discouraged	Encouraged
Resistance to Change	Strong	Minimal
Group Membership	Based upon social status	Based upon economic, sociopolitical, and psychological factors
Loyalty	To individual manager	To organization

Source: Kaynak, Erdener: editor [1986] International Business In the Middle East. Uger Yucelt: "Managerial Practices In The Middle East." pg. 113.

Note: We believe that these are merely relative generalizations. For example, "Trust in Subordinates" is not necessarily great in all Western firms, but as compared to the Middle East, they generally are.

As can be seen from Table 5.2.1, there is a great deal of discrepancy between the managerial practices of the West and those of the Middle East. A lot of the issues mentioned above are ones that have to be addressed in a serious fashion if the Middle East wishes to become competitive in world standards. For example, new ideas should be encouraged at all levels of the organization, since the top level management cannot know all the details and issues that take place on the lower levels of the organization. Trust and incentives should be delegated to the subordinates in order for them to feel their work is of value and relevance to the overall organization. Moreover, the organization should not be resistant to change if the market environment and forces dictate that things ought to be done differently than traditionally the case. Until today most businesses in the Middle East tend to shy away from change.

The Middle East in general is lacking a lot of the managerial processes and values that are practiced in the US and other industrialized countries. Below is a table summarizing the gaps in managerial processes and business gaps that exist between the developing countries of the Middle East and the US. If the Middle East is to reach competitive standards with the West, it has to work on bridging the gap of differences in projects and practices. Management education must hence be practiced in the Middle East in order to elevate the managerial operations in these countries to a standard comparable to the industrialized world.

The table below, Table 5.2.2, essentially describes the system of the Middle East relative to those in the US. It is not meant to give an absolute description of the processes in the region, but merely a comparison.

Table 5.2.2

The Managerial Systems in the Middle East Relative to those in the US

Management Process	The Middle East	The United States
Planning:		
- Objectives	Inconsistent	Profitability and Market Share, etc.
- Concept	Production	Strategic (Financial/Marketing)
- Time	Annual is Long Range	5 to 10 years in Long Range
Organization:		
- Orientation	The Individual	The System
- Structure	Functional	Program and Matrix
- Authority	Centralized	Decentralized
- Management	Owners	Managers
- Accountability	Informal	Formal
- Performance Indicators	Adherence to Procedures	Result
Decision Making:		
- Nature	Incremental	Strategic
- Participants	Government/ Public Sector	Private Sector
- Information Base	Weak and Spotty	Strong and Well Balanced
- Psychology	Emotional/Personal	Rational/Corporate
Communication:		
- Direction	Top Down	Multiple
- Frequency	Infrequent	Frequent
- Urgency	Urgent	Routine
- Primary Purpose	Orders	Informs
- Orientation	Reactive	Interactive Open/Clear
- Channels	Obscured/Hidden	

Business Functions	The Middle East	The United States
Production: - Dominance - Orientation - Capacity	 Higher Quantity Physical	 Lower Quality Marketing
Marketing: - Orientation - Concept - Emphasis	 Products Lacking Warehousing	 Markets Marketing Mix Distribution Management
Financing: - Magnitude - Sources - Terms - Security - Criteria	 Millions Limited International Soft Loans Government Guarantees Funding	 Billions Consortium International Conventional Terms Feasibility Studies Cash flow, Pay-Back, and Return on Investment

Source: Kaynak, Erdener: editor [1986] International Business In the Middle East. Uger Yucelt: "Managerial Practices In The Middle East." pg. 45.

These differences in managerial style and practices in addition to socio-economic differences is the cause of much of the frustration experienced by Western managers attempting a business transaction or operation in the Middle East. A mutual understanding of the different styles is essential for smooth transactions to occur from both sides and to minimize the frustrations experienced.

A managerial culture must be developed into the society, a culture that allows for practicing the different managerial methods that have proved to work in the West. These methods of course have to be fine-tuned to fit into the society, but nevertheless should be taught to the business people of the region. For example, teamwork is a concept that is very popular in the Industrial World, but is essentially alien to Middle Eastern

organizations and practices. The individual drive and need for self-promotion are very characteristic in the Middle Eastern practices. More weight and importance in the teachings should be oriented towards promoting group work and shared problem-solving, which in many different fields have proved to be more productive and innovative than individual work. In addition, management should take a conscientious effort to improve the working conditions of their employees. Work satisfaction is a well researched organizational variable that has consistently been found to be associated with favourable and more productive work related out comes. Such concepts and ideas have not yet been well infiltrated into the Middle Eastern way of doing business, but are, as noted above important in overall firm productivity.

5.3. Choices and Issues Facing Businesses in the Middle East:

The following is a brief summary of some of the biggest challenges and choices that have been facing Middle Eastern business, and business opportunities. Calculated decisions have to be made to pursue the policies that are in the long-run benefit of the business:[42]

1. The movement towards business and industrial democracies versus the need for centralized management control;
2. The need for long term economic development versus short term development in various countries in the Middle East;
3. Foreign direct investment of oil surpluses versus national investments to diversify sources of GNP;
4. Business monopolies limited to Arab nationals of a specific country versus business competition open to all Arab nationals; and

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[42] Erdener Kaynak, editor, [1986]; *International Business in the Middle East*. Erdener Kaynak: "Comparative Study of Marketing and Management in the Middle East." pg. 42.

5. Slow growth due to unwillingness to hire expatriates in order to avoid social and cultural problems or to run such social and political risks.

These issues have plagued the policy makers and strategists in the Middle East for decades, and continue to be subjects of major debate today. The nationals; businessmen and policy makers, have to be able to see beyond their immediate environments and short term objectives, if they wish to grow economically. The need for well established institutions to guide the policy makers become more vivid when examining these issues. There is a dire need to have strategic decision making to be pursued on both the micro and macro levels of these countries in order to better position the countries on global market basis.

In the late 50s and 60s, there were a number of studies made regarding this very issue of the need for organized management in the Middle East. The Inter-University Study Group encompassing MIT, Harvard, Princeton, and a number of other institutions conducted studies in this domain. The idea was that the Middle East has labour and capital, but what is really needed is the management link: in other words, there is a great need for structured and organized management teaching and practices to best utilize the available resources in these countries.

The issue of management seems to be one field that was heavily undermined and discarded as not important enough to pursue serious work on. Whenever the World Bank or IMF allocated funds for development in the Middle East, it was almost always dedicated to the pursuit of education, medicine, and even technology related projects, but never really anything to do with the actual teaching of the managerial skills and structures. We believe that management is very important, and in fact crucial to the advancement and better competitiveness of Middle East industries. It is one thing to provide all the

necessary technological means and capabilities, but another to actually implement the new technology improvements into the actual industries and firms - to actually come up with an end product that can be consumed by the markets. The link is crucial and essential to cover the spectrum necessary to reach the stage of development that the Middle East nations aspire to achieve.

High level research and teaching of managerial skills and capabilities open entirely new doors to the concept of business and industry in the Middle East. Well trained managers would have better foresight of strategic planning for their firms and operations management of their production plants, and the effective marketing of their end products to the consumers. All these issues are pertinent to efficient operations of any firm operating in the increasing global environment of today's world. This is, as mentioned above, definitely a field that has not been adequately researched into and given justice in the Middle East as a whole. Moreover, the educational facilities have not given it the emphasis that it should really have.

Chapter 6

Meeting the Technology and Management Need

Based on the discussion above, we are able to conclude that there is a need for a technology an management research and educational institution in the Middle East. The institution will act as a center for research and higher education in the Middle East. This will be in the form of advancing technological and managerial skills and expertise in the region. These two fields are in dire need in the Middle East. Individually, technology and management can meet the needs of many organizations within these countries, but collectively, they can serve as a powerful tool to promote and implement successful technological and managerial reformations that are sure to benefit not only individuals and organizations but entire nations as well.

The research institution proposed would serve as a knowledge base and center for knowledge enhancement. In some fields, its research departments can perform studies on technology, in others it can transfer the technologies developed in other countries, such as the US and teach it in the institution, while working on methods to improve it and making it adaptable to the business in the Middle East - similar to or following the Japanese model.

Although the Japanese have never been reputed to inventing new technologies, they outperform the rest of the world in a number of technologies they do use, and are particularly renowned for process improvement. After World War Two (WWII) they imported Western technology, and they built upon it to develop superior products. This method has gotten them very far in the consumer market. A similar approach would be

highly desirable in the Middle East. Rather than attempting to re-invent the wheel with everything, it would make more sense from an economic as well as a strategic point of view for the Middle East not to try to start from the technological point they are currently at, but to go straight to a higher level of what is already out there all over the world, and improve upon it, or put more research on it in order to make it adaptable and implementable in the region. We are hence proposing some degree of "leap-frogging". Consequently, a combination between adopting others' technology and formulating its own would be what the institution would try to achieve.

Bridging the technology gap starts with achieving self-reliance in the area of technology as well as providing technology choices to researchers, industry and governments. This requires generating the ability to absorb, and improve the utility and relevance of imported technology to reach appropriate and national levels for the development of the nation. To reach this end goal, there has to be a channel for collaborative efforts with the technologically rich industrial world. Through highly sophisticated and technically capable institutions this transition is made easier and smoother than otherwise. Moreover, having the local capabilities for learning and teaching the technologies used in the industrialized nations would guarantee the absorption of the inventions and capabilities of the industrialized countries into the region. Before developing the capabilities for local technological innovative development, there has to be a phase, as mentioned above, whereby the country leap-frogs into the level of technological richness of the more advanced societies. Only then would the country in question be capable of its own research of world class value.

However, Middle Eastern countries have not found it easy to get the kinds of technologies they might need for their own economic and political prosperity.[43] This gives all the more reason for advocating the encouragement of local research and development in the different fields until Middle East countries reach a point where they can surpass such threats and be able to support technological innovation and applied research from the labs of local institutions such as the proposed one. The institution will in effect serve the industries of the region and aid them in their required technological transfers; help them learn how to actually use, repair, build upon and improve the acquired technology for their own benefit.

As noted previously, the issue of "brain drain" that is occurring on such an extensive scale in the Middle East is a very serious problem. In an attempt to face this broad issue and to deal with it, there have to be a number of changes made in the region. Our proposed institution is an attempt along these lines. Having a regional resource base, a center for technology and management research and education will not be not only an alternative to some people being sent abroad, but in fact an incentive for high talented individuals to remain in the Middle East for their higher education. Moreover, it will reduce the heavy reliance and dependence on expatriate workers that most Middle Eastern countries have gotten used to in their quest to industrialize.

To acquire such a workforce, it is necessary to provide the means and institutions where training can take place. It is well known that education and especially through research is the primary route to development. The provision of universities and institutions help guarantee the education of the population to be carried to a higher level. Through this, high-level sophisticated nationals would emerge from institutions that serve

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[43] Ibid.

the region in not only easing the flow of technology and technology absorption into the region, but to also developing the capabilities for indigenous technology in the future.[44] It is only through such institutions that the Middle Eastern countries can guarantee the continuity and relevancy of technological policies to their national needs and aspirations, and prevent the possibility of obsolescence of the technologies and policies.

Furthermore, a research institution that is broad-based enough, and with the right technological capabilities can act as a center for the fostering of the establishment of the technology triangle. Currently, MIT is involved through the "Technology and Development Program", in addressing problems central to national needs by undertaking collaborative research identified jointly by the government, the businesses and the scientific community. "Only when there is a clear self-interest recognized by each of the parties will collaborative activities be effective." Understanding this crucial factor, will be one of the major tasks of the proposed research institution to aid the different sectors in recognizing this issue -- that all will benefit, and that it would be in each one of their self-interest when they collaborate to establish the link.

The teachings of management theories and models would give the Middle Eastern managers frameworks to follow or keep in mind when examining the positioning of their firms and how they should or could expand; what kinds of products they should be manufacturing, how to conduct feasibility studies and test markets, etc. All these concepts are important and must be adequately taught in the Middle East.

Moreover, it is important to stress the point that the management education should be done in an appropriate form and advocated in such a way that it does not come in

[44] Ibid.

direct conflict with hierarchies in established organizations in the Middle East. It is easy to say that cohorts of young managers in the Middle East should be simply taught the Western models, but this does not necessarily mean the systems can be placed into the Middle Eastern environment, and practiced there. There should be special teaching methods and models made to accommodate the Middle Eastern arena and adapt into them, rather than a simple copy of the Western techniques. For example, promoting "hybrid organizations" that combine elements of Western models with Western practices in a way that would best suit the Middle East, would be an option worth examining, and promoting within an institutional structure of research and education.

One main objective or purpose of the proposed institution is to meet and satisfy this need with both management research and education. This would develop a class of industry people and managers who are more open to inter-play between the need for better functioning and more advanced equipment and operating techniques as well as more open minded and professional managers at the head of the firms and businesses to better encompass the new technological capabilities into their own production plants and industries. From this point of view it becomes clear how an institution that promotes one aspect (such as technology) and not the other (management) would not be maximizing the benefits and practical implementation of the projects pursued and innovations made in the research departments of the institution. When a manager in a high position in a firm is aware of the advantages and benefits of the technology innovations to his firm, he/she would be more receptive and encouraging to the idea of practically implementing the recommendations of institutional research labs.

The ability to change to meet the needs of one's changing surrounding environment is crucial to remaining at the competitive edge of today's global markets. Middle East firms tend to be averse to change. They like to maintain things harmoniously, the way

they are used to. Unless the high level managers or those who are on their way to such levels are taught the needs for change and the different managerial options and methods, then technological advances and other such improvements cannot be maintained in the long run. It is a major objective and function of the proposed institution to be able to create world class managers, who are able to balance between their traditional and cultural practices and the fundamental managerial practices and operations that all managers should be aware of.

Research applied to national, commercial, or social needs should be encouraged in a conscientious effort to make the institution as independent and self sufficient as some Western institutions are. Initially, the institution might perceivably start as a center for the transfer of technology from abroad, teaching it, learning how it is done and translating it for the local industries, agencies and universities. This will ensure the infiltration of technological and managerial innovations to the users. However, without initially building the capabilities to perform applied research, the whole purpose of the institution is lost. To reach that stage the institution will have to conduct its own research whether collaboratively with other institutions both locally and globally, or independently if need be.

PART III:

THE INSTITUTION

Chapter 7

The Questionnaire

There are many unknown factors inherent in the process of establishing such an institution. To get a better understanding of these factors, we distributed a questionnaire to a number of academics and business leaders. The questionnaire addresses the issues of most importance to the establishment of this institution. Specifically, the need for this institution, the political and economic infrastructure, as well as the expectations of Middle Eastern industry and government are addressed.

7.1. Description of the Questionnaire:

The questionnaire consisted of general questions with regards to the need and importance of a research and education institution in the Middle East. The process of establishing such an institution is uncommon and often does not follow a pre-established structure. Consequently, the questions we asked reflected a general approach as to the issues that we thought are relevant to establishing the institution. The point was to get a comprehensive feedback from the interviewees as to what they believe are the issues of most importance in addressing the establishment of an educational and research institution in the Middle East. For example, we asked them what fields of research *they* believed were of most importance for the institution to be conducting, and listed a series of fields from which they could categorize in order of importance. Moreover, without mentioning to the interviewees which country we had in mind as a most viable alternative to place the institution in, we asked their opinion to rank the top three choices they had for the

different countries in the Middle East and to provide a brief explanation as to why they chose the countries they did.

The people who received the questionnaire include professors from MIT, Stanford, Harvard, AUB, Princeton, Oxford, etc. The Business people include high ranking officials in banks, oil companies, computer software companies, construction companies, etc. The idea was to get a broad spectrum of people involved in one way or the other with the Middle East to contribute to this thesis. We felt it was important to get the knowledge and expertise, personal and professional views and ideas from a group of people who would be able to ensure a different level of insight over some of the issues and thoughts we had concerning this project.

We would like to point out that this was really meant to be a random sample of people involved with the region. It is by no means exhaustive or inclusive of all the people who would have provided us with valuable insight. In fact, there is a large portion of people who are in a position to contribute unique insight to this project either due to past research that they have conducted on related topics or positions they might hold or have held. Some we tried to reach, or sent questionnaires to that we never received back from them, and others we were unable to contact due to time and other constraints.

The feedback we did receive became an integral part of the analysis we made in this thesis. Our research sources of materials, books and articles that have been written over similar or related aspects offered one kind of information and resource base in the formulation of the thesis. However, the interviews and questionnaire responses offered a different angle and insight over the issues that are of concern and importance to today's academicians and business people who are in one way or another involved with the Middle

East. This method of combining both resources into the overall composition of the thesis gave us a more enriching overview of the issues to be addressed.

Exhibit C shows a complete copy of the questionnaire we distributed to the majority of the people interviewed. Some of the questionnaires were sent by mail and others were conducted in a personal interview method. Moreover, there were a number of people interviewed in the Middle East using non-quantitative method, and their input is included in the analysis of the questionnaire below and throughout the thesis.

The questionnaire included a cover sheet that briefly describes the project and its objective. This is to give the people receiving this questionnaire an idea of what we are doing and the concept of what we have in mind. The next page included an identification form that asks the interviewee his/her name, affiliation, department, position, and education. This is to give us an overview of the background of the people who answered these questions (this is more for our personal knowledge and information than anything else). A list of the people interviewed is provided in Exhibit D (please note that a full comprehensive list could not be given due to specific requests by some interviewees that they did not want their names mentioned). We also sent an extra page including four questions to the business people who filled out the questionnaire (academics did not receive this page). The page had company specific questions that we thought were worth while addressing.

Overall in the questionnaire, the questions for the most part required the person answering it to circle a number form the choices given. Usually these were on a scale from 1 to 5, from "least" to "most" important, etc. and were always explained in every question as to what the scales meant. Certain questions required a rating of issues in order of importance, while others required a percentage allocation. Again please refer to

Exhibit C for a comprehensive overview of the question types. The idea was to minimize the time required for the interviewees to fill out the questionnaire.

In the following section we go through and discuss the different questions included in the questionnaire, and we provide an analysis of the responses we received from the people responding to it. We received 29 questionnaires back with the format discussed above. Exhibit E shows the results of the questionnaires received in a spreadsheet: Exhibit E1 show the overall means and standard deviations of all the questionnaires received (T). Moreover, we separated the results into Academic (A) and Business (B), and computed means and standard deviations for each. The purpose of this was to see whether there were any notable differences in the results between academics and business people. Exhibit E2 shows the answers of the Academic respondents, and Exhibit E3 shows those for the Business professionals (please note that the names of the respondents are not included with their answers and the list is in no specific order) In addition, we have a total of 8 people interviewed personally who provided qualitative input, and so are not included in these figures but are included in the discussions of the different questions below.

7.2. Analysis of the Questionnaire:

1. The questionnaire began with the question of whether the interviewee thinks that such a research institution is needed in the Middle East. The resounding answer received for this question was that it was very much needed. On a scale from 1 to 5, the mean response was a 4.74 (with a standard deviation, SD of 0.45). This gave us support for the case we provided earlier in that the Middle East lacks the provision of high caliber research and educational institutions, and consequently, a research and education institution such as the one proposed is greatly needed in the Middle East.

2. Next we asked "What Kind of research is most needed in the Middle East? Please rate in order of importance: Technology; Management, Science, Agriculture, Medical, Humanities, or other areas. Out of the 29 respondents, 14 people identified technology research as the most important. For management 5 people recognized it as most important. The third ranking first choice is agriculture research which 3 people identified them as most important. However, given the great variety in the top choices categorized by the respondents, we further listed the number of times any one of the choices was chosen by any one of the respondents without reference to the ranking quoted:

- Technology research was identified in 28 responses;
- Management research was identified in 22 responses;
- Agriculture research was identified in 20 responses;
- Medical research was identified in 17 responses;
- Science research was identified in 14 responses;
- And humanities research was identified in 3 responses.

These results show the importance that the respondents placed on the need for technology and technological research. The problems faced by technology transfer illustrate how acute this issue is and as one interviewee put it "there has been a lot of "salesman" activities of technology trade without the locals knowing how things work or having "absorption" of technology into the region." Furthermore, it was encouraging to see the widespread recognition of the need for management and management research in the Middle East. As one respondent put it: "...the institute will provide high added value by doing applied research in and training that meets the demand for local needs. As an example, lets talk about management, the Japanese have developed the Theory Z, the American Y, the German X, the Arab world has to develop its own management theory that fits the local traditions and customs. Theory A (for Arabs) has yet to be researched and developed." This helps illustrate the extent of studies that are yet to be done in the

field of management. Furthermore, management research becomes even more emphasized if part of the agriculture research identified above is essentially management of agricultural development, marketing, and distribution. Consequently, through this question, we gained the backing of the respondents in the two fields we highlighted as the primary functions of the proposed institution.

3. The third question asked was about how feasible is it to start and maintain such a research institution. The responses were mixed with a mean of 3.20 and a standard deviation of 0.98. Although none of the respondents marked the option "not feasible", Respondents were not confident about the feasibility and ability to develop this institution in a volatile region such as the Middle East, as things stand today.

4. When asked about their thoughts over the ability of the current economic structure in the Middle East to support the establishment of such an institution, the respondents were only slightly positive with a mean of 3.64. However, the responses were more optimistic about the possibility in 20 years with a mean of 4.40. This again refers to the skepticism felt with regards to the ability of the Middle East to accommodate such an institution and allow it to function at the level and extent proposed, given the extent of political pressure and unrest that so easily unfolds in the region. In twenty years, however, there is hope that a lot of this instability and unrest would have been resolved in a manner that would be more accommodating to high quality research and education.

5. In question 5 we asked the interviewees to select and rate the countries in the defined Middle East region where it is most optimal to establish the institution. We

provided the respondents here with a complete list of the Middle Eastern countries as we defined them. Although most of the respondents selected the countries of their choice, not all of them rated the countries in order of preference. Consequently, we rated the countries in terms of the number of times it has been selected. On top of the list Lebanon was chosen by 20 respondents, followed by Egypt 15; Saudi Arabia 9; Turkey 7; Jordan 5; Bahrain 4; UAE 4; Israel 3; Syria 3; Tunisia 3; Iran 3; Algeria 1; Kuwait 1; Occupied Territories 1. Although the questionnaire was biased as a result of having more Lebanese responding to it, we believe that Lebanon and Egypt would be the most viable options.

This question, in addition, specifically asked the respondents to comment on their choices. One respondent chose Lebanon as most viable and commented: "If the political situation keeps improving at the current rate, this country is the best candidate due to the presence of a large number of educated Lebanese in the West who understand both cultures and can be the connection between East and West." This seemed to be a general impression amongst many of the interviewees. Moreover many commented that Lebanon provides a unique environment of a liberal setting with prior experience in institutions and as one respondent commented: "Lebanon is important due to its strong base in institutions such as AUB. Moreover, Lebanon is conceived as a moderate and central country in the region, and would thus gain more international support than most others."

One respondent said he selected "Lebanon as the number one spot because it offers a very open environment as well as a solid base of educators and students -- If you look at the number of Middle Eastern nationals engaged in research in the US, you will find that the biggest number comes from Lebanon... Turkey is a number 2 given the fact that they already have a number if institutions that they could transition into this role. Egypt could be site number 3 given its population and movement towards an open environment. I ruled out Iran (even though it has the populace base) because of the political situation."

Another chose Lebanon due to the "network of Lebanese expatriates throughout the Middle East, in addition to Lebanon's geopolitical location and natural environment." Bahrain was his second choice because it is the "most open and progressive of the oil producing states -- this facilitates getting funds from oil rich countries."

One other said "the first choice was assigned to Saudi Arabia because of its financial resources and its need. The second choice was assigned to Israel because of its relative technological advancement with respect to other countries in the Middle East; human resources are also available; disadvantage = political. The third choice was assigned to Lebanon as a geopolitical compromise and relative availability of human resources." Another respondent advocating Egypt said he chose it because "Egypt has the intellectual infrastructure, but is disadvantaged by burdensome bureaucracy, living standards, etc."

These comments were extremely helpful in understanding the reasoning behind the choices made by the respondents. One respondent actually did not mark any of the countries and in fact went as far as saying "with the current situation I do not believe that any of the countries is a good one to establish such an institution. Turkey could be one but this will not help the institution be part of Middle East life and business activities." However, there seemed to be a more general consensus that this institution could be located fairly well in the Middle East, and as things stand Lebanon would be one good option.

6. In question 6 we asked to select the appropriate time window to start this institution. Most respondents answered that within 10 years would be appropriate. Here some respondents chose longer time horizons than others because they were skeptical of

the ability of the Middle East to accommodate and utilize such an institution in an efficient and high quality manner. However, recognizing the dire need for such an institution in the region, many did state that they would like to see it established within the next five years.

7. In question 7 we asked the respondents to rate the importance of a number of channels that we believe may be important to the establishment of the institution. The results were as follows:

- Local industry support: was quite important with a mean of 3.96 (SD 0.77);
- Foreign industry operating locally support was relatively important with a mean of 3.57 (SD 1.10);
- ME Gov.(s). commitment & financial backing was considered very important with a mean of 4.39 (SD 1.10);
- Mentorship with a recognized institution such as MIT was also considered very important with a mean of 4.32 (SD 0.67);
- Support from local education institutions was considered relatively important with a mean of 3.52 (SD 1.31);
- Availability of interested exceptional faculty was considered the most important with a mean of 4.68 (SD 0.55);
- Large initial endowment was also considered quite important with a mean of 4.15 (SD 0.99).

8. In question 8 we asked the respondents to identify the priority of a number of events that are required in the establishment phase of the institution. The results in order of higher mean of priority were as follows:

- Assemble a core group of people to launch the project was considered of highest priority with a mean of 4.46 (0.84);

- Fund raising was also considered of very high priority with a mean of 4.45 (SD 0.91);
- Sell the idea to local governments was considered of relatively high priority with a mean of 4.28 (SD 1.07);
- Establishing a relation with a recognized institution was also considered of high priority with a mean of 4.07 (SD 1.19);
- Building support from local industry and community was considered of a lesser priority with a mean of 3.86 (SD 1.27);
- Similarly, attracting faculty and administrative personnel was considered of a lesser priority with a mean of 3.79 (SD 0.90);
- Establishing a link with a local institution had a priority mean of 3.46 (SD 1.26);
- Developing an evaluation criterion for selecting personnel had a lesser priority with a mean of 3.33 (SD 1.27);
- Organizing operations had a priority mean of 3.30 (SD 1.27);
- Establishing a public relations office had a priority men of 3.21 (SD 1.03);
- And of lowest priority was identifying the site and buying the land with a priority mean of 2.83 (SD 1.31).

9. Question 9 asked if the respondents think that the institution can survive and produce quality research in the current political environment. The response was mixed with a mean of 3.30 and a standard deviation of 1.10 which means that the opinions are spread over a wide spectrum of the scale from "not being able" to "quite able." There were a lot of concerns over the Middle Eastern governments interfering and influencing educational programs and admissions policies, as well as forcing their opinions on the research that should be done.

10. Question 10 asked if the respondents foresee that the institution would play an important role in the political environment of the region. The response indicated that the institution is perceived to have an active role in the political environment in the future with

a mean of 3.50. However, the standard deviation was large with a value of 1.32, which means that the opinions were not concentrated around the mean but were relatively extreme. Some people, particularly academics believed that such an institution if well functioning, could in turn have an impact on the political environment of the region: For example, teachings of promising individuals would give them a notion of the things that are needed in the region, and in turn, if and when they reach high ranking positions in their respective countries, they would have an influence on the policies and actions selected and pursued by those countries. Moreover, a Middle Eastern institution serving the Middle Eastern community would provide an intellectual center for people from all over the region to meet and discuss issues of concern to all of them, and would perhaps help bridge the gap in some of the animosity some nationals feel towards other nationals. The hope is to have these different representatives collaborate on different research projects, and then infiltrate this sense of cooperation and collaboration to their home countries, which might in turn influence political policies. This might very well be a far fetched optimistic strategy, but is nevertheless worth keeping in mind as pointed out by one of the interviewees.

11. Question 11 asked if the respondents expect local governments to support the project legally and financially. The response was concentrated around a mean of 3.00 (SD 0.9) which means that the respondents were not too confident of the governments ability or desire to contribute. This follows the skepticism over the governments in the region, and their consent to financing an institution which they do not have control over.

12. Question 12 asked if the respondents foresee major conflicts if a number of governments contribute to the same institution for research. The responses indicated that

there is concern that conflict would occur but not necessarily major. The mean was 3.45 but had a high standard deviation of 1.24 which means that the responses were not concentrated around the mean. Quite a few respondents foresaw conflict unraveling if and when a number of Middle Eastern governments contribute to the same source.

13. Question 13 asked the respondents to allocate funds in terms of percentage to research, education, and operations. Surprisingly, the results were not too far from MIT's figures. Furthermore, the results had small standard deviations and were as follows:

- Research: Mean of 42% and S.D. of 14%;
- Education: Mean of 34% and S.D. of 12%;
- Operations: Mean of 23% and S.D. of 7%.

The general consensus is that the greatest proportion of the money has to be allocated towards research since research is costly, and in order for the institution to perform its proposed functions well, it has to have a large access base to money and other resources. Since the institution has a major objective to teach, educational resource allocation should be the next priority, and a large portion of this money would be allocated to paying professors and instructors competitive salaries. Operations should be the lowest proportion of resource allocation (after the initial endowment of constructing the buildings and campus of course).

14. When asked how important it is to establish a mentor relationship between this institution and an established and internationally recognized research institution, the majority of the respondents answered that it was very important, with a mean of 4.29

(S.D. 0.98). However, some respondents pointed out the need and importance establish a mentor relationship with more than one institution. The argument was that there would be concerns over having heavy connections and reliance on only one institution since there is always the possibility that some biases exists against the particular international institution with which the mentor relationship is established.

15. Given the recognized importance of establishing this mentor relationship, the respondents were hence asked to categorize the form in which this relationship should take place, the extremes being from an advisory role to a joint research center initiative. Opinions here varied a great deal and the mean was 3.68 with a S.D. of 1.28. More respondents thought there was a need for a "Joint Research Center" than those who indicated a preference of an "Advisory Role". The majority, however, were in balanced opinion over this, and rated it a 3, or else they were not certain as to which one of the two choices would be more beneficial. Moreover, there were a few suggestions that there should be a "research-exchange program" established with several major research institutions worldwide.

16. We then asked the opinions of the interviewees whether they believed an internationally recognized institution would have an incentive to become a mentor for a newly established institution in the Middle East. Again there was mixed opinion over this issue with a mean of 3.96 and a S.D. of 0.96. With this question in mind, some of the interviewees who were aware of this pointed to the kinds of projects and programs that have already been carried out by internationally recognized institutions with various universities in the Middle East. For example, there is the "Technology and Development Program" that MIT participates in and has already taken active part in promoting

collaboration and joint research effort with a division of Cairo University, and another one with the American University of Beirut. The fact that such initiatives and programs already exist, gives adequate support to the argument that the proposed research institution, if it works out as planned, would be able to gain the support of universities like MIT. Furthermore, universities in Israel such as the Technion, The Weissman Institute, and Beer Sheva University, all have a very heavy connection and interaction with research institutions worldwide that help them with their research and are a source of exchange of ideas.

In addition, one respondent argued that internationally recognized institutions would have an extremely strong incentive to become a mentor because the "upshot is tremendous." The reason being that this channel gives these international institutions access to some of the best brain power the Middle East can offer. And that their only disincentive would be the volatile political situation in the Middle East.

17. For the question "do you have any concerns that this institution might not be able to maintain the highest standards of research and academic work integrity?" the consensus was that there was some concern over this issue. In fact most respondents had strong concerns over this matter, but the very few who had no concern skewed the mean to 3.50 with a standard deviation of 1.14. The general concerns included issues such as the possibility of intervention on the part of the Middle Eastern governments to influence the research and educational programs carried out by the institution as well as the biases and preferential treatment that might exist in admissions policies -- i.e., the last concern means that those admitted would not necessarily be those most qualified to enter but actually, those who are more heavily connected. These are valid issues and concerns that must be addressed carefully when the institution is actually established.

18. Next we asked that "assuming that this institution has strong financial backing, do you think it will be able to attract world class research and academic talent?" The general consensus was that the institution would be able to attract the needed world class talent (with a mean of 3.89), given the right incentives and assuming the institution actually does what it is set out to do.

19. Getting more into the specifics and details of the institution, we then asked the interviewees what they perceived as the most optimal faculty to student ratio at the institution. The answers here varied, and the academicians were more comfortable giving a figure than the business people. In general the mean answer called for a ratio of 1/10-1/20. However, the academicians seemed to advocate a lower ratio of 1/5-1/10. The reasons were that if research is to be conducted in the research and if sufficient attention is to be paid to the students to have them directly involved in the projects, then a low ratio is preferred.

20. Then we asked what they recommend the institution should start with - whether undergraduate only, graduate only, or a combination of both. Here opinion was split in half between starting the institution with graduate only and starting it with both graduate and undergraduate. Those advocating graduate only, explained that this way there would be more concentrated effort on research and research involvement of students without having to allocate the time and resources in providing basic undergraduate general education. This way, there would be more focused teachings and research at a more senior level. However, most interviewees proceeded to advocate the eventual inclusion of both undergraduate and graduate programs in the functions of the institution but only after it is well established. The importance of providing a world class undergraduate

education is important and cannot be undermined, but it should not be the primary objective of the institution on its inception.

21. We asked the question of whether the interviewees expected currently established institutions in the region to be receptive of the idea of establishing such a research institution. Most respondents thought not, although a few expected these institutions to be extremely receptive of the idea - the mean was 2.75 and the SD was 1.27. One argument had it that these institutions might feel threatened by the existence of an institution such as the one proposed since it might take away from them their better students and instructors. Another argument had it that the current institutions would be extremely receptive and accommodating of a new high caliber research and education institution since it would act as a resource base to them, and would serve to enrich the overall region and populace, something that they generally advocate.

22. We then asked whether the regional corporations will have a strong incentive to support the establishment and funding of this institution. Generally, the respondents believed that they would since they would be benefiting from it and its resources in one way or another. The mean was 3.52 and the SD was 0.95. It was interesting to note that in the industry sector, there was a lot of consensus over the need for such an institution, however, if support meant funding, then there was no prevailing willingness to support the institution. This is understandable when looking at it from a Middle Eastern business point of view. Such an investment would only reeve benefits for them after years have passed, whereas they would rather allocate their resources into things that would give them positive returns faster. Moreover, it is interesting to note that one international Middle Eastern corporation has already invested heavily in establishing its own program of

vocational training and apprenticeship, in order to meet its quota demands for hiring locals in its organization. In addition, it also spends a fair amount sending some employees to institutions in the West in order to acquire certain specialized skills that they need to have in their operations. Altogether, this comes out to a substantial sum of money that this organization spends per year on making sure that its employees have the skill levels they need (it costs a great deal to contract getting some well reputed instructors to come to the Middle Eastern country in order to give some lectures). Consequently, the interviewee said that he perceives his corporation would be willing to invest in the services of such an institution only when it would sum up to cost them substantially less in terms of money and resources to do so than to do it on their own as they have in the past.

23. When asked to comment on whether foreign corporations with operations in the Middle East will have a strong incentive to support the establishment and funding of this institution, the opinion was once again mixed. Some thought that the foreign corporations would have a strong incentive this support because this institution would increase the skill level in the Middle East and thus make it easier for foreign corporations to conduct business there. Others thought that foreign corporations would not have such an incentive merely because they might not believe the cost of such an investment would be directly rewarding to them. Overall, the mean response was 3.48 with a SD of 1.18.

24. We then asked whether the interviewees thought that such a research institution would be of benefit to local businesses, whether directly or indirectly. Whereas there was a very strong general consensus that local businesses would greatly benefit *indirectly* from the institution (the mean was 4.52 with a SD of 0.69), there was a less rigorous conviction that the local businesses would benefit *directly* from this research and educational

institution (the mean for this was 4.00 and SD is 1.04). Nevertheless, the respondents recognize the benefits that would come onto the businesses in the Middle East when institutions such as the one proposed are established and well functioning in the region.

25. Further probing on the business aspect, we asked whether the interviewees thought that local businesses would be willing to collaborate with this institution on research projects to work on managerial or technical problems these businesses might be facing in the region. Most respondents thought that the local businesses would have an inventive to collaborate with this institution on research problems related to their line of work (the mean was 3.81 and the SD 0.96). The collaboration would be beneficial to both sides: the businesses would be getting answers or solutions to problems faced by their businesses, and the institution would be benefiting from the opportunity to practically research problems and help implement the solutions to the local industries.

It is interesting to note here that we found academics to be stronger advocates of this willingness than the business people. One possible explanation for this is that local businesses have not traditionally relied on local institutions to research issues of concern to their industries, mostly because this channel has not existed in the Middle East in a well functioning manner. They have therefore relied on other means to satisfy their needs. Consequently, they are less apt at this point to see the practicality of using such a channel. One business man said that their international company realized a long time ago the lack of adequate institutions to help perform R&D for them, or even to provide them with well trained labour. As a result, they pursued a rigorous policy to establish their own R&D facilities and capabilities using foreign aid. Moreover, they established their own vocational training program, as described in question 22 above. This system, although costly to the company, nevertheless guarantees they get the research and skills they need.

26. Question 26 asked the respondents to allocate the optimal breakdown percentage to funding contributions that should be received from different groups in order to maintain the integrity and independence of the institution. The results were as follows:

- Contribution from individuals had a mean of 19% and a S.D. of 15%;
- Contribution from local businesses had a mean of 23% and a S.D. of 12%;
- Contribution from foreign businesses had a mean of 17% and a S.D. of 11%;
- Funding from ME governments had a mean of 33% and a S.D. of 21%;
- Other contributions had a mean of 8% and a S.D. of 14%.

These results indicate that the respondents believe that the responsibility for funding this institution should be distributed among the various groups . This actually supports the argument for a private institution as exemplified in the percentage mean of funding from ME governments which is about a third of total funding requirement. Some of the comments received with the questionnaire indicate that dependency on governments should be reduced as a result of the concern that ME governments bureaucracy would undermine the objective and quality of this institution.

27. Question 27 asked the respondents to identify the range of minimum endowment fund in today's money value that the institution would need to maintain its independence. The results had a mean of 2.18 which is around the range of 250 to 500 million dollars. This result indicates the importance of a substantial initial endowment to create a successful research oriented institution.

Questions 28 through 31 were only sent to business people. Consequently, we only have 13 respondents for these questions and the means and standard deviations reflected are those of the 13 people:

28. Question 28 asked if the company of the respondent ever relied on help from local institutions to overcome business problems. The result had a low mean of 2.69 with a high standard deviation of 1.32. This means that there were some companies that did rely on institutions for research and development or consultation etc. However, there were many other business people who perceived their companies did not rely on local institutions. This is particularly true of Middle East companies who did not have the appropriate institutions functioning to utilize their resources for their benefit.

29. With the following question, we asked whether the respondents believed their respective companies would be willing to participate in the establishment and funding of such an institution. The answers for this question was extremely low with a mean of 2.04 and a S.D. of 1.25. This was an interesting answer, because although all business people highly supported and recognize the need for such an institution, and the added value it could bring about to their firm or industry, they were not willing to commit funding for the institution. They would conceivably invest in the direct research geared towards their specific problems, i.e. when the institution is already established and well functioning. However, coming up with substantial sums of money to invest in a long term project such as this one would not be something an average company is willing to do since in their view the outcome, or returns, are long term and uncertain since there is no real guarantee that their investment would be realized in terms of value-added returns. It is a risky investment to them and many companies tend to be risk averse in general.

30. Question 30 asked whether the respondents believed their respective companies would be willing to participate in a collaborative student internship program. Many respondents indicated their companies would be quite willing to do so. Some indicated that this would be a good way for mutual benefit for both the institution and the company: The company would benefit from the relatively less costly labour as well as exposure to some of the better educated students from the region. Overall, this question received a mean response of 3.77 with a S.D. of 1.01

31. The last question in the questionnaire asked "how often have governments in the region relied on local academic institutions to perform research studies?" In general people were not entirely sure of the answer to this questions, and in fact three of the respondents did not feel knowledgeable enough with regards to this question in order to answer it, and others chose a neutral answer of 3 indicating their uncertainties. Overall, the mean for this question was 3.00 with a S.D. of 0.94.

7.3. Summary:

In conclusion to this section we can say that the interviewees strongly endorse the need for and the establishment of a research and education institution. Technology and Management are indicated as the most commonly needed research fields to bridge the gap the Middle East faces with respect to developed countries. Respondents indicated the economic structure of the Middle East might be more able to support the establishment of such and institution in 20 years than today, and yet it would be more optimal to start this institution within the next ten years. The country most optimal for the establishment of such an institution would be Lebanon, with Egypt as a second alternative. For the

making of the institution, the respondents ranked as most important the availability of interested qualified faculty followed by Middle Eastern governments commitment and financial backing. Mentorship with an institution such as MIT and a large initial endowment were also indicated as extremely important. Moreover, in the establishment phase of the institution. it is most important to assemble a core group of people to launch the project. This is followed by the importance of fund raising in the initial steps, as well as the importance of selling the idea to local governments, who many believe would be the primary source of substantial contributions towards the establishment of the institution even though they had doubts over whether the governments would actually contribute without perhaps some conflicts. There was some concern over the institution's ability to survive and produce quality research in the current political environment due to the influence of some governments.

Moving to the logistics of the institution, there was a general consensus that the largest proportion of the funds available to the institution should be allocated towards research, followed by education and finally operational expenses. The optimal faculty to student ratio averaged out to about 1/10 - 1/20. Moreover, the opinions of the respondents were split in half over whether the institution should start with only a graduate program, or both graduate and undergraduate. The minimum initial endowment fund recommended by the respondents as necessary for the institution to maintain its research independence and integrity was around 500 million dollars. In addition, it was perceived as extremely important to have a mentor relationship with a well established and internationally recognized institution, but there was difference of opinion over whether this relationship should take an advising role or be in the form of a joint research center. Moreover, the respondents perceived a relatively strong incentive for an internationally recognized institution to become a mentor for a newly established institution in the Middle East.

The respondents indicated that they perceived both local and foreign businesses would have some incentive to support such an institution. In addition, this institution would be a great benefit to local businesses indirectly, as well as directly. Consequently, local businesses should be willing to collaborate with this institution on research projects to work on managerial or technical problems these businesses might be facing in the region. This would be particularly true when the institution is well established and functioning. Without this perspective it is hard to get the business people support at the establishment phase, especially so when they do not have extensive experience in relying on research institutions in the past to help them with problems they might be facing with their businesses.

Taking into consideration the recommendations we have received from the interviewees, we can move on to describe the institution's structure and functions in detail. But first, we will start with a case for a private institution followed by a description of MIT as a "quasi-model". We then build on MIT's incentive system for quality research to develop a structure for the proposed institution.

Chapter 8

The Case For a Privately-Held Institution:

After examining the universities and institutions that already exist in the Middle East, we are able to come out with a few interesting facts. For example, as seen from the argument above, the vast majority of the institutions and universities in the Middle East are state owned and run. The institutions that have historically functioned well and received the greater recognition for the quality work and quality of their graduates have been by far the few private universities that exist in the region. The best examples are the AUB in Lebanon, AUC in Egypt, Hebrew University of Jerusalem and Tel-Aviv University in Israel. A great number of reasons can be given as to why these universities have functioned better than their state run counterparts.

Given the history of government dominance and influence in all state affairs in the Middle East, one begins to see a case for establishing a private institution rather than a state owned one. Governments in the Middle East, in general have sought to keep a powerful hand in everything that goes on in the country. Politically they want to dominate unchallenged, and economically they want to have a strong enough role and power to keep businesses from getting too powerful and consequently dangerous for the ruling part. This has particularly been the case in the Gulf countries. The government owns the most powerful businesses: the oil companies and refineries. Moreover, they dictate precisely what is to be taught to their populace in schools and universities.

Given the level of inefficiencies that dominate the majority of state run enterprises, one can see the problems and inefficiencies that can accompany their universities and

education facilities. The fact remains that the government has certain goals and aspirations in its educational structure and system that it terms might benefit the society as a whole, as well as the political stance of the government, but not the overall benefit of higher, more advanced technical and business capabilities. For example, the government might have an objective to meet in terms of enrolling the largest number of students in the universities and representing the largest geographical areas in the countries. In addition, in terms of the faculty, administration and instructors, they most often have a further policy to employ the largest number of nationals into these positions. This does not mean they would have the best suited faculty on the job, but the most national group of people. Moreover, the government might cut non-national faculty members if the need ever arose, and keep as many nationals they could, even at the expense of depressing the quality of the institution and its faculty.

In the case of private institutions, in the other hand, there tend to be fewer authoritative and bureaucratic structures that inhibit the pursuit of a more rigorous academic educational process. In the private arena, competition emerges, and gains momentum on the basis of academic reputation and stature. For this reason, private institutions take their admissions policies much more strictly. They might seek to attract and admit the highest proportion of more talented and academically strong students as opposed to the state policy to recruit the largest number of national students over and above every thing else. It tends to be the case that quality rather than mere quantity counts more in private than state institutions in the Middle East. Consequently, the extent to which the public administration of the state owned institution controls engagement, faculty, students, or even salaries, all become important factors in establishing whether a state run or a privately held institution is more optimal to meet the end objective of the proposed institution.

In state run institutions, the government wants to have a say in what exactly gets taught in the universities. They might ban the education of certain political thoughts and theories for the fear of students taking the ideas and practicing them against the government. There tends to be a lot of state monitoring of what is being taught in the universities. They tend to want to breed a nationalistic culture in the educational system. Intellectual thoughts and innovations might not necessarily be encouraged in a state run environment as opposed to a private one located in a more relaxed political environment. These issues might not be of relevance in a country like the US, but in the Middle East, with the kinds of political systems and government, there might be a conflict of interest between the theoretical objectives of modernization and advancement, and what the governments might actually be willing to tolerate in these environments.

Then there is the issue of the relationship between the institutions and the businesses in the country or region. Here one must ask the question: Do private firms tend to affiliate more easily to private institutions rather than public institutions? There is no clear cut general answer for this. However, in the case of the Middle East, given the structures of the governments, their inefficiencies and the lengthily times it takes them to carry out projects and policies, etc. there becomes a case for private firms to shy away from seeking government run research and development on their particular field of industry. However, when a private institution is contracted to perform research necessary for the firm, the institution is more active and liable to pursue the project within the agreed upon contractual frame.

In addition, private institutions and entities are more accommodating and more likely to change when their environment changes -- the inertia of the institutions are important. The ability to capture new subjects of interest and concern to the society and its industries, as well as releasing studies that were pursued on subjects that are no longer

of importance to the country, is an important issue when looking at a region where resources for research and development are not too abundant. Private institutions tend to be more likely to accommodate change faster and easier than state enterprises. Part of the reason is the immense bureaucratic red tape that has to be cut through before any change is permitted in the state organization. This means a lot of time and resources are wasted whereas they could have been utilized for more productive issues than otherwise. MIT, for example, made the decision to stop its research on power when the field seemed to have been exhausted by research already done by itself and a number of other institutions. It wanted to free up the resources that were allocated to this sector in order to pursue more urgent market demands for research in other fields. However, after a few years, demand shifted again towards power and more research to be done in the field. MIT once again responded to the change in demand by allocating more funds and resources to the research of power, while reducing expenditure on some other fields that were no longer a priority at that point. The objective of any institution maximizing resource allocation should be to become this flexible, in order to be always able to pursue studies on areas that are in demand by the industries or government or the society in general. There is a notion that private institutions tend to be more flexible in this sense. This is hence a further advantage to establishing a private research and educational institution.

Chapter 9

MIT as a "Quasi Model":

It is very important that our proposed institution be established and promoted within the local Middle Eastern environment framework. The institution's structure should reflect its goal of serving the region and its business community. Consequently, it should not follow a rigid model of a particular international institution. Nonetheless, it is beneficial to start with an existing model such as MIT to gain an understanding of the factors that contributed to the success of this model. We have selected MIT as the model for this project for many reasons including the following three important ones:

- MIT is at the forefront of research in technology and management.
- Current structure reflects a long historical experience with research.
- MIT is one of the world's premiere institutions that had a major impact on society through advancements in technology.

In this section we start by looking at MIT's history, current structure, and finances. Through this perspective we specifically look at the major incentives at MIT that we believe contributed to its success. We then project in chapter 8 a framework within which our proposed institution can be established. This is not to say that this framework is binding but rather a starting point. The events and the climate in the Middle East should guide the founding process and continuous growth of this institution. Time of establishment, location, political and economic changes would strongly influence and shape our proposed institution.

9.1. MIT in Perspective:

MIT did not become the great institution as we know it today in a short period of time. The institute encountered continuous phases of growth throughout its life with a major part of this growth occurring as a result of WWII. In fact, MIT started with 15 students and six faculty members in 1865 four years after it was founded. However, This institution was unique in that its founder William Barton Rogers started it with a dedication to intellectual excellence and pursuit of knowledge. From the beginning, MIT faculty and administration concentrated on technology with the noble idea of serving society. Furthermore, they concentrated on pushing technology to its limits by inviting the best scientific minds in the United States and the world and providing them with an environment that allows them to be creative and productive. This open and highly intellectual environment became a center for scientific research in the United States and during WWII it became a Mecca for scientists and intellectuals.

By the end of WWII MIT was established as a major research center with strong government ties. According to Dr. James Killian, president of MIT from 1948 to 1949, "MIT's evolution into a major research university was dramatically accelerated by its research in support of World War II[45]." During the war a number of research laboratories were established at MIT including the famous Radiation Laboratory which was responsible for the development of the radar. At one time the Radiation Laboratory attracted an estimated 20% of the nation's top ranking physicists[46].

In the postwar period MIT continued to attract the best talent in science and technology as well as large public and private financial contributions. A big part of MIT's

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45 James R. Killian, Jr. [1985]; *The Education Of A College President.*
46 Ibid.

success was its ability to realign its mission after the war. It began to rapidly establish the primacy of teaching and research at the institute through rebuilding both its graduate and undergraduate schools. In addition, MIT's administration consisted of a group of individuals who were dedicated to improving and promoting MIT to become one of the premiere institutions in the world. Furthermore, the institute went on a talent search identifying and attracting exceptional researchers from the war research laboratories around the country[47].

As a result of the strong reputation in applied technology that MIT developed, private and public organizations viewed MIT as a resource base that can help provide them with a competitive technological edge. Consequently, such organizations contributed large sums of money for the institute to perform state of the art research. This reputation combined with the strong funding for research and its dedicated administration helped MIT to continue to attract the best talent in science and technology. To maintain its edge, MIT implemented an incentive system that promoted research and helped maintain or increase the quality of scholars and students. Supporting both entrepreneurship and some of the unconventional research performed by its faculty allowed MIT to become the birthplace for other major research centers and corporations around the country such as the Draper Laboratories and the Mitre Corporation.

Early on, MIT realized the need for social sciences particularly in the fields of business and engineering administration. However, the interest in the liberal arts and the social sciences did not strengthen until the 1950's when MIT went on "the search for the appropriate contribution of the humanities[48]." Since then MIT began to develop and strengthen the Political Science, Economics, Management, Linguistics and other liberal art

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47 Ibid.
48 Ibid.

and social science programs. The concentration on research at MIT was contagious and was spread so effectively to these programs that they became international centers for excellence, for example the Economics department and the Sloan School of Management.

Overall, MIT's evolution was dependent on the historical events that were taking place in the world at the time as well as the events unraveling in its local community. MIT in its current form is different from the way it was first envisioned when it was established in the 1860's. However, the underlying theme of vigorously pursuing knowledge and excellence and contributing to society's welfare continue to be the motivation behind its success in being at the research frontier of technology, science, and social sciences. Consequently, it is neither rational nor possible for a new institution to follow the same path that MIT or any other institution had. It is important to learn from MIT's history but it would be more relevant to this project to examine and learn from MIT's current structure.

9.2. MIT's Current Structure:

Currently, the MIT community covers more than 128 acres and has more than 17,000 people, including around 8,500 students, 1,000 faculty staff, 2,000 members of the professional research and administrative staff and 5,000 supervisory, technical, and service employee[49]. MIT is centered around five schools of study with a large number of inter-linked and joint programs among the schools. Its large number of research centers and laboratories with more than 70 laboratories on campus, stand out as we look at the Institute at a macro level. A number of these research centers and labs extend beyond

49 *How To GAMIT XXIII*, 1991-1992.

MIT's five schools and exist as independent centers within MIT's overall structure. These centers provide the setting for inter-disciplinary, problem-focused research that cuts across the more traditional structure of departments and schools. MIT's five schools is composed of the following departments and centers[50]:

SCHOOL OF ARCHITECTURE AND PLANNING

Department of Architecture
Media Arts and Sciences Section
Department of Urban Studies and Planning
Aga Khan Program for Islamic Architecture
Center for Advanced Visual Studies
Center for Real Estate
Media Laboratory

SCHOOL OF ENGINEERING

Department of Aeronautics and Astronautics
Department of Chemical Engineering
Department of Civil and Environmental Engineering
Department of Electrical Engineering & Computer Science
Department of Materials Science and Engineering
Department of Mechanical Engineering
Department of Nuclear Engineering
Department of Ocean Engineering
Artificial Intelligence Laboratory
Biotechnology Process Engineering Center
Center for Advanced Engineering Study
Center for Technology, Policy, & Industrial Development
Center for Transportation Studies
Laboratory for Computer Science
Laboratory for Electromagnetic and Electronic Systems
Laboratory for Information and decisions Systems
Laboratory for Manufacturing and Productivity
Leaders For Manufacturing Program
Materials Processing Center
Program in Environmental Eng. Education & Research
Technology, Management and Policy Program

SCHOOL OF HUMANITIES AND SOCIAL SCIENCE

Department of Economics
Department of Humanities

50 MIT: Report To The President, 1992

Department of Linguistics and Philosophy
Department of Political Science
Program in Science, Technology, and Society
Center for International Studies
Center for Materials Research in Archeology & Ethnology
Integrated Studies Program
Women's Studies Program

SLOAN SCHOOL OF MANAGEMENT

SCHOOL OF SCIENCE

Department of Biology
Department of Chemistry
Department of Earth, Atmospheric, & Planetary Sciences
Department of Mathematics
Department of Physics
Center for Cancer Research
Center for Space Research
Experimental Study Group
George Russell Harrison Spectroscopy Laboratory
Laboratory for Nuclear Science
George Wallace, Jr. Astrophysical Observatory

In addition, MIT has a number of research laboratories that are outside the organization structure of the above schools. Of most importance is the Lincoln Laboratory which is a government facility managed and administered by MIT. The Lincoln Laboratory is one of the most advanced research labs in the United States. Its budget of $377 million for 1992 is approximately a third of MIT's overall research and operating budget. Its research concentrates on Surveillance Technology, Satellite Communications, Air Traffic Control, Electronic Devices, Machine Intelligence Technology, Digital Integrated Circuits, Speech Systems Technology, Neural Network Technology, Sensor Processor Technology, Strategic Defense Program, and Adaptive Optics for Astronomy.

In addition, a number of research centers and laboratories are organized under the Vice President and Dean for Research:

Whitaker College
    Department of Brain and Cognitive Sciences
    Division of Toxicology
    Center for Environmental Health Sciences
Harvard-MIT Division of Health sciences and Technology
Technology Licensing Office
Center for Cognitive Science
Center for Materials Science and Engineering
Clinical Research Center
Decision Sciences Program
Division of Comparative Medicine
Energy Laboratory
Francis Bitter National Magnet Laboratory
Haystack Observatory
MIT Supercomputer Facility
Nuclear Reactor Laboratory
Operations Research Center
Plasma Fusion Center
Research Laboratory of Electronics
Sea Grant College Program
Technology and Development Program

The objective of listing all the research programs and laboratories above is to show the heavy concentration that MIT places on research within its structure which indicates that MIT is primarily a research institution.

In addition to the administrative, operational and financial structures, MIT strongly emphasizes its information systems. The information systems' function is organized under the Vice President for Information Systems who is responsible for acquiring, maintaining, and managing all the Institute's computer and telecommunications systems other than the Supercomputer. MIT recognized the need to create a system through which researchers, staff and students can communicate efficiently and flexibly with the goal maximizing information access and sharing. Project Athena, currently developed for campus networking, was established in collaboration with IBM and DEC. Although this project is currently dedicated to the immediate physical campus of MIT, its true power lies in its

capacity to extend the physical campus via network linkages to participants, independent of their locale thus creating a "virtual campus[51]." This backbone communications network enhances information sharing by MIT's faculty and students through direct and time-efficient communication networks.

Another key element at MIT is the fund raising and industrial liaison activities. The Treasurer who is also a Vice President is responsible for campaigning for funds as well as maintaining corporate and foundation relations. An industrial liaison program was established at MIT to diversify the source of funding for the institute. A campaign for starting this program was built around the slogan: "Funding Our Independence." This program promoted industry-sponsored research and innovations and gained international recognition and support from American and international corporations. This program strengthened MIT ties with the industrial world and provided a strong link transferring benefits to both MIT and industry. This industrial liaison program became critical in the survival of MIT as a truly independent institution.

An important aspect of MIT is the research done by graduate and undergraduate students as well as faculty and research personnel. Graduate students, especially doctoral students, are usually funded either as research assistants or teaching assistants for professors. In addition, graduate students perform research in fulfillment of the thesis requirement which may overlap with the funded research. The key point is that although graduate students pay tuition, they usually get reimbursed through the abundant funded research or teaching available at MIT. Furthermore, having students assisting faculty in teaching allows the faculty members to concentrate on their research work.

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[51] Manning, Kennith R., editor, [1991]; *MIT: Shaping The Future.* Thomas R. Moebus: "MIT And Industry: The Legacy And The Future", pg. 172.

The MIT Undergraduate Research Opportunities Program (UROP) is a key element in integrating the education of undergraduate students with the institute's research. This program is beneficial on a multitude of levels. First, it provides the faculty with an abundant and intelligent resource of undergraduate students who can act as research staff and thus expedite and contribute to the faculty research work. Second, it creates a process that allows the knowledge developed through research to be infiltrated to the undergraduate students and thus to the educational system at MIT. Third, the program allows students to receive credit or earn income for the research work they perform under the UROP program. This exchange maximizes the learning process as well as provide a cost efficient research support for the faculty.

The research incentive system at MIT plays an important role in promoting a lean research environment. For example, a faculty member from the engineering school is only paid approximately 50% of his/her salary by MIT. The faculty member is expected to raise the remaining 50% through contract research work with either government agencies or private corporations. Furthermore, faculty research work plays an extremely important role in the tenureship process at MIT. As part of the evaluation process for tenureship award, the research work performed by the faculty member has to be recognized by more than a dozen internationally renowned academics from other institutions in the same or related field of study. These academics then have to submit recommendations on behalf of the evaluated faculty member to MIT. This incentive and pressure to perform quality research by MIT faculty members creates a lean environment with survival of the fittest in terms of research work.

MIT faculty is also encouraged to perform consulting activities while teaching at MIT. For example, a faculty member can dedicate up to an average of one day per week during the period when she or he are teaching. Furthermore, during the summer period or

during a sabbatical leave, a large number of faculty members perform consulting on a full-time basis. This ability creates benefit to both MIT and the faculty members. First, the faculty's earning is not limited by the salary provided by MIT. The ability of earning additional income through consulting helps reduce the migration of faculty into higher paying industry jobs. Second, consulting for industry provides a strong and up to date link between academia and industry thus benefiting MIT and its student body.

Another major advantage of MIT has been its ability to promote entrepreneurship. It has been identified that MIT is the spawning ground for 636 companies in Massachusetts and 176 companies in California. MIT acted as an engine of economic growth and in many cases, the firms and their founders remained close to the institute, participating and contributing in many different ways[52]. In many cases, the MIT Technology Licensing Office helped realize and expedite the commercialization of MIT developed technologies and have supported MIT "start-ups" by providing advisory service as well as financial backing . This office played a critical role in promoting MIT technologies and generating income for MIT.

The above description of MIT touches only on few critical elements that are focused on the mission and incentive system at MIT. We believe that the following key elements play an important role in the conceptual development of the proposed institution:

- MIT has identified research and education as dual elements of its mission, inextricably linked, such that research feeds education and research experience is part of education;
- Undergraduate as well as graduate students at MIT are engaged in research through available research assistantships, established programs such as UROP, and thesis requirement;

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52 Ibid.

- MIT has augmented the standard organization of schools and departments defined by academic disciplines with research centers that engage in interdisciplinary, problem focused research that cuts across those formal divisions;
- The financial incentive system encourages the faculty members to pursue funded research opportunities thus promoting links with industry and government;
- The tenureship incentive system encourages the faculty to concentrate on the state of the art quality research that promotes recognition of the individual faculty member as well as MIT within the academic and business world;
- MIT places strong emphasis on promoting entrepreneurship which in turn promotes MIT financially and publicly;
- MIT places strong emphasis on industrial and governmental relations thus building strong links as described in the technology triangle.

Another element that would help to better understand MIT's success is its financial structure. In the following section we look at MIT's funding as well as its research and operations spending.

9.3. MIT's Current Financial Structure:

"When an institution must take risks or borrow, it needs adequate endowment to protect its independence[53]."

To protect its independence MIT relies on a large endowment fund that has been growing over the years to a 1992 book value of $1,589,261,000[10]. Although the endowment is seen as a cushion in case of a major crisis, only the income generated from investing it can be used to support MIT's operations. Furthermore, MIT follows the policy of continuously growing its endowment and only using a portion of endowment

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53 James R. Killian, Jr., [1985]; *The Education Of A College President*

generated income earned for operations. The other portion is reinvested and added to the endowment total value. As the cost of research and education continue to rise, a strong endowment is a major indicator of an institution's ability to carry forward its desired research and education. This is especially so in the case of MIT which is trying to stay at the forefront of technology while maintaining its independence and intellectual integrity.

MIT's total operating expense nearly doubled from 1982 to 1992 with a total operating expenses in 1992 of $1,083,360,000. The following are rounded figures for 1992 expenditures and revenues[54].

Expenditure Type:	**Value($M)**	**%**
Sponsored Research: Lincoln Lab.	342.1	32
Sponsored Research: Campus	231.5	21
Instruction & Unsponsored Research	207.0	19
Expenses Applicable: Inst./Res./Dep.	197.1	18
Scholarships & Fellowships	58.8	5
Auxiliary Activities	34.1	3
Alumni Association & Other Expenses	8.8	1
Research Administration	4.0	1
Total	1,083.4	100

Revenues And Funds:	**Value($M)**	**%**
Research Revenues: Lincoln Lab.	367.4	34
Research Revenues: Campus	319.6	30
Gifts/Inv. Income/Receipts/Plant Fund	141.6	13
Tuition & Other Related Income	170.3	16
Endowment Income For Operations	38.3	3
Auxiliary Activities	33.1	3
Current Gifts & Other Fund Balances	13.1	1
Total	1,083.4	100

Source: 1992 MIT Report of the Treasurer

54 MIT: Report Of The Treasurer

As can be seen from the figures, MIT spends 53% of its expenditures on sponsored research. This shows the strong support that MIT receives from government and private corporations to perform research. Moreover, this high percentage confirms the need for a strong government and industry support for research institutions. This is more evident through the tuition and other related income revenue which consists of only 16% of total revenue. Although the above figures can be analyzed more deeply, the intent of this section is to provide a general perspective on the financial size for an institution such as MIT. These financial figures as well as the MIT perspective provides us with a reference point for developing a structure for our proposed institution.

Chapter 10

The Structure of the Proposed Institution

10.1. The Framework:

As identified earlier, the Middle East is in need of a research institution that fosters creativity and promotes the pursuit of knowledge in the fields of technology and management. The input from our questionnaire confirms this regional need. However, to create a successful institution of high quality research and teaching requires extensive strategic planning. This planning begins with establishing the objective and a structure for the institution. The structure will then be used as a selling tool for fund raising, public relations, and concept promotion within governments and industry. It is extremely important, however, that the structure fully supports the objective without compromising the quality of research and education for financial or any other type of gain. Furthermore, although we use the word structure it is by no means our intention to create a rigid plan but rather a flexible one that responds to the needs in the region.

The framework we provide in this section reflects the input we received through the questionnaire and our analysis of the need for the proposed institution. Furthermore, it takes into consideration the complex and uncommon process of establishing a research institution in a developing region. It is important to note that the institution's clients consist of a diverse group of countries with different levels of sophistication, needs, and national objectives. The institution must have the flexibility to satisfy its clients either directly or through a consortium of existing institutions. Consequently, the framework is developed at the conceptual level except in certain areas where we believe it is necessary

to provide detailed information. The time and location of establishment of this institution will govern its structure and implementation process. This structure should be used only as a guiding document.

10.2. The Concept:

The concept of this institution is to create an organization that extends beyond the gathering and dispersion of information to the pursuit of knowledge in technology and management. It is important that this institution be developed as a center for creativity and an engine for economic growth in the Middle East. Research and teaching will be combined to further promote quality researchers and industry and government leaders. As identified in the technology triangle section, this institution should be used as a resource base for governments and industry to promote technology and technological innovations. Building these ties should be an inherent requirement in developing the institution's structure.

This institution would conceivably combine technology transfer with applied research to develop solutions for local problems. The institution may play an important role in transferring technology to Middle Eastern companies. For example, its initial research may concentrate on improving the process and speed of technology absorption in the Middle East. However, the process or detail of the specific research performed at this institution whether technology transfer related or in advanced research would be driven by the customer consisting of Middle Eastern governments and industry. Consequently, the structure should reflect this flexibility as well as have the right incentives for faculty and students to reach their full potential and beyond. Promoting local and international support is key to provide researchers with access to research information. This concept

should always be an integral part of, and should always drive, the future structure of this institution.

10.3. The Governing Body:

The governing body should consist of a board of trustees whose members consist of distinguished leaders in technology, management, industry and the public sector. The establishment of this governing body will be the very first step in establishing this institution. Once this body is organized, all planning and fund raising activities can proceed. The initial governing body should consist of a small, dynamic, committed, and highly educated and influential group of individuals.

It is the responsibility of the board of trustees of this institution to ensure that the concept is fully implemented and that the objective is continuously pursued. Furthermore, it is the responsibility of this body to ensure that adequate funding is secured for on-going and future operations of the institution. Through this institution's administration, the board of trustees should also ensure that high quality of research and education is maintained and pursued and that academic integrity is protected.

10.4. The Institution's Quality:

This institution's mission should be based on quality. Quality in this concept is very difficult to quantify. However, the most important measure of quality output of this institution is its ability to serve its client: the Middle East community. However, quality measurement for research and teaching at this institution is difficult to specify at this point

in time. This is more so in our proposed institution because its diverse client base makes it very difficult to measure quality in terms of a specific customer. Unlike MIT which decided that its quality should be measured by the academic community, this institution will deal with a number of countries with varying industrial sophistication levels and will deal with technology transfer issues as well as primary research and teaching. Consequently, it faces a more complex quality issues. Although such issues can not be currently addressed, they should be defined during the initial implementation phases and especially in the concrete development of the institution's mission. However, in general, the success in promoting and supporting industrialization, solving local technical and managerial problems, and pursuing knowledge to enhance the well-being of individuals, corporations, and governments in the region is the key measure of quality for this organization. Performing quality research without the ability of disseminating the knowledge to the community would fall short of the goal of this institution.

More than a community of scholars and students, this institution requires a complex infrastructure to function. The infrastructure should be driven by the pursuit of quality which should not be compromised for size or financial backing. Excellent researchers, students, and workforce should be invited only if they improve the quality of the institution. Downsizing the scope of research and applications driven by the institution should always be a viable option in the event that quality cannot be sustained. There is danger, however, that the evaluation process of quality may not appreciate and thus attract new and different forms of creativity. Consequently, consensus, open mindedness, and consultation with international organizations are key to best evaluate quality. As a result of developing a rigorous internal quality organization, the quality concept would be injected into local corporations through direct applied research and through graduates who would leave the institution with an understanding of quality that would serve as a benchmark for life.

10.5. The Curriculum:

The results from the questionnaire indicate that the general opinion is divided between starting this institution with both the undergraduate and graduate programs or starting with only a graduate program. Ultimately, it is to the benefit of the institution to accept students in both of these programs. The graduate program will provide graduate students with the opportunity to perform research. Such a program will develop a stable and much needed source of local researchers in the region. Graduate students will be sponsored through research or teaching assistantships to attract the most qualified ones and provide them with the opportunity to perform research without worrying about personal finances.

The undergraduate program will attract excellent high-school graduates from around the region and the world. The students will be taught the basics of technology and management as well as the latest advances in these areas. Furthermore, they will gain hands-on experience through a required internship with a local or international corporation. In addition, the students will be introduced to research through a program similar to MIT's UROP program. Students will develop combined theoretical and applied understanding of technology and management that will allow them to either pursue a research or an industry career.

Both of these programs are critical in enlarging the knowledge base of the institution and in enhancing its ability to act as an agent of change in the region. However, to maximize the utility of funds in the research area it may be optimal to initially start with only the graduate program. The graduate program allows the institution to focus on technology and management without being required to provide the diverse knowledge that is usually sought in an undergraduate program such as the arts and humanities. As the

institution gets more established, the undergraduate program can be started and linked with existing areas of study. The details of such programs as well as the specific fields of study are issues that are best addressed and developed during the establishment phase of the institution.

10.6. The Virtual Campus:[55]

The virtual campus concept is critical to the ability of this institution to perform its function of both learning and dissemination of knowledge to its customers (see figure 10.1). In order for the institution to strengthen its links in the technology triangle, it should develop the tools and establish the physical infrastructure to create a direct access to governments, industry, and other institutions. Consequently, the institution should have the capability to:

a. Exchange information with major research centers and universities around the world to stay up to date with the latest innovations in technology and management.
b. Maximize learning by the sharing of information among scholars and students and by providing internal communications capability within the institution.
c. Effectively disseminate knowledge to corporations and governments all over the Middle East.

Such capability requires the institution to have state of the art information technology and telecommunications systems to support these capabilities. These systems

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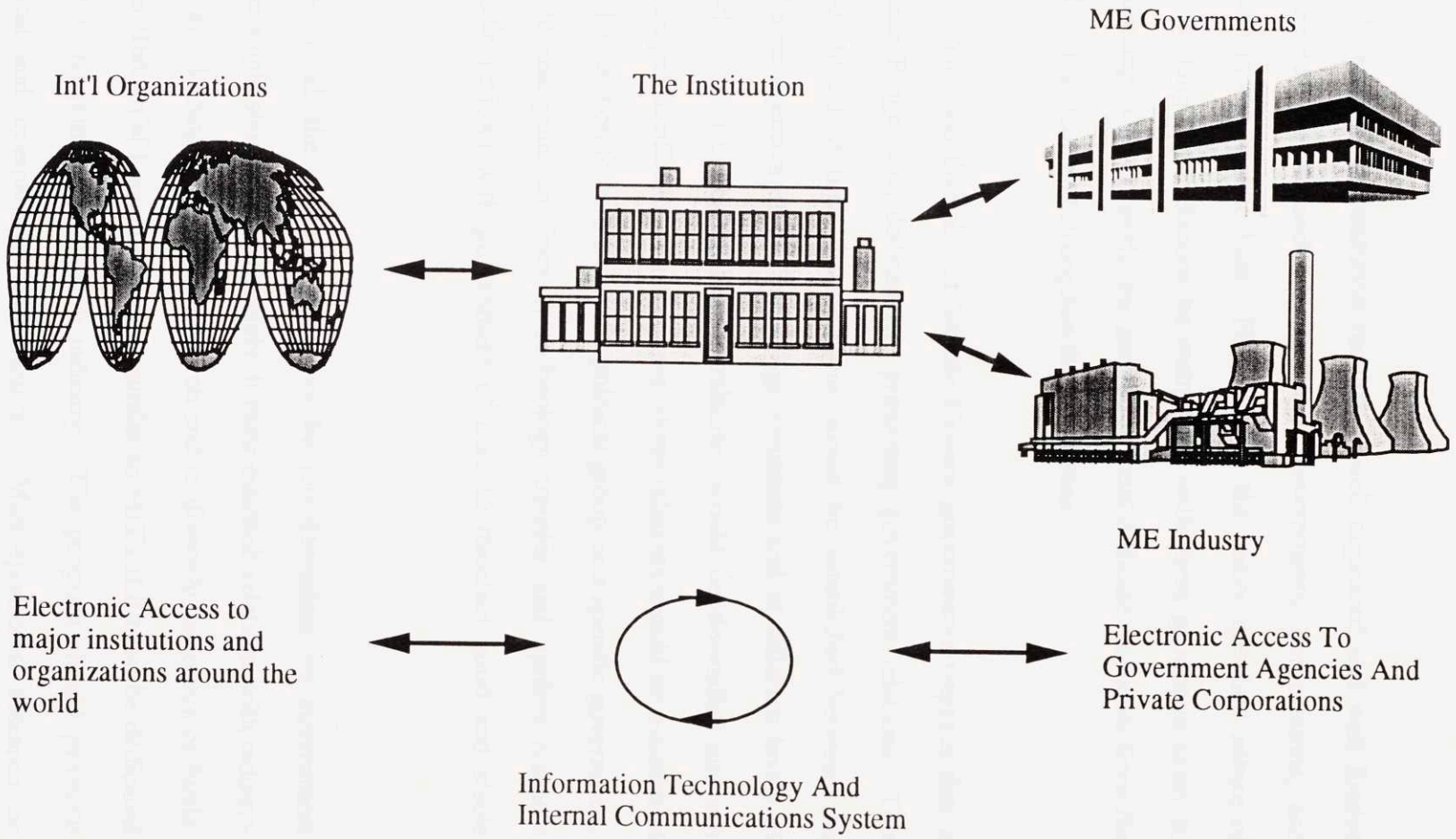
55 Manning, Kennith R., editor, [1991]; *MIT: Shaping The Future*. Thomas R. Moebus: "MIT And Industry: The Legacy And The Future", pg. 172.

would reduce the importance of geographic location and would provide a virtual contact with the outside world.

Consequently, at the center of this institution a system such as MIT's Athena is needed. This system would be connected through ground or wireless communication systems (Cellular, Satellite, Microwave) to the outside world. Having such capability is essential to the survival of this organization and its ability to perform quality research while located in the Middle East. Depending on the country location and the quality of telecommunications within the country, this institution may have to have its own communications system without relying on the local system.

Furthermore, this system can be used to provide virtual sessions, featuring satellite and computer-based courses that will offer a great increase in educational opportunities for participating engineers and managers from industry. Creating the virtual campus capability through technology is one of the most essential steps in the establishment phase of this institution.

Figure 10.1: The Virtual Campus



Source: Nasrallah and Salty [1993]

10.7. Public Relations:

The establishment of this institution requires a well organized and well funded campaign that promotes the research concept with governments, corporations, and influential individuals in the Middle East. Furthermore, the heavy spending nature of research requires that long term relations be maintained with these groups in order to secure sources of funding. Consequently, the institution must dedicate resources from the beginning to establish, maintain, and strengthen these relations.

The large number and diversity of Middle Eastern governments requires that a Governmental Liaison Program be dedicated to promoting government relations. This program should be structured such that relations would be established between the institution and different agencies of the various governments and at different levels of government hierarchy. It is critical that these relations would be diversified and not dependent on specific public officials. Furthermore, these relations should be established without any political alienation toward a specific political group or a specific government. This program would use joint activities in technology transfer and applied research supported by periodic reviews with government officials to maintain good and stable relations.

On the other hand, the institution must not be too dependent on government funding or any other single source. Consequently, it must establish relations with industry to both meet the heavy funding required for research and to diversify its source of funds. For this purpose, an "Industrial Liaison Program" similar to MIT's ILP must be dedicated to promote relations and joint research with industry. The program should promote membership of local and international corporations. Multi-sponsored research or technology transfer would be pursued to harness and maintain mutually beneficial

relationships with corporations and to minimize the cost to industry. This program should become an important tunnel through which corporations can monitor and gain access to innovations in technology and management.

Finally, it is important not to forget the importance of influential individuals in funding or supporting the progress of the institution. This is especially important in the Middle East where business or high level government access is mostly dependent on individuals as opposed to organizations. A dedicated program should be established to develop these relations and ensure that influential individuals are continuously educated about the benefit of research in technology and management and the important role that they can play in promoting it.

To a certain extent, the institution has the responsibility of promoting public awareness of the importance of applied research to society. This awareness can become critical in receiving public support. However, this is an evolving task that gets achieved as the institution performs quality research that becomes apparent and more known to the public.

The establishment of the institution and its survival as a long-lasting and independent entity requires that strong relations be maintained with the above groups. Consequently it is important to allocate the appropriate resources in terms of quality personnel as well as funding to build these relationships.

10.8. Relation with Middle Eastern Research and Education Centers:

The institution must establish strong ties to existing Middle Eastern universities, colleges and research centers. Through the exchange of information, academic conferences and joint programs, resources can be maximized. The institution can build on the knowledge base of scholars at existing institutions while providing them the opportunity to interface with and access a quality research environment. Joint activities would be promoted on both the institution and the individual scholar levels.

10.9. Incentive to Attract Qualified Faculty:

The institution must develop the right incentive system to attract and maintain qualified faculty with strength in research. The incentive system should take into consideration the following issues:

a. Financial;
b. Open, stimulating, and challenging environment;
c. Access to resources;
d. Prestige.

The financial incentive for the faculty should consist of relatively high salaries as well as the ability to earn additional income through consulting or entrepreneurship. Similar to MIT, faculty members should be able to dedicate a portion of their academic time for personal business activities.

The institution's environment is very important to attract qualified scholars. An open and stimulating environment that promotes creativity and the ability to exchange

ideas with highly qualified colleagues would be a magnet for intellectuals. The ability to work with peers that are considered the best in their field would provide a challenging environment for scholars. Such an environment is very difficult to create immediately. Consequently it is important to start with a small but highly qualified group of people and then grow at the rate of availability of more qualified scholars or researchers.

Providing access to information through the institution's established relationships with other entities would attract researchers who would not have this access otherwise. The ability to establish channels for information access regionally and internationally is very important to provide this incentive.

In general, recognition of association and achievement is very important to scholars and researchers. Consequently, this institution should develop a reputation of a premiere research and education center in the Middle East from the inception phase. Although prestige is gained through quality output over time, it should be pursued from the beginning to add to the institution value to prospective scholars. This aspect can be strengthened through a mentorship program with an established and recognized institution such as MIT.

Other incentives such as sabbatical leave and a reduced teaching load may need to be provided to attract the most qualified scholars to join this institution. It is very important that this issue be given ample attention during the establishment phase.

10.10. Incentive to Attract Quality Students:

Similarly, the institution must develop the right incentive system to attract quality Middle Eastern and international students. The institution must provide a stimulating and challenging environment whereby students can learn state of the art technology and management practices while assisting faculty members in performing research work. The presence of high quality, well-reputed faculty are a great attraction to quality students. Moreover, the presence quality students in the institution are in themselves a magnet to other quality students throughout the region. A major part of the students learning process is achieved through interaction with other students. Consequently, the physical campus design, projects, and activities should maximize this interaction. It is important that ample non-academic activities be provided on campus to balance the academic intensity and competitiveness of such an institution.

Another incentive is to provide the students with opportunities for work in leading Middle Eastern industry either as interns or full-time members. This can be better achieved as the institution gain more reputation for its quality of teaching and research. Scholarships and fellowships must also be provided to attract quality students.

Other incentives such as the ability to interact informally with faculty, access to resources, ability to be visiting scholars in other international institutions, and prestige must also be addressed in terms of the students needs and expectations. Although attracting quality students may be less challenging than attracting qualified faculty, it is nonetheless essential to attract the best students in the region as well as provide with the opportunity to excel and be leaders in industry or academia in their future careers.

10.11. Research Incentive:

The institution's system should have strong incentive for faculty to perform research. Consequently, the evaluation criteria for initial hiring and tenureship should be centered around the ability of the faculty member to perform well recognized and applicable research. Similar to MIT, the tenureship process should include the evaluation of outside experts of the faculty member's work in a specific field of study. At the same time, ample time may be needed to produce quality research. Faculty members should be given a large window of opportunity to research issues that may take few years. Consequently, the hiring process should be very selective to provide the best qualified researchers with such opportunities.

Additional incentives for research should be provided through organizing academic conferences and sponsoring publications that promote and recognize exceptional research. This institution should actively be involved in promoting such conferences and publications on both regional and international levels. Similar to MIT's Technology Review and Sloan Management Review, this institution should develop its own press and should promote and distribute its own publications on technology and management in the Middle East.

Access to information is very important to promoting research. Consequently, the institution should be involved in promoting its own internal information base as well as in creating channels to access public and private organizations. The library, (to be discussed in more detail later), becomes very important in encouraging research. In addition, information technology and strong public relations ties can provide the access to information in the market place.

Overall, the research incentive should be continuously strengthened and improved upon to maintain this institution as an attractive environment for highly qualified researchers.

10.12. Entrepreneurship Incentive:

A major part of this institution's mission is to promote industrialization in the region. It should embrace industry and develop close ties with technology based industrialists. Faculty and students should be encouraged to turn their ideas and research into concrete operations. Consequently, this institution should be viewed not just as an academic organization but also as a source of industrial creativity and entrepreneurship.

The ability to build upon an institution to promote industrialization is strongly evident in MIT's ability to act as a source for a large number of technology based companies in California and the Greater Boston area. The MIT Technology Licensing Office as well as the various venture capital firms initiated by MIT professionals played a key role in this development[56]. The proposed institution should investigate in detail the incentive system that created this success and should establish the appropriate support organizations for start-up companies. The ability to succeed in this endeavor will be very beneficial to the institution in terms of acquiring fund contribution and royalties from such start-ups.

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56 Manning, Kenneth R., editor, [1991]; *MIT: Shaping The Future.* Edward B. Roberts: "An Environment For Entrepreneurs."

10.13. Language Of Study:

In order to attract highly qualified scholars and to have immediate access to resources, the language of study at this institution should be English. As more qualified Arabic speaking scholars and resources are available in Arabic, the language used at this institution may become a mixture of Arabic, English, or other languages such as French. It is very important, however, to prevent nationalistic feelings from dictating the official language of this institution.

10.14. Library:

The library is the heart of any academic institution and especially a research one. Planning the development of this institution's library should go hand in hand with the planning for the institution itself. The structure of the library and its future growth and evolvement should be aligned with the goal of the institution of becoming a premiere research institution in the region.

This library should rely on the advances in information technology to acquire and maintain information, books, journals and all other relevant resources for the institution. The implementation of advanced information technology from the beginning in this library would help:

a. Minimize the space required to store materials by using electronic storage devices versus having a paper copy of a number of publications and databases.
b. Minimize access time to data and information available within the library by providing the user with the ability to scan available resources efficiently.

c. Minimize the time required for the librarian to acquire new materials through downloading electronically the data from major sources around the world.

d. Provide on-line computer access to international information data bases such as Lexis /Nexus.

It is very important, however, to maintain the library as an environment for learning and creativity. Consequently, this library should maintain a balance of resources between electronic and printed material and should provide adequate space for study and reflection for both individuals and groups.

This library should have a strong link with the rest of the institution and other regional institutions on both the physical and organizational levels. Physically, the library should be connected to the backbone information and communications system of this institution and if possible to other institution's systems. This ability allows faculty and students to research data from their own workstation. Organizationally, the library should be able to understand and prioritize the needs of its users on an on-going basis. Consequently, the librarian plays a very important role:

a. The librarian should be well trained to understand the current and future needs of the institution.

b. The librarian should have an influential position within the administration.

The library then will not just be a place to store information but rather a process to maintain and increase the knowledge base of the institution. Subsequently, its role and operations become critical to the livelihood and future of the institution itself.

10.15. Location:

It may be premature to currently decide on the location where this institution should be established. However, it is important to identify the criterion for selecting a location and then propose a country based on these criterion. At a minimum, the criterion should include the following concerning the prospective country of choice:

a. A regulation system that does not put controls on private academic institutions.
b. A strong community understanding of the importance of an advanced academic institution within a society.
c. Examples of previously established successful private academic institutions.
d. A country that has a positive relation with the majority of the countries in the region.
e. A country with strong ties to the Western world. This criteria becomes more important with the need to access information from major institutions around the world.

Although Israel and Turkey provide a fertile environment for such an institution, choosing one of them would alienate the Arab countries which constitute the majority of countries in the Middle East. Consequently, from the questionnaire's results and from the above criterion, we are left with two countries: Egypt and Lebanon that satisfy the above criterion.

In this thesis we make Lebanon the country of choice for the following two reasons. First, the American University of Beirut and Universite Saint Joseph are examples of very successful private universities that graduated a good percentage of industry and government leaders in the Middle East. These universities proved that the regulative and social environments in Lebanon are supportive of higher private education

even during the civil war years. Second, in Lebanon the institution would not face the government intervention risk present in Egypt, a country that is heavily regulated and state oriented.

However, although Lebanon currently seems like a strong candidate, the ultimate location decision has to be further investigated during the planning stages of this institution.

10.16. Architecture Theme:

We felt that this issue deserves attention even at this stage of planning. The architecture plays a critical role in providing a sense of pride and belonging to its scholars, students, employees, and the community at large. Consequently, the architecture should reflect both the mission of this institution and the Middle Eastern culture. Furthermore, the design should provide a pleasant physical environment and should create the space incentive for people to communicate with each other.

The goal of identifying the architecture in this thesis is to identify its importance to the future founders of this institution. We hope that it will receive the attention it deserves.

10.17. Financial Structure Of The Proposed Institution:

It is very important that adequate funding is raised not just to operate the institution but also to maintain it as an independent organization without alienation toward

a specific government or organization. This institution must rely on a solid endowment that provides this independence. Operations should not proceed without having a strong endowment to sustain the institution for a long time in the event of a financial crisis. In this section we divide the fund raising activity into three steps and we provide a sample of a research institution's financial structure. However, financial data can not be developed without a detailed plan for the institution including its exact location and time of establishment. Consequently, the financial structure we provide in this section is intended to show the breakdown of cost allocation to the major functions in a research institution.

The fund raising activity should be performed sequentially for the following distinct purposes:

1. Endowment
2. Construction and establishment as a physical entity
3. Operations

It is critical to ensure that the projected endowment funding objective is achieved before construction or operations can be established. We believe that a minimum endowment of $500 Million[57](in 1993 money value) must be raised before proceeding with operations. The minimum endowment value for such an institution is at this point a subjective issue. However, we feel that anything less than $500 Million would jeopardize the independence of this institution. Furthermore, the majority of the endowment should be invested outside the Middle East to diversify the risk inherent in having the institution's on-going operations dependent on fund raising in the Middle East. In addition, increasing the value of the endowment should be a continuous goal of the institution. Fund raising for construction and operations may proceed, based on the preference of donors,

[57]This figure is based on the results from the questionnaire and on our perception of needed endowment value.

concurrently with the endowment fund raising. However, construction or operations should not proceed before the minimum endowment fund is raised. The scope and size of these two activities should be limited by the amount of money raised for these purposes.

The input from the questionnaire identifies the high importance and priority of selling the idea to local governments first. Although we agree with the importance of selling the idea to Middle Eastern governments, we believe that the fund raising activity should be pursued within both the private and public sectors. Governments, corporations, and individuals should be approached simultaneously in a planned and outlined public relations campaign. The mission of this institution to operate as a private entity requires that all of these groups be approached simultaneously. The governing body establishing this institution may rely on a number of public relations and consulting organizations to establish relations at a high level with government officials, executives and influential individuals.

The required effort and the needed financial support to start such an institution may cause the fund raising activity to be extended over a period of a few years. It is hence important to start the fund raising activity with this understanding to minimize frustration with obstacles and delays. Furthermore, it is important to ensure that anxiousness to start the institution does not cause construction and operations to be pursued without pre-secured funding.

The specific numbers required to construct and operate this institution will be dependent on the location, time of establishment, and the scope of operations. Consequently, it is not feasible to identify at this time the amount of funds required to perform these activities. However, it may be helpful to observe the percent expense allocation and fund raising from different sectors for a research and education institution.

For this purpose we provide the MIT figures of 1992 in terms of percentage of total expenses for the year. Although MIT is not a typical research institution and every institution will have an expense structure of its own, these percentage figures may help the reader understand the financial structure of a research oriented institution. (See Exhibit F)

10.18. Summary:

The objective of this structure is to emphasize the importance of research as a primary activity as well as a vehicle for teaching. To develop the capability to perform quality research, this institution must have the right incentive system as well as the appropriate tools and financial backing. Consequently, the above structure emphasizes the quality research incentive to attract qualified scholars and students, information technology, as well as the need for a substantial endowment.

Creating a successful institution of high quality research and teaching is a complex and uncommon process and requires extensive strategic planning. Subsequently, the institution's framework in this section is developed at the conceptual level with specific emphasis on quality research and teaching in the Middle East. The time and location of establishment of this institution will govern the details of developing and operating this institution.

CONCLUSION

The Middle East as defined in this thesis consists of a group of countries that vary in terms of development, wealth, and educational base. Nonetheless, all the countries, with the exception of Israel, are in dire need for development to promote industrialization. To expedite this development, Middle Eastern countries have doubled the number of higher education institutions during the seventies and eighties. However, these institutions, outside Israel and Turkey, are focused on education with minimal applied research. Without the indigenous research capability, Middle Eastern countries will not be able to advance industrialization to international standards and thus compete with developed countries. This is especially so in the fields of technology and management.

As identified in this project, the Middle East is in need of a research institution that fosters creativity and promotes the pursuit of knowledge in the fields of technology and management. The objective is to create an organization that extends beyond the gathering and dispersion of information to the pursuit of knowledge in technology and management. Quality research and teaching will be combined to develop this organization as a center for creativity and an engine for economic growth in the Middle East. Research and teaching will be further combined to promote quality researchers as well as industry and government leaders. This type of linkage is further promoted by the institution within the concept of the technology triangle which seeks the establishment of a relationship between the research and education institutions, the industry and government.

The questionnaire we distributed to a number of academicians and business leaders helped us develop a better understanding of the numerous unknown factors inherent in the process of establishing such an institution. The respondents strongly endorsed the need for a research and education institution. Furthermore, technology and Management were

indicated as the most commonly needed research fields to bridge the gap the Middle East faces with respect to developed countries. Although the respondents had some concern over the institution's ability to survive and produce quality research in the current political environment, they were generally enthusiastic about the important role that such an institution would play in promoting Middle Eastern industrialization.

Considering the Middle East's diversity and level of governmental bureaucracy and centralization, only a private institution can survive as a quality research center and an unbiased institution in its mission in the region. We used MIT as a "Quasi Model" to highlight the role that a successful private research institution can play in promoting industrial relations, entrepreneurship, and economic growth. Specifically, we investigated the MIT incentive system that promotes research. While understanding that this specific model was affected by certain historical events can not be fully and successfully copied, we developed a structure for the proposed institution based on the incentive system of this model. This structure was maintained at the concept level to avoid binding details that may not be applicable during the actual implementation of the institution.

This project has been an exciting and challenging one. There are numerous unknown factors intrinsic in establishing a research and education institution such as the one proposed. Moreover, the lack of publicly available data on the Middle East makes the task of obtaining accurate information all the more difficult. However, despite all this, it is extremely important to realize that the issue addressed is an important and crucial one facing the Middle East. The region has a long task ahead of it for it to reach a level of industrial growth comparable to that of the industrialized world. A research and education institution promoting technology and management is only one of numerous institutions that are needed in the Middle East to promote higher education and research. Nonetheless, we are proposing a starting point that can help contribute to the

establishment of other similar institutions as well as the growth of skilled labour and industry in the region.

EXHIBITS

Exhibit A: Universities and Research Institutions in the Middle East
Exhibit A1: Universities

Name	Founded	Library Volume	Faculty	Students	S/F Ratio	Language	Control	Country	Tech.	Mgmt
Universite D'Algier	1879		1100	30000	27.3	A/F	S	Algeria		
Universite D'Oran	1965	200000	850	14000	16.5	A/F	S	Algeria	y	
Universite De Constantine	1969	140000	1500	20000	13.3	A/F	S	Algeria	y	
Univ.Des Sciences Et De La Technologie	1974		1350	19000	14.1	A/F	S	Algeria	y	
Universite De Tlemcen	1974	66000	436	6241	14.3	A/F	S	Algeria		
Universite D'Annaba	1975		1105	18740	17.0	A/F	S	Algeria	y	
Univ.Des Sciences/Technology D'Oran	1975			5971		A/F	S	Algeria	y	
Universite De Setif	1978		570	9485	16.6	A/F	S	Algeria	y	
Inst. Nat.D'enseignement Sup.De Tiaret	1980		66	1020	15.5	A/F	S	Algeria	y	
Universite De Blida	1981		644	7990	12.4		S	Algeria	y	
Universite De Boumerdes	1981						S	Algeria	y	
Arabian Gulf University	1980		68	368	5.4	A/E	S	Bahrain		
University Of Bahrain	1986	122131	320	4050	12.7	A	S	Bahrain	y	y
Al-Azhar University	0970	80000	3604	90000	25.0	A		Egypt		
Cairo University	1908	1057000	4494	76794	17.1	A/E	S	Egypt		
American University In Cairo	1919	210000	266	3486	13.1	E	P	Egypt	y	y
Alexandria University	1942	122225	3610	92000	25.5		S	Egypt		
Ain Shams University	1950		4703	1E+05	21.3		S	Egypt		
Assiut University	1957	250000	2110	42520	20.2	A/E		Egypt		
Tanta University	1972		1037	35507	34.2	E	S	Egypt		
Mansoura University	1973		3144	32678	10.4	A/E	S	Egypt		
Zagazig University	1974		4331	64908	15.0	A/E/F	S	Egypt	y	
Helwan University	1975	299283	1281	31352	24.5	A	S	Egypt		
Suez Canal University	1976		1050	10327	9.8	A	S	Egypt	y	
Menia University	1976		770	16120	20.9			Egypt	y	
Menoufia University	1976		863	18366	21.3			Egypt		
Iran University Of Science & Technology	1928		175	6000	34.3	Farsi	S	Iran	y	
University Of Teheran	1932		924	28555	30.9	Farsi		Iran	y	

Source: The World Of Learning, 1992

Exhibit A: Universities and Research Institutions in the Middle East
Exhibit A1: Universities

Name	Founded	Library Volume	Faculty	Student	S/F Ratio	Language	Control	Country	Tech.	Mgmt
Shiraz University	1945		360	11500	31.9	Farsi/E	S	Iran	y	
University Of Tabriz	1946		336	9576	28.5	Farsi	S	Iran	y	
Isfahan University Of Medical sciences	1950		355	6124	17.3	Farsi	S	Iran		
University Of Isfahan	1950		350	10200	29.1	Farsi	S	Iran	y	y
Mashhad University Of Medical sciences	1954	35000	40	1117	27.9			Iran		
Shahid Chamran university	1955		350	7500	21.4	Farsi	S	Iran	Y	
Amir Kabir University Of Thecnology	1958			4928				Iran	y	
Shahid Beheshti University	1959		310	11799	38.1	Farsi	S	Iran	y	y
Al-Zahra University	1965	43000	190	5000	26.3	Farsi	S	Iran		y
University Of Urmia	1967	21500	145	2469	17.0			Iran	y	
Bu-Ali Sina University	1973					Farsi/F/E		Iran	y	
University Of Sistan And Baluchistan	1974		100	3500	35.0	Farsi	S	Iran	y	
Shaheed Bahonar university	1974					Farsi/E	S	Iran	y	
Ferdowsi University Of Mashhad	1975		316	10600	33.5	Farsi		Iran	y	y
Mazandaran University	1975		106	2210	20.8	Farsi	S	Iran		
University Of Gilan	1977					Farsi	S	Iran		
Isfahan university Of Technology	1977		295	6000	20.3	Farsi	S	Iran	y	
K.N. Toossi University Of Technology	1980	60000	120	3000	25.0	Farsi		Iran	y	
Art University Complex	1980		93	1527	16.4	Farsi/E	S	Iran		
Tabriz University Of Medical Sciences	1986		230	3136	13.6	Farsi	S	Iran		
Bakhtaran University Of Medical Sciences	1986	12310	46	829	18.0			Iran		
Shahrekord University Of Medcal Sciences	1986		48	654	13.6	Farsi		Iran		
Ahwaz University Of Medical Sciences	1988		231	2675	11.6			Iran		
Sharif University Of Technology	1993							Iran	y	
University Of Baghdad	1957	210000	1500	19300	12.9	A/E	S	Iraq		
Al-Mustansiriya University	1963	150000	734	18000	24.5	A/E	S	Iraq		y
University Of Basrah	1964	180000	616	4000	6.5	A/E	S	Iraq	y	
University Of Mosul	1967	147903	1400	21471	15.3	A/E	S	Iraq	y	y

Source: The World Of Learning, 1992

Exhibit A: Universities and Research Institutions in the Middle East
Exhibit A1: Universities

Name	Founded	Library Volume	Faculty	Students	S/F Ratio	Language	Control	Country	Tech.	Mgmt
University Of Salahaddin	1968	118000	560	7000	12.5	A/E/K	S	Iraq		y
University Of Technology	1975		429	7384	17.2	A/E	S	Iraq	y	
University Of Tikrit	1987						S	Iraq		
Saddam University For Eng. And Science	1988	1500	70	200	2.9	A/E	S	Iraq	y	
Technion-Israel Institute Of Technology	1912	800000	1100	9500	8.6	Hebrew		Israel	y	y
Hebrew University Of Jerusalem	1918	4000000	1400	20500	14.6	Hebrew	p	Israel	y	y
Weizmann Institute Of science	1949	216675	300	651	2.2		P	Israel		
Bar-Ilan University	1953	725000	1100	12000	10.9	Hebrew	P	Israel	y	y
Tel-Aviv University	1953	780000	1729	20250	11.7	Hebrew	P	Israel	y	y
University Of Haifa	1963		360	6800	18.9	Hebrew	p	Israel		
Ben Gurion University Of The Negev	1965	400000	632	6588	10.4	Hebrew		Israel	y	
Open University Of Israel	1974	4500	180	16000	88.9	Hebrew		Israel	y	y
University Of Jordan	1962		862	19124	22.2	A/E	S	Jordan	y	y
Yarmouk University	1976	250000	531	10979	20.7	A/E		Jordan	y	y
Mutah University	1981	32000	70	3000	42.9	A/E	S	Jordan	y	y
Al-Quds Open University	1985	6000	95	30000	315.8			Jordan	y	y
Jordan Univ. Of Science & Technology	1986	18000	304	3008	9.9	A/E	S	Jordan	y	
Kuwait University	1962	340000	955	12500	13.1	A/E	S	Kuwait	y	y
American University Of Beirut	1866	573899	400	5000	12.5	E	P	Lebanon	y	y
Universite Saint Joseph	1881	90000	1025	6053	5.9	A/F/E	P	Lebanon	y	y
Universite Saint-Esprit De Kaslik	1950	100000	338	3350	9.9	A/F/E	P	Lebanon		
Universite Libanaise	1951		1602	26957	16.8	A/F/E	S	Lebanon	y	
Beirut Arab University	1960	200000	260	20331	78.2	A/E	P	Lebanon	y	y
University Of Garyounis	1955	294844	550	1000	1.8	A	S	Libya	y	y
Al-Arab Medical University	1970	30000	238	1967	8.3			Libya		
Al-Fateh University	1973		1000	24000	24.0	Arabic	S	Libya	y	
Bright Star university Of technology	1981		70	700	10.0	A/E	S	Libya	y	
Sebha University	1983		200	2000	10.0	A/E	S	Libya	y	

Source: The World Of Learning, 1992

Exhibit A: Universities and Research Institutions in the Middle East
Exhibit A1: Universities

Name	Founded	Library Volume	Faculty	Students	S/F Ratio	Language	Control	Country	Tech.	Mgmt
Universite Quaraouyine	1200		90	3600	40.0	A	S	Morocco		
Universite Mohammed V	1957		1883	27338	14.5	A/F	S	Morocco	y	
Universite Sidi Mohamed Ben Abdellah	1974	2000				A/F	S	Morocco		
Universite Hassan II	1975		1496	44928	30.0	A/F		Morocco	y	
Universite Mohammed I	1978		400	17668	44.2	A/F	S	Morocco	y	
Universite Cadi Ayyad	1978		630	29094	46.2	A/F	S	Morocco		
Universite Ibnou Zohr	1989							Morocco		
Birzeit University	1924	94000	208	1800	8.7	A/E	P	Occ. Terr.		
Hebron University	1971	40000	95	1994	21.0	A/E		Occ. Terr.		
Bethlehem University	1973	100000	115	1600	13.9	A/E	P	Occ. Terr.		y
An-Najah National University	1977	82000	277	4200	15.2	A/E	P	Occ. Terr.	y	y
Sultan Qaboos University	1985	25000	300	1000	3.3		S	Oman	y	
University Of Qatar	1973	2860000	453	5281	11.7	A	S	Qatar	y	y
Islamic Univ. Of Imam Muhamad Ibn Saud	1953		1236	13613	11.0	A	S	SaudiArabia		
King Saud university	1957	1000000	2733	32000	11.7	A/E	S	SaudiAral	y	y
Islamic University	1961		383	2449	6.4	A	S	SaudiArabia		
King Fahad Univ.Of Petroleum & Minerals	1963	236836	619	4674	7.6	A/E	S	SaudiAral	y	
King Abdulaziz University	1967	434592	1147	20077	17.5	A/E	S	SaudiAral	y	y
King Faisal University	1975		519	4579	8.8	A/E	S	SaudiArabia		y
Umm Ul-Qura University	1979	370250						SaudiAral	y	
Omdurman Islamic University	1912	90000	192	2010	10.5	A	S	Sudan		
Cairo University/Khartoum Branch	1955		80	20000	250.0			Sudan		
University Of Khartoum	1956	209000	685	14000	20.4	A	S	Sudan		
Ahfad University For Women	1966	45000	102	1384	13.6			Sudan		
University Of Gezira	1975		140	1000	7.1	E		Sudan	y	
University Of Juba	1975	38700	220	1200	5.5	E		Sudan		
Omdurman Ahlia University	1986		40	750	18.8			Sudan	y	
University Of Damascus	1903		2609	81175	31.1	A	S	Syria	y	

Source: The World Of Learning, 1992

Exhibit A: Universities and Research Institutions in the Middle East
Exhibit A1: Universities

Name	Founded	Library Volume	Faculty	Students	S/F Ratio	Language	Control	Country	Tech.	Mgmt
University Of Aleppo	1960		2293	57594	25.1	A/F/E	S	Syria	y	
Tishreen University	1971		214	18130	84.7	A	S	Syria	y	
Al-Baath University	1979	33500	183	12860	70.3	A	S	Syria	y	
Universite De Sfax	1986		556	8895	16.0	A/F	S	Tunisia	y	
Universite Des Lettres/Arts/Sc.Humaine	1988		590	8700	14.7			Tunisia		
Universite Des Sci./Techniques/Medecine	1988							Tunisia	y	
Universite Zitouna	1988							Tunisia		
Universite De Droit/Economie/Gestion	1988							Tunisia		y
Hacettepe Universitesi	1206	256000	2373	26980	11.4	T/E	S	Turkey	y	
Istanbul Universitesi	1400		2457	31669	12.9	T	S	Turkey	y	y
Istanbul Teknik Universitesi	1773	28000	1711	21895	12.8	T	S	Turkey	y	
University Of The Bosphorus	1863		723	9437	13.1	E	P	Turkey	y	
Mimar Sinan Universitesi	1883	51200	420	3509	8.4	T	S	Turkey		
Marmara Universitesi	1883	90334	1073	16457	15.3	T/E	S	Turkey		y
Yildiz Universitesi	1911	60000	699	15683	22.4			Turkey		
Ankara Universitesi	1946		2865	31000	10.8	T	S	Turkey		
Aegean University	1955		1678	18034	10.7	T/E	S	Turkey	y	
Middle East Technical University	1956	360650	1447	17758	12.3	E	S	Turkey	Y	Y
Ataturk Universitesi	1957	296141	1273	14737	11.6	T	S	Turkey	y	y
Karadeniz Teknik Universitesi	1963		877	12899	14.7	T	S	Turkey	y	
Tigris University	1966		704	7144	10.1			Turkey		
Cukurova Universitesi	1973		1058	15060	14.2	T	S	Turkey		
Republic University	1974		648	6321	9.8	T	S	Turkey	y	
Uludag Universitesi	1975	135000	1158	19882	17.2	T	S	Turkey	y	y
Inonu Universitesi	1975		380	5211	13.7	T	S	Turkey		y
Selcuk Universitesi	1975		1229	19100	15.5	T	S	Turkey		
Nineteenth Of May University	1975	60000	635	8587	13.5	T	S	Turkey		
Euphrates University	1975		531	6302	11.9	T		Turkey	y	

Source: The World Of Learning, 1992

Exhibit A: Universities and Research Institutions in the Middle East
Exhibit A1: Universities

Name	Founded	Library Volume	Faculty	Students	S/F Ratio	Language	Control	Country	Tech.	Mgmt
Erciyes Universitesi	1978		609	7672	12.6	T	S	Turkey	y	y
Ninth September University	1982	187500	1694	26000	15.3	T	S	Turkey	y	y
Trakya Universitesi	1982		610	16250	26.6	T		Turkey		
University Of Anatolia	1982		1150	2E+05	212.2	T/E	S	Turkey	y	y
Akdeniz Universitesi	1982		461	9500	20.6			Turkey	y	
Centennial University	1982		204	2338	11.5	T	S	Turkey		
Gazi Universitesi	1982		2034	45296	22.3	T	S	Turkey		
Bilkent Universitesi	1984		800	7500	9.4	E	P	Turkey	y	y
United Arab Emirates University	1976	168000	583	8000	13.7	A	S	UAE	y	y
San'a University	1970		332	10715	32.3	A/E	S	Yemen		
University Of Aden	1975		646	3862	6.0	A/E	S	Yemen		

Source: The World Of Learning, 1992

Exhibit A: Universities and Research Institutions in the Middle East
Exhibit A2: Technology/Management colleges

Name	Founded	Library Volume	Faculty	Students	S/F Ratio	Language	Control	Country	
Ecole Nationale Polytechnique	1962	40000	300	1850	6.2	F/E	S	Algeria	
Ecole Polytechnique D'Arch./D'Urbanisme	1970	2120	91	409	4.5	F	S	Algeria	
Inst.Hydrometeorol.Formation/Recherche	1970	60000		200			S	Algeria	
Institut Des Telecommunications	1971						S	Algeria	
Mansoura Polytechnique Institute	1957	21400	147	2290				Egypt	
Cairo Polytechnique Institute	1961							Egypt	
Higher Industrial Institute	1962							Egypt	
Sadat Academy For Mgmt Sciences	1981	32000	124	4948		A/E	S	Egypt	
Abadan Institute Of Technology	1939	50000	50	1015			S	Iran	
Institute Of Administration	1964						S	Iraq	
Institue Of Technology	1969						S	Iraq	
Technical Institute Of Basra	1973			1660			S	Iraq	
Technical Institute In Najaf	1976						S	Iraq	
Technical Institute In Mosul	1976						S	Iraq	
Technical Institute In Missan	1976						S	Iraq	
Institute Of Administration In Karkh	1976						S	Iraq	
Technical Institute In Ramadi	1976						S	Iraq	
Technical Institute In Hilla	1976						S	Iraq	
Technical Institute In Kirkuk	1976						S	Iraq	
Ruppin Institute	1949	40000						Israel	
Jerusalem College Of Technology	1970	20000	45	350				Israel	
Shenkar College Of Textile Tech.& Fashion	1970	20000	40	360				Israel	
Amman Polytechnic	1975	17000	91	1500				Jordan	
Al-Husn Polytechnic	1981	10000	60	800				Jordan	Two year diploma
Kuwait Telecomm.& Air Navig.Train.Centre	1966		178	453				Kuwait	
Faculty Of Technological Studies	1976	15727	314	3100				Kuwait	
Beirut University College	1924	115000	150	3700		E	P	Lebanon	
Haigazian University College	1955	45000	35	350		Arm/E	P	Lebanon	

Source: The World Of Learning, 1992

Exhibit A: Universities and Research Institutions in the Middle East
Exhibit A2: Technology/Management colleges

Name	Founded	Library Volume	Faculty	Students	S/F Ratio	Language	Control	Country	
Islamic College Of Business Administration	1988	5000	12	100			P	Lebanon	
Posts And Telecommunications Institute	1963	510						Libya	
Higher Institute Of Technology	1976	10000	60	500				Libya	
Higher Institute Of Mech./Elec. Eng.	1976	8391		413				Libya	Grad/trng. emphasis
Ecole National Forestiere D'Ingenieurs	1968		19	160				Morocco	Six year courses
Ecole Des Science De L'Informatique	1974	10559	35	380				Morocco	
Oman Technical Industrial College	1984	10000	50	500				Oman	
Technical Institute	1964			1000				Saudia Arabia	
Khartoum Polytechnic	1975		208	4250				Sudan	Incl. postgraduate
Damscus Institute Of Technology	1963	6000						Syria	
Institute Of Electrical Eng. & Electronics	1974							Syria	
Institute Of Technical Training	1978							Syria	Two year courses
Ecole Nationale D'Administration	1949	42000		1050				Tunisia	Post graduate course
Ajman University College Of Sci./Tech.	1988							UAE	
Higher Colleges Of Technology	1988	12000	126	677				UAE	

Source: The World Of Learning, 1992

Exhibit A: Universities and Research Institutions in the Middle East
Exhibit A3: Technology/Management Research Institutions

Name	Founded	Country	Staff	Description
Centre D'inform. Scientifique/Technique	1957	Algeria		Technology transfer
Institut National De Cartographie	1967	Algeria	500	Cartography and surveying
Commissariat Aux Energies Nouvelles	1983	Algeria		R&D in the field of renewable sources of energie
Bahrain Centre For Studies And Research	1981	Bahrain	28	Scientific study and research in all spheres
Hydraulics & Sediment Research Institute	1949	Egypt	26	
National Research Centre	1956	Egypt		Research in both pure and applied sciences
Egyptian Atomic Energy Organization	1957	Egypt		Nuclear and radiation research
ME Reg.Radioisotope Centre/Arab Count.	1963	Egypt		Trains specialists in the applications of radioisotopes
Textile Quality Control Centre	1967	Egypt	300	Central laboratories for testing and quality control
Academy Of Sci.Research & Technology	1971	Egypt		National body Responsible for acience and technology
Central Metallurgical Research/Devlop.Inst.	1972	Egypt		
Textile Development Centre	1975	Egypt		Applied research on all textile technical problems
Egyptian Petroleum Research Institute	1976	Egypt	850	Petroleum and energy related research
Textile Information Centre	1978	Egypt		
Electronics & Computer Research Centre	1963	Iraq		
Petroleum Research Centre	1963	Iraq		
Genetic eng. & Biotechnology Research	1963	Iraq		
Solar Energy Research Centre	1963	Iraq		
Space Research Centre	1963	Iraq		
National Council For R&D	1950	Israel		Government body to promote long term R&D
Technion R&D foundation	1952	Israel		Co-operates closely with Technion-Israel Institute Of Tech.
Samuel Neaman Inst/Adv.Study/Sci.&Tech.	1978	Israel		Research on national problems in sci./tech./educ./econ. dev.
Islamic Academy Of Sciences	1986	Jordan		Exchange of ideas on dev. of sc.&tech. in the Islamic world
Kuwait Institute For Scientific Research	1967	Kuwait		Promote & conduct various scientific & technical research
Nat. Centre To Plan Sci./Tech.Research	1976	Morocco		Prepares the national plan for science & technology
King Abdul Aziz City For Sci. & Tech.	1977	Saudi Arabia		To formulate the national policy for sci.& tech. development
Islamic Foundation For Sci./Tech./Dev.	1980	Saudi Arabia		Coord. & mgmt of sci./tech. cooperation among OIC states
Institut National De Recherche Sci./Tech.	1969	Tunisia		Applied research in various areas

Source: The World Of Learning, 1992

Exhibit A: Universities and Research Institutions in the Middle East
Exhibit A3: Technology/Management Research Institutions

Name	Founded	Country	Staff	Description
Centre National De L'Informatique	1976	Tunisia		Dev. of computer projects/project coordination for public sect
Ankara Electronics R&D Institute	1963	Turkey		Attached to the Middle East Technical University
Defence Industry R&D	1963	Turkey		Attached to scientific & technical research council of Turkey
Ankara Nuclear Res. & Training Centre	1967	Turkey	143	Applied research in physics, chemistry, and electronics
Marmara Sci. & Industrial Research Centre	1972	Turkey	631	Research on basic and applied sciences

Source: The World Of Learning, 1992

Exibit B: Universities in the Middle East
Sorted By Founding Date

Name	Founded	Library Volume	Faculty	Students	S/F Ratio	Language	Control	Country	Tech.	Mgmt.
Al-Azhar University	0970	80000	3604	90000	25.0	A		Egypt		
Universite Quaraouyine	1200		90	3600	40.0	A	S	Morocco		
Hacettepe Universitesi	1206	256000	2373	26980	11.4	T/E	S	Turkey	y	
Istanbul Universitesi	1400		2457	31669	12.9	T	S	Turkey	y	y
Istanbul Teknik Universitesi	1773	28000	1711	21895	12.8	T	S	Turkey	y	
University Of The Bosphorus	1863		723	9437	13.1	E	P	Turkey	y	
American University Of Beirut	1866	573899	400	5000	12.5	E	P	Lebanon	y	y
Universite D'Algier	1879		1100	30000	27.3	A/F	S	Algeria		
Universite Saint Joseph	1881	90000	1025	6053	5.9	A/F/E	P	Lebanon	y	y
Mimar Sinan Universitesi	1883	51200	420	3509	8.4	T	S	Turkey		
Marmara Universitesi	1883	90334	1073	16457	15.3	T/E	S	Turkey		y
University Of Damascus	1903		2609	81175	31.1	A	S	Syria	y	
Cairo University	1908	1057000	4494	76794	17.1	A/E	S	Egypt		
Yildiz Universitesi	1911	60000	699	15683	22.4			Turkey		
Omdurman Islamic University	1912	90000	192	2010	10.5	A	S	Sudan		
Technion-Israel Institute Of Technology	1912	800000	1100	9500	8.6	Hebrew		Israel	y	y
Hebrew University Of Jerusalem	1918	4000000	1400	20500	14.6	Hebrew	p	Israel	y	y
American University In Cairo	1919	210000	266	3486	13.1	E	P	Egypt	y	y
Birzeit University	1924	94000	208	1800	8.7	A/E	P	Occ. Terr.		
Iran University Of Science & Technology	1928		175	6000	34.3	Farsi	S	Iran	y	
University Of Teheran	1932		924	28555	30.9	Farsi		Iran	y	
Alexandria University	1942	122225	3610	92000	25.5		S	Egypt		
Shiraz University	1945		360	11500	31.9	Farsi/E	S	Iran	y	
University Of Tabriz	1946		336	9576	28.5	Farsi	S	Iran	y	
Ankara Universitesi	1946		2865	31000	10.8	T	S	Turkey		
Weizmann Institute Of science	1949	216675	300	651	2.2		P	Israel		
Ain Shams University	1950		4703	100179	21.3		S	Egypt		
Isfahan University Of Medical sciences	1950		355	6124	17.3	Farsi	S	Iran		
Universite Saint-Esprit De Kaslik	1950	100000	338	3350	9.9	A/F/E	P	Lebanon		

Source: The World Of Learning, 1992

Exibit B: Universities in the Middle East
Sorted By Founding Date

Name	Founded	Library Volume	Faculty	Students	S/F Ratio	Language	Control	Country	Tech.	Mgmt.
University Of Isfahan	1950		350	10200	29.1	Farsi	S	Iran	y	y
Universite Libanaise	1951		1602	26957	16.8	A/F/E	S	Lebanon	y	
Bar-Ilan University	1953	725000	1100	12000	10.9	Hebrew	P	Israel	y	y
Tel-Aviv University	1953	780000	1729	20250	11.7	Hebrew	P	Israel	y	y
Islamic Univ. Of Imam Muhamad Ibn Saud	1953		1236	13613	11.0	A	S	SaudiArabia		
Mashhad University Of Medical sciences	1954	35000	40	1117	27.9			Iran		
Aegean University	1955		1678	18034	10.7	T/E	S	Turkey	y	
Shahid Chamran university	1955		350	7500	21.4	Farsi	S	Iran	Y	
Cairo University/Khartoum Branch	1955		80	20000	250.0			Sudan		
University Of Garyounis	1955	294844	550	1000	1.8	A	S	Libya	y	y
University Of Khartoum	1956	209000	685	14000	20.4	A	S	Sudan		
Middle East Technical University	1956	360650	1447	17758	12.3	E	S	Turkey	Y	Y
Universite Mohammed V	1957		1883	27338	14.5	A/F	S	Morocco	y	
University Of Baghdad	1957	210000	1500	19300	12.9	A/E	S	Iraq		
King Saud university	1957	1000000	2733	32000	11.7	A/E	S	SaudiArab	y	y
Ataturk Universitesi	1957	296141	1273	14737	11.6	T	S	Turkey	y	y
Assiut University	1957	250000	2110	42520	20.2	A/E		Egypt		
Amir Kabir University Of Thecnology	1958			4928				Iran	y	
Shahid Beheshti University	1959		310	11799	38.1	Farsi	S	Iran	y	y
University Of Aleppo	1960		2293	57594	25.1	A/F/E	S	Syria	y	
Beirut Arab University	1960	200000	260	20331	78.2	A/E	P	Lebanon	y	y
Islamic University	1961		383	2449	6.4	A	S	SaudiArabia		
Kuwait University	1962	340000	955	12500	13.1	A/E	S	Kuwait	y	y
University Of Jordan	1962		862	19124	22.2	A/E	S	Jordan	y	y
Karadeniz Teknik Universitesi	1963		877	12899	14.7	T	S	Turkey	y	
University Of Haifa	1963		360	6800	18.9	Hebrew	p	Israel		
Al-Mustansiriya University	1963	150000	734	18000	24.5	A/E	S	Iraq		y
King Fahad Univ.Of Petroleum & Minerals	1963	236836	619	4674	7.6	A/E	S	SaudiArab	y	
University Of Basrah	1964	180000	616	4000	6.5	A/E	S	Iraq	y	

Source: The World Of Learning, 1992

Exibit B: Universities in the Middle East
Sorted By Founding Date

Name	Founded	Library Volume	Faculty	Students	S/F Ratio	Language	Control	Country	Tech.	Mgmt.
Ben Gurion University Of The Negev	1965	400000	632	6588	10.4	Hebrew		Israel	y	
Universite D'Oran	1965	200000	850	14000	16.5	A/F	S	Algeria	y	
Al-Zahra University	1965	43000	190	5000	26.3	Farsi	S	Iran		y
Tigris University	1966		704	7144	10.1			Turkey		
Ahfad University For Women	1966	45000	102	1384	13.6			Sudan		
University Of Urmia	1967	21500	145	2469	17.0			Iran	y	
King Abdulaziz University	1967	434592	1147	20077	17.5	A/E	S	SaudiArab	y	y
University Of Mosul	1967	147903	1400	21471	15.3	A/E	S	Iraq	y	y
University Of Salahaddin	1968	118000	560	7000	12.5	A/E/K	S	Iraq		y
Universite De Constantine	1969	140000	1500	20000	13.3	A/F	S	Algeria	y	
Al-Arab Medical University	1970	30000	238	1967	8.3			Libya		
San'a University	1970		332	10715	32.3	A/E	S	Yemen		
Hebron University	1971	40000	95	1994	21.0	A/E		Occ. Terr.		
Tishreen University	1971		214	18130	84.7	A	S	Syria	y	
Tanta University	1972		1037	35507	34.2	E	S	Egypt		
Cukurova Universitesi	1973		1058	15060	14.2	T	S	Turkey		
University Of Qatar	1973	2860000	453	5281	11.7	A	S	Qatar	y	y
Bethlehem University	1973	100000	115	1600	13.9	A/E	P	Occ. Terr.		y
Bu-Ali Sina University	1973					Farsi/F/E		Iran	y	
Mansoura University	1973		3144	32678	10.4	A/E	S	Egypt		
Al-Fateh University	1973		1000	24000	24.0	Arabic	S	Libya	y	
Univ.Des Sciences Et De La Technologie	1974		1350	19000	14.1	A/F	S	Algeria	y	
University Of Sistan And Baluchistan	1974		100	3500	35.0	Farsi	S	Iran	y	
Universite Sidi Mohamed Ben Abdellah	1974	2000				A/F	S	Morocco		
Universite De Tlemcen	1974	66000	436	6241	14.3	A/F	S	Algeria		
Zagazig University	1974		4331	64908	15.0	A/E/F	S	Egypt	y	
Shaheed Bahonar university	1974					Farsi/E	S	Iran	y	
Open University Of Israel	1974	4500	180	16000	88.9	Hebrew		Israel	y	y
Republic University	1974		648	6321	9.8	T	S	Turkey	y	

Source: The World Of Learning, 1992

Exibit B: Universities in the Middle East
Sorted By Founding Date

Name	Founded	Library Volume	Faculty	Students	S/F Ratio	Language	Control	Country	Tech.	Mgmt.
Universite Hassan II	1975		1496	44928	30.0	A/F		Morocco	y	
Uludag Universitesi	1975	135000	1158	19882	17.2	T	S	Turkey	y	y
University Of Aden	1975		646	3862	6.0	A/E	S	Yemen		
Universite D'Annaba	1975		1105	18740	17.0	A/F	S	Algeria	y	
Ferdowsi University Of Mashhad	1975		316	10600	33.5	Farsi		Iran	y	y
University Of Technology	1975		429	7384	17.2	A/E	S	Iraq	y	
Inonu Universitesi	1975		380	5211	13.7	T	S	Turkey		y
Selcuk Universitesi	1975		1229	19100	15.5	T	S	Turkey		
Univ.Des Sciences/Technology D'Oran	1975			5971		A/F	S	Algeria	y	
Helwan University	1975	299283	1281	31352	24.5	A	S	Egypt		
University Of Gezira	1975		140	1000	7.1	E		Sudan	y	
Mazandaran University	1975		106	2210	20.8	Farsi	S	Iran		
Nineteenth Of May University	1975	60000	635	8587	13.5	T	S	Turkey		
Euphrates University	1975		531	6302	11.9	T		Turkey	y	
University Of Juba	1975	38700	220	1200	5.5	E		Sudan		
King Faisal University	1975		519	4579	8.8	A/E	S	SaudiArabia		y
Suez Canal University	1976		1050	10327	9.8	A	S	Egypt	y	
Menia University	1976		770	16120	20.9			Egypt	y	
United Arab Emirates University	1976	168000	583	8000	13.7	A	S	UAE	y	y
Menoufia University	1976		863	18366	21.3			Egypt		
Yarmouk University	1976	250000	531	10979	20.7	A/E		Jordan	y	y
University Of Gilan	1977					Farsi	S	Iran		
An-Najah National University	1977	82000	277	4200	15.2	A/E	P	Occ. Terr.	y	y
Isfahan university Of Technology	1977		295	6000	20.3	Farsi	S	Iran	y	
Erciyes Universitesi	1978		609	7672	12.6	T	S	Turkey	y	y
Universite De Setif	1978		570	9485	16.6	A/F	S	Algeria	y	
Universite Mohammed I	1978		400	17668	44.2	A/F	S	Morocco	y	
Universite Cadi Ayyad	1978		630	29094	46.2	A/F	S	Morocco		
Al-Baath University	1979	33500	183	12860	70.3	A	S	Syria	y	

Source: The World Of Learning, 1992

Exibit B: Universities in the Middle East
Sorted By Founding Date

Name	Found-ded	Library Volume	Faculty	Students	S/F Ratio	Lan-guage	Con-trol	Country	Tech.	Mgmt.
Umm Ul-Qura University	1979	370250						SaudiArab	y	
K.N. Toossi University Of Technology	1980	60000	120	3000	25.0	Farsi		Iran	y	
Art University Complex	1980		93	1527	16.4	Farsi/E	S	Iran		
Arabian Gulf University	1980		68	368	5.4	A/E	S	Bahrain		
Inst. Nat.D'enseignement Sup.De Tiaret	1980		66	1020	15.5	A/F	S	Algeria	y	
Mutah University	1981	32000	70	3000	42.9	A/E	S	Jordan	y	y
Bright Star university Of technology	1981		70	700	10.0	A/E	S	Libya	y	
Universite De Blida	1981		644	7990	12.4		S	Algeria	y	
Universite De Boumerdes	1981						S	Algeria	y	
Ninth September University	1982	187500	1694	26000	15.3	T	S	Turkey	y	y
Trakya Universitesi	1982		610	16250	26.6	T		Turkey		
University Of Anatolia	1982		1150	244000	212.2	T/E	S	Turkey	y	y
Akdeniz Universitesi	1982		461	9500	20.6			Turkey	y	
Centennial University	1982		204	2338	11.5	T	S	Turkey		
Gazi Universitesi	1982		2034	45296	22.3	T	S	Turkey		
Sebha University	1983		200	2000	10.0	A/E	S	Libya	y	
Bilkent Universitesi	1984		800	7500	9.4	E	P	Turkey	y	y
Sultan Qaboos University	1985	25000	300	1000	3.3		S	Oman	y	
Al-Quds Open University	1985	6000	95	30000	315.8			Jordan	y	y
Tabriz University Of Medical Sciences	1986		230	3136	13.6	Farsi	S	Iran		
Jordan Univ. Of Science & Technology	1986	18000	304	3008	9.9	A/E	S	Jordan	y	
Omdurman Ahlia University	1986		40	750	18.8			Sudan	y	
Bakhtaran University Of Medical Sciences	1986	12310	46	829	18.0			Iran		
University Of Bahrain	1986	122131	320	4050	12.7	A	S	Bahrain	y	y
Universite De Sfax	1986		556	8895	16.0	A/F	S	Tunisia	y	
Shahrekord University Of Medcal Sciences	1986		48	654	13.6	Farsi		Iran		
University Of Tikrit	1987						S	Iraq		
Universite Des Lettres/Arts/Sc.Humaine	1988		590	8700	14.7			Tunisia		
Ahwaz University Of Medical Sciences	1988		231	2675	11.6			Iran		

Source: The World Of Learning, 1992

Exibit B: Universities in the Middle East
Sorted By Founding Date

Name	Found-ded	Library Volume	Faculty	Students	S/F Ratio	Lan-guage	Con-trol	Country	Tech.	Mgmt.
Universite Des Sci./Techniques/Medecine	1988							Tunisia	y	
Universite Zitouna	1988							Tunisia		
Saddam University For Eng. And Science	1988	1500	70	200	2.9	A/E	S	Iraq	y	
Universite De Droit/Economie/Gestion	1988							Tunisia		y
Universite Ibnou Zohr	1989							Morocco		
Sharif University Of Technology	1993							Iran	y	

Source: The World Of Learning, 1992

Exhibit C

The Questionnaire

From: May Nasrallah: MIT student/Sloan School/Econ. Dept./Pol.Sci.Dept.
Samer Salty: MIT student/Sloan School

Subject: Questionnaire regarding the establishment of a research and education institution in the Middle East.

==========

We are currently working on a project to develop a strategic plan to establish a research and education institution in the Middle East. This project is in fulfillment of a Master's thesis requirement for the MIT Sloan School of Management. We request your assistance by answering the few enclosed questions. Your input will be most valuable to us in structuring and shaping this challenging project. Below is an objective statement and a brief description of this project.

We appreciate your time and effort and we look forward to receiving your input. Please mail the enclosed form and the answered questionnaire in the pre-addressed envelope as early as possible.

Objective: The objective of this thesis is to develop a strategic plan for an education and research institution in the Middle East. This regional institution will be primarily modeled on MIT with the goal of promoting applied technological and managerial research in the Middle East. This plan will not be static but rather a dynamic one that permits flexible implementation of the institution and promotes quality research by its selected faculty.

Description: The purpose of this institution is to act as a base for technological and managerial research in the Middle East. The institution's high-tech structure and advanced telecommunications capabilities will allow it to be in constant touch with international institutions and businesses to exchange information and keep the institution updated with the latest developments and advancements in technology. This institution will build upon the resources of existing local institutions and will establish a link with them to exchange and encourage advanced technological and managerial innovations. One main goal of the institution will be to serve the industries of the region to help them reach new competitive levels with the objective of producing products and services that are competitive by international standards.

In this thesis we attempt to identify the key elements that are required to successfully establish this institution. We investigate the political, economic, and research structures in the region followed by analysis that will help us propose organizational and financial structures.

Identification Form

Last Name:

First Name:

Affiliation:

Department:

Position:

Education:	PhD___	Institution:	Year:
	Master___	Institution:	Year:
	Bachelor___	Institution:	Year:

1. Question: Do you think that such a research institution is needed in the Middle East?

1	2	3	4	5
Not Needed				Very Much Needed

2. Question: What kind of research is most needed in the Middle East? Please rate in order of importance.

Technology ____
Management ____
Science ____
Agriculture ____
Medical ____
Humanities ____
Other (Specify) ____

3. Question: How feasible is it to start and maintain such a research institution?

1	2	3	4	5
Not Feasible				Quite Feasible

4. Question: Do you think that the current economic structure in the Middle East will be able to support the establishment of such an institution?

Currently

1	2	3	4	5
Not able at all				Quite able

In 20 Years

1	2	3	4	5
Not able at all				Quite able

5. Question: Please select and rate three countries where it is most optimal to establish such an institution. Please briefly comment on your selection.

Algeria	____	Kuwait	____	Saudia Arabia	____
Bahrain	____	Lebanon	____	Sudan	____
Egypt	____	Libya	____	Syria	____
Iran	____	Morocco	____	Tunisia	____
Iraq	____	Occ.Terr.	____	Turkey	____
Israel	____	Oman	____	UAE	____
Jordan	____	Qatar	____	Yemen	____

6. Question: Please select the appropriate time window to start this institution.

		Years		
1	2	3	4	5
0 - 5	5 - 10	10 - 15	15 - 20	> 20

7. Question: Please rate the importance of each of the following to the establishment this institution .

	Not Imp.				Very Imp.
Local Industry Support:	1	2	3	4	5
Foreign Industry Operating Locally Support	1	2	3	4	5
ME Gov(s). commitment & Financial Backing	1	2	3	4	5
Mentorship With An Institution Such As MIT	1	2	3	4	5
Support From Local Education Institutions	1	2	3	4	5
Availability of Interested Exceptional Faculty	1	2	3	4	5
Large Initial Endowment:	1	2	3	4	5

8. Question: Please rate the priority of each of the following events that are required in the initial establishment phase of this institution?

	Low Pri.				High Pri.
Sell the idea to local governments	1	2	3	4	5
Build support from local industry and community	1	2	3	4	5
Fund raising	1	2	3	4	5
Identify the site and buy the land	1	2	3	4	5
Establish a relationship with a recognized institution	1	2	3	4	5
Attract faculty and administrative personnel	1	2	3	4	5
Develop an evaluation criterion for selecting personnel	1	2	3	4	5
Establish a public relations office	1	2	3	4	5
Assemble a core group of people to launch the project	1	2	3	4	5
Organize operations	1	2	3	4	5
Establish a link with local institutions	1	2	3	4	5

9. Question: Do you think that such an institution can survive and produce quality research in the current political environment?

1	2	3	4	5
Not Able				Quite able

10. Question: Do you foresee that such an institution would play an important role in the political environment of the region?

1	2	3	4	5
No Role				Very Strong Role

11. Question: Do you expect local governments to support this project legally and financially?

1	2	3	4	5
No Support				Strong Support

12. Question: Do you foresee major conflicts if a number of governments contribute to the same institution for research?

1	2	3	4	5
No Conflict				Major Conflict

13. Question: If this university is to become a premiere research institution in the region, what percentage of spending each of the following areas should receive from total available funds?

Fund allocation for research	____%
Fund allocation for education	____%
Fund allocation for operations	____%
Total	100 %

14. Question: How Important is it to establish a mentor relationship between this institution and an established and internationally recognized research institution?

1	2	3	4	5
Not Important				Very Important

15. Question: If important, in what form should a mentor relationship develop?

1	2	3	4	5
Advising Role				Joint Research Center

16. Question: Would an internationally recognized institution have an incentive to become a mentor for a newly established institution in the Middle East?

1	2	3	4	5
No Incentive				Very Strong Incentive

17. Question: Do you have any concerns that this institution might not be able to maintain the highest standards on research and academic work integrity?

1	2	3	4	5
No Concerns				Strong Concerns

18. Question: Assuming that this institution has a strong financial backing, do you think it will be able to attract world class research and academic talent?

1	2	3	4	5
Not Able				Quite Able

19. Question: What is the optimal faculty to student ratio in this institution?

1	2	3	4	5
>1/30	1/20 - 1/30	1/10 - 1/20	1/5 - 1/10	<1/5

20. Question: Do you recommend that this institution start with:

Programs

1	3	5
Graduate only	Undergrad. only	Both Grad. & Undergrad.

21. Question: Do you expect currently established education institutions in the region to be receptive to the idea of establishing such a research institution?

1	2	3	4	5
Not Receptive				Quite Receptive

22. Question: Regional corporations will have a strong incentive to support the establishment and funding of this institution.

1	2	3	4	5
Strongly Disagree				Strongly Agree

23. Question: Foreign corporations with operations in the Middle East will have a strong incentive to support the establishment and funding of this institution.

1	2	3	4	5
Strongly Disagree				Strongly Agree

24. Question: Do you think that such a research institution would be of benefit to local businesses?

Directly

1	2	3	4	5
No Benefit				Great Benefit

Indirectly

1	2	3	4	5
No Benefit				Great Benefit

25. Question: Do you think that local businesses would be willing to collaborate with this institution on research projects to work on managerial or technical problems these businesses might be facing in the region?

1	2	3	4	5
Not Willing				Quite Willing

26. Question: To maintain the integrity and independence of this institution, what is the optimal breakdown of percentage contribution to funding from the following groups?

Contribution from individuals	____%
Contribution from local businesses	____%
Contribution from foreign businesses	____%
Funding from ME governments	____%
Other (specify)	____%
Total	100 %

27. Question: What is the minimum endowment fund that this institution needs to maintain its research independence and integrity? (other than the establishment cost/ in today's money value)

Million Dollars

1	2	3	4	5
0 - 250	250 - 500	500 - 750	750 - 1000	> 1000

28. Question: Has your company ever relied on help from local institutions to overcome business problems.

1	2	3	4	5
Never				Frequently

29. Question: Would your company be willing to participate in the establishment and funding of such an institution?

1	2	3	4	5
Not Willing				Quite Willing

30. Question: Would your company be willing to participate in a collaborative student internship program?

1	2	3	4	5
Not Willing				Quite Willing

31. Question: How often have governments in the region relied on local academic institutions to perform research studies?

1	2	3	4	5
Rarely				Frequently

Furthermore, we would appreciate any further comments, advice, names of people who would be helpful in providing relative information, or any other resources: articles, papers, and books that would be beneficial reading for us.

We thank you for your time and input.

Exhibit D

List of People Who Responded to the Questionnaire

Name	Affiliation	Position	Latest Degree
Lester Thurow	MIT	Dean of the Sloan School of Management	PhD, Harvard
Philip Khoury	MIT	Dean of School of Humanities, Arts and Social Sciences; Professor of History	PhD, Harvard
Joel Moses	MIT	Dean of the School of Engineering	PhD, MIT
Steven Graves	MIT	Deputy Dean of Sloan School ; Professor	PhD, Univesity of Rochester
Mike Spence	Stanford	Dean of the Business School	PhD, Harvard
Nazli Choucri	MIT	Professor in Political Science	PhD, Stanford
William Massey	Stanford	Professor; Director Stanford Inst. for Higher Education & Research	PhD, MIT
Charles Grader	MIT, Sloan School	Director of Sloan Fellows Program	
Samir Sawaya	Dar Al- Handasah Consultants	Partner	SM, MIT
Frank Vogel	Harvard Law School	Assistant Professor	PhD, Harvard
Mohamad Khouja	Wafra Investment Advisory Group.	CEO	PhD, University of California, Berkeley
James Austin	Harvard Businees School	Professor	
Samir Khalaf	Princeton	Visiting Professor	PhD, Princeton
Nadim Khalaf	AUB	Professor; Chair of Economics Dept.	PhD, Princeton
Charles Helliwell	MIT	Deputy Director of the Technology and Development Program	SM, MIT
Naila Jermanous	Tufts	Associate Research Professor	PhD, Tufts
Munir Jermanous	Janis Research Co., Inc.	Technical Director	PhD, Tufts
Khalid Tabbara	Digital Equipment Corporation	Senior Software Engineer	Ms, Cornell

Name	Affiliation	Position	Latest Degree
Fadi Chehayeb	Intellicorp		PhD, MIT
Fowaz Habbal	Polaroid Corp.	Division VP	PhD
Shadia Habbal	Harvard	Staff Physicist	PhD, Univ. of Cincinnati
Stephen Van Evera	MIT	Assistant Professor of Political Science	PhD, University of California, Berkeley
Karim Solh	Price Waterhouse	Management Consultant	Ms, Georgetown
Bassel Hamwi	World Bank	Arab States Program Consultant	Ms, University of North Texas
Fathi Al-Badri		Construction Management Consultant	Bsc, Cairo University
Ralph Gakenheimer	MIT	Professor of Urban Studies & Planning	PhD, Univ. of Pennsylvania
Mutasem El-Fadel	Failure Analysis Associates, Inc.	Managing Engineer	PhD, Stanford
Fadi Kabboul	Oil Industry - Venezuela	Quality Assurance Manager	SM, MIT
Amal Alayan	Management of Technology	Graduate Student	SM, MIT
	Microsoft Corp.	Group Manager	

List of People Interviewed, but Did Not Fill Out the Questionnaire

Shukri Nasrallah	Aramco	Manager of Contracting Procurement	
Samir Makdisi	AUB Lebanese Govt.	Director of Money & Banking Department Former Minister of Economics	PhD, Columbia University
Makhluf Haddadin	AUB	VP for Academic Affairs	PhD
Adnan Iskandar	AUB	VP for University Relations	PhD
George Tomey	AUB	VP for Administration	Ms
Saad Andary	AUB	Professor in Money & Banking Department	PhD
Naim Kassab	AUB	Assistant VP for Research, External Programs and Planning	PhD
Paul Salem	AUB	Assistant Professor of Political Science; Editor of "The Beirut Review"	PhD, Harvard

Exhibit E1: Questionnaire Results

Q:	Total Mean	Total S.D.	Acad. Mean	Acad. S.D.	Bus. Mean	Bus. S.D.
1	4.74	0.45	4.75	0.45	4.73	0.46
2						
3	3.20	0.98	3.04	1.01	3.33	0.98
4	3.64	1.28	4.23	1.01	3.13	1.30
	4.40	0.76	4.70	0.48	4.20	0.86
5						
6	1.66	0.77	1.71	0.73	1.60	0.83
7	3.96	0.92	4.08	0.95	3.87	0.92
	3.57	1.10	3.62	1.04	3.53	1.19
	4.39	1.10	4.69	0.48	4.13	1.41
	4.32	0.67	4.15	0.55	4.47	0.74
	3.52	1.31	3.42	1.56	3.60	1.12
	4.68	0.55	4.92	0.28	4.47	0.64
	4.15	0.99	3.92	1.26	4.36	0.63
8	4.28	1.07	4.43	0.94	4.13	1.19
	3.86	1.27	4.00	1.30	3.73	1.28
	4.45	0.91	4.36	1.08	4.53	0.74
	2.83	1.31	2.71	1.20	2.93	1.44
	4.07	1.19	3.79	1.19	4.33	1.18
	3.79	0.90	4.00	0.88	3.60	0.91
	3.33	1.27	3.38	1.33	3.29	1.27
	3.21	1.03	3.00	1.00	3.40	1.06
	4.46	0.84	4.62	0.65	4.33	0.98
	3.30	1.27	3.17	1.40	3.40	1.18
	3.46	1.26	3.31	1.44	3.60	1.12
9	3.30	1.10	3.31	0.95	3.30	1.25
10	3.50	1.32	3.85	1.28	3.20	1.32
11	3.00	0.90	3.31	0.75	2.73	0.96
12	3.45	1.24	3.29	1.14	3.60	1.35
13	0.42	0.14	0.38	0.08	0.46	0.16
	0.34	0.12	0.39	0.09	0.31	0.14
	0.23	0.07	0.23	0.07	0.23	0.08

Exhibit E1: Questionnaire Results

Q:	Total Mean	Total S.D.	Acad. Mean	Acad. S.D.	Bus. Mean	Bus. S.D.
14	4.29	0.98	4.07	1.14	4.50	0.76
15	3.68	1.28	3.23	1.30	4.07	1.16
16	3.96	0.96	3.77	1.09	4.13	0.83
17	3.50	1.14	4.15	0.80	2.93	1.10
18	3.89	0.96	3.77	0.93	4.00	1.00
19	3.26	1.02	3.54	1.05	3.00	0.96
20	3.00	2.00	3.29	2.05	2.73	1.98
21	2.75	1.27	2.54	1.39	2.93	1.16
22	3.52	0.95	3.64	1.15	3.40	0.74
23	3.48	1.18	3.64	1.22	3.33	1.18
24	4.00	1.04	4.14	1.03	3.87	1.06
	4.52	0.69	4.57	0.65	4.47	0.74
25	3.81	0.96	4.42	0.51	3.33	0.98
26	0.19	0.15	0.20	0.11	0.19	0.17
	0.23	0.12	0.20	0.10	0.26	0.12
	0.17	0.11	0.21	0.12	0.14	0.10
	0.33	0.21	0.31	0.15	0.34	0.25
	0.08	0.14	0.08	0.17	0.08	0.13
27	2.18	0.91	2.70	0.95	1.75	0.62
28	2.57	1.34	NA	NA	2.69	1.32
29	1.96	1.23	NA	NA	2.04	1.25
30	3.86	1.03	NA	NA	3.77	1.01
31	3.18	1.08	NA	NA	3.00	0.94

Leb	20	Syria	3
Egypt	15	UAE	3
S.A.	9	Tunisia	3
Turkey	7	Iran	3
Jordan	5	Algeria	1
Bahrain	3	Kuwait	1
Israel	3	O.T.	1
		Total	62

Exhibit E2: Questionnaire Data From Academics

Q:	A	A	A	A	A	A	A	A	A	A	A	A	A	A
1	5	5	4	5		5	5	5	5	5	4	NA	5	4
2	Law Med. Ag. Tech.	Mg. Ag. Tech. Med.	Tech. Ag. Ag. Med.	Tech. Mg. Sci. Hm.	Tech. Ag. Med. Sci.	Tech. Mg. Hm.	Sci. Tech. Mg. Med.	Sci. Tech. Ag. Mg.	Med. Ag. Mg. Hm.	Tech. Mg. Ag. Med.	Mg. Tech. Ag. Sci.	Tech. Mg.	Mg. Tech. Med.	Mg. Ag. Tech. Sci.
3	2	2	3	3	2	3	3	3	2	3	NA	5	5	3.5
4	5	3	4	4	5	5	3	5	2	4	5	5	5	NA
5	5 Egpt Bah UAE	4 Egpt S.A. Iran	5 Leb S.A. Bah	4 Leb Bah	5 Turk Leb	5 Leb Jord Egpt	5 Leb Egpt	NA Leb S.A. UAE	4 Leb Jord Syria	NA Egpt S.A. Syria	NA Turk Tuns Jord	5 Egpt Turk	5 Tuns Leb Egpt	NA Egpt Bah UAE
6	1	2	1	2	2	3	2	2	1	2	1	1	3	1
7	3	3	3	3	4	5	3	5	5	4	5	5	5	NA
	3	3	4	3	2	5	3	5	3	5	3	3	5	NA
	5	4	5	5	5	5	4	5	5	5	4	5	4	NA
	4	4	4	5	3	5	4	5	4	4	4	4	4	NA
	1	3	2	3	5	5	5	5	5	3	1	NA	3	NA
	5	5	4	5	5	5	5	5	5	5	5	5	5	NA
	2	2	4	4	5	5	5	5	5	4	2	5	3	NA
8	5	5	4	4	5	5	3	5	5	5	4	5	2	5
	5	3	4	2	4	5	4	1	5	5	5	5	3	5
	4	4	5	5	4	1	5	5	5	4	5	5	4	5
	2	3	2	1	3	1	5	3	5	3	2	3	3	2
	4	4	4	5	3	1	5	5	5	3	4	4	4	2
	4	4	3	5	5	3	5	3	5	3	5	3	4	4
	4	3	2	2	5	1	5	3	5	3	3	NA	5	3
	3	3	2	2	3	5	3	3	5	2	2	NA	3	3
	5	4	5	5	5	5	4	5	5	5	5	NA	3	4
	2	2	3	2	5	1	3	5	5	2	4	NA	4	NA
	2	2	2	2	5	5	4	3	5	5	1	NA	3	4
9	2	3	2	3	3	5	4	3	2	4	4	NA	4	4
10	3	3	5	1	4	5	5	5	4	5	4	NA	4	2
11	2	3	4	2	3	3	3	3	4	4	4	NA	4	4
12	3	2	3	4	4	3	4	5	4	3	1	5	2	3
13	0.4	0.3	0.33	0.45	0.35	NA	0.4	0.4	0.4	0.4	0.2	NA	0.5	NA
	0.4	0.5	0.33	0.45	0.4	NA	0.4	0.4	0.4	0.3	0.5	NA	0.2	NA
	0.2	0.2	0.33	0.1	0.25	NA	0.2	0.2	0.2	0.3	0.3	NA	0.3	NA

Exhibit E2: Questionnaire Data From Academics

Q:	A	A	A	A	A	A	A	A	A	A	A	A	A	A
14	4	5	5	5	4	3	4	5	5	4	4	5	3	1
15	2	3	3	3	1	NA	5	5	5	2	2	3	4	4
16	2	3	4	4	3	NA	5	5	5	4	2	3	5	4
17	5	4	4	4	4	NA	4	3	5	3	5	5	5	3
18	2	3	4	5	3	NA	4	5	3	4	4	5	4	3
19	4	3	4	4	4	5	3	3	3	3	1	NA	4	5
20	5	1	5	1	5	5	1	5	5	5	1	5	1	1
21	2	2	1	2	3	1	5	5	2	3	2	1	4	NA
22	4	3	4	3	4	1	5	3	5	4	2	5	4	4
23	5	3	4	3	2	1	5	3	5	5	3	4	4	4
24	3	2	5	4	3	5	5	5	5	4	5	5	3	4
	5	4	5	4	4	5	5	5	5	5	5	5	3	4
25	5	4	5	4	4	5	5	5	4	4	4	NA	4	NA
26	0.3	NA	0	0.3	0.3	NA	0.3	0.2	0.2	0.1	NA	NA	0.1	NA
	0.3	NA	0	0.2	0.2	NA	0.3	0.2	0.2	0.1	NA	NA	0.3	NA
	0.2	NA	0	0.2	0.1	NA	0.3	0.2	0.2	0.3	NA	NA	0.4	NA
	0.2	NA	0.5	0.3	0.4	NA	0.1	0.4	0.2	0.5	NA	NA	0.2	NA
	0	NA	0.5	0	0	NA	0	0	0.2	0	NA	NA	0	NA
27		3	2	2	2		3	5	2	3	NA	2	3	NA
28		NA	NA	NA	NA	NA	NA	NA	1	NA	NA	NA	NA	NA
29		NA	NA	NA	NA	NA	NA	NA	1	NA	NA	NA	NA	NA
30		NA	NA	NA	NA	NA	NA	NA	5	NA	NA	NA	NA	NA
31		NA	NA	NA	NA	NA	NA	NA	5	NA	NA	NA	NA	NA

Exhibit E3: Questionnaire Data From Business Professionals

Q:	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
1	5	4	5	5	5	5	5	5	5	4	4	5	5	5	4
2	Ag. Med. Tech.	Mg. Ag. Tech. Sci.	Ag. Mg. Tech. Med.	Mg. Sci. Ag. Tech.	Tech. Ag. Mg. Med.	Tech. Sci. Ag. Mg.	Tech. Mg.	Tech. Med.	Tech. Ag. Mg. Sci.	Tech. Sci. Mg. Ag.	Med. Mg. Tech. Ag.	Tech. Mg. Med. Ag.	Ag. Med. Tech. Sci.	Mg. Tech. Sci. Med.	Tech. Ag. Sci. Med.
3	3	4	3	4	5	2	4	4	3	3	2	2	5	3	3
4	1	4	2	3	5	2	4	3	2	5	4	2	5	3	2
5	3	5	4	4	5	5	5	5	4	3	4	3	5	5	3
		Leb Tuns Jord	Leb Turk Egpt	Leb Syria Kuw	S.A. Isrl Leb	Egpt S.A. Isrl	O.T. Leb	Leb Turk Egpt	S.A. Leb UAE	S.A. Alg Leb	Egpt Turk Iran	Leb S.A. Isrl	Leb Turk Egpt	Egpt Jord Leb	Leb Egpt Iran
6	2	2	2	1	1	1	1	1	4	2	1	2	1	1	2
7	5	5	4	4	3	3	5	5	4	4	3	4	2	3	4
	3	5	3	3	1	4	3	4	5	5	2	4	5	3	3
	1	4	5	3	5	5	5	5	4	5	5	4	5	1	5
	4	5	3	5	3	4	5	5	4	5	5	4	5	5	5
	4	2	2	3	2	4	3	5	4	4	5	5	3	3	5
	5	4	5	4	5	5	5	4	4	5	4	5	5	3	4
	5	4	5	4	5	5	5	NA	4	4	4	4	5	4	3
8	5	2	5	3	5	3	5	3	4	5	5	2	5	5	5
	5	5	5	4	3	2	5	5	4	4	3	1	2	4	4
	5	4	5	4	5	5	3	5	5	5	5	5	5	3	4
	3	2	1	2	1	1	3	3	4	2	4	5	5	5	3
	4	5	5	5	1	5	3	5	3	5	5	4	5	5	5
	4	3	2	4	3	5	2	4	4	4	4	3	5	3	4
	4	2	1	3	3	5	2	4	NA	3	2	4	5	5	3
	5	3	2	4	2	5	2	4	3	4	4	3	2	4	4
	5	5	3	4	2	5	3	5	4	5	5	5	5	4	5
	3	5	2	3	2	4	1	5	3	4	3	3	5	4	4
	4	4	5	3	1	4	3	5	4	4	4	5	3	2	3
9	1	4	2	4	1	3	5	4	3	4	4	5	3	4	2.5
10	1	5	3	3	3	2	5	3	2	5	2	2	5	3	4
11	2	4	2	4	1	4	3	2	3	4	2	3	2	2	3
12	5	4	3	3	5	5	2	4	2	4	1	2	5	5	4
13	0.6	0.3	0.3	0.6	0.35	0.2	NA	0.6	0.4	0.4	0.8	0.5	0.6	0.4	0.4
	0.2	0.5	0.3	0.3	0.35	0.5	NA	0.1	0.4	0.4	0	0.3	0.3	0.3	0.35
	0.2	0.2	0.4	0.1	0.3	0.3	NA	0.3	0.2	0.2	0.2	0.2	0.1	0.3	0.25

Exhibit E3: Questionnaire Data From Business Professionals

Q:	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
14	5	5	3	5	3	4	5	5	4	5	NA	4	5	5	5
15	3	3	1	4	3	4	5	5	4	4	5	5	5	5	5
16	5	3	3	4	3	5	5	4	3	5	4	4	5	5	4
17	4	4	4	3	3	5	1	2	3	3	2	2	2	2	4
18	3	3	5	3	5	3	3	5	4	5	3	5	5	5	3
19	4	2	3	3	3	2	4	NA	2	3	5	4	2	3	2
20	1	1	1	5	5	1	1	5	1	5	1	1	5	5	3
21	1	2	2	4	3	3	3	5	3	4	5	3	2	2	2
22	3	5	4	2	3	3	4	3	3	3	4	4	3	3	4
23	4	5	4	3	3	4	2	4	2	3	1	2	5	4	4
24	2	3	5	5	5	4	5	4	4	3	4	2	5	4	3
	3	5	5	5	5	5	5	5	4	3	5	4	5	4	4
25	3	4	2	5	2	3	2	3	4	3	4	4	5	3	3
26	0.45	0.05	0.1	0	0.33	NA	0	0.05	0.3	0.1	0.2	0.2	0.25	0.55	0.1
	0.4	0.4	0.1	0.1	0.33	NA	0	0.4	0.3	0.3	0.19	0.3	0.25	0.3	0.2
	0.15	0.3	0.2	0.1	0	NA	0	0.3	0.05	0.1	0.1	0.1	0.25	0.15	0.15
	0	0.15	0.3	0.4	0.33	NA	1	0.25	0.35	0.5	0.51	0.3	0.25	0	0.4
	0	0.1	0.3	0.4	0	NA	0	0	0	0	0	0.1	0	0	0.15
27	2	1	1	2	2	NA			3	2	1	2	1	2	2
28	3	4	5	2	2	NA	NA	4	4	2	1	1	3	1	3
29	3	1	5	2	1	NA	NA	1	2	1	2	2	NA	1	3.5
30	3	4	5	3	3	NA	NA	3	3	2	4	5	5	5	4
31	1	4	3	4	4	NA	NA	NA	3	3	NA	NA	3	2	3

Exhibit F: MIT's 1992 Expense and Revenue Allocations

Operating Expenses	
Instruction and unsponsored research	19.11%
Sponsored research	
Departmental and interdepartmental	21.37%
Lincoln Laboratory	31.58%
Research administration and general expenses	0.37%
Expenses jointly applicable to instruction and research	
Libraries	1.19%
Medical	0.87%
Plant operations and maintenance	5.66%
Administration	2.06%
Fiscal, personnel, and other Institute-	3.45%
General expenses	2.10%
Other instruction and research support activities	0.64%
Student services	1.56%
Alumni Association	0.60%
Other expenses	0.21%
Scholarships and fellowships	
Undergraduate	2.68%
Graduate	2.75%
Dining and housing	1.70%
MIT Press	1.44%
Operating expenses before capitalization of equipmen	99.34%
Less: capitalization of equipment included above	-1.42%
Depreciation of buildings and equipment	2.08%
Total operating expenses	100.00%

Revenues And Funds Used	
Tuition and other related income	15.72%
Research revenues	
Depatmental and interdepartmental	29.50%
Lincoln Laboratory	33.91%
Endowment income applied to operations	3.54%
Gifts, investment income, and miscellaneous receipts	
Scholarships and fellowships	3.83%
Other restricted and unrestricted purposes	8.58%
Plant fund used	0.66%
Dining and housing	1.61%
MIT Press	1.44%
Current gifts and other fund balances used	
to meet operating expenses	1.21%
Total revenues and funds used	100.00%

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