Research and development in science and technology in GCC countries: role of information centres and libraries

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RESEARCH AND DEVELOPMENT IN SCIENCE AND TECHNOLOGY IN GCC COUNTRIES: ROLE OF INFORMATION CENTRES AND LIBRARIES

by

Abdullah Abdul Kader, B.A, PGDip, M.A., M.L.S.

a doctoral thesis

submitted in partial fulfilment of the requirements

for the award of the degree of

Doctor of Philosophy

of the

Loughborough University of Technology

February, 1997

Supervisor of Research: Dr. John Feather

Department of Library and Information Studies

Loughborough University of Technology

C Abdullah Abdul Kader, 1997
WHERE IS THE LIFE WE HAVE LOST IN LIVING?

WHERE IS THE WISDOM WE HAVE LOST IN KNOWLEDGE?

WHERE IS THE KNOWLEDGE WE HAVE LOST IN INFORMATION?

(T. S. Eliot)
DEDICATION

To my mother,

for her prayers and good wishes

To my wife Sabra,

for her endless patience and support

To my daughter Maryam,

for her smiles and tolerance during this long research work.
ACKNOWLEDGMENTS

First I would like to sincerely thank my supervisor Professor John Feather for his help, guidance and valuable comments, in helping me to complete this research work.

Also I thank Directors of Research for their kindness and advice at the University.

My thanks are also due to all the friends and families who helped me to complete this study including Ms. Martindale and Mrs. Joan Latchford who were very helpful to format this study, with special thanks to my guide and mentor Dr. Anis Khurshid for his inspired and dedicated guidance as a model teacher and scholar.
ABSTRACT

This research study identifies the role of library and information centres at the major science and technology related universities and research institutes in the six GCC countries i.e. Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and United Arab Emirates, in relation to the institutes/organisations research and development activities. It also had a comparative aspect in that it examined information resources and information services available in the institutes/organisations under study with users perceptions on the effectiveness and efficiency of library and information services. A survey research design utilizing questionnaires was chosen as the most appropriate and effective method for gathering the data needed with intensive interviews with academe, Deans/Directors of Library Information Centres and R & D personnel to answer the study's research questions. The different populations were queried including the Chief Executives of institutes/organisations, Deans/Directors of Library and Information Centres and selected R & D personnel associated with them. It was found that in spite of large library collections and a number of de-centralised library systems in all the universities, information services available to the R & D personnel were inadequate. The findings of this investigation provided the means for the development of the proposed regional and national library/information network systems for successful library and information services model presented in this study. As an alternative a GCC information subsystem GCC-SIST has been recommended along with emphasis on an electronic information system.

KEYWORDS:

RESEARCH AND DEVELOPMENT
SCIENCE AND TECHNOLOGY LIBRARIES
INFORMATION USERS
ABBREVIATIONS:

AGU Arabian Gulf University
BSTIN Bahrain Science & Technology Information Network
DOBIS/LIBIS Dortmund Bibliographic System/Leuvenes Integral Bibliographic System
GCC Gulf Cooperative Council
GSTIN Gulf Science & Technology Information Network
KAAU King Abdel Aziz University
KACST King Abdel Aziz City of Science & Technology
KD Kuwaiti Dinar
KFU King Faisal University
KFUPM King Fahed University of Petroleum & Minerals
KISR Kuwait Institute of Scientific Research
KSTIN Kuwait Science & Technology Information Network
KSU King Saud University
LSP Linked System Projects
NSTIC National Science & Technology Information Center
OSTIN Oman Science & Technology Information Network
OVRRI Office of Vice Rector of Research
QSTIN Qatar Science & Technology Information Network
QU Qatar University
RI Research Institutes
RMU Research Management Unit
SAN CST Saudi Arabian National Center of Science & Technology
SQU Sultan Qaboos University
SR Saudi Riyal
SSTIN Saudi Science & Technology Information Network
STI Scientific & Technical Information
UAEU United Arab Emirate University
UAQU Umme al Qura University
USTIN United Arab Emirates Science & Technology Information Network
VTLS Virginia Technical Library System
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CHAPTER ONE

1. INTRODUCTION AND STUDY: ELEMENT AND PROBLEM

1.1 INTRODUCTION

There is a gradual development of interdisciplinary studies which merge and mix together information in several fields or sub-fields to generate new knowledge especially in the field of science and technology. The ability to expand information activity efficiently whilst strengthening endogenous information capacity hinges therefore on the establishment of a systematic information system. This improvement in understanding is contributing to better planning and control -elements which are essential as future progress and development.

The "information revolution", ushered in by communication and computer technology, is affecting the economic and social order. Without doubt, the scientific and technological revolution has transformed the capacity of society to retrieve, store, process and transmit massive flows of information with unbelievable speed. Perhaps, electronics has created the "information society" with impact on procurement, marketing, transport, management, medicine, education and many other matters. Informational globalism makes the whole world kin and informatics (the science of the laws and methods of amassing processing and transmitting information) has initiated new thinking for the future of the world, shaped by explosion of this new "revolution".

Alvin Toffler (1980), in his book, The Third Wave, considers this tornado of information through technology as holding the potential for great social change. He does not pause to consider who will control this new technology— the haves or the have—nots?

Yoneji Masuda (1981), a Japanese futurologist, also studies the portents of the information society. If information stimulates learning and learning kindles creativity,
the consequent global informational order — a Utopian concept, dialectically speaking — may be intellectually advanced. But the reality of class divisions will cause these expectations not to be reduced, especially when the switchboard for the information realisations of society is in the control of economic imperialists.

Masuda (1981) notes:

The information epoch to be brought about by computer-communication technology does not mean simply that it will have a big socio-economic effect upon contemporary industrial society; it will demonstrate a force of societal change powerful enough to bring about the transformation of society into a completely new type of human society, which is the information society.

(Masuda, 1981, p.59)

However, he is oblivious to the role of the dominant class in exploring informatics to advance their interest. Even so, the information revolution will surely shake up developments, national and international and cause political repercussions.

The explosion of information and exclusion from information are two competing trends in our cosmos of human rights and democracy versus government of secrecy. In a Foreword by the Director General of UNESCO to the McBride Report entitled *Many Voices, One World*, emphasises that communication is at the heart of all social intercourse. Why? Because in the words of the Director General:

It is essential that all men and women, in all social and cultural environments, should be given the opportunity of joining in the process of collective thinking thus initiated, for new ideas must be developed and more positive measures must be taken to shake off the prevailing inertia. With the coming of a new world order communication, each people must be able to learn from the others, while at the same time conveying to them its own understanding of its own condition and its own view of world affairs. The mankind will then have made a decisive step forward on the path to freedom, democracy and fellowship.

(*Many Voices One World*, 1980, p. xv)

Communication of what? All information — Why? So that every person may be well informed to judge for himself the issues that affect his life, his national destiny and international unity. The simplistic world of old is gone and the complex forces at play today, with high technology and imperial domination fiercely competing to occupy
human minds, affect the merging national order and communication process. In this background, the international information order has a vital nexus with international economic order within the internal frontiers, fundamental freedoms become alive only if the free flow of information becomes real. Freedom of association and other fundamental freedoms become viable only if there is no suppression of freedom of expression. Information and communication are powerful tools and have a potential to shape and shake social and political developments depending on the classes concerned with these resources.

Information resources are constantly increasing at an accelerating rate. It is generated, processed, stored, disseminated and used, as well as the principal agencies involved, their organisation, level of activity and the possibilities for co-ordination and co-operation, on international, regional and national level. The results obtained are being used in policy-making, planning and control of information development strategies to develop an Information System for science and technology which can be applied in the GCC region.

Human intelligence is characterised by its unique capacity to generate knowledge, by observing the surrounding world, or by combining observations with already acquired knowledge to generate new knowledge. All these efforts at the national, regional and international levels depend, however, on one crucial factor: understanding of the existing level and structure of information activities within each country and in the world. It is only by examining the prevailing organisation and distribution of international, regional and national information activities that sound development and co-ordination strategies and plans can be drawn up. In addition, implementation of these plans, data is needed to help in evaluating the progress made, adjusting the orientation and maintaining firm control of development.

Research and development activities are responsible for the generation of new knowledge which is collected, processed and disseminated. These activities show the level of generation of information, how it is collected, processed and disseminated and
its use. The principal items to be measured are the institutions and individuals performing these activities, the amount of financial resources and physical facilities available and the number of users of the information.

Apart from quantifying these items they are also examined according to various criteria so as to determine their characteristics, internal structures and relative distributions. The ultimate goal is to understand, with the aid of relevant data, every facet of information activity performed in the country — the organisation of the entire system, the level of activities, the level of use and the country-wide distributions extending to the GCC regional study as a whole.

Improvements in the understanding will lead to the identification of the strong points as well as the shortcomings, which in turn will serve as the basis for the design of strategies and plans for the co-ordination and development of national and regional information infrastructures and systems.

Kennedy (1996) reviewed:

Hama and Prahalad’s book titled *Competing for the Future* which analysed the current concepts about competitiveness in the context of today’s revolutions: “the environmental revolution, the genetic revolution, the materials revolution, the digital revolution and MOST OF ALL, THE INFORMATION REVOLUTION” (capitals emphasised by the author). The challenge to today’s organisation is to shift the emphasis from the competing for today and with the shift in new economy industries, to focusing on competing for tomorrow. The challenge to the information professional is clear: to create an information environment that ensures consumer access to dynamic intelligence mechanism that can lead to “smart” tactical and strategic decisions.

(Kennedy, 1996, p. 121)

Research and development in science and technology and the unparalleled growth of academic/national research libraries and information centres in the Gulf Co-operation Council (GCC) countries received an extraordinary boost in the 1970’s. Petrodollars were channelled to build an indigenous scientific and technological capability. GCC countries are now in the process of formulating science policies based on rapid
industrialisation following the western pattern of development in the 20th century.

In the GCC countries language itself is a problem. Because the majority of developing countries use English in science and technology education and research, those that do not are at a disadvantage. This encompasses almost all the GCC countries.

The importance of science and technology information in technological advancement, research and development is obvious. Likewise, it contributes directly to the economic development of a country. Scientists and technologists cannot function properly without having access to up-to-date information in their respective fields. The bulk of such information is generated in developed countries. Providing access to this information for scientists and technologists in the GCC no doubt is a challenging task.

Saracevic (1986) explained the importance of the concept of “Information consolidation” in increasing the effectiveness of information usage and widening the circle of users. He suggested that this concept can be applied to provide information to scientists and engineers and further identified the basic process involved in information consolidation:

1. Study of potential users
2. Selection of information source(s)
3. Evaluation of information
4. Analysis
5. Reconstructing
6. Packaging and/or repackaging of restructured information
7. Diffusion or dissemination of information
8. Feedback

(Saracevic, 1986, p.216)

According to Duff, Craig and McNeill (1996):

Regarding “information society”, many believe that an immediate precursor was the theory of post-industrialism, a belief that was epitomised in the title
of Masuda’s popular monograph *The Information Society as Post-Industrial Society*, (Masuda, 1980). In another influential study, Beniger located the origins of the information society in some economic and technological developments of the nineteenth century (Beniger, 1986). Berger traced them much further back, saluting Democritus (born circa 460 BC) as the first philosopher of the computer age” (Berger, 1984, p.4). In the same speculative spirit, one could cite the following words of wisdom from an Egyptian papyrus of even greater antiquity (circa 1600 BC):

Put writing in your heart that you may protect yourself from hard labour of any kind and be a magistrate of high repute. The scribe is released from manual tasks; it is he who commands” (Catlin, 1947, p.13)). This linking of political power and information technology (i.e. writing) betokens one of the key ideas associated with what has become known as the information society thesis” — or so it could be argued. Who invented the information society?

(Duff, Craig and McNeill, 1996, pp.117-118)

The information system exists where there is a development of co-operation and coordination among several libraries and documentation and information centres to maximise the utilisation of existing information for the benefit of information users. Many countries have created information systems dealing with a given scientific and technical field. The major difference between less developed countries and developed countries is that “the latter have fewer national STI systems and more subject systems” (Saracevic, 1980, p.217).

According to Julien (1996):

The field of information needs and uses in library and information science (LIS) is broadly defined as that which is concerned with information seeking, determining users’ needs for information and information use.

(Julien, 1996, p.86)

Lee and Pow (1996) stated that:

Information demand characteristics is the quality pattern that users expect in needed information. The better the quality, the higher the value; the higher the value, the higher the demand. Further, user information satisfaction is in part determined by the extent to which user information demand is met. However, it should be noted that the quality standard of information (and hence its value) is determined by the users themselves. For example, one user may require accurate information as his or her priority, while another user may value timely
information most. Therefore, differences in the preferred information quality pattern of the users may directly affect the information demand and consequently the satisfaction level in relation to an information system.

(Lee and Pow, 1996, p.172)

Von Seggern and Jourdian (1996) while acknowledging “that scientific literature is unique from engineering literature, both are recognised as equal cornerstones of innovation. The two branches of knowledge are thus permanently linked together as scientific and technical information or STI. Questions about the use of STI have increased recently as a result of the rising interest and concerns regarding industrial competitiveness and technological innovation.” Pinelli, (1993). These studies confirm what may have suspected that communication of STI by engineers and scientists plays a critical role in the innovation process. The studies have also increased curiosity about how that information is gathered and used by engineers versus scientists (Von Seggern, 1996, p.98).

1.2 STATEMENT OF THE PROBLEM

An information system for the utilisation of scientific and technical knowledge is essential to the improvement of the GCC countries research and development.

Dissatisfaction with the present information systems on a national/regional level warrants the need for the investigation of scientific and technical information activity in the GCC.

This study seeks to:

a. determine whether or not the information resources of the GCC countries are adequate for research and development in science and technology.

b. determine whether there is a relationship between better information services and research and development in science and technology in GCC.

c. determine whether there is a need for regional co-ordinated scientific and technical information systems.
d. determine a strong scientific library and information systems in GCC as an essential component of scientific information transfer.

e. determine the need to establish a national agency to be government-chartered, so as to plan and implement a library network.

1.3 PURPOSE OF STUDY

The purposes of the study are:
1. to identify the current status of scientific and technical information centres in the six GCC countries.

2. to make recommendations for an effective and efficient S & T information system in the GCC with national strategic plans.

3. To determine the correlation of improved information services with better results in research and development in science and technology.

1.4 IMPORTANCE OF STUDY

First this study should provide useful information concerning the prevailing conditions of scientific and technical information systems in the GCC on a national and regional level. Second the findings of this study will be useful to library administrators, educators and science policy makers in the GCC countries. Third it would help them to understand the need for a better information system that would be useful for research and the development of science and technology. Finally, it would help librarians and policy-makers establish efficient scientific and technical information systems suitable for the GCC situation.

1.5 THEORETICAL FRAMEWORK MODELS FOR THE STUDY

Smith 1991; Terbille 1992; Walster 1994; Weisman 1972; Wilson 1981; and others) proposed a series of models that show how information is used and identified the variables that affect the use of information in STI environment.

A research model can facilitate many functions, but its primary function is to communicate something about what it models to generate a better understanding of reality (Burt and Kinnucan 1990). A model makes it easier to break down the elements of any system to provide an effective framework of analysis and discussion.

Weisman explained that an information system “consists of a complex collection of information messages, persons who produce them, institutions which processes them and a set of behaviour patterns, customs and traditions by which these persons and institutions interrelate” (Weisman, 1972, p.23). In Figure 1.1 Weisman (1972, p.31) presents a model for scientific information systems in general. Also Figure 1.2, given for the flow of scientific and technical information (UNESCO, 1971, p.26) bears a close relationship to the concept of an information system. Because the flow of information shown in Figure 1.2 presents a complex of information sources, information institutions, the producers and users of information and their relationships, it may well represent a national information system.

At its simplest, the basic elements and functions of a national scientific and technical information system (NSTIS), as illustrated in Figure 1.3, are:—
Figure 1.1 Conceptual Structure of STI System.

(Source: Weisman, 1972)
FIGURE 1.2  FLOW OF S & T INFORMATION

The flow of scientific and technical information

(Source: UNESCO, 1971)
1. The generation of information by individuals, in universities and research institutes may take the form of journal articles, reports, pamphlets, books, patents, statistics etc.

2. The processing of information which involves acquiring, organising, analysing, storing and disseminating information by such institutions as libraries, information centres, documentation centres, information analysis centres, clearinghouses, referral centres, data banks etc.

3. The users who may also be the generators of information.

4. A mechanism which allows the interrelationship and inter-action; the co-operation and co-ordination of the components elements of the system whose fundamental purpose is to provide the flow of information that meets the needs of the nation.

For information users needs the model developed in Figure 1.4 is based on both Wilson’s and Haygarth models (Wilson 1981) and (Haygarth 1981). The main idea was to use it to examine the impact of different types of information-seeking behaviour on the use of the information resources. From this model the method and technique were derived for deciding on and improving appropriate questions to be asked, such as:

1. What are the major sources of information that R & D personnel use and to what extent do institutions depend on such sources in providing information?

2. What are the main types of information provided by institutions and how relevant is this information to users' needs?

3. In what form do institutions provide this information and what are the main services and facilities available to the users?

What steps do institutions take to enhance users awareness for effective and efficient use of information?

5. Do institutions take initiative to develop their information services?
FIGURE 1.3  NATIONAL INFORMATION SYSTEM STRUCTURE – OUTLINE.
Figure 1.4. Information Needs Model.

(Based on Wilson, 1981 and Haygarth, 1981)
FIGURE 1.5 COMPONENTS OF NATIONAL SCIENTIFIC AND TECHNOLOGICAL INFORMATION SYSTEMS
As the study in hand is a combination of NATIS and users needs study, it was appropriate to develop a national information strategic plan model which could be applied to all the six countries of the region under study and it could also be developed on regional level.

This model Figure 1.5 is divided into five main components. The first three components cover the information resources, information services and information technology which represent the major components of the national information model system. The fourth component of human resources and the fifth, the national co-operative plans were necessary due to limited R & D production and human resources at universities and S & T research institutes in all the countries of this region.

The following are the major components of the national information model system which will be tested throughout the study as a strategy plan, without going into the technicalities of networks which is a different topic not directly related to this study.

1. Information Sources
   To select, procure and organise information resources in science and technology in a cost effective manner to serve at a national level.

2. Information Services
   To promote and disseminate consistent and prompt information, exploiting information networks of all types and forms at local, regional and international levels having adequate facilities.

3. Information Technology
   To activate an automated system exploiting the contemporary information technology and co-operative library networking using multimedia.

Human Resources
To stimulate users to be self-sufficient and elevate the skills at national LIS to exploit national information resources and technology in the most effective and efficient manner through educational/training programme.

5. National Co-operative Plan

To design the national information policy in science and technology at national levels for effective decision making by providing a framework to create and execute co-operative national projects and programmes.

The researcher highlighted principal variables from the research literature Figures 5.1 – 5.2, but only principal variables illustrated in Figures 5.3 – 5.5 as part of the theoretical framework will be tested throughout in this study for adoption and implementation.

1.6 RESEARCH QUESTIONS

The main research questions to guide this study are as follows:

a. Are academic/national research libraries and information centres fully assisting the enhancement of the research and development activities in science and technology in the GCC countries?

b. Is there a need for the establishment of a science and technology information network in GCC countries on a regional co-operative basis with a distinct national NATIS?

c. Are national/regional links being established between academic departments, research institutes in the universities, industry and government?

d. Is there a necessity for information resources to be procured in all formats using leading edge technology in a cost effective manner so as to benefit all at a national and regional levels?
e. Do information provision institutes/organisations need to render and exchange uniform and prompt information, utilising information networks at local, regional and international levels?

1.7 LIMITATIONS OF THE STUDY

This study is limited to the selected institutions within the following six GCC countries:

Bahrain: Arab Gulf University (AGU)
Kuwait: Kuwait University (KU) and Kuwait Institute for Scientific Research (KISR)
Oman: Sultan Qaboos University (SQU)
Qatar: Qatar University (QU)
Saudi Arabia: King Abdul Aziz City for Science and Technology (KACST),
King Abdul Aziz University (KAAU),
King Fahad University of Petroleum & Minerals (KFUPM),
King Faisal University (KFU),
King Saud University (KSU), and
Umm Al Qura University (UAQU).
United Arab Emirates University (UAEU)

GCC academic/national research libraries and information centres form part of this study. All the twelve major organisations and institutions of the GCC countries are covered, these being the major centres of scientific and technological research and development activities.

The time frame for this study is limited from 1985 to 1990, because with the total destruction of libraries in Kuwait during the 1990 Gulf War and its after effects on all the libraries of the GCC countries, there was no scope for comparison with a post 1990 study. As the fieldwork was completed in 1990, the continuing relevance of the results are updated, discussed and conflated in sections with further literature review,
annual reports of the institutions, minutes of the meetings of the GCC Deans and Directors of Libraries, interviews and personal visits. The bulk of the literature review about the Gulf War and its impact on library and information services will be covered in Chapter 3, Literature Review. The impact of the Gulf War in R & D context will be highlighted in Chapter 5 and in R & D perspective in Chapter 7. However, the bulk of The Gulf War related materials has been added in the main text of Chapter 6 in relevant sections to clarify the latest status. Furthermore, an update status up-to mid 1996 is being discussed to continue relevance through further interviews, literature review, review of annual reports, professional meeting minutes and questionnaire data conflated and treated as essentially qualitative materials in each section. The theoretical model has been tested throughout the study for adoption and implementation. However due to the nature of this inter-disciplinary study three final models in relevance to theoretical model framework of this study will be comprehensively covered in concluding analysis in chapter eight.

1.8 AREA OF STUDY

Based on the Status of World Science Report (1993): The Arab States by Fakhruddin A. Daghestani, a short background of the area is given below.

The area of GCC is arid and semi-arid land makes up 99.5% of land belonging to members of the Gulf Co-operation Council (GCC). The GCC countries have a small population and labour force, compensated for by expatriates, who constitute around 25% of the population in Saudi Arabia and around 75% in Kuwait, the UAE and Qatar. It is expected that the target of 10% illiteracy can be reached by Bahrain by the year 2004 and perhaps a few years later by Kuwait and Saudi Arabia. The average enrolment ratio by age group at secondary level is 51.5% in the Arab States and above the 51.5% average are Bahrain, Kuwait, Qatar and the UAE. The ratio of students in technical fields at secondary level is above the stated average but the values are very low in the UAE (0.8%), Saudi Arabia (1.9%), Qatar (3.5%) and Oman (5.1%). Enrolment ratios are the highest in Qatar (24%) and Kuwait (18%). The country with very low ratio is Oman. The annual rate of increase in several of the GCC States,
namely Saudi Arabia, Qatar, the UAE and Oman took the lead with ratios higher than 13%. (World Science Report, 1993, pp.75-80).
CHAPTER TWO

2. RESEARCH DESIGN

2.1 INTRODUCTION

According to Julien (1996):

Information needs and uses studies in LIS have a long history. Scanning the literature from Berelson's (1949) studies of public library users, which he concluded by calling for a recommitment by librarians to their traditional middle-class patrons, to Hewins (1990) review of information needs and uses studies, it becomes clear that information service practitioners and researchers have, with varying degrees of sophistication and success, attempted to discern who library patrons are, how they use libraries and what the information needs of people are and how various sources of information help or do not help them, independently of formal information delivery systems such as libraries.

(Julien, 1996, pp.54-55)

In pre-research discussion with GCC experts it was revealed that in the GCC environment where the sharing of information is not the norm of life, where people are reluctant to give information or share failure or success or give special disclosure of financial matters. The study is based on a questionnaire survey method and this was intensified with three phase of personal visits to almost all the institutions under study and face to face unstructured interviews individually and in groups. Extensive use was also made of annual reports of the institutes in general and library departments in particular. Another data beside the literature published were the minutes of the GCC Library Deans and Directors meetings and the papers presented at the Arabian Gulf Chapter of Special Library Association Annual Conferences being held annually after the Gulf War.

As Julien pointed that:

The field of information needs and uses in library and information science (LIS) is broadly defined as that which is concerned with information seeking,
determining users' needs for information and information use. Hewins (1990) also suggests that the trends to research users' cognitive processes and to utilise research methodologies other than surveys, should be continued. Jarvelin and Vakkari (1990) argued that, without analysis of methods used in LIS research, researchers will uncritically duplicate these methodologies and the research results obtained.

(Julien, 1996, pp.53-54)

As long as the questionnaire is well designed and not too long or ambiguous and directed to the right people who have the knowledge required, there is a high probability of a good response to the questionnaire. Acceptance of the questionnaire completed by the respondents and answers given to questions directed to interviews is based on certain assumptions:

1. that the answers are to the best of the knowledge and ability of the respondents correct and full;
2. that any information is without reservations.

On the basis of these assumptions the researcher believes that any deductions made from the available data are as correct as the data themselves.

Basically in library and information science research Kuhlthau (1988) summarised

The major writings on the theoretical foundations of library and information services have organised the user's perspectives as a critical component in information provision. Shera's (1972) classic text, The Foundations of Education for Librarianship, begins with a chapter entitled, Communication and the individual, which includes an extensive discussion of learning. In Library Services in Theory and Context, Buckland (1983) introduces the notion of the process of "becoming informed" and discussed barriers to the process. Along with indicative and physical access which libraries traditionally emphasise, he include linguistic and conceptual access which are commonly considered outside the purview of the library or information system. Vickery and Vickery (1981), in Information Science in Theory and Practice, address the information needs of everyone by discussing such problems as selective attention and transfer of meaning and by devoting an entire chapter to "People and Information".
Wei (1995) added that:

Few articles have appeared in the literature describing qualitative research techniques used in conjunction with quantitative techniques. But many have discussed the theory, methodology and findings of either quantitative research or qualitative studies. (Valentine, 1993) Focus group interviews are a qualitative research technique employing interviews with small groups of eight to eleven people with the intent of identifying the key concerns or wishes of the groups. (Widdows, 1991).

Wei (1995) concluded:

The combination of quantitative research methods such as survey questionnaires with qualitative research techniques, such as focus group interviews can achieve the goal of producing reliable findings. The method of focus group interviews is normally used to retrieve in-depth information concerning users' beliefs, perceptions and attitudes about a subject.

In this study the researcher conducted joint interviews with the group of professional librarians who came to attend the Arab Gulf Chapter - Special Library Association Meeting (AGC-SLA Meeting) - 1996 to Kuwait and academic staff from the GCC countries who came to attend the Science and Engineering Education Conference to Kuwait at the same time in 1996, which is analysed in chapter seven.

According to Poole (1985):

The technique used by Glaser and Strauss (1967) in developing their grounded theory was that known as the "constant comparative method of qualitative analysis" (p. 101). The comparative method of qualitative analysis has been employed by sociologists for many years to perform a variety of tasks, theory building being one of them (p. 21) and it is a general method which has come to be just as acceptable as the experimental and statistical methods. By "qualitative analysis" it is meant that the data under analysis are not statistical or quantitative in nature.

Initially, it was proposed that the study would cover all the major research and developments institutes and organisations in the six GCC countries but before reaching a final decision on the number of samples to be studied and the method of research,
it seemed important to visit the area to finally determine the number and kind of universities and organisations to be covered.

In spite of disadvantages the method of data collection selected for the present study was a questionnaire with short visits, one before and several after the questionnaires were handed over. This technique was chosen for the following reasons:

a. it was hoped to study twelve institutions/organisations in six countries;
b. it was out of the question to spend any longer time conducting fully-fledged interviews or participant observations;
c. it was financially too expensive;
d. time off required from professional work to do this was unacceptable.

The final version of the questionnaire consisted of thirty-six questions divided into three parts and is reproduced in Appendix A.

2.2 GENERAL METHODS

Several authors writing were consulted however, Kuhlthau (1988) surveyed the research on information seeking quoting several authorities which still remains a most comprehensive work.

On several occasions, the visits provided an opportunity to make an on-the-spot tour of the library and information centres, assess their accommodation and make professional observations. "Webb et al (1977) observe that the major mass of social science research is based upon interviews and questionnaires and deplore this over dependence upon a single method. They point out the shortcomings — but at the same time admit that they are probably the most flexible and generally useful devices for gathering information". Their main objection is "the tradition which allowed them to become the methodological sanctuary in which the myopia of operational definitionists permitted a retreat" (Webb et al., 1977, p.172). The "tradition" may be regarded as immaterial so long as the principle of use is right. "The importance of
questionnaires and interviews as a good means of information gathering have been affirmed in the literature which asserts that a good questionnaire, for example, can lead to frankness and openness on the part of the respondent as it provides a meaningful degree of anonymity and eliminates the fear of an intermediate listener.

Interviews and questionnaires lend themselves to quantification and have the quality of placing reliance on the respondent’s verbal reporting and unobserved feelings and experiences. If the respondents are widely scattered, geographically and the possibility of getting in touch with all is not feasible, postal enquiries in the form of questionnaires have a lot to commend.

According to Hewins (1990):

Some innovation work on cognitive processes is being done by faculty and graduate students at the School of Information Studies Syracuse University under the leadership of Michael Nilan. He and his colleagues are studying the cognition common in user behaviours (Nilan et al., 1988; 1989). Not only is the attempt to study these common cognition innovative but the methods used in the studies are extremely innovative. Nilan’s studies are not limited to any one type of information need or even to the use of bibliographic systems. For example, one study took at the criteria used in a user’s evaluation of information sources of any type (Nilan et al., 1988; 1989). The list of criteria used is not novel and is like a “common sense” list, which includes aspects such as trust, love, power, ease of access and ease of use. Nilan’s study is less an evaluation of these aspects a more a validation of the time-line method he used. It is intended to test the method used and to recommend further refinements to method to determine cognitive processes involved in behaviours that should be integrated into system design. These processes need not be traditional information-retrieval or information-seeking tasks but are more broadly applied to any automated task requiring a user interface. In fact, Nilan applies the method to the design of an interface for a desktop publishing system.

(Hewins, 1990, pp. 157-158)

In the GCC environment personal interviews overcome many of the barriers of the mail questionnaire. The interviewer can also measure the mood of the respondent, elucidate points and get fuller, more meaningful responses. Furthermore, much of the necessary coding of the answers can be done immediately. The interview technique
may suffer since the interviewee is not often given sufficient time to gather his thoughts, thus many of his answers may be off-the-cuff rather than reasoned replies. There may also be personality differences between the interviewer and interviewee which may lead to a lack of co-operation on the part of the latter and there may be delays and difficulties in scheduling interviews. Another useful method is the examination of documentary sources i.e. literature and information requests to obtain statistics generated in institutes and organisations use of services and facilities. These are what Herner and Herner (1967) call indirect studies. Within the information field there are a number of studies which have been carried out using a combination of the major data gathering techniques as described above. The most common combination appears to be that of questionnaire followed by interview.

2.3 ON SITE OBSERVATIONS AND INTERVIEWS

Another technique in the gathering of data is that of observing the participants and recording the amount of time spent on a given activity and the sources used. Since the observer is impartial, the results, like interviews, should be less biased than if the participants completes a set of self-administered questionnaires. The method also permits the person under observation to go about his normal activities without him/herself losing time. However, the procedure is still fairly lengthy since it must be conducted over a period of time. It is usually impractical to follow the participant about everywhere and observe him/her in his/her office or the library or wherever else he/she happens to be seeking information. Also observation may cause the participant to feel self-conscious and even step up his/her normal information-seeking activities simply because he/she knows he/she is under observation.

2.4 FIELD TRIP: PHASE ONE

The first phase of the trip was to Saudi Arabia, Bahrain, Kuwait, Oman and United Arab Emirates.
2.4.1 SAUDI ARABIA

In Jeddah, Saudi Arabia King Abdul Aziz University established in 1967, has a Central Library besides a network of faculty and departmental libraries. The evidence of budget cuts were visible with many out of date books and periodicals. The Dean of Libraries was away on holiday in the UK but the Director and other senior staff members were very co-operative in providing all the requested information, documents and annual reports.

According to the Director of King Abdul Aziz University (KAAU) Library, the KAAU is one of the seven universities of Saudi Arabia under the Ministry of Higher Education. The university offers all major subjects such as Science, Engineering, Medicine, Arts, Economic, Business, etc. To support teaching and research, Deanship of Library Affairs compromises of one central library and 14 branch libraries. The central library holdings includes books in addition to periodicals, dissertations, official publications, maps, audio visual materials, etc. All these materials are housed as open stakes providing free and easy access. The branch libraries serve as reference libraries with local circulation. The technical processing of material is centralised and it is performed at the central library. Several pages of photo copies were supplied within a week of request. The researcher meeting with the Deans and senior faculty members of the following faculties were very useful:

- Faculty of Medicine
- Faculty of Engineering
- Faculty of Science
- Faculty of Earth Sciences
- Faculty of Marine Sciences
- Faculty of Meteorology and Environment

Directors of the following research centres were very kind in briefing the researcher on R & D activities:

- King Fahad Centre for Medical Research
- Research Centre for Economic Development
Outside the university the visit to the offices of the Bureau de Recherches Geologiques et Minerales (BRGN) in Jeddah was very useful. After the historical contribution of US Geological Survey in Saudi Arabia, BRGN is playing a vital role in the national mineral research activities of the Kingdom of Saudi Arabia. The visit to the following two agencies who are active in joint research projects with national and international universities and research institutes was very useful:

- Saudi-Sudanese Red Sea Commission
- Meteorology and Environmental Protection Agency

The discussion with the Director of Research and the visit to the automated library of the International Airport Project was very useful. One of the most useful engagements in Jeddah was a three day association with the Islamic Foundation of Science, Technology and Development (IFSTAD). The Director General briefed the researcher on research and development of science and technology in the GCC countries. The data from different countries was available but scattered in an unorganised information centre and library.

From Jeddah, the researcher went to Mecca to visit Umme el Qura University, established in 1949 as Sharia College but gaining university status in 1979–80. This university is biased towards Islamic subjects, but due to its strong Faculty of Applied Sciences and Engineering and Engineering and Applied Sciences Research Centre it was decided to include it in the study. The university also has a branch in Taif. The meeting with the staff of the faculty and centre together with those from the library was very fruitful.

From Mecca the researcher went to the Medina campus of King Abdul Aziz University. The researcher’s visit to the Islamic University Medina was arranged but will not be included in the study due to being a purely Islamic subject university. To end the western region research trip, a day visit to research departments of the Royal Commission of Jubail and Yanbu (Yanbu branch) was made. The research and
development programmes were very impressive. The contacts with private sectors research organisations were also very useful specially with the following:

Jeddah Oil Refinery Company
Arabian Aerosurvey Company

From the western region the researcher took a trip to the eastern region of Saudi Arabia visiting two of the modern science and technology universities. Based on discussion with the staff, there seemed to be a growth in the status of local faculty staff but it was disappointing to find the effects of cuts in funds made without planning in both the research and information activities. In the last ten years something similar to wastage of resources, through duplication of materials, occurred at King Saud University, the former University of Riyadh, where the researcher was associated for several projects. The fully fledged Research Institute at King Fahd University of Petroleum and Minerals with an independent Information Centre is a model in the area. The meetings with the Director of the Research Institute and Managers of the following divisions were very useful:

Petroleum and Gas Technology Division
Energy Resources Division
Geology and Minerals Division
Water Resources and Environment Division
Meteorology, Standards and Materials Division
Economics and Industrial Research Division

The Manager and senior members of the Program Development Office who coordinate the research activities of the Research Institute briefed the researcher with the latest developments and progress of research and development. This is again a model example of R & D co-ordination in a university environment in this part of the world. The material collected from here was quite comprehensive, because their co-operative research activities were spread over national, regional and even at international levels.
The following Deans or their representatives at the King Fahd University as well as
the Vice Rector and Dean of Graduate School were very kind in briefing the candidate
on their research activities carried out separately with finance from KACST or other
government organisation or ministries:

- Faculty of Engineering Science
- Faculty of Applied Engineering
- Faculty of Science
- Faculty of Industrial Management
- Faculty of Environmental Design
- Faculty of Computer Science

Both the university and the Research Institute have several joint sustaining research
programmes with other corporations and private sectors like a major one with
ARAMCO. The modern library at King Fahd University with almost complete library
automation of one central plus six branch libraries is facing recruitment and retention
problems. This is the only library in the area connected to international, regional and
local databases. Another poor area was the collection development programme in the
library, branches and the information centre of the Research Institute.

In the neighbourhood of the university a day trip was arranged to visit the Research
and Development Project Department of ARAMCO and its library. They are very
active in training oriented research programmes and with joint sustaining research with
other universities and research institutes nationally and internationally.

In the twin city of Dammam the visit to King Faisal University, established in 1975,
was very useful. The Dean of the following faculties or their representatives briefed
the researcher on their research activities:

- Faculty of Agriculture
- Faculty of Architecture
The researcher was also taken to the official headquarters at the Alhassa region campus situated in Hofuf specially visiting the following research centres:

- Bees Research Centre
- Research Centre of Water Studies
- Research Centre of Agricultural Experiments

There were further visits to other organisations and institutions in the eastern region where the researcher was briefed by experts on the progress of their research activities. Some of the places visited were:

- Royal Commission of Jubail and Yanbu (at Jubail)
- International Airport Authority
- Owedah Establishment
- Al-Hassa Irrigation and Drainage Authority
- Saudi Arabian Fertiliser Company

Saline Water Conversion Corporation
Saudi Consolidated Electric Company

2.4.2 BAHRAIN

From Saudi Arabia the researcher went to Bahrain. An ex-Deputy Minister of Higher Education Saudi Arabia and now President of the Arab Gulf University, was very kind to arrange the visit to Bahrain on an official level. At the time of the researcher’s visit the Arab Gulf University was basically a teaching university for all the GCC countries and other Islamic countries but the management really saw the need for research and development activities for regional benefit with Arab, Islamic and other international universities. A representative of the Arab Gulf University was very kind
to take the researcher to the following institutions/organisations whose representatives and librarians were very co-operative in giving published and unpublished reports highlighting their research and information activities. On the researcher’s request visits to various private sector industrial and research organisations active in R & D as follows:

- University College Bahrain
- College of Health Sciences Bahrain
- Gulf Polytechnic
- Budaiya Experimentation Station
- Materials Testing and Research Section
- Public Health Laboratory
- Bahrain National Oil Company (BANOCO)

2.4.3 KUWAIT

From Bahrain the researcher went to Kuwait to visit a university and a research institute. Kuwait University, established in 1962, has no Central Library but ten faculty / branch libraries. The libraries have a co-operative network system and could be a good model. Most of the Deans or their representatives from the following faculties briefed on their research activities.

- Faculty of Science
- Faculty of Engineering and Petroleum
- Faculty of Medicine
- Faculty of Nursing and Allied Health

The quality of staff and services was of a very high standard and that reflected on their research projects. The researcher was very kindly taken to the following institutions:

- Agriculture Experiment Station
Kuwait Foundation of Advancement of Science

Kuwait University Directorate of Research Administration provided all the relevant information and documents. In Kuwait the researcher was associated for four days with the Kuwait Institute for Scientific Research (KISR) and its information section National Scientific and Technical Information Centre (NSTIC). At KISR the Director General and Deputy Directors of Life and Environment Sciences; and Physical and Engineering Sciences directed the researcher to the heads of the following divisions and other relevant personnel of Research Administration, Technical Support, Training, Management and Administrative Executives:

- Division of Environmental and Life Sciences
- Division of Food Resources
- Division of Engineering
- Division of Techno-economics
- Division of Petroleum, Petrochemicals and Materials

The prominent NSTIC services of a co-operative pattern were visible with the advanced information and extension activities of NSTIC whose main goals are to provide scientific and technical information services to support research and development in KISR and to meet the scientific and technical information needs of the government agencies, academic, business and industrial institutions in Kuwait. All the management staff of NSTIC were very co-operative.

2.4.4 OMAN

Sultan Qaboos University founded in 1981 but formally started in 1986, is one the latest additions to GCC university system. At this early stage of development the deans were not very sure about the future research activities as it is more of a teaching university dominated by British experts. The library department acquired the services of some of the prominent expatriates from the GCC countries to make a development plan for one of the best university libraries in the GCC.
2.4.5 UNITED ARAB EMIRATES

In the UAE the visit to the twin cities of Abu Dhabi and Dubai was taken. However, most of the three day visit was limited to the United Arab University at Al Ain. The Rector and Deans of the following schools briefed the researcher on their educational and research activities. However, here again more emphasis was on teaching.

Faculty of Science
Faculty of Agriculture
Faculty of Engineering

2.5 FIELD TRIP SECOND PHASE

2.5.1 SAUDI ARABIA

On the second phase of the visit all the ten days were spent in Riyadh. The new campus of King Saud University, ex-University of Riyadh was the main attraction. The Dean of Research very kindly arranged the whole visit and many Faculty Deans personally known to the researcher were very kind in giving a briefing on their research activities. King Saud University established in 1957/58 is the largest university in the Kingdom of Saudi Arabia and its branches extend as far as Qassim, Abha and Alhasa. The following deans or their representatives were very kind in giving a briefing about their research activities:

Faculty of Agriculture
Faculty of Pharmacy
Faculty of Medicine
Faculty of Dentistry
Faculty of Allied Medical Sciences
Faculty of Science
Faculty of Engineering
Faculty of Environmental Design

King Saud University’s one central and thirteen branch libraries have one of the lowest ratios of professional staff, which has an impact on their services. Though the
new physical facility is attractive, it was revealed by one senior staff member that more than seventy five thousand books are scattered, uncontrolled and even inaccessible in some cases. The senior professional staff blamed the non professional Deans which is still the tradition in most of the Saudi universities. The researcher was briefed on the research activities which are mostly done in Arabic and some of the research reports looked more like translations instead of original research. The following research centres within the university were very active. The Directors or their representatives highlighted some of the research activities:

Centre of Agriculture Research  
Research Centre Faculty of Medicine  
Research Centre Faculty of Dentistry  
Research Centre Faculty of Pharmacy  
Research Centre Faculty of Sciences  

King Saud University is very famous for its publication activities and three boxes of its documents and publications were presented.

The next two days were spent at King Abdul Aziz City of Science and Technology (KACST) formally SAN CST. The President and other senior members were very kind in giving a briefing about their financial sponsorship of research activities at a national and international level. The Chiefs of the following Directorates were very cooperative in briefing:

Scientific Research  
Information Systems and Technical Services  
Scientific Awareness  
Technology Transfer  
Atomic Energy  
Space Sciences  
Patents
The visit to King Faisal Foundation and King Faisal Teaching Specialist Hospital and Research Centre was very useful.

In Riyadh, the researcher also visited the following institution/organisations:

- Saudi Consulting House
- Royal Saudi Air Force
- Ministry of Petroleum and Natural Resources
- Ministry of Finance
- Saudi Arabian Basic Industrial Corporation
- Ministry of Information
- Riyadh Water and Sewerage Directorate
- Ministry of Defence and Aviation

The researcher further undertook three follow up trips to the GCC area including the latest one in 1994.

2.6 PERSONAL EXPERIENCE

The personal experience record does have value when the type of behaviour being studied is continuing. In literature examples of surveys using the record method are relatively rare in the information field as described a study using personal-recording techniques. Herner and Herner (1967) and Christie (1981) and lists several other surveys using the personal experience record technique which has been updated by Kuhlthau (1988) very comprehensively.

In the personal experience record, which is normally based on a structured means of gathering data, respondents are asked to keep personal experience records of their information seeking behaviour regularly over a period of time. This was used specifically for questionnaire number three addressed to one hundred and twenty users in this study. The technique suffers, to a large extent from many of the same disadvantages as questionnaires, i.e., lack of interaction; prolonged procedure; frame of mind not determined; lack of follow-up; need for detailed explanation. Moreover,
it is not at all sure that busy, frequently absent respondents will really be able or
willing to keep a running record of their information activities. Keeping a personal
experience record is virtually a full-time job. Since there is no organised framework
for replies or entries, as there is with mail questionnaires and interviews, it is also
difficult to compare, code and analyse record entries with any degree of meaning.
Another problem is that of how representative is the respondent’s operation during the
particular period of time under study.

2.7 DATA COLLECTION AND ANALYSIS
The target populations in universities were highly active in teaching, consequently
there were problems in scheduling sufficient interviews on even three visits to the
GCC countries to get a comprehensive response. The frequent absences and high
work load also precluded the use of diaries. A questionnaire also allowed the
responders to complete it at their leisure with follow up interviews and queries.

Within the questionnaire itself, a special type of question may ask for comments e.g.
asking for comments for improvement of the library and information centre or relating
to a particular problem like: in questionnaire three addressed to users in this study
where it was asked “Would you say that you get most of the information you need
for your R & D work from your library/information centre and if your answer is no
would you please indicate what kind of information you cannot get from your
library/information centre, from where do you normally get this information and do
you feel the library/information centre should be able to supply this kind of
information”; or asking for general comments to Dean or Directors of Libraries and
Information Centres to comment on how you think a scientific and technological
information system can be developed in your country/region addressed in
questionnaire number two in this study. Such a question may be completely open or,
once the event is described in the users own words, the question may be closed so that
the action taken is identified in a menu of likely actions and responses. In view of
the fact that the staff both in academic and organisational environment had such a
high work load and were very mobile it was believed they would never complete a
fully open-ended questionnaire and so it was decided to make it closed as far as possible incorporating both menu and scale-type questions.

In order to design questionnaires the balance had to be made between having them in a logical progressive order and the advisability of having the most important questions early in the sequence, in case the interest of respondents flagged towards the end. It was also considered useful to add an open ended question to elaborate the point of view for improvements, preferably, as a last question.

The final questionnaire used in the present study went through three versions. The first consisted of some 120 questions based basically on the UNESCO pattern seeking both financial and action related queries for research and development activities, academic institutes and research organisation libraries and information centres and users’ responses on the usefulness of the libraries and information centres concerned. Among other topics explored, were barriers to and problems in, information seeking and exchange as a result of working with people from different cultures, races, backgrounds and countries.

This initial draft was created by using four kind of sources and resources:

1. First based on the studies and their results to get a feel for what had and had not been covered;
2. Second, other questionnaires in the same field to see, whether any of the questions might be profitably included in the researcher’s draft, whether they could serve as a check for what was included by the researcher;
3. Third, a list of all the questions to which the researcher felt he would like to have responses within the framework of the study and
4. Fourth, by discussion with a number of scientists and engineers, with librarians and information scientists especially from the GCC countries.
This last method proved immensely valuable since, the researcher's working experience in the library and information centres was mostly as Project Manager (Information) actively involved in the day-to-day operations of the other divisions and sections, it was not difficult to know the exact nature of the work of the scientists and engineers, how often they went on mission and why they went, what meetings they attended and what they discussed and so on. Being a part of the everyday life of the average scientist/engineer, the researcher had a real idea of whether the responses he had given for each question were valid, appropriate or exhaustive. However, another reason for discussing the draft questionnaire with the users was to make the points clear. One further advantage was that the researcher was able to clarify some of the language so that it was comprehensible to most of the participants who were Arabic speaking. In the end, all the three questionnaires were addressed to the nationals of GCC countries, except to an expatriate Chief Librarian of the newly established AGU. It became very clear from these discussions with staff that the questionnaire as it stood was far too long and asked far too many financial questions which were considered to be confidential for this part of the world. Because names were asked for, the staff polled were reluctant to answer in case their replies got back to Management. As a result of these preliminary discussions the initial draft was drastically reduced to some thirty six questions, divided into three parts and addressed to different authorities to respond. Questionnaire number one was addressed to twelve Deans, Vice Rectors of Research or Directors of Research. Questionnaire number two was addressed to twelve Deans or Directors of Libraries and Information Centres and questionnaire number three to users was addressed to one hundred and twenty R & D personnel using libraries and information centres.

In the original version it was intended to provide six point scales ranging between “usually” and “rarely” for various questions. With an even number people would be forced to make a choice and could not mark everything straight down the middle as they could with an odd numbered scale. Respondents were expected to tick the appropriate place on the scale. Since some of the menus were rather lengthy it was decided for Version 2 of the questionnaire to make a neat matrix of boxes and to have
greater clarity by not writing “usually/rarely” each time, but instead just to have them once only at the top of each row of boxes and leaving out the intervening possibilities (often/not very often, etc.).

Version two was finalised after further visits and discussion with scientists/engineers and library deans/information specialists of the GCC countries. With a few further amendments suggested by an overseas advisor and the supervisor the final version was formulated for distribution. Almost all of questionnaires one and two were handed out and taken back personally with follow up interviews and further reviewing of annual reports either on the spot or taking reports or photocopies of other data. However, questionnaire number three addressed to one hundred and twenty R & D personnel was distributed and most of them were returned within three months. However, some of them never came back in spite of sending a general notice for return, because participants were not identified by name for this particular questionnaire.

After the questionnaire was drawn up, a pre-test was run on the questionnaire number three. The purpose behind this exercise was to discover ambiguities, errors of grammar, omissions and superfluities. It was decided to pre-test questionnaire three during a course for R & D personnel at the University of Karachi in which the researcher was one of the twenty-five participants. Twenty of the participants agreed to help and all the questionnaires were returned after some prompting. The pilot study was intended to reveal shortcomings of all procedures, instructions for completion and questions and thus a form was attached to the questionnaire asking for specific comments on the questionnaire itself, for instance, the format, order of questions, clarity, length, etc. At this stage it was of greater interest to the researcher to get the questionnaire right than it was to get relevant and useful data from the sampling participants. Rather disappointingly, some respondents made no real attempt to complete the questionnaire and contented themselves with scrawling “much too complicated” across certain questions. The overall impression was that the questionnaire was reasonable, but in general the respondents felt that it was too technical as most of them did not know what SDI was and on-line searching for some
of them was a new technique. For some it was too long just to cross-check on replies to certain questions. Most people spent some 20-30 minutes filling it in. Happily there were few problems in understanding, although one or two people did suggested alternative wordings where they thought it was unclear especially to personnel with no knowledge of information retrieval and dissemination in the contemporary sense. The comments were generously given and discussions held. However, no corrections or adjustments were needed.

The major change was that the questionnaire had to become anonymous due to respondent pressure (two organisations, one each in Kuwait and Saudi Arabia refused to participate unless it was made anonymous). One of the original ideas behind the project had been to study the flow of information through and across sections, projects and establishments, both in academic and organisational environments, i.e. universities and organisations like King Abdul Aziz City of Science and Technology (KACST) and Kuwait Institute of Scientific Research (KISR).

The final version of the questionnaire consisted of thirty-six questions in three parts and is reproduced in Appendix One (English and Arabic versions).
CHAPTER THREE

3. LITERATURE REVIEW

3.1 INTRODUCTION

There are several articles in general and others which are specific and pertain to this study which the researcher will review throughout sections 3.2 to 3.9. Regarding the GCC area the literature in the field of library and information systems, mostly repetition of each other in particular that which pertains to Saudi Arabia. Very few articles were related to Bahrain, Kuwait, Oman, Qatar and United Arab Emirates. Unfortunately, very few of them were relevant to the theme of this research work, but it was necessary to consult all of them to understand library and information framework of the GCC area countries. Based on several doctoral theses and a few recent articles regarding the GCC library and information services, a summary analysis will follow in section 3.10, but will be limited to Saudi Arabia. With research emphasis on S & T the researcher endeavoured to carry on an in-depth investigation into S & T based universities in GCC and also two major scientific and technological information centres, i.e. the Kuwait Institute of Scientific Research (KISR) in Kuwait and King Abdul Aziz City of Science and Technology (KACST) in Saudi Arabia. The study also reviewed other scientific and technological information establishments, the policies of a number of developed countries and regional establishment especially OECD, NORDIC and system in the former USSR, to find out how they were established, how awareness is disseminated and how they are implemented for which Hill’s 1989 and 1994 National Information Policies books were used as a key information resource for conceptual framework.

Certain background factors have an influence, directly or indirectly, on the dissemination of knowledge within a country. It is essential to review briefly some of these in order to obtain an understanding of conditions in the developing countries. Neelameghan (1995) discusses a third world perspective about the requirements for information system development which Chapter could be applied to any third world
Politics and bureaucracy are the two main problems together with the lack of finance, that are common to the developing countries.

On an international perspective Tocatlian (1994) reviewed international programmes in information and the role of FID in particular. Simon (1993) elaborated on the national, regional and local level; and on global communication networks etc., specifically in the European context elaborating on the cultural aspect. Bearman (1992) identified key information policy issues and asserted leadership in getting policy makers to address these issues, raised consciousness of the need to tackle information policy issues and to create an informed climate. Galvin (1994) focused on information as the most valuable commodity and its significance in influencing the character of global society in the 21st century.

Hannum (1995) reviewed issues in information policy and the access of the USA and Canada to a national policy for equitable and affordable dissemination of, and access to, information. Yushkiavitshus (1994) studied the economic growth of information in the rapid changing developments.

3.2 IMPORTANCE OF INFORMATION
The importance of information has been extensively covered in the literature in an interdisciplinary perspective, but the researcher will identify and highlight the contribution of works related to the library and information science perspective.

On the national perspective Varn (1994) the paper identified government’s role in the electronic era pertaining to user’s needs and government’s response. The author further argued for the improvement of access to government information by US citizens, as a means of improving the machinery of politics in a democracy. Shatberashvilli (1993) described the state-of-the-art of information policy in Georgia since the disintegration of the USSR, independence, and the transition to a market economy especially the need to set up national mechanisms to deal with tasks formerly undertaken by the USSR central information services, the need to participate
in the information programmes of international organisations, and the need to provide further training for information professionals. Moore (1993), on the other hand, in his paper regarding China’s information policy, identified three different policy levels: industrial; organisational; and social, states that there are five elements which need to be taken into consideration: information technology; information markets; information engineering; human resources; and legislation and regulation. Boon (1994) distinguished the past “western” form of information policy from the present “development” information policy in new South African environment. In the British perspective Corrall (1995) in a paper basically based on the Follett Report expressed, that the way in which higher education library services are viewed, planned and managed must change radically if they are to survive and thrive in the future. He especially, highlighted the need for stronger management and more confident involvement in institutional planning and organisational change, emphasising effective electronic communication, and the suggestion of new models and change in organisational structures and management styles. Mahoney (1996) “outlined the three main elements that shape the British Library’s Information System Strategy i.e. the context of the library’s operations; current systems in the British Library and the vision for BL systems in the future”. (Mahoney, 1996, p.269)

In global perspective Quinn (1994) made a very interesting note, emphasising that as libraries become repositories of computerised information, they follow the modern drift toward the quantification and dehumanising of knowledge and education. Kesner (1994) discussed that advancement in information technology is transforming the way people work, communicate, and document their activities. He emphasised that library administrators need to consider alternatives to current structures and modes of management. The author further characterised the operational, organisational, and technological developments that are transforming the workplace; discussing the advent of the “knowledge worker” and the “information utility”, and considers how all of these factors provide opportunities for library administrators and other information resource management (IRM) professionals to serve their customers better. Finally, in general Saracevic (1992) examined the interdisciplinary relations with four fields:
librarianship, computer science, cognitive science (including artificial intelligence) and communication.

The role of information in development is according to Akhtar (1990) that “information plays a vital role in assisting the advancement of economic growth in developing countries and the use of relevant, accessible information in meeting stated objectives, is an invaluable and increasingly powerful tool to affect change”.

(Akhtar, 1990, p.35)

The importance of science and technology information in technology advancement, research and development is obvious. Likewise, it contributes directly to the economic development of a country. Scientists and technologists cannot function properly without having access to up-to-date information in their respective fields. The bulk of such information is being generated in developed countries. Providing access to this information in the GCC for scientists and technologists, is no doubt a challenging task.

Kuhlthau (1988) emphasised that “libraries have developed sophisticated systems for collecting, organising and retrieving sources and have applied advanced technology to provide extensive access to vast sources of information. Information retrieval has concentrated on what matches the system’s representation of texts rather than responding to users’ problems and the process of information gathering”. (Kuhlthau, 1988, p.1)

Finally Lynch identified that:

Libraries face some extraordinarily difficult challenges in the coming years. The transition of the scholarly communications system will not be instantaneous. During the traditional period, which may be as long as decade, libraries will face pressures from their constituencies both to invest in the new and to continue existing base of services. Given the budgetary pressures they face, heroic efforts will be required merely to continue the existing service base that serves the current system of scholarly communications. Finding the funding and the energy to make the investment in the developing, post-transformational system will be almost impossible under the current
In the early days of science, communication between scientists was largely personal, involving meetings, letters and visits. But, when the idea of scientific societies became entrenched, members started to deliver papers to each other thereby describing the research they had carried out. Subsequently, scientific journals began to be published and these ensured the dissemination of research findings to a wider audience of scientists. Originally, these journals constituted the primary sources of information but are now largely supplemented by other basic literature forms — the so-called unpublished or semi-published materials - such as reports, dissertations, patents, etc.

3.3 SCIENTIFIC TECHNOLOGICAL DEVELOPMENT AND INFORMATION.

The selective literature on scientific and technological information and communication is covered by several authors on a national level and international perspective in general.

On the national level Gupta (1992) presented an in-depth analysis of existing information systems for science and technology in India, and the role of various organisations involved in the process of information system provision. Mikoski (1993) discussed the role of The Canada Institute for Scientific and Technical Information (CISTI) emphasising that like most publicly funded research institutions CISTI is also facing a formidable challenge to meet the country’s information needs. Katz (1995) concluded that “CISTI plays a major role in providing part of the infrastructure that supports research and development, technology transfer and innovation”. (Katz, 1995, p.121). Thawley (1991) discussed in Australian STI perspective, policies and problems. McClure and Bishop (1989) highlighted the federal scientific and technical information (STI) policy system and described an exploratory model for revising the policy making process so that the information needs of STI users can be better met in the USA. Correia (1993) gave an overview of the management of scientific and
technological information (STI) and the application of new technologies in Portugal. On the regional level White (1992) recognised that information collection, management and dissemination are key elements in the development of a modern, science-based society. The Board on Science and Technology for International Development (BOSTID) of the US National Research Council started a project to expand and improve the planning, design and management of scientific and Technological Information (STI) resources and networks in Africa. It discusses rationale, constraints and examines ways in which the latest technologies suit developing countries and refers to successful information projects under way in Africa and the improvements in communication and information access achieved. It also highlighted BOSTID’s plans for the building of a network of users and a database.

Turner and Le Coadic (1992) in general argued that the scientific and technical information sector (STI) is in the midst of a paradigm change and the problem is now less of improving access to stocks of stored information than that of getting information to the right place at the right time, suggesting that attempts should be made to frame a policy perspective that might be useful for thinking through the implications of this paradigm change in the field of science and technical information. Seymenyu (1995) identified the technological stage of the scientific and technical revolution (STR) and information science in the changing society.

However, King et al., (1979) compilation of papers presented at a conference on the evaluation of the applicability of marketing theories to the marketing of scientific and technical information (STI), which was sponsored by the National Science Foundation is still valid as most comprehensive collection on STI.

Von Seggern and Jourdian (1996) summarised the scientific and technological information comparing:

science and engineering in perspective comparing that engineers may engage in many diverse activities including the generation of new ideas, problem definition, problem
solving, information seeking, experimentation, calculations, management of personnel and teams and production of reports and scientists are likely to work in an independent environment where they (1) select questions for investigations based largely on personal interest, (2) publish results to claim discovery and gain personal recognition and status in the profession and (3) participate in the broad exchange of ideas on scientific questions for the sake of knowledge itself. (Von Seggern and Jourdian, 1996, p.99)

The scientific literature produced in developing countries does not always contain up-to-date science and technology information and most developing countries rely for such information on literature produced in the developed countries. Scholars such as Hill (1986, pp.29-30) detailed specific pitfalls and problems the developing countries will face if they are to pursue policies in scientific and technological development that are inconsistent with indigenous needs and potentialities. He described the earlier approaches to the universal valorising of scientific knowledge exemplified by researchers such as Moravcsik (1985), as the “cargo cult of science” because they assumed that all increases in scientific knowledge are beneficial to local communities, irrespective of whether they are appropriate or not. Instead, Hill proposed the following criteria for evaluating for scientific and technological research and development in developing countries:

First, a very high priority must be given to understanding how national science, whatever its quality, can be effectively targeted towards the most critical development contributions in national context. Second, an equally high priority must be accorded to understanding how to construct knowledge bridges that link indigenous research with its social and economic environment. However, while these are priority questions in their own right, they also frame any other science studies questions about any aspect of the research process and its comparison with practices in the west.

(Hill, 1986, p.30).

Von Seggern and Jourdian while acknowledging that:

scientific literature is unique from engineering literature, suggested that both are recognised as equal cornerstones of innovation. The two branches of knowledge are thus permanently linked together as scientific and technical information or STI. Questions about the use of STI have increased recently as a result of the “rising interest and concerns regarding industrial competitiveness and technological innovation.” Pinelli, (1993). The studies
have also increased curiosity about how that information is gathered and used by engineers versus scientists. Several extensive reviews of the literature provide background and state-of-the-art research on communication by engineers. King and Kramer, (1995), Pinelli (1993)


Meadows and Buckle (1992) updated the earlier study of the Royal Society regarding the study of trends and problems affecting the communication of science in the UK stated that:

Past work on the scientific information system can be divided very roughly into two types. The first consists of studies aimed at elucidating general aspects of the nature, processes and structure of the system. The second covers studies of specific, more limited aspects. These have typically been aimed at identifying particular problems and suggesting improvements.

(Meadows and Buckle, 1992, p.276)

Information will now be viewed in the context of science and technology. The contemporary events demonstrate that science and technology are important factors in measuring political, economic, cultural and military strength. Europe recognised and remained convinced that scientific and technological co-operation constitutes an important contribution to the strengthening of security and co-operation, among the European countries.


scientific literature published in any country could be considered as a reliable yardstick to measure magnitude and sophistication of scientific and technological research in that country and cited several related works mostly quantitative studies, based on ISI Science Citation Index and others.

(Majid, 1995, p.55-56)

An aspect of government policy symptomatic of the advanced countries is the gradual realisation of the value of information and its integration in national development plans. Increasingly, information is planned side by side with energy, environment, science and technology, food production, population, trade and commerce and foreign
policy.

In a review by Cornish (1995) at a conference held in 1995 regarding “Researching for academic libraries” he asserted that academic libraries, like nearly all libraries throughout the world, are facing a crisis in resources. He elaborates that:

Electronic future will be cheaper than the paper environment. There are no data to support this and the electronic world need at least as careful financial management as that of the paper, if not even tighter and further emphasised that: in the UK the Follett Report has challenged many conventional conceptions especially regarding IT, copyright and intellectual property.


The other question is the border control of this seemingly un-abating literary output. The quantitative growth of scientific and technical literature has attracted a lot of comments in professional articles. Observers and specialists in the field speculated that this growth cannot continue indefinitely with a combined interest curve, that is, exponentially.

It is important at this point to refer to some instances which make it necessary for the developing countries to look beyond their own boundaries for scientific and technological information if they want to develop their scientific and technological capacities. It is a well known fact that scientific and technological knowledge, scientific and technological manpower and the sources of scientific and technological knowledge and experience are extremely unevenly distributed among nations. Most of the expenditure and manpower assigned to scientific research and development is concentrated in the developed countries while developing countries account for very little of scientific and technological expenditure and manpower.

For developing countries to attempt, as an alternative, to generate all the scientific and technological knowledge required for their development without making full use of the relevant knowledge already available, through the work of scientists and technologists all over the world, would not only be a task of extreme difficulty but would also be wasteful and unreasonable. It would not only extend, beyond
acceptable limits, the time-frame in which these countries could hope to achieve their development goals but also, if adopted universally, in all countries, including the most advanced countries.

3.4 RESEARCH DEVELOPMENT AND INFORMATION.

Welsh (1994) edited papers presented at the International seminars, at the Kanazawa Institute of Technology Library Center, Kanazawa, Japan, between 1982-1992 and Lynch (1993) expressed that the modern research library is a product and an integral part of scholarly communication. Lynch further explored the gulf between the traditional system of scholarly communication and the traditional institutions, and examined the transformation effect of technology on libraries and scholarly communication and the role of libraries within a new system in national perspective. However, Erens (1991) report will be analysed in section 3.8 in detail.

Bengston who is primarily an economist established that several inter-related factors outside the research system have an impact on the capacity of research institutions to carry out productive and relevant programmes. Increasing the level of resources devoted to LDC research and improving the organisation and management of those resources is vital for increasing research capacity. Adequate resources and efficient management is necessary, but not sufficient for a high level of research capacity (Bengston 1989). This means that the social, cultural, historical and economic context must determine what is particularly appropriate for maximising its research potential. In terms of specific and concrete empirical case studies from the developing regions, however, evidence of successful scientific and technological research strategies are hard to come by in the literature.

In British perspective the Follett Report (1993) criticised that:

 provision of library facilities in support of research across the newly unified higher education sector is very uneven and suggested that in these circumstances, whilst institutional libraries must continue to be primarily responsible for ensuring that the basic library needs of their researchers are met, there are opportunities for the development of a more strategic approach, to promote co-operation and more sharing of certain facilities and to
supplement those facilities which are available at each individual institution. (JHEFC, 1993 p.57).

An important trend identified by scholars is the making of university-based research more accessible to the community-at-large through the institutional and trans-institutional mechanism of linkage/bridging, which increases the three basic functions of information and communication, brokering, negotiation, as well as delivery (Lynton and Elman, 1987). An exciting aspect of these theoretical advances is the incorporation of student participation in the research component, in addition to the more traditional faculty consultative role. This ensures a steady influx of experienced and qualified new graduates into the work force as well as into an academic environment.

Bengston (1989) suggested that the set of factors affecting research capacity in individual countries is sufficiently unique that no universal approach or policy to strengthen LDC research institutions will be adequate.

Scholarly work that does not take into account the socio-cultural specifics has very limited utility within the GCC context. For example, the study by Wood (1990), which can only identify "internal and situation criteria that influences the research performance of university academic staff, focuses only on one university (the University of New England) and within a relatively homogenous academic community; she located the variability of research performance and differences in 'personal characteristics, research styles, methods and strategies, both within and between disciplines; and dependence on funding'. (Wood, 1990, pp.81). Though all these criteria are undoubtedly valid and though her thesis that research performance is a widely variable parameter is correct, findings do not indicate the extent and function of institutional and external constraints on research in a heterogeneous context.

R & D activities lead to innovation and certain factors are decisive in the process of innovation. In the new world order among the most highly rated factors are the recognition of scientific or technical opportunity, the recognition of the need, efficient
internal R & D management, of these factors, it can be said in general terms that they make all the difference between the developed countries and the developing countries. The developed countries tend to have greater motivation towards scientific explorations than their counterparts in the developing countries.

3.5 INFORMATION TECHNOLOGY AND TECHNOLOGY TRANSFER

The interrelationship of technology transfer and information transfer, its usefulness and constraints is covered in the literature, but this section will emphasise on the information technology perspective related to this study.

Fitzsimmons (1994) discussed the power of information, that the world of information technology is changing faster than most of us can monitor, and emphasised that information explosion has created the necessity for people to harness electronic technologies. Strub (1993) outlined information transfer exploration aspects within the framework of the Research and Technological Development from the European perspective, describing trans-national technology transfer and described the Strategic Programme for Innovation and Technology Transfer (SPRINT) Programme, designed to improve the innovative capacity of European (small and medium) enterprises and to facilitate technology transfer.

Kanamugire (1993) in an article on implementing information technology projects in developing countries is an ideal study, pointed out that technology transfer involved not merely the purchase of materials and equipment but, also the importing of such things as management, budgeting, theories, techniques and procedures and training programmes of various sorts. Moreover, once the technology has been transferred, provision must be made for its operation and maintenance. This is difficult and cannot be achieved without a local research and development (R & D) capability of a relatively high order. Since technology is not static but dynamic and since all local environments differ in their needs, successful transfer implies an ability to digest, adapt and improve upon the original technology. This cannot be achieved without the existence of a well-developed research capability. Sikka (1995) looked in reference
to Indian science and technology policy formulation and its implementation which can be a good example for developing world.

The role of information in R & D and technology transfer is vital. Likewise, the availability of information contributes directly to a country’s economic development. The United Nations and UNESCO have held three intergovernmental conferences in 1971, 1974 and 1985 (the last was a meeting of experts) on scientific and technological information systems. At these conferences the emphasis was on the need for appropriate information policies in the developing countries. In 1983, the Research and Information System for Non-aligned and other Developing countries was set up in New Delhi under UNESCO. The aim of this organisation is to act as a focal point for non-aligned and other developing countries in the dissemination of information related to areas such as industrialisation, technology transfer, education, health and raw materials. In Rome, the Third World Academy of Sciences was established to promote and support scientists who are engaged in research in third world countries. One of the aims of this organisation is to provide scientific literature and services not normally available in the third world countries.

Lynch (1993) outlined that information technology-computers and computer communication networks are changing many of the existing assumptions about how people discover and communicate information, teach and learn. Akhtar (1990) discussed that developing countries generally depend on information which is produced in and controlled by the west. An indigenous effort to generate relevant information is largely un-co-ordinated and mismanaged, thus reliance on Western experts continues. However, without self-reliance in the procurement, management and utilisation of information, self reliance in economic development is an unrealistic aim.

"The free flow of information is regarded as a desirable ideal by those who regard access to information as a basic human right essential for democracy and self-determination and by those who believe it can stimulate the world’s economy to the advantage and benefit of all" (Moohan et al., 1988, p.27). There has been a debate
as to the importance of free exchange of information and the universal availability of publications, “not so much in principle but as a consequence of the restricted access to resources in many countries” (Bell, 1986, p.327).

While it is generally recognised that the free flow of information advances science and technology, political, cultural, economic and technical factors present barriers to the free transfer of scientific and technical information.

Neelameghan and Tocatlian identified barriers to intercultural and international flow of information:

1. Language difficulties
2. Difficulties arising from the cultural environment
3. Difficulties of a psychological or intellectual nature — the presentation of information
4. The “pollution” of information — not in perfect condition
5. Legal and administrative barriers hindering the flow of information across national borders.

(Neelameghan and Tocatlin, 1985, pp.160-161)

The technical factor in information transfer according to Moohan et al., is that “transferred data flow is made possible by the convergence of computer and telecommunications technologies which have facilitated the transfer of mechanically-readable information across national boundaries with unprecedented speed and efficiency” (Moohan et al., 1988, p.34). The development of applications of new information technologies provides many information agencies with potentially valuable information in a variety of forms such as magnetic tapes, floppy disks, CD-ROM, on-line database services and electronic bulletin boards (Sprehe 1988).

Clarke (1988, p.9) stated that “NTIS, began to provide access to Japanese on-line information service through the JICST databases, similar to the NTIS database.
Information users from academic, private and government sectors now have access to Japanese databases, using electronic dissemination of information". Some experts claim that there is a need for monitoring foreign developments in information technology and acquiring related literature. Rosenbaum (1988, p.15) compared the Japanese and American information policies and proposed several alternative policies to maintain and improve access to and dissemination of Japanese scientific and technical information to public and private sector users in the United States."

Regarding the language factor and information transfer Michel (1982, p.132) stated that "in the presentation of scientific information, English is increasingly used for primary publications in the basic discipline, in applied sciences the authors use their local language much more". According to Takayama (1986, p.12) "Japanese researchers and engineers at the research front in the field of computer science present most of the information in Japanese, e.g., over 80% for proceedings in Japanese".

In GCC perspective Al Qaisi and Ali identified that:

Arabic speaking users(student and faculty) not proficient in the English language find it difficult to use information sources published in English without the assistance of reference librarians. Since the available information in the Arabic language is not up-to-date in many disciplines, especially in science and technology, the users tend to rely on information sources published in other languages, mainly English. Moreover, at the University of Bahrain, the composition of faculty, whose members come from 25 different countries, puts some pressure on students to use information sources other than those using in Arabic language for their research methodologies, designing of experiments, review of related research, etc. In the past, owing to their language limitations, non-English-speaking users were often not inclined to refer to printed sources for their research needs.

(Al Qaisi and Ali, 1996, p.24)

The solution is best set out by Risseeuw (1981) and Bergeijk et al., (1980), in one word, translations. They discuss solutions in relation to on-line searches, the increasing role of the computer in the process of translating, the need for clearinghouses for existing translations. In particular the International Translations Centre (formerly the
European Translations Centre) at Delft in the Netherlands is mentioned. Its objective is “to encourage, improve and facilitate the use of literature published in less accessible languages and for interest to science and industry and also to promote international co-operation in this field”. (Bergeikj et.al., 1980, p.40)

Bell identified two problems related to language in trans-border data flow. First, the existence of this information may be of value to only a certain portion of the population in the field, but this tendency would affect a majority of the population, having little control over the available international information. Second, the problem for international understanding of developing countries’ difficulties exists as long as the local materials are published in the local language. Bell (1986, p.237) further suggested that one solution to this problem might be for documents to be translated into various languages at publication, but this is a very expensive and time-consuming task.

The information imbalance between developed and developing countries caused by economic and technical factors has been one of the important issues in trans border data flow. The MacBride Report (1980) is the most frequently cited document covering the dilemma of trans-border data flow and the proposed solution of a New World Information and Communication order (NWICO). (Moohan et al 1988) and Ali (1989) identified several problems for the dissemination of information in developing countries in such areas as finance, politics and bureaucracy, language, education systems, lack of professional meetings or conferences (invisible colleges), brain drain and literacy rate.

Trans-border data flow has been a debated issue in the third world where it might pose challenges to economic, cultural, social and political autonomy. Many developing countries in Asia and Latin America have information policies which clearly represent an example of the third world’s possible responses to the problems of international information transfer: lack of data privacy, concentration of data processing power in developing nations and an imbalance in the distribution of
information resources (Moohan et al., 1988). The third world is calling for developed countries to exchange scientific and technical information freely, because one of the best policies for national economy development is information exchange programmes.

The tremendous growth in the scientific and technical research output and in the number of information users has brought about the need for an effective system for information transfer. The increasing role played by science and technology in the economic and social development of the country has created a pressing demand for quick transfer of technology to industries. In addition to getting access to information generated within the country, it is also necessary to get access to the information generated externally to support internal efforts on research and development. Information centres that have come up to serve the needs of different industries and R & D units, need to be co-ordinated and organised into an integrated system following uniform national and international standards to avoid haphazard growth and duplication of activities.

3.6 LIBRARY AND INFORMATION NETWORK

The topic of network in library and information science literature is overwhelmed with literature, both within the LIS field and in other related fields. However, this research without going into the details of network technicalities will attempt to study only the strategic and management aspects of networks together with some basic background literature which is covered in the literature which will be discussed in the following section.

“Network” has come to mean different thing to different people depending on the context in which it is used. Markuson and Woods (1993), took what is probably the most comprehensive view on problems and potentials of library networking. In the literature one comes across several definitions of library networks.
Susan Martin defines a network:

as a group of individuals or organisations that are interconnected to form a system to accomplish some specified goal. This linkage must include a communications mechanism and many networks exist for the express purpose of facilitating certain types of communication among members


First, there are several general studies which are mainly descriptive and analytical. Among these could be included a number of papers read at Information Networking 93, in which several papers were presented on networks, telecommunications, computer networks and computerised information storage and retrieval. Surprenant and Blake (1992) presented a paper at the 13th National On-line Meeting regarding the coming crisis in information on the global information network, elaborating on the fact that telecommunications developments have made possible the multinational corporation reliant upon trans-national data flow and that each nation will have to develop its own information policy as an integral part of its overall international economic policy. They also discussed the US information policy and its relationship to the current state of the economy, as evidence of this new imperative for the information age. Kelly (1992) discussed how networks are merging to form an information environment through the library network, wide area/value-added networks, academic research networks and local area/campus networks, examining the information infrastructure of the INTERNET, the National Research and Education Network, the digital library system and the Coalition for Networked Information. He proposed ways in which the library may remain the centre of the information infrastructure/digital library/virtual library. Kirk and Alldredge (1992) discussed the development of networked information services, technological change and a costing model. Seven models of the economics of networked information and rights for Electronic Access to the Delivery of Information Programme prospects for networked information resources and services were discussed. Kahn (1992) emphasised that a national information infrastructure will comprise three basic components: the network that links the various users and computational elements; the set of databases that provide relevant information within the network; and the infrastructure intelligence which is mostly invisible to the end user. Lynch (1993) pointed out the system of
scholarly communication is starting to change and the rate of change will only accelerate as the networked information revolution takes hold. (Lynch, 1993, p.20).

Second, there are a number of national studies outlining the benefits of network in national perspective. Among them is a comprehensive publication by Houweling and McGill (1994) regarding evolving national information network background and challenges. Joshi (1992) reviewed the importance of information and library networks and the networks and schemes of co-operation developed in India limited to scientific and technological institutes.

The importance of networks in the British perspective according to the Follett Report is that the:

Selective research funding financial constraints and the explosion of publications and their costs mean that it is neither feasible nor even desirable to expect each institution itself to provide itself for all the research needs of its staff and users. Instead, in order to provide for specialist or very expensive needs, networks of research libraries should be encouraged to develop at national or regional level, which might be discipline base of cover a number of subject areas.

(JHEFC, 1993, p.57)

Third, there are several thematic studies on networks including Ward and Kolman (1993) who presented a paper at Online Information 93, reviewing the current state of networking including developing user friendly user interfaces and clear information presentations showing how the client/server searching system, based on a standard protocol and a single network, has made searching networked databases easier. They also examined new services that will expand the quantity and quality of resources available. There are also many specific thematic studies identified above in general studies.

Advancement in computer and information technology facilitated the speed and force of the trend toward decentralisation and that trend, in turn, has a dramatic impact on the way those technologies are being used in the field of library automation and
networks.

There have been strong forces against centralisation, which Segal (1985) identified:

1. A fear of the loss of autonomy and control;
2. An increase in telecommunications costs;
3. Technological advances, especially in mini—and micro computer technology; and
4. Increasing cost of network services.

(Segal, 1985, p.209)

The need for resource-sharing is based on several factors. First individually no information unit, library or organisation individually contains all the information required. Second, information has no boundaries, hence it makes sense to share what others have generated in their own countries. Third, there are often enough funds available to acquire all the necessary resources. (Lungu, 1987).

In meeting these needs, information networks offer advantages such as, the better utilisation of existing resources, a larger base of knowledge available to serve local needs, the capacity to reach a great number of users, greater economy and efficiency of operations. Networks confront the economic inefficiency of massive duplicate collections proliferating in different locations. Ever-advancing communication technology can ensure the free flow of information with equal access to available knowledge no matter where people reside or where information is located. Furthermore, information is provided in various forms other than print. Based on the assumption that co-operation between network members would lead to a saving in resources (human, material and financial) and to an increased efficiency, networks not only meet various information needs, but also provide a valuable service in consolidating information from all sources for a specific purpose.

3.7 NATIONAL INFORMATION SYSTEMS
The literature has been rich in discussion of national information systems, “the methodology and techniques for planning and implementing integrated national systems and individual services within them still remain to be developed with greater precision” (Penna, 1970, p.5). Penna’s book is a valuable reference guide to planning, presenting planning as a continues process with various stages. These stages may extend over many years and the planning process should be, according to Penna, an integral part of national development plans.

First, there are number of national studies outlining and emphasising the benefits of national systems in national perspective. Among them are Le Coadic and Chambaud (1993) regarding France’s politics and policies in the scientific and technical information sector who describes the role of professional and scientific societies and who makes some comments on the education and research politics and policies in the information field.

Meadows (1991) work with special reference to the United Kingdom, followed by BLRD (1993) study also examined academic management and library budget trends, the scientific information supply, new information media systems and usage of scholarly information in British perspective. Pilling (1994) reviewed the report “The Scientific, Technical and Medical Information System in the UK”, published by the Royal Society. The conclusion highlighted the fact that the survey has failed to resolve many important contradictions between some of the main points and has not confronted the fundamental characteristics of the problems facing the present system. It argues that, had the study accepted and emphasised the incompatibility between the two distinct elements, dissemination and publicity, it could have provided the information community with a starting point from which to evaluate current technology in relation to these two purposes. Russon (1991) reviewed the range of approaches to provide services to the scientific, technological and industrial communities that have been adopted by national libraries in different countries. This paper describes, the approach taken by the British Library with reference to document supply services, information services and other activities such as bibliographical
services, publishing, education and seminars, collaborative ventures and sponsorship of research.

Malley (1990, p.89) pointed that:

if we define national information policy as policy directed by the government to co-ordinate all matters concerning the organisation and dissemination of information, than there is general agreement that no such strategy currently exist in the UK.

Other studies in the literature are extensively covered including Ma (1994) work concerning Taiwan; Sandow-Quirk (1994) pertaining to Australia. A very interesting query and analysis was made by Oppenheim (1996) on the theme of “Do we need a national information policy?”

A comprehensive article by Mohammad (1989) discussed the information revolution, the trend towards the formulation of national policies for library and information services, and UNESCO initiatives in promoting the development of improved information infrastructures and systems both at national and regional levels. He specifically described the Malaysian experience with a National Information System (NATIS) and the formulation of a National Policy for Library and Information Services. He also outlined the principles of the National Policy for Library and Information Services and suggested recommendations with respect to the formulation of national and regional policies on library and information services.

Groen (1994) from the Canadian perspective, highlighted the broadening of the concept of resource sharing, the revolution in information technologies, in particular, the Internet, and the prospect of cost savings university budgets revitalised in resource sharing in conjunction with Research Libraries Group and the Centre for Research Libraries, which extend access to scholarly information resources beyond the local institution. The author concluded that resource sharing and information technology are inseparable in improving the information infrastructure on which the scholar and
researcher depend. King and Kraemer (1995) discussed the dilemma of national policy formation for information technology in the context of the information super-highway initiative, or national information infrastructure, in the US. They reviewed the technological forces shaping the convergence of computers and communications, describing current and future services on the information super-highway, outlining the major providers and the markets at stake. They concluded with some implications for the information super-highway for national competitiveness.

Second, there are several articles which focused on a single organisation such as Inose (1992) presented a detailed overview of NACSIS, the National Center for Science Information Systems, in Japan, describing its organisation, its library network connections, its information retrieval services and other services such as electronic mail and its bulletin board. Mikoski’s (1993) emphasises is on resource sharing: Canadian perspectives regarding the Canada Institute for Scientific and Technical Information (CISTI) which has a unique comprehensive collection, but like most publicly funded research institutions is facing formidable a challenge to meet the country’s information needs. He discusses the need to choose between a decentralised national collection, with a comprehensive widely distributed union catalogue, open systems inter-connectivity and a network of local and regional resource sharing services, and a central science collection.

Third, there are several thematic studies on national information systems including Lee’s (1993) article on organisational change in research libraries and the work of Jackson-Brown (1993) which elaborated on electronic information resources, such as CD-ROM bibliographic databases, are transforming significantly the way academic researchers find information and the way in which librarians assist academic researchers, emphasising that new resources bring new demands from end-users for services from librarians. He proposes that in order to meet these new demands, proposing that academic librarians as information providers must work more closely in an active partnership with researchers and producers of electronic databases.
Similar views were expressed by Dougherty and Dougherty (1993) who examined major professional issues for academic libraries over the next decade about campus culture, electronic publishing, changes to the campus information infrastructure (reconfiguration of services, development of the NREN national network), education and training of library professionals and the need for faculty and students to become information literate.

However, Iyengar (1992) emphasised that in the third world countries if information services are intended to support national development as an aid to progress, they should be designed to serve the community and to improve its productive capacity and the overall quality of life. In the first place there should be an identification of different categories of users, their information seeking behaviour patterns, their capacity to assimilate information and the application to their different tasks are all shown to be important.

Trigo, Correia and Wilson (1996) identified that:

Individuals and societies are constantly bombarded by information. So, the problem is not one of information shortage but one of finding better ways to access, filter and use the available information. This suggests the need for efficient management of the information sector, on a national scale. Governments of the various countries, industrialised or developing countries have been concerned with the co-ordination of the national information services, aiming to organise their information services on a national bases to satisfy their citizen’s information needs. In this sense, Montviloff, (1990, p. 87) considers that: it is expected that the integration of an information policy into the national development policy will result in a wider acceptance of the strategic significance of information services and their managerial implications for businesses and national economies. (Trigo, Correia and Wilson, 1996, p.221)

UNESCO (1985) considers that one of the reasons for the existence of national information policies has to do with the need to formulate strategies that enable the information society to reduce the inequalities that exist in the world. This aspect is valid if we accept the idea that access to information is a source of power and that those who have access to information are information rich and those who do not have access are information poor.
If a country needs to promote the effective flow of information in the society, the formulation of an information policy may be a starting point in the process. Conversely, the information policy may also appear as a mechanism to introduce some constraints in the information flow.

The document, *National Information Policies*, (Hill 1989, p.5) considers that one of the main reasons for the formulation of information policies:

is the need to establish a reasonable and workable set of balances between gaining the maximum benefits from the rush of new informatics and telecommunication technologies and the avoidance of consequence disadvantages to groups or individuals, organisations and even State and the extent of its involvement in or funding of certain activities.

(Hill, 1989, p.5)

The effective participation of a country in the development of information systems and networks at a regional or international level depends on the existence of a strong internal information infrastructure.

With the consolidation of the information society, new problems have occurred: those associated with privacy, data protection, trans-border data flow and copyright being the most prominent. In response to these problems, governments or responsible bodies in the information sector have tried to solve them through the formulation of national information policies Montviloff (1990).

Wilson (1990,p.29) considers that, due to the difficulty in defining the information concept and also to the complexity of the idea of information as an economy sector, “it is not surprising that the idea of a national information policy is also difficult”.

However, Hill (1989 p.4) stated that:

when one examines the situation in detail, it is clear that the information field is, in practice, regulated by a series of policies, which while they may not make a coherent whole, nevertheless do add up-to an almost comprehensive policies.
The need and urgency for planning national information systems have been clearly pointed out at several international conferences. Yet, the fact remains that no sufficiently precise methodology has yet been developed for this complicated task. Planning national information systems is a continuing and complex process which has no easy ready-made formulas which could be completed in a short time frame. In literature almost all the studies were based either on resources or services. However, in this study an attempt has been made to cover both the Information Resources and Information Services as dual focal points to develop a regional and national information system.

Several reasons may be considered as providing the bases from the formulation of national information policies. In some countries, the problem consists of enabling and promoting the free exchange of information; in other situations, the information policy aims to limit the transnational exchange through the use of barriers e.g. legislation. However, the formulation and implementation of these policies has met with economic, legal and political constraints. Other difficulties must also be considered: the difficulty of evaluating the economic dimension of the information sector and the absence of a commonly accepted definition for that sector.

3.8 USERS PERCEPTION STUDIES.

The research about information needs and the use of information is quite contradictory in the literature. A number of studies were done in the developed countries including large numbers of studies on information needs and use of information by scientists or by engineers. The research of the 1950’s, 1960’s and 1970’s was summarised in the Annual Review of Information Science and Technology of the American Society of Information Science. In the 1980’s the research on information needs and use was done by Dervin and Nilan (1986).

Recently Julien (1996) summarised the information needs as:
information needs and uses constitutes only approximately 8% of the total research literature of LIS (Jarvelin and Vakkari, 1990), analysis of LIS research, in general, has significant consequences. As Hernon (1992) and Hernon and Schwartz (1993) recognise, identifying good quality LIS research can provide researchers with models to improve their own investigations and assist in decision making. McClure and Bishop (1989, p. 127) argue that careful consideration of the status of research if necessary for LIS to “progress as a discipline”, and Jarvelin and Vakkari (1990) suggest that self-analysis is necessary to improve teaching and research in LIS. Buttlar (1991, p.52) notes that analysis of the literature of LIS has additional value in documenting the “historical development of librarianship. “Feehan et al. (1987, p. 174) argue that the “subject concerns of a discipline are nowhere better reflected than its research literature” and that “analysis of research in library science over time will help our discipline to monitor its progress and to identify both subjects in need of further research and under utilised research methods” (p.182).

(Julien, 1996,p.53-54)

Julien further adds that:

Analysing the information needs and uses literature, Hewins (1990) noted several recent trends. Of specific interest were Hewins’ observations that: (1) the literature of information needs and uses now can be found in many disciplines; (2) research is focusing on the cognitive processes of users and relating these processes to systems design; (3) some diversification is occurring in the research methodologies used to investigate information needs and uses.

(Julien, 1996,p.54)

There are several studies and contributions in general and specific ones on scientific and technological environment, including series of papers edited by Frick (1992) on user’s services in libraries: theories and concepts and their application between 1991-1992, were very relevant for research environment. The author explored what is known about users of libraries, problems of measurements of success, practice in various services and their adaptation to various “success models”, specialised problems in user service management, and education for public service librarians in Canadian perspective.

According to Hewins (1990):

Saracevic et al. undertook an extensive study of information-seeking and retrieving behaviour. They identify a model of seven events occurring in
information seeking and retrieving and consider several variables for each event. These variables include user characteristics, problem statements, searcher characteristics, question analysis, search strategy, items retrieved, formats delivered and relevance and utility of responses. The study presents a multiple matrix of variables, with each cell in the matrix representing a complex research question. The greatest contribution of Saracevic's research is that it offers a vision for the direction of future research into information need and use. It is clearly a mandate for a multi-disciplinary approach to research in that it crosses over into cognitive psychology, artificial intelligence, computer science, philosophy, mathematics, semantics, linguistics and many other disciplines.

(Hewins, 1990, p.158)

Wei (1995) identified that:

The perceptions of science library users are essential to this process of “rethinking” and change. It is important to know who the users are, what their information needs are and how they feel about the library’s services and its collection, including both printed and electronic information resources.

(Wei, 1995, p.18)

Frohmann (1994) analysed the ways in which information, its uses, and its users are discursively constructed, especially in the theoretical discourses of LIS. Hurd, Weller and Curtis (1992) investigated the information seeking behaviour of science and engineering faculty and explores the use of major abstracting and indexing tools such as Current Contents and Science Citation Index, to establish a baseline for a subsequent survey to assess the impact of availability of locally mounted databases.

Further to the Royal Society study of 1980 and several deliberations by Meadows discussion on the theories of Derek Price and Northcote Parkinson on literature growth and Garfield’s influence on citation analysis. The recent article carry out an in depth survey of biological communication by Rolinson, Meadows and Al-Shanbari (1996). However, the most comprehensive work on national level was done by Erens (1991) on the British perspective in a report entitled Research Libraries in Transition: academic perception, which correlates the services and collection, from a research perspective. This review is based on questionnaires addressed to more than 3000
academics in the UK in which a majority 46% suggested improvement in collection as compared to 38% asking for improvement in services.

Second, there are studies which emphasise the changing role of information professionals with regards to users' information seeking patterns. These include works by Vries and Minnigh (1995) who outlined some possible future roles for a specialist academic library and information science professionals against the background of rapid changes taking place in academic libraries from traditional services to an electronic networked environment. Corrall's (1995) paper prompted a review of the roles and responsibilities of information professionals. The technical demands of the job are expanding and at the same time a wider set of management and business skills will be required as the focus shifts from providing information to facilitating access by end users.

Williams and Woudstra (1993) investigated the correlation between the social engagements of biologists and engineers and their use of general mass media in the Netherlands and found no correlation between the social engagement of scientists and their use of non-specialist information sources. Ellis et al. (1993) asserted that the fundamental differences in information seeking could not be determined. The extent to which developments in the electronic communication patterns of the scientists and social scientists information seeking behaviour is concerned except, on emphasis which could differ from subject to subject and person to person.

In different types of service situations Cole (1978) discussed the difference between the concept of the user in research into the functions of scientific and technical information (STI) and that of the user in research on a computer-based selective dissemination of information (SDI). Woods et al. (1994) reported results of an investigation, into the effects of posting information (the display on the screen of the number of references in the retrieved sets) on searching behaviour, proposing that training should place greater emphasis on the value of posting information at different stages of the search and should optimise the searching behaviour of those by
introducing varied search methods.

Kuhlthau (1988) pointed that:

The constructive process of learning in the library requires services which enable individuals to relate new information to what they already know and extent that knowing to form new understandings. Wilson proposes that libraries and

information systems be tailored to the way people use information in their daily lives. “Any policy for library system development should be based on an understanding of individual information gathering behaviour”.

(Kuhlthau, 1988, p.5)

Meadows and Buckle (1992) rightly concluded that:

The need for more training in information/communication activities for all participants in scientific information chain was generally recognised. It is less easy to see how the funding and more especially, the time for this is to be provided on the scale required. Most information intermediaries expect to be providing more training for users over the next few years; apart from this, however, many feel uncertain what role they should be planning to play in the longer-term future. Several respondents, both scientists and intermediaries, felt that it is time for the “publish or perish” syndrome to be replaced by some more appropriate research quality filter.

(Meadows and Buckle, 1992, p.289)

Library services based exclusively on a source/location premise are constrained in situations which call for mediation into the constructive process of users. In British perspective Follett Report:

distinguishing the role of libraries in supporting the information needs of researchers from their support for teaching is not straightforward. All academic staff, even if not directly involved in research themselves, require access to the research findings of others to enable them to keep abreast of developments in their fields and ensure that their teaching is well informed.

(JHEFC, 1993, p.47)

The study of technical communication in engineering and science, but limited to defence industry by Von Seggern and Jourdain (1996) identified that:
The technical communication and information-related activities of engineers and scientists have been a topic of study and discussion for more than 40 years. There is little to challenge the notion that both groups rely heavily on information and engineers and scientists themselves generally acknowledge that information is their most significant product. Aside from these fundamental conclusions, there has been scant progress in studying the varied role of information for engineers in comparison with its role for scientists. Research into the functions of information for these groups has lagged behind other user studies largely because the majority of research on information needs and use has focused on scientists alone or on heterogeneous groups of engineers and scientists working together. Such studies have not contributed significantly to differentiating the information behaviours of the two groups. This unique study compares engineers and scientists at the same laboratory.

(Von Seggern and Joudain, 1996, p.96)

They did further literature survey summarising previous studies by Pinelli (1991), Kline (1985), Shapley and Roy (1985) and Allen (1988) which made it apparent that engineers and scientists do not have the same information gathering and usage patterns.

3.9 RELATED STUDIES
Several authors touched the researcher's topic in one way or other, but some specific studies are analysed which are directly related to this study. However, major literature specific to GCC countries will be covered in section 3.10

FID (1990) reported on the policies concerning the availability of information and achieving access to it; information policy problems arising from the differences between industrialised and non-industrialised countries or those with changing economic systems and problems arising when national policies have to be related to regional ones. Mamtora's (1991) article described the work of the Pacific Information Centre, as a regional information network spanning ten countries in the South Pacific. Mostafa and Khan (1990) proposed the creation of an information network for the member countries of the South Asian Association for Regional Co-operation (SAARC), proposing that the network should involve the use of computers in
developing and sharing data bases among the participating countries and national focal points should have telecommunications links with other centres within their own countries.

Istasi (1976), in “Planning Guidelines for National Scientific and Technical Information System in the Sudan”, investigated the conditions and needs of information systems and proposed guidelines for planning and implementing a national information system for the Sudan. An analysis of the present system was based on opinions of professional librarians in the Sudan; the opinions of international experts served to provide a framework for the formulation of the guidelines. The researcher found that libraries in the Sudan have suffered from unnecessary duplications, lack of co-ordination, isolation, fragmentation of resources and inadequate services. Nevertheless, there has been an awareness of the need for developing a national information system. Suggested guidelines include the following components:

1. Diagnosis of the present condition
2. Goals, objectives and priorities of functions
3. System organisational structure
4. Specialised information subsystems
5. Operational requirements
6. Requirements essential for the emergence of a national information system.
7. Linkage of a national information system with other national and international systems

Amores (1978) in a “National Library for Science and Technology in Philippines: Prolegomena to Co-operation and Co-ordination”, found that the most pressing problems among the Philippines science libraries are as follows:

1. Lack of co-operation and inadequacy of co-operative activities.
2. Unnecessary materials duplication and uneven collection development;
3. Lack of nationally-produced scientific literature;
4. Difficulties in acquirement of scientific literature from abroad;
5. Absence of library surveys and application of library standards.

The lack of attention or indifference by top administrators, was the most serious problem influencing the current conditions of the Philippines science libraries. The researcher recommended the development of a plan for a co-operative science library network in the following ways:

1. Establishment of a single agency within the national government and continuing financial support
2. Establishment of a national library for science and technology
3. Improvement of scientific libraries in terms of materials, services and human resources
4. Development of national standards of procedure and format
5. Provision of adequate funds for library development in various scientific institutions
6. Investigation into the use of advanced scientific technologies
7. Improved communications among libraries in the Philippines and improved bibliographical tools and methods
8. Implementation of the plan for a scientific library network.

The basic suggested plan is that the main headquarters of the proposed national scientific library system be located in the present Scientific Library and Documentation Division under the National Science Development Board. The
Scientific Library and Documentation Division will be the prototype of the projected National Library for Science and Technology.

Machaly (1979) in "A Perspective Model for planning a National Scientific and Technical Information System for Egypt", investigated the present status of scientific and technical information handling in Egypt and compared it with the Standards for College Libraries, prepared by the Association of College and Research libraries in the U.S. The findings report that the impact of the libraries in Egypt has been meagre. The researchers proposed a model for a national scientific and technical information system in Egypt which includes the following essential components:

1. Identifying environmental forces which define library activities
2. Forecasting environment
3. Establishing general and specific objectives
4. Identifying system requirements — organisational and administrative, operational and personnel
5. Establishing the organisational structure of the system
6. Identifying the conditions required for the emergence of the system

The researcher suggested a combination of the decentralised/centralised concepts which eventually would evolve into a nation-wide scientific and technical information network.

Koskiala (1980) in "Flow of Technical Information Through the Industrial Information Services in Finland", attempted to do the following:

1. To assist the planning for the development of a national network for scientific and technical information activities in Finland by analysing technical information transfer patterns,
2. To develop a methodology based on the concept of information transfer as a chain process from information producer to information user.

According to the findings, the scientific and technical information transfer system, the series of transactions involved and the patterns and types of transactions, are suitable for information transfer in the Finnish industry. Koskiala proposed a technical information transfer network within the framework of the three essential information services categories such as citation identification, document access and delivery and information transmission services. The investigator also made recommendations on applying transfer chain methodology to information flow to other subject fields in other environment.

Algola (1993) in "Scientific and technical information transfer promoting information acquisition in Saudi Arabian industrial sector", asserts that the availability of scientific and technical information (STI) resulting from adequate information acquisition on as broad a scale as possible is indispensable to maintaining the vitality and international competitiveness of industry.

The study investigated the current status of STI transfer to the industrial sector in Saudi Arabia, which the researcher claimed has both a broad and an immediate purpose. The study examined the general characteristics of STI flow to Saudi industrial companies, acquisition, patterns among various industries and factors affecting information flow to the industrial sector.

In acquiring information, Saudi industries used original producer nodes for domestic information and distributor nodes for foreign resources. Information was most often transferred directly from originating sources to industrial information centres and the second most common means of transfer was through the use of one intermediary. Also based on the study's findings, there appeared to be many barriers affecting information
transfer in the Saudi information specialists, absence of acquisition tools, acquisition tools, absence of industrial information centres, lack of co-operation between the public and industrial sectors and lack of scientific impact on the highest levels of industrial management. These barriers can be minimised by the study's proposed information transfer system. The system presents ways in which Saudi industrial companies acquire information quickly and efficiently from foreign and domestic sources and thus links information producers to ultimate users in Saudi Arabia. The system can be used by Saudi industries to improve and facilitate an information service to their community users.

Saracevic (1980, p.253) noted that quite a number of national information systems exist in developing countries. The Saudi Arabian National Centre of Science and Technology (SANCST), established in 1977, has been involved in disseminating domestic and international scientific and technical information to Saudi researchers (Manzoor, 1985, p.77). Manzoor stated that the National Data Bases Division (NDBD) of SANCST collects and disseminates data on science and technology activities and programmes in Saudi Arabia and scientific and technical information to the users regardless of its source, origin and format. Another prominent organisation is the Kuwait Institute for Scientific Research (KISR).

3.10 GCC ACADEMIC SCIENTIFIC AND TECHNOLOGICAL LIBRARY SYSTEMS.

One of the earliest studies of university libraries was Ashoor’s (1978). This study assessed faculty and student attitudes toward the adequacy of library resources and services at three universities in Saudi Arabia: KFUPM, KAAU and Riyadh University. Ashoor found that (a) faculty and students at RU(KSU) and KAAU view library resources and services as being inadequate to meet their needs; (b) faculty and students, particularly at UR and KAAU, believe that the libraries are faced with numerous problems which tend to prevent library users from satisfying their needs for library resources and services; (c) faculty and students at all the three universities were not adequately involved in utilising and improving the resources and services of the
university library; (d) faculty and student’s attitudes and their perceptions of the library staff seem to indicate that the library staff, particularly at RU(KSU) and at KAAU, lack required training in modern librarianship and therefore, are not capable of meeting the needs of the library users (p.II).

Chaudhry (1994) described the development of collections and services at the King Fahd University of Petroleum and Minerals Library and indicated services to the institution’s own users and to other neighbouring libraries and institutions, describing the use of information technology in the library and considers collection development and control and other services to users.

Networking in the library fields has been a major concern since the 1970’s. Dhohayan (1981) sought to identify and articulate requirements for an Islamic Resource Sharing Network (IRSN) among the university libraries in Islamic countries, with Turkey and Saudi Arabia selected as representative Islamic nations. The two participating university libraries of each country were the University of Riyadh and the University of Petroleum and Minerals in Saudi Arabia and Middle East Technical University and Poshphore University in Turkey.

Dhohayan categorised three types of findings from this study. In areas of existing librarianship in Saudi Arabia and Turkey, he found that (a) books comprise the largest collections and experience the highest degree of usage; (b) none of the libraries surveyed had computerised their acquisitions and circulation systems. (c) in areas of co-operation, he found that (a) there are some types of co-operation among the libraries surveyed within each country; however, it is not at the level that should exist; (b) both countries have separate co-operative programmes with other countries, it is limited to a very few types of services. (pp. 108-117).

A descriptive study of university libraries in Saudi Arabia was done by Isa (1982). The primary objectives of his study was to give a clear picture of the existing resources in the university libraries of Saudi Arabia and to provide a basis for
formulating realistic minimum standards for university libraries in Saudi Arabia. Isa described the process and the result of his study as follows:

the investigator invited librarians, library educators and administrators working in the Saudi universities to identify tentative elements of standards for university libraries in Saudi Arabia. The investigator developed the proposed standards for university libraries in the Kingdom covering the following areas: objectives of the library, collections, staff, organisation of materials, services, facilities, administration and budget. The investigator again invited the same selected librarians, library educators and the administrators from the Saudi university libraries to view and comment on the proposed standards. These persons who were contracted for the second time believed that the proposed standards were realistic minimum standards which, if applied, would accelerate improvement of university libraries in Saudi Arabia. (p.150)

Availability of materials is an important element in the scholarly world and this issue has been a focus for many researchers. Tamraz (1984) examined the availability and actual usage of Arabic and English monographs in science and technology in three university libraries in Saudi Arabia. He found that (a) relative to ownership King Saud university had the largest science and technology holdings in Arabic and in English; (b) when shelf availability of monographs was investigated KSU again ranked first in Arabic and in English; (c) investigation of actual usage demonstrated English title circulation to be greater than Arabic and technology placed first (p. III).

Ajlan (1985) assessed the effectiveness of two academic libraries in Saudi Arabia: KFUPM and KSU. He used the rate of book availability to measure effectiveness of library services and to determine the operational factors that affect the availability of materials. He found that (a) the overall rates of book availability in both universities were almost the same; (b) each library was able to fulfil about 50% of user requests for books; (c) the causes of unavailability in KFUPM include circulation policy and circulation management functions; and (d) the causes of unavailability in KSU include collection development policy and user search skills (p. III).

In a related study, Atram (1984) studied the availability of periodicals in major Saudi Arabian libraries. He designed this study in order to demonstrate the need for a policy. He found that except for scientific titles, Saudi libraries have few periodicals. Generally, a correlation exists between availability of periodicals and the institution’s
level of development. Most periodicals are acquired by modern libraries; these are mostly English titles dealing with modern science, issued in the industrialised world. Academic libraries are the richest, while public libraries are extremely poor in periodicals. There is a real need to improve existing periodical collections and integrate them in an organised national system whose goals and objectives should be defined within the framework of a comprehensive national library policy (p. III).

According to the study by Ashoor and Chaudhry:

A total of 1,082 entries were reported from Saudi Arabia from 1980-1984. The majority of papers identified in our studies were in Medical sciences. 1,082 papers included in this study were authored by 544 scientists. 37 authors published 5 or more papers during the period of five years, their average being one paper per year. The highest number of papers by one author was 23.

The researchers were affiliated with 59 organisations, the majority of which are teaching institutions that contributed more than three quarters of the published materials in the Kingdom of Saudi Arabia, while private organisations make a very minor contribution to research literature.

(Ashoor and Chaudhry, 1993, p.68)

Like other organisations, libraries have begun using computers and getting benefits from automation. Abdo (1986) studied the automation projects of the 13 academic libraries of the six Arabian Peninsula countries: Bahrain, Kuwait, Oman Qatar, Saudi Arabia and the U.A.E. He found the following: (a) the libraries of the more technical/specialised universities were automated while the libraries of the comprehensive universities were not; (b) one of the basic problems of academic library automation is the lack of standardised bibliographic tools for controlling Arabic bibliographic information; (c) only two systems are presently available that can handle the automation of bilingual collections; d) the lack of trained competent librarians is another problem for automation (p. VII). According to Qari’s paper presented at the AGC/SLA 1996 Conference the status at KAAU illustrates that:

Currently, the library looks very much different from the past two years. Campus wide networking of OPAC and CD-ROM searching, full-text databases, prompt and low-cost electronic document delivery services have proved an invaluable vehicle to extend campus wide library services
successfully and to convince the library patrons that the library offers “total solution” to their information technology (IT) demands.

(Al Qari, 1996, p.3)

Tameem (1988) provided a brief overview of many important studies on the development of academic libraries in the Kingdom of Saudi Arabia. He addressed his findings to Saudi library officials including deans of library affairs, university directors, administrators and professional librarians. He pointed out the importance of library legislation, the shortage of Saudi native professional librarians, library associations, staff training and network utilities to improve the systems as a whole (pp. 477,488).

Salem (1992) revealed the effect of the Gulf War have been a tremendous financial loss of resources to the university library sector:

as all the branches of Kuwait University libraries were destroyed and damaged. It was revealed the collections, furniture and equipment have been shifted to Baghdad. The buildings were damaged between 40% to 100%. The general ratio of damage to buildings was 64% and for electricity and sanitation were 71%. The total losses for buildings, utilities and furniture came to 2.25 millions Kuwaiti Dinars(KD) and furniture represents one millions of the amount. The most affected organisations were the department of libraries, the Faculty of Law and the Faculty of Jurisprudence. The less affected organisation was the Faculty of Education. The total damage and looting of collections came to 650,000 items and the cost to six million Kuwaiti Dinars.

(Salem, 1992, pp.425-426)

According to Salem (1992) there was an extreme loss of manpower in the university sector in Kuwait very extreme after the Gulf War.

The authors Abdel-Motey and Hmood focused on the loss of university professional and technical staff after the Gulf War:

university suffered loss of numerous staff and professionals. Many left the country before or during the invasion and never returned. Attempts were made to cover the shortage by appointing recently graduated Kuwaitis who were to be trained on-the-job or through training abroad for three months or more. A new manpower plan has been prepared and awaiting approval by university authorities. The pre-invasion project of automation at the university libraries
is to be studied currently and many companies are presenting offers for such systems.

(Abdel-Motey and Hmood, 1992, p.442)

One of the topics receiving the most attention since the 1990's is networking and resource sharing among the university libraries and major research libraries in Saudi Arabia. This topic was investigated by three researchers: Algamidi (1988), Al-Tunisi (1988) and Hafez (1989). They investigated the existing state of development in the libraries concerned and examined the attitudes and perceptions of librarians and library administrators toward establishing a co-operative network system. Algamidi's (1988) work was an exploratory study investigating the existing status of Saudi university libraries and the attitudes and opinions of university librarians and some university officials toward an automated co-operative university library network in the Kingdom. He found that (a) co-operation among libraries was found primarily in the areas of inter-library lending, gift and exchange, photocopying and union lists and catalogues; (b) the majority of respondents saw an automated co-operative library network as feasible and expressed willingness to participate in it; (c) major obstacles for establishing a network were the human factors, lack of co-operative planning, institutional leadership, bibliographic control, standards and communication (p. III).

Al-Tunisi (1988) investigated the current situation of co-operative programmes and activities among Saudi university and special libraries. He found that (a) the co-operative activities among the investigated libraries are ineffective and need to be formally and scientifically planned and implemented; (b) the major problems for inter-library co-operation include the lack of adequate funds, adequate role of the national library, professional associations, information sources, library legislation and information policy and governmental support; (c) the desire to establish a national information network system for Saudi Arabia exists among all librarians, administrators and almost all library users (p. III).

In a related study, Hafez (1989) investigated and analysed the condition of the systems
of university libraries in Saudi Arabia to determine the perceptions of the librarians in the seven universities toward collaboration. He also designed a prescriptive model for resource sharing and information network system among Saudi university libraries. Hafez reported that (a) university libraries lack co-ordination, have no national planning, have an insufficient number of professionals and are faced with shrinking budgets; (b) university librarians perceived the proposed network activities as important factors for improving the current situation; (c) the majority of respondents desired a co-operative system and felt that it was time to establish one (p. III).

Continuing education activities for librarians have been a very important aspect of librarianship and other professions. The changes that occur in the world at large and the library and information fields require continuing education. Alsereihy (1993) -I examined continuing library education practices and preferences of university librarians and librarians at the major research centres in Saudi Arabia and proposed a model for successful continuing education. The major findings of this study are below:

1. there is strong support for the concept of continuing education among the librarians working in the Saudi university and major research libraries.
2. there are inadequate continuing education activities and opportunities available to the librarians in the Saudi university and major research libraries.
3. there is a lack of financial support for continuing education in most libraries.
4. library and information science departments in Saudi universities currently have no role in providing continuing education programmes to librarians in the university and major research libraries in the country.
5. there is no formal written continuing education policy in any of the libraries surveyed (p. 166).

Ian M. Johnson reviewed the education and training in the Arab states including the GCC countries based on documents and special meetings arranged Johnson revealed that:
Since 1977 the higher authority for education and training in Kuwait has arranged a course for school librarians. The need now is to rebuild facilities following the occupation. Planning began in 1988 for a department in the university but was disrupted by the occupation. It is planned to be an interdisciplinary program-two years librarianship and information studies within the bachelors' program. It is now hoped that instruction will begin in 1995-96.

(Johnson, 1994, p.59)

He further asserted that:

The emerging national information network in Saudi Arabia now includes 1000 schools, public and national libraries. In 1973 University level courses were initiated and since that time a significant number of information specialists have been produced. Each university has a focus on a particular thing. Fifteen percent of Saudi University students are foreigners and all receive Saudi government scholarships.

(Johnson, 1994, p.60)


If we examine the status of library and information study programs in the Gulf Region, currently, there are 8 institutions offering professional education programs in the field of library and information science in the Arabian Gulf region, 4 in Saudi Arabia and one each in Bahrain, Kuwait, Oman, Qatar. All library education programs are offered in universities except in Kuwait, where the College of Basic Education under the Public Authority for Applied Education and Training is responsible. Out of four Saudi Universities, one offers the Ph.D. and masters, one the B.A. and masters and two offer only the B.A. program in library and information science. A 2-year post-secondary diploma in librarianship is offered by the Institute of Public Administration in Saudi Arabia. In Oman the program is also run as a 4-year B.A. in library and information science, while the Bahrain and Qatar programs are post-graduate diplomas. For the purpose of this paper all programs up-to the B.A. have been considered as undergraduate and all post-B.A. programs are treated as graduate programs.

(Rehman, 1996, p.3)
At the Fourth Annual Conference for the Arabian Gulf Chapter/Special Libraries Association (16-18 April 1996, State of Kuwait. Human Resource Development in the Electronic Library Environment) Chaudhry (1996) described the status of continuing education of library and information in the GCC and its importance in today’s electronic environment, recommending that it is time that the needs of continuing education are systematically determined and more rigorous programmes are designed to fulfil the needs of information professionals in the region.

Salem (1992) also gave description of special library sector after the Gulf War:

giving a sample of 8 special libraries was chosen to represent the situation of the special libraries sector after the Iraqi invasion. The damage to buildings was between 25% and 100%. The most affected library was the National Scientific and Technological Information Centre (NSTIC) as its premises were totally damaged and burned. Utilities were out of function and furniture were looted or burned and the essential losses of buildings and utilities came to 1.5 million Kuwaiti Dinars.

The collections of these 8 libraries affected by the damage, looting and burning (some Iraqi soldiers burned the books to cook their food). The total loss came to above 2 million items (with an estimated cost of 1.3 million Kuwaiti Dinars distributed:

The information services in the 8 special libraries were strongly affected during the invasion period. Part was recovered after invasion and part is still out of work.
Salem concluded that:

The affect of the Iraqi invasion on Kuwait will remain for a long time as it was a vicious aggression against a cultural movements especially for the library and information infrastructure in Kuwait. There will be a detailed report in future for all the events of the aggression on libraries in Kuwait, which has been completed in which NSTIC played a major role.

(Salem, 1992, p.426)

Salem (1992) revealed the loss of special library after the Gulf War:

Also the special libraries lost manpower because of the Iraqi invasion. The 8 libraries lost 29% distributed as: 14 librarians, 6 assistant librarians, 2 operators/clerks and 7 secretaries. The most affected library was NSTIC.

(Salem, 1992, p.426)
According to Motey and Hmood (1992) at Kuwait University, development after the Gulf War that:

As early as April 1991, barely two months after Kuwait’s liberation, rebuilding of the university’s collection was under way. Arabic titles of more than 25,000 items were ordered and were to be received before the end of 1992. Foreign titles have been ordered through dealers who originally supplied foreign collections. They were asked to supply orders of the previous five years (1986-1990), which was estimated at more than 35,000 titles. Until April 1992, Arabic titles received were approximately 8,692 which is about one-third of those ordered and foreign titles received numbered approximately 16,000. Subscriptions were paid for 3,550 foreign and 350 Arabic periodicals. Back issues were ordered on CD-ROM; however, they are not expected to replace lost periodical collection of more than 670,000 volumes; some collections were complete since issue one. (Motey and Hmood, 1992, p.442)

Regarding the major S & T special library the NSTIC the authors revealed that before the Gulf War:

The centre which consists of four main divisions (Technical Services, Information Services, Automated Information Systems and the Kuwait Information Centre), had the following collections as of 2 August 1990:

- Book and reference titles — 50,000
- Periodical titles—1,400
- Technical reports—300,000
- KISR reports—1,500
- Databases on CD-ROMs
- Special information files —1,000
- Arabic information files —1,000

(Motey and Hmood, 1992, p.443)

One of the most interesting articles was “Libraries and information systems in the Arab Gulf States after the war”, by Mohammad M. Aman an authority on GCC libraries who conducted several studies in Kuwait after the Gulf War. This article describes the conditions which will be facing libraries and information centres and their services in the Arab World after the Gulf war, which resulted from Iraq’s invasion of Kuwait.
According to Aman (1992):

Before the Gulf war, libraries were receiving the positive attention of government officials in the Arab world in general oil producing Gulf States in particular.

There are many facets to the impact of Gulf War on libraries and information systems in the region. Some are negative while others are positive. The negative impact has been brought about by declining revenues. The result may be positive one for the future, as many of these administrators and the librarians they supervise begin to manage their financial resources more responsibly and efficiently. (Aman, 1992, p.447)

Harold Young and S. N. Ali (1992) also highlighted some of the effects of Gulf War on the state of Bahrain and Al-Tasan (1992) described the services of KACST.
CHAPTER FOUR

4 SCIENCE, TECHNOLOGY AND INFORMATION

4.1 INTRODUCTION
The importance of science and technology for national and regional development is obvious. Likewise, it contributes directly to the economic development of a country. Scientist and technologists cannot function properly without having access to up-to-date information for their respective fields. The bulk of such information is being generated in developed countries. Providing access to this information in the GCC for scientists and technologists, is no doubt, a challenging task. This will be discussed in chapters five and seven.

4.2 HISTORICAL BACKGROUND
When and where science began has always been the problem of the historians of science. But, there does seem to be a consensus that it all began when men started solving many problems of life. The inventions of the primitive man were mere expedients as these lacked the abstraction and conceptualisation characteristic of scientific inventions. Sarton (1960, p.3) commented that “gradually (these) expedients would be compared, generalised, rationalised, simplified, interrelated, integrated; the texture of science would be slowly woven”.

However, the mission of the present work is not the history of science or technology. The researcher believes that science is a human heritage and that scientific knowledge was developed by various civilisations throughout history. Each successive civilisation draws knowledge from others and adds, to this knowledge, its own contributions.

As the area of this study is limited to the region from where the Muslim world started it would be appropriate to cite a few references which highlight the historical perspective of scientific and technological achievements of Muslims from the year
Several authors including (Ali, 1977; Hassan and Lai, 1984; Kazi, 1990; Mushtaq and Tan, 1991; Quraishi, Bhutta and Jafar, 1987; and Saud, 1986) had made points in their papers. The point of interest is the twentieth century trend for the integration of science and technology and the commonality of science. A dichotomy between science and technology is now only tenuous, if ever there was one. This is not to suggest that science has stopped growing. The contrary is the case and in contemporary times it has become a major standard for judging the strength of nations; the economic well being of a nation almost totally depends on the science it cultivates.

It would be wrong to assume that the impact of science and technology on society has always been that of total progress: environmental pollution from giant factories, the hazards of nuclear reactors, diminishing natural environments and social dislocation are some of the attributes of science and technology that have put strains on society. On the whole, when the pros and cons of scientific progress are weighed, the odds are in favour of continued cultivation of science and technology.

Many national governments were loath to involve themselves in the development of science or in its application. Science was a private affair, almost exclusively confined to the universities where research was of a fundamental or basic nature. The application of scientific research and government participation in research and experimental development (R and D) was only situational. Without going further into the details of the historical background of science and technology development in the 19th and 20th century it would suffice to cite a few relevant references beside the monumental five volume "History of science, by George Sarton".

Nations after nations, both in the developed and developing world, have come to the realisation that science must be cultivated, planned and that clear-cut policies have to be laid out in its approach. Organisation of research and development activities is imperative. In contemporary times, the strength of a nation or otherwise its weakness, politically and economically, has a bearing with the degree of research and
development activities being carried out.

4.3 INTERNATIONAL PERSPECTIVE
Science is by nature an international activity. As a major factor in the race for military and economic supremacy there is an increasing evidence of a degree of secrecy and exclusiveness in a substantial proportion of new science and emerging technology. It must be realised that global research and development investment is overwhelmingly feared to be for military and economic goals. Science is power and military and commercial considerations seal critical areas of it as the exclusive possession and property of the producers Garfield (1986); Rosenberg and Nelson (1992); UNESCO (1969, 1977, 1983, 1984, 1985, 1987).

There is, however, a great deal of science and technology still freely available and readily shared, that is, if a developing country has enough capability to gain access to it. In order to be able to gain access to this, it is first necessary to develop competence in the field of Informatics, create information systems in selected fields, get satellite and telecommunication linkages with international and regional S & T data-banks, information systems and referral services. Technological capability is also extremely valuable for gaining access to non-propriety technology which can be easily or freely acquired. Technology today is science-based and information on the development of a great deal of technology is available in scientific papers, technical reports, proceedings of scientific and technological meetings and conferences. Several authorities, organisations and programmes are involved in S & T analysis in international perspective and also based on national programmes.

4.4 UNESCO AND INFORMATION
In the family of the United Nations organisation, the United Nations Educational Scientific and Cultural Organisation (UNESCO) holds a unique position as described by Neelameghan and Tocatlian (1985).

UNESCO information programmes developed as follows:
4.4.1 UNISIST
UNISIST, an intergovernmental programme, was established within UNESCO, to stimulate and give voluntary co-operation in the following fields of scientific and technological information at national, regional and international levels. Scientists were the first users of information to feel the inadequacies of control and availability of information. As early as 1896, the Royal Society convened an international conference to consider the publication of a complete catalogue of original scientific literature to meet the needs of scientific research. The International Conference on Scientific Information (ICSI) held in Washington in 1958 made a proposal for the involvement of bodies such as UNESCO and the International Council of Scientific Union (ICSU) in conducting a feasibility study to establish an international centre for scientific information.

4.4.2 NATIS
The idea of NATIS was introduced in the documents of the UNESCO Intergovernmental Conference on the Planning of National Documentation, Library and Archives Infrastructures (Role of National Library, 1977).

The meetings were held between 1972 and 1974 dealing with matters relating to libraries, archives and manpower planning. These meetings culminated in the Intergovernmental Conference on the Planning of National Documentation, Library and Archives Infrastructure, which met in Paris from 23rd to 27th September, 1974. The Conference was organised by UNESCO in co-operation with the International Federation for Documentation (FID), International Federation of Library Associations (IFLA) and the International Council on Archives (ICA). The aims and objectives of NATIS based on the conference were identified in UNESCO (1975) document.

4.4.3 THE GENERAL INFORMATION PROGRAM (PGI)
With the UNISIST and NATIS programmes operating side by side, duplication of effort began to appear. Financial and administrative problems soon came to light within UNESCO itself. The 19th General Conference of UNESCO, held in Nairobi in 1976, adopted a recommendation for the amalgamation of UNISIST and NATIS into one general information programme under UNESCO. Also at the same conference, UNESCO's Medium-Term Plan for 1977-1982 was approved which covered all aspects of the Organisation's work, including the transfer and exchange of information (Tocatlian, 1985), the usefulness of which was emphasised by Neelameghan and Tocatalian (1985). Through its programmes in science and technology, education and communication, UNESCO has promoted and supported the application of informatics in member states. The increased attention given by UNESCO to informatics led it to establish an Interim Intergovernmental Council on Informatics.

4.5 REGIONAL PERSPECTIVE

The education system in most of the GCC countries is being modernised, however, new concepts and approaches have not been introduced; and as a result, graduates have difficulty in functioning effectively in their own areas. Though individuals participate in professional meetings or conferences, very little benefit is gained and most of them return unaware of the latest research developments in their subject fields.

As a reasonable number of independent research centres has not been established at regional and national levels, the research being done has not yet been institutionalised except in a few cases. It is difficult for scientists to secure funds for pure research activities. A few authorities like Daghestani and Shahateel (1988), Qasem (1987, 1989) have highlighted the Arab perspective of science and technology including the GCC and the latest facts and figures are highlighted in international reports and statistical data references such as (UNDP 1991, 1992; UNESCO 1991; and World Bank 1992). In the GCC countries institutes of higher education are being established because a high priority is now attached to science and technology education, recognising that this contributes directly to the economic well-being of a country especially KFUPM and KU are GCC in the academic area and KISR and KACST are
institutions of international standing which are located in GCC countries. In addition, a number of research institutes and centres of high technical standards have been set up and these institutions play a leadership role in some areas. For example, desalination is being given much attention in Saudi Arabia; food and solar energy in Kuwait, Agriculture in Oman etc. Moreover, in certain GCC countries, the Chief Executive in the country oversees the interests of science and technology development. With such changes occurring, the economics of a number of GCC countries are being transformed, in a very short time, from predominantly oil exporting countries to emerging industry conscious ones.

Science and Technology has only recently been accorded its due importance in Saudi society for the following reason: the recent transformation of Saudi Arabia from a simple agricultural society to an economic and social entity, which is increasingly and universally advancing towards an all embracing modern life. Instrumental in this change was the establishment of the Saudi National Centre for Science and Technology (SANCST) in December 1977. The SANCST was re-named KACST in 1986 in accordance with the planning and co-ordinating with perceived changes in the role and function of the organisation, which was entrusted with the planning and co-ordinating roles of the National Science and Technology Program of the Third Development Plan. The KACST is also responsible for the transfer, advancement and adaptation of technology in keeping with the solution of social, economic and development issues. The Fourth Development Plan takes this a step further by focusing on the creation of self-generated development in the field of science and technology.

The main organisational structures that assist in the formulation of National Science and Technology policy are, KACST and the Inter-University Supreme Council and the Ministry of Planning. The KACST enjoys independent legal standing and reports administratively to the Chairman of the Council of Ministers, as does the Inter-University Supreme Council. The Inter-University Supreme Council formulates policies for the university system in Saudi Arabia which includes all scientific research
activities. The Ministry of Planning is responsible for planning and developing science and technology programmes in the country. In addition to the five universities involved in secular education, the KACST, the Ministry of Industry and Electricity, the Ministry of Agricultural and the King Faisal Specialised Hospital are some of the major institutions involved in prompting, financing and executing scientific and technological research in the Kingdom.

There does not seem to be a current census of available human resources in science and technology, but it is only a matter of time before comprehensive information on skilled manpower is published. Three major aspects of scientific and technological services are provided by the state.

The UNESCO study identifies six major areas as priorities for future scientific and technological development. They are manpower development, infrastructure development, development of production sectors (water resources, agriculture, oil production, refinement and transport, mineral resources and mining, electricity, solar energy and industrial development), environment, standardisation and policies of science and technology (UNESCO, 1986, pp.53-54).

The reorganisation of the SANCST in forming the King Abdul Aziz City for Science and Technology (KACST) was a crucial step in the enlightened attempt to organise, co-ordinate and enhance the scientific research and technology capacity in the Kingdom of Saudi Arabia. The objectives of KACST are, therefore, fundamental to understanding the resurgence of science technology in the country and its socio-cultural underpinnings. They include:

* Formulate and implement science and technology policies, taking into account Saudi Arabian national social and economic goals.
* Develop Saudi Arabian research capabilities, facilities and the necessary infrastructure.
* Undertake and support specific research programmes in areas important to Saudi Arabians social and economic development objectives.
* Organise and support joint international Saudi Arabian research programmes.
* Create and manage a system of national research laboratories to focus on applied research of unique interest and need to Saudi Arabia.
* Support existing Saudi Arabian educational and training institutions in their efforts to increase the number of scientifically and technically train people in Saudi Arabia.
* Establish and maintain a scientific and technical manpower information system as an aid to science planning and an effective use of scientific and technical personnel.
* Organise, operate or sponsor effective science information institutions and activities, including international conferences, symposia and research publications that will be useful in achieving the objectives of the KACST.
* Co-operate with universities, laboratories and other research centres to encourage research exchange knowledge and experience and avoid duplications of effort,

(KACST,1988, pp.15-16)

KISR’s overall objectives is to promote scientific and applied research by undertaking the following responsibilities:

1. Carry out scientific research and undertake studies relating to the advancement of national industry and to matters referred to it by the ministers.

2. Follow up modern developments in scientific and technological progress in order to furnish scientific and industrial data and information to government departments, industrial concerns and those engaged therein.

3. Study and discover resources of natural water wealth and devise methods for their exploitation; and for improvement of agricultural processes, promotion of water wealth, elimination of pests, as well as making studies conducive to the preservation of the environment.
4. Encourage Kuwaiti citizens in scientific research and promote the spirit of research in the rising generation.

5. Establish and maintain relations with scientific and technological research institutes and centres in Kuwait and with other countries of the world and exchange therewith information and know how with a view to achieving world-wide co-operation.

(Behbehani, 1981, p.81).

Baron (1992); Cunningham (1993); Lall (1993); and Studt (1992) recently addressed the question of technology and skill transfer. Adherence to these objectives has led to the promotion of indigenous technology, the facilitation of the transfer of technology, the development of human resources in science and technology and financial and institutional support for scientific research (mostly applied to environment) in universities. KACST awards annual applied research grants. KACST, through its Directorate General of Information Systems, provides up to the minute science and technology information for researchers, scientists, engineers and students. These services include the provision of Information Services, National Data Bases (five), Computer Services and Communications Networking. (KACST, 1986, p.17)

4.6 S & T CO-OPERATION

Technology is a response to a basic need, while science is a search for knowledge independent of its practical uses. However, the use of science in the service of technology transforms it from a compendium of empirical knowledge into a practical result of the ideas of science, while pursuing science without transforming it into technology might not result in great improvements to the population in general.

According to Dean of Agriculture KFU

Many planners in the GCC think that research is a luxury to be left to those who can afford it among developed countries. It was also suggested that it is better to leave the developed world invest its finance and manpower for the
science and technology, while the developing world may use those results made readily available by them. (KFU Dean interview).

Such a thought is dangerous for the survival of the GCC. Research is nothing more than looking at the different problems that are faced at national and regional level, then studying the most efficient ways and means of facing and solving them. Therefore, research in any needed area is a necessary condition for healthy development.
5. RESEARCH, DEVELOPMENT AND INFORMATION

5.1 INTRODUCTION
Research and development are activities whereby knowledge is acquired from free inquiry and utilised for specific benefits. The enlightened model of awareness evidenced in OECD member nations is not as widespread elsewhere, particularly among the developing nations of the world, for a number of historical, socio-economic and cultural reasons. The study undertaken in this chapter will attempt to evaluate the performance and role of scientific and technological research in the GCC: a small entity of states plus big Saudi Arabia with an emerging S & T base.

The responses of questionnaire number one to universities and institutes of R & D in science and technology chief executives will be analysed in this section in conjunction with interviews conflated in sections. The major issues regarding the finances, manpower, activities and output etc., will be considered. This section contains the following subdivisions:

1. R & D trends
2. GCC perspective
3. R & D budget
4. R & D personnel
5. R & D activities
6. R & D co-operation
7. R & D production

In each section of this chapter the conceptual model 1.3 will be tested especially the following sections 1, 3 and 4 for adoption and implementation which will be finally highlighted in the Chapter 8, concluding analysis section due to the interdisciplinary nature of this study.
1. The generation of information by individuals, in universities and research institutes. The information generated may take the form of journal articles, reports, pamphlets, books, patents, statistics etc.

3. The users who may also be the generators of information.

4. A mechanism which allows the interrelationship and inter-action; the co-operation and co-ordination of the components elements of the system whose fundamental purpose is to provide the flow of information that meets the needs of the nation.

Science and technology plays an important role in national development. It is impossible to discuss industrial development in any country without taking into account the striking impact and role of S & T. The situation of S & T research and development activities in the GCC and as revealed specially in case of Saudi Arabia is still weak and this deficiency has caused many problems with respect to the development plans. It has been indicated by the designers of the Saudi Fifth Development Plan 1990-1995 that "in many fields of data provision, the quality of information produced (in Saudi Arabia ) is not yet up to the standards of accuracy and reliability required for national and responsible analysis, planning decision making. Decisions based on inaccurate information can prove very costly to individuals, organisations and society as a whole" (Kingdom of Saudi Arabia. Fifth Development Plan, 1990-1995, P.74).

The Fifth Development Plan of Saudi Arabia has identified basic information needs to improve the quality and flow of information to the private sector in order to guide its investment and management decisions. Four main barriers facing the flow of information in the country have been highlighted by this plan:

1. Data collection tend to occur on an irregular basis. Discontinuity of information on key themes, such as demographic and labour market data, seriously impair analysis and national policy making.

2. The elapsed time between the completion of data collection and the availability of that information to users is often unacceptably long. The more outdated information
becomes, through time lags in dissemination, the less valuable it is to users.

3. A significant proportion of the information produced by government agencies cannot be considered as a public commodity. The private sector may at times not again access to information that is important to its decision making and which could be disclosed with no harm to the interests of the state.

4. The private sector has not adjusted to the changing conditions in terms of the need to carry out its own research and organise data collection concerning the private sector itself. Private sector groupings have an important role to play in this respect (Kingdom of Saudi Arabia —Fifth Development Plan, 1990-1995. PP. 75-76).

5.2 RESEARCH AND DEVELOPMENT TRENDS
According to the literature, illustrated in section 3.4, the valid theoretical model for university research is one that integrates research with teaching, beginning at the early undergraduate level. As the student specialises, the research component becomes more important and more interdisciplinary in procedure, turning into genuine research at the graduate school level. By this process, research becomes an integral part of the university curriculum as well as an essential component of the university’s contribution to national development and international co-operation. The ideal is well expressed in the multi-disciplinary model of university role and performance which is derived from an understanding of the university as the highest realisation of scholarly and educational goals.

Traditional basic research, with potential outcomes that are both long-range and unpredictable, continues to be an important need of society. In the majority of OECD countries it is this function of universities which receives the greatest emphasis and the one that is viewed as their distinctive feature. (OECD, 1987, p.100).

Even within developed nations, there is less uniformity than would be expected, but the record of the USA is outstanding in the areas of research output and performance as evidenced by publication rates (OECD 1988). According to the OECD study cited
above, the higher output of US scientists and researchers is also accompanied by increasing spending on R & D. Three factors for this higher production have been identified: the possibility of economies of scale operating to make big systems more productive than small ones; the non-governmental input to basic research which is more important in the USA than in other developed countries and the contention that USA funding arrangements might provide greater publication and dissemination incentives for researchers.

Most of the USA research funding for higher education is allocated as separately budgeted research in the form of competitively awarded grants to individual researchers and teams. Since in many other developed nations academic research is funded primarily through annual grants to institutions (often based on such criteria as size of student enrolment), this factor is the decisive one in promoting increased publications (OECD, 1988, p. 44). It would appear, therefore, that other developed nations and the third world in general would benefit from the experience of the USA by moving towards competitively awarded grants rather than annual budgets based on institution size which, in turn, would enhance both the quality and the dissemination of research.

The importance of university research is not only due to the fact that it is research which predominantly consists of strategic, long-term research and that, as such, it plays a crucial part in ensuring the balance and quality of the overall R & D effort. Its uniqueness resides in the fact, stressed in the present research, that it fulfils a number of functions and its influence extends to the educational, economic, social and cultural spheres in a comprehensive way that has no equivalent in any other segment of the research system. The reverse side of the coin is that it is often affected by the unintended consequences and decisions.

5.3 GCC PERSPECTIVE

Daghestani stated in World Science Report 1993

"Research and development activities at universities are essentially carried out on an
individual basis by faculty members aided by research assistants". In addition KISR in Kuwait and R & D centre within the university (KFUPM Research Institute) is managed by and large in response to economic needs where R & D had to be performed on multidisciplinary basis. Generous research grants are provided by universities in, Saudi Arabia and the rest of the GCC countries.

(World Science Report, 1993, pp.80-81).

The Saudi Fifth Development Plan emphasises several development activities that the Saudi government has considered to improve S & T. These includes the following:

1. a long term plan for the development of S & T;

2. measures to ensure maximum co-ordination between the relevant government agencies and effective co-operation with the private sector;

3. concerted action to expand and improve educational courses and curricula related to S & T at all levels;

4. mobilisation of all available means to promote deeper public awareness of the importance of S & T;

5. strengthening the government's role in improving overall infrastructure support for S & T, through improved information services, a patent protection scheme and establishment of an appropriate mechanism for sponsoring risk-sharing systems and efficient transfer of technology;

6. promoting establishment and expansion of R & D activities in both public and private sectors.


For this study the following faculties/divisions/departments were studied:

Agriculture
Architecture
Engineering
Medicine
Science

Basically, the topic was science and technology, however to give coverage to overall scientific and technological subjects medicine, agriculture and architecture were
included to give a comprehensive coverage. (Table 5.1)

Only KSU covers, comprehensively, all the above faculties for the practical purpose of this study. KSU is one of the oldest universities of the region with a network of faculties and branches established in several parts in Saudi Arabia, whilst KFU fully covers the faculties of Agriculture, Medicine, Architecture and partial coverage of Engineering, one of the subject specialist universities in Saudi Arabia.

Agriculture is fully covered by SQU, KFU, KSU and UEAU. In spite of the arid environment agriculture is emphasised in all the GCC countries both for food and horticulture/greenery programmes.

Architecture is fully represented in two Saudi universities, KFU and KSU. However, KFUPM has a strong programme in Urban Planning with some architectural programmes. Architecture is the great tradition of the Muslim world which the rich GCC countries want to maintain. It was also handy for the fastest physical facilities development in GCC in the last three decades. Sciences are covered by all the twelve institutes covered in this study.
## TABLE 5.1

### DIVISIONS & DEPARTMENTS OF SCIENCE AND TECHNOLOGY

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
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<td>Yes</td>
<td>Yes</td>
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<tr>
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<tr>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>King AbdulAziz Centre S&amp;T</td>
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<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>King Faisal University</td>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>King Fahad  UPM</td>
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<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
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<tr>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Ummal Qurah University</td>
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<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>UAE University</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Source: Questionnaire 1.5
Medicine is covered by all the universities except QU, UAQU and the special scientific and technological university KFUPM. However, KFUPM Research Institute is active in medical research partly through its Division of Environment. Basic and advanced health programmes are one of the major ambitions of the GCC government, for the masses and expatriates, to maintain the healthy manpower demanded by multinationals which form the major segment of the society in GCC countries.

Engineering is covered by all the institutes in this study except the AGU which only had a Faculty of Medicine during the coverage of this study.

The two research institutes KISR and KAeST do sustain and support research in all the five fields referred to earlier.

All universities in the GCC States include research as one of their main three functions namely, teaching, research and community services. However, the function of research has remained weak due to its low priority in the university budget as well as in its working agenda. University staff members time allocated to research varies among departments within the same college, among same colleges, within the same university and among universities operating within the same States. The variation among GCC States in the level of priority given to research is also wide. In most universities research work published in recognised journals is one of the necessary conditions for promotion. However, the facilities, time allocated to research and support provided for staff to carry out research, although, variable among universities, do not reflect adequate level of commitment in the majority of GCC States. It has extensively depleted after the Gulf War due to the shortage of funding.

During the Fifth Development Plan, Saudi Arabia has moved rapidly towards industrialisation. Due to this movement there are hundreds of production factories in Saudi Arabia. These industries are of such nature and level of sophistication, that STI service would be potential use to them. KACST and other information centres existing today in Saudi Arabia cover the whole range of STI. Some information
centres have developed a wide network of international contracts. But unfortunately, co-operation among Saudi libraries and research centres in information services does not exist. Active and efficient information transfer, requires systematic and well planned co-operation on the national level to get the full benefit of existing resources and established linkages with the international information flow. This

5.4 R & D BUDGET

The researcher simply asked the size of the annual budget for the last two years in local currency for the institutes/organisations covered in this study. Only four Saudi universities and the only university in Kuwait responded. (Table 5.2).

KU distinctively excels in the overall percentage of money spent both for the library and the R & D budget of the total university budget. However, comparatively, its R & D budget fell quite sharply from 3.28 % to 1.93% in the year after reporting. The R & D budget status at all the other Saudi universities was between just above 1% to 0.42% and for libraries 0.72% for a year at UAQU to as low as 0.23% in a year at KSU.

When comparing the KU R & D budget with Saudi universities R & D budgets it is clear from the figures in Table 5.2 that at KU the R & D budget is three to six times higher than the Saudi universities R & D budget. One of the reasons is that in addition to the undergraduate programme at the KU, they have a network of undergraduate colleges for different faculties which takes the bulk of undergraduate students. However, this position does not exist in Saudi Arabia, where there are no separate undergraduate colleges, and universities do have the major role of teaching undergraduate students.

In Saudi Arabia two of the largest and oldest universities, i.e., KAAU and KSU, have the lowest R & D budget compared to other Saudi universities. In KAAU the budget range was 0.51 and 0.61 and KSU 0.42 and 0.93. The main reasons for this trend.
was that both are predominantly general studies universities with the number of branches catering for undergraduate education. The majority of their programmes are also in Arabic with a predominantly Arabic speaking faculty which has the heavy burden of administrative work and teaching large undergraduate classes. Therefore they have very limited time for research and development.

In the absence of any real agricultural and industrial base most of the GCC countries still survive on oil exports and explorations for oil and other minerals. Most of the oil drilled in the last thirty years is still being processed overseas and imported back. This phenomena lead to fewer and fewer R & D programmes and to a decreased budget. By comparing the budgets of R & D with libraries’ budget in Table 5.2, it can be seen that the library budget is sometimes higher than the total budget for R & D for the whole university. In contrast, special subject universities like KFU and to some extent even UAQU are better off in R & D budgets compared with two of the larger general subjects Saudi universities.

R & D expenditure on the basis of sectors in the GCC States may be a better course to produce policy oriented. Such information may be helpful to policy makers to focus and consolidate R & D efforts in few sectors rather than to thinly allocate the limited R & D resources to a large number of sectors. Resources allocated to R & D activities have been thinly distributed to a broad spectrum of research areas, a situation which worsened the level of R & D indicators.

The literature and research findings reveal that the research budgets of universities in the Gulf region fall well below requirements and that bureaucratic constraints in the financial management of grants and allocations restrict both the scope and breadth of scientific and technological research in the Gulf State universities. At a discussion among presidents of Gulf State Universities on the issue of scientific research, for instance, it was noted that in Arab nations only 0.2% - 0.3% of national expenditure was allocated for scientific research.

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TABLE 5.2

COMPARISON OF ANNUAL BUDGETS

<table>
<thead>
<tr>
<th>Year</th>
<th>Budgets</th>
<th>Kuwait Univ.</th>
<th>King Abdul Aziz Univ.</th>
<th>King Faisal Univ.</th>
<th>King Saud Univ.</th>
<th>Um Al Quara Univ.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>KD</td>
<td>SR</td>
<td>SR</td>
<td>SR</td>
<td>SR</td>
</tr>
<tr>
<td>1</td>
<td>Univ Budget</td>
<td>56450000</td>
<td>1505000000</td>
<td>689000000</td>
<td>4925000000</td>
<td>525000000</td>
</tr>
<tr>
<td></td>
<td>R&amp;D Budget</td>
<td>1850400</td>
<td>7610000</td>
<td>5100000</td>
<td>20634000</td>
<td>4832860</td>
</tr>
<tr>
<td></td>
<td>%</td>
<td>3.28</td>
<td>0.51</td>
<td>0.74</td>
<td>0.42</td>
<td>0.92</td>
</tr>
<tr>
<td></td>
<td>Lib. Budget</td>
<td>616800</td>
<td>7410000</td>
<td>4500000</td>
<td>10014213</td>
<td>3768360</td>
</tr>
<tr>
<td></td>
<td>%</td>
<td>1.09</td>
<td>0.49</td>
<td>0.65</td>
<td>0.20</td>
<td>0.72</td>
</tr>
<tr>
<td>2</td>
<td>Univ Budget</td>
<td>68564000</td>
<td>1374000000</td>
<td>521000000</td>
<td>1997000000</td>
<td>453000000</td>
</tr>
<tr>
<td></td>
<td>R&amp;D Budget</td>
<td>1320600</td>
<td>8432000</td>
<td>6200000</td>
<td>18486000</td>
<td>4662960</td>
</tr>
<tr>
<td></td>
<td>%</td>
<td>1.93</td>
<td>0.61</td>
<td>1.19</td>
<td>0.93</td>
<td>1.03</td>
</tr>
<tr>
<td></td>
<td>Lib. Budget</td>
<td>622000</td>
<td>9700000</td>
<td>3500000</td>
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</tr>
<tr>
<td></td>
<td>%</td>
<td>0.91</td>
<td>0.71</td>
<td>0.67</td>
<td>0.23</td>
<td>0.55</td>
</tr>
</tbody>
</table>

Source: Questionnaire & Annual Reports

KD = Kuwaiti Dinar - 1 KD = £ 2.105
SR = Saudi Riyal - 1 SR = £ 0.174
This is twelve times lower than in the West (this was reiterated with reference to the Gulf States in a non-specialist magazine (Al-Yamamah, 1990, p.47). This compares unfavourably with the developed world where consistently over 2.0% of national expenditure is allocated for research, more than 1.5% of which goes for non-defence R & D. In addition, roughly 92% of the world’s scientists engaged in R & D are in the developed nations which accounts for about 98% of the global expenditure for these activities. In recent years, a gradual increase in third world spending on scientific and technological research has been discerned and while this trend is to be welcomed, it still remains a regrettable fact that the per capita expenditure on R & D in third world countries is roughly 300 times less than in developed nations (Faruqui, 1986, pp.119-120). The situation of budget has gone from bad to worse after the Gulf War.

At KU, in 1981, new management necessitated re-designation of Research Management Unit (RMU) as the Office of Vice Rector for Research (OVRR), investing it with greater autonomy in research sponsorship. During the next five years, new strategies for research promotion, support and services, evoked an encouraging response from faculties, resulting in a dramatic increase in the number of grants (KU-Research Report, 1987, p.33). With the upgraded services, some of the recurrent constraints in grants management melted away encouraging a larger academic community to participate in the Sponsored Programmes. The statistics for the period 1986-87 and 1988-89 provides further evidence of increased faculty participation in the Sponsored Programme, which was reassuring for determining directions for further growth. Positive signals for this move emanated from the vast research information resource, under collation since 1986, providing a valuable insight into faculty research interests, areas of national significance, themes of declining interest and emerging areas of research concentration. These trends became increasingly obvious through the documentation of faculty publications resulting from funded research (KU-Research Report, 1990, pp.20-21).

The following observations are based on the analysis and interviews in section 5.4.
above and also confirmed in literature review section 3.10, which ascertain that the
promotion of science and technology cannot be carried out without a driving
philosophy. Basically, the request for funding, problems of standardisation; problems
of ‘politics’. These are the problems, the researcher gathered from interviews and
analysis above, that the problem is far more than unsolved technological barriers, that
keep networks from getting under way. Handsome budgets do not solve all the
problems. Researchers must receive encouragement and incentives to conduct research
oriented on projects and programmes leading towards national development goals and
their input must be heard at the planning stage. Trans-national mechanisms of co­
operation and mutually beneficial research linkages should be established and nurtured,
both regionally and outside the region. The area singled out for the most consistent
critique was the lack of a budget for scientific research within the university which
was therefore, dependent on ad hoc contributions from governmental sources, in the
case of Saudi Arabia particularly the KACST and PAAF/KFAS in case of Kuwait
which have mostly funded applied research. There was no clear vision or long-term
prioritisation of research discernible either at the university or inter-university level
and systematic resources were minimal. The KACST mandate was invariably utilised
for quick solutions to the urgent problems.

5.5 R & D PERSONNEL

For this study the researcher questioned the institutions/organisations, about

the number of people engaged in S & T/ R & D activities in the previous two years
giving the details of:

Managerial staff
Scientific staff
Technicians
Administrative staff

KFUPM is predominantly a S & T university with strong R & D programmes, PhD
programmes and with a separate Research Institute, though a part of the university
with semi-independent administration, takes a distinctive lead in all the categories of R & D personnel. This is the only university in the study which gave the total number of personnel present as a whole with Managerial Staff of 61 and 60, Scientific staff of 533 and 591, technicians 1,090 and 871, but surprisingly a very high figure of 1,800 and 1,750 for administrative staff due to the development of the research institute and a very comprehensive R & D programme. In the case of KFUPM, the only university where pro-rated figures were not needed, the staffing figures were very comprehensive for the whole university including contract staff. This is the only university in the study which is just purely a S & T university with a strong R & D programme and attached with a modern up-to-date large semi-independent Research Institute on the level of the Stanford Research Institute in the USA or one of the large science park projects in the UK.

However, for other Saudi universities the figures on personnel were given as an estimation for S & T programmes faculties and departments from the total staff available and these figures cannot be assumed to be accurate except in the case of KFU. (Table 5.3).

The researcher was able to verify personally the status of personnel figures in some cases on one of his visits. However, it was impossible to verify in all the cases of the Saudi universities as the researcher was unable to visit some of the campus sites in the remote areas of Taif, Abha and Tabuk to name but a few.

At the KU the rise from 348 to 418 scientific staff was justified due to a strong R & D base university in the region. Due to the re-organisation of R & D management there was also an increase in Managerial staff from 35 to 48 almost totally controlled by locals. However, both the categories of Technicians and Administrative staff remained fairly static with a slight rise from 410 to 422.

At the newly established AGU the jump of more than 100% in Managerial Staff was expected, because beside the Faculty of Medicine they started with, the university was preparing to develop other programmes for which senior managerial staff were
appointed for the planning stage. The trend also continued in all the categories of staffing, jumping from 30 to 42 in scientific staff; 50 to 65 for technicians and 40 to 64 for administrative staff.

At KISR there was a gradual growth in all the categories of staff where recruitment is carried out in a very organised manner, therefore, the retention is also very high and the professional growth is very well organised. For scientific staff the increase was from 430 to 442; for technicians there was a meagre rise from 112 to 116 and for administrative staff from 168 to 182. However, due to a reorganisation plan Managerial Staff was cut to 51 from 53. Another newly established university SQU, as expected, reported a sharp rise in staff recruitment. There was a 400% rise in Managerial Staff from 7 to 28. More than a 400% rise in Scientific staff from 25 to 112. Also more than a 400% rise from 31 to 124 staff and 100% rise from 42 to 84 for Administrative staff.

For QU, basically a teaching university with very few R & D activities, staffing figures remained very stable with the increase from only 2 to 4 in each category.

KAAU whose staffing figures were reported on a pro-rata basis for S & T faculties remained 12 to 12 for Managerial Staff and increased from 67 to 71 for Scientific Staff and decreased from 84 to 82 for technicians and administrative staff. In spite of several requests the staffing figures for the Faculty of Medicine were not provided. These figures are limited to the Jeddah Campus only.
TABLE 5.3
PERSONNEL ENGAGED IN R & D ACTIVITIES

<table>
<thead>
<tr>
<th>Institutes</th>
<th>Managerial Year 1</th>
<th>Managerial Year 2</th>
<th>Scientific Year 1</th>
<th>Scientific Year 2</th>
<th>Technician Year 1</th>
<th>Technician Year 2</th>
<th>Administrative Year 1</th>
<th>Administrative Year 2</th>
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<td>AGU</td>
<td>5</td>
<td>12</td>
<td>30</td>
<td>42</td>
<td>50</td>
<td>65</td>
<td>40</td>
<td>64</td>
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<tr>
<td>KU</td>
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<td>48</td>
<td>348</td>
<td>418</td>
<td>410</td>
<td>422</td>
<td>280</td>
<td>280</td>
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<tr>
<td>KISR</td>
<td>53</td>
<td>51</td>
<td>430</td>
<td>442</td>
<td>112</td>
<td>116</td>
<td>168</td>
<td>182</td>
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<td>SQU</td>
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<td>28</td>
<td>25</td>
<td>112</td>
<td>31</td>
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<td>42</td>
<td>84</td>
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<tr>
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<td>15</td>
<td>42</td>
<td>46</td>
<td>48</td>
<td>50</td>
<td>65</td>
<td>68</td>
</tr>
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<td>12</td>
<td>67</td>
<td>71</td>
<td>84</td>
<td>82</td>
<td>84</td>
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<td>180</td>
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<td>12</td>
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<td>34</td>
<td>74</td>
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<td>122</td>
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<td>1,800</td>
<td>1,750</td>
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<td>15</td>
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<td>79</td>
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<td>0</td>
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</table>
KACST, the major R & D funding institution, reported figures for only one financial year, these being 30 for managerial; 180 for scientific, mostly senior consultants at a national level to review the progress of programmes and projects; only 10 technicians due to very limited in-house R & D; and quite a high figure of 122 for administrative staff.

The figures for both the KSU, the largest university network system in this study and the UAQU at Mecca another Saudi university which has the largest number of postgraduate programmes in non S & T subjects, reported pro-rated stable figures for their staffing, limited to their Mecca campus.

The numbers of Managerial staff at all levels remained static in all the institutions except at new institutes like AGU, SQU and surprisingly at KFU.

The scientific, technicians and administrative staff follow almost the same pattern.

The native qualified senior academic staff in the GCC universities concentrate their energies on non-academic and administrative duties within their respective academic environments. The traditional linkages between universities in the region and their respective communities have been tenuous and collaboration with industry as well as support from wealthy sponsors has been lacking. By and large, the emphasis for research has been short-term problem-solving as opposed to fundamental issues or long-term applied research projects.

According to the Director of the Research Institute (KFUPM):

There are several factors in Saudi Arabia that weaken S & T research and development activities. The shortage of scientific and technical manpower in Saudi Arabia is the main weakness related to S & T research and development activities. Another reason for S & T weakness may be insufficient systems for scientific and technology development. He argued that a nation can make progress in S & T development only when its educational system, R & D system, ties between research and industry and industrial management systems have been modernised and co-ordinated in an efficient manner.
UAEU Professor of Chemistry revealed that

In terms of incentives to encourage research at the faculty level, the limitations placed salary on increases (researchers can only be paid a maximum of 30% of their salary for research, irrespective of its scope or duration) was perceived as a stumbling block. Also the fact that faculty was not supported in their attempts to keep abreast of international developments in their respective fields through attending conferences and collaborating in projects was seen as counter-productive.

An important constraint on faculty research as identified by Kuwait University Physics Department Chairman:

was the absence of research or teaching assistants at universities. In fact, there appeared to be a lack of infra structural support. The faculty spent a lot of time on administrative duties and non-research committees, since the relative newness of GCC universities made it impossible for the faculty to concentrate exclusively on research. Another factor, observed by non-GCC faculty, was a statute which denied foreigners access to consultancies and research. Among many GCC faculty, only Associate Professors and above are permitted to be consultants.

According to the KSU Dean of Science:

the major obstacles towards increasing both the universities’ role and performance in scientific and technological research appeared to be the terms of "Conditions of Service", "Faculty Training and Development", "University Autonomy" and "Research Vs Teaching". Under Conditions of Service the negative constraints on research were perceived in terms of the lack of real financial and recognition incentives as well as the absence of any kind of assistance in the maintenance of laboratories and the conducting of experiments. There was a near-universal complaint that Faculty Training and Development was an impediment since access to disciplinary conferences and symposia was curtailed and the availability of on-line reference systems, database and even journals was restricted thereby handicapping the faculty through a lack of exposure to recent developments in their respective fields.

Director Engineering Division KISR illustrated that:

The scientific community should not be released from its responsibilities in carrying out R & D relevant to actual needs and in pursuing the development required for the application of R & D rules. After all, the scientific community makes its own rules and regulations that promote the same incentive for further effort beyond publications. Several R & D institutions in Arab States did start to promote contract research with the productive sector in the 1990’s. For
example, Kuwait Institute for Scientific Research (KISR) generated around 50 percent of its annual expenditure from contract research (prior to the Gulf War).

The following observations are based on the analysis and interviews in section 5.5 and also confirmed in literature review section 3.2 to 3.4 and 3.7 to 3.10.

In assessing the changes that have taken place in university research over the past five years, the respondents identified two different elements which contributed to complicating the scenario (based on questionnaire analysis and interviews). It would appear that the output of research has increased purely due to increased faculty from abroad, but cut-backs in funding especially due to the Gulf War and other institutional support such as research supplies and journals has led to decline in per capita research.

A large number of manpower persons are trained in the field of science and engineering, however most of them are engaged in occupations unrelated to science and engineering. Manpower development should be fully linked to the needs of society and utilised creatively. It must be understood that the ability of scientific workers to exploit new opportunities and to meet new demands is infinitely more important to the future of the GCC than their absolute number. Information about science is of little avail for the purpose; the attribute needed is creativity and training in science and engineering.

At present the GCC is divided into a multitude of tiny and hardly viable entities. Each state taken separately, will be unable to make manpower training respond to their needs and help their citizens lead a modern and full life. In other words, most of the GCC countries, do not by themselves have the critical human mass that would allow them to make any scientific and technological action economical or viable. Therefore, this fact should be taken into account in manpower development and appropriate solutions should be thought of.

Based on analysis and interview findings it is realised that no single member of the
GCC can provide the S & T expertise in all the fields of socio-economic development. On a collective basis, however, there is sufficient expertise, which when pooled, could render consultancy services in most fields except a few sophisticated and emerging technologies. Panels of highly qualified consultants and advisors could be organised whose services may be utilised for projects ranging from technological, complex to simple and routine tasks. In this manner a beginning will be made in progressively reducing the total dependence of the members of the GCC on foreign consultants and achieving a good deal of self-reliance in the important area of consultancy and advisory services. This is needed more after the Gulf War.

The total size of the high-quality indigenous scientific and professional community in GCC is still very small. GCC universities and the GCC governments development efforts are still heavily dependent on expatriate scientific and professional manpower and that about 50% of the science and engineering faculties are staffed by expatriate professionals.

5.6 R & D ACTIVITIES

Historically, if we were to consider the specific example of KSU, in historical perspective the oldest and largest university in the Kingdom of Saudi Arabia during the two years 80/81 and 81/82, only 1,103 current and published research projects were undertaken by faculty and graduate students. Of these 669 came under the classification of science and technology. When this is compared with the total number of faculty and graduate students, it shows that well below half of their productivity goes towards scientific research. In fact, considering only the number of faculty at the university in the broad area of science and technology, the research ratio was 0.67 which means that approximately two faculty members undertook one research project at KSU during this two year period. A sample study undertaken in the US showed that in 1984/85 the average publication rate in science and technology was over 1 per year which is three times the optimistic figure cited above for King Saud University (KSU-Annual Report, 1982-83, p. 120).
In a 1986 report of the Research Institute of KFUPM which presented abstracts of research undertaken since 1979, of the 54 projects listed, only 6 lasted over two years, while 18 were for 6 months or less. The overwhelming majority of these research projects addressed specific problems that required quick solutions. Scientific and technological research conducted at KFUPM outside the Research Institute (RI-Abstracts, published in April 1990). According to this, since 1978, a total of 156 research projects has been undertaken by the faculty, of which 130 have been completed successfully. The situation concerning scientific and technological research at KFUPM was quite similar. According to the Abstracts of Funded Research Projects [1989], research projects were restricted to 10 month periods and out of total of 71 projects funded by the university through its Scientific Research Council, 22 were classified as pure Science projects while 23 were in the Applied Sciences. However, within the so-called Pure Sciences, all, excluding four mathematical projects, could broadly be classified as applied research. More than half the total expenditure of SR 7,743,403 for the year 1989 was allocated to 9 research projects in the medical sciences (KFUPM-Research Institute Report 1986: Abstracts of Funded Research Projects 1989).

Before 1977, there was practically no specialised S & T information organisation in Saudi Arabia. The collection and use of documents were carried out separately by both the research and production units themselves. In 1977 Saudi Arabia established in Riyadh an independent organisation specialising in S & T originated as Saudi Arabian National Centre for Science and Technology (SANCST) now under the name of King Abdul Aziz City for Science and Technology, or as it is known by its acronym, KACST. The King Abdul Aziz City for Science and Technology (KACST) is an independent scientific organisation in the Kingdom of Saudi Arabia and is administratively attached to the office of the Prime Minister. It was established in 1977 and is responsible for the formulation of national science and technology policies and for the co-ordination and promotion of applied scientific research in the Kingdom of Saudi Arabia. KACST also sponsors and supports research activities across a broad spectrum of scientific and technological fields. Recognising the
importance of current scientific and technical information for the success of its research and development programmes, KACST created a special directorate for information systems and technical services to provide a wide variety of support services to the academic and research community in the Kingdom. The services offered by the Directorate of Information Systems and Technical Services included production of national S & T databases, provision of on-line search services and operation and maintenance of two data communication networks. These services varied greatly in their scope, impact and visibility and were provided to scientists and researchers in the Kingdom without any regard to their location or affiliation (KACST Handbook).

Although the mandate of KACST supports only applied research projects, this system of centralised funding has one crucial advantage of actively soliciting and encouraging research, that is in keeping with national development goals by specifying areas of urgent need for research. For the year 1987-88, KACST detailed a list of 27 areas within which proposals for funding were encouraged. (KACST Ninth Annual Report, 1988-89, p.14).

In addition, KACST supports many wide-ranging national research projects which are determined on the basis of national importance and urgency. Seven of these research programmes were funded in 1987, six of which were to be implemented by university researchers. Notable among these is the nutritional status projects undertaken by KSU for the Ministry of Health. This project is a fruitful research collaboration between planners and faculty, which could provide an invaluable basis for further work in the areas of public health, preventive medicine and environmental medicine. In addition, it will foster community-based education programmes which would improve the relationship between the universities and their constituencies. (KACST Ninth Annual Report, 1986-87, p.14).

By establishing this organisation, Saudi Arabia hopes to achieve many advantages by putting researchers together in one place, leading to communication of ideas and more
scientific and technological innovation. Furthermore, KACST can be an effective way
to reduce expenditures on expensive research equipment since researchers can share
them. KACST objectives include the following:

1. to formulate a national policy for S & T development and draw up the
strategy and plan for its implementation;
2. to conduct applied scientific research programmes to further promote the
Kingdom's development;
3. to assist the private sector in research and development with regard to
agricultural and industrial products;
4. to support joint research programmes between KACST and international
scientific institutions;
5. to award scholarships to develop the necessary skills in individuals and
grants to institutions to undertake applied research work;
6. to co-ordinate with government agencies, scientific organisations and
research centres in the Kingdom (King Abdul Aziz City for Science and Technology,
1990, P.6).

KACST is involved in many activities such as transfer and adaptation of suitable
technologies, development and diffusion of indigenous technologies and provision of
technological assistance to different sectors of the Kingdom. KACST is also
responsible for formulating appropriate laws and regulations for the transfer of
technology.

In order to achieve its responsibilities and promote S & T, KACST has the necessary
infrastructure for carrying out scientific research activities. These include laboratories
communication facilities and information systems. KACST performs its activities and
functions through the following directorates and institutions:

1. General Directorate of Research Grants programmes
2. General Directorate of Scientific Awareness and
   publishing
3. General Directorate of Information Systems
4. General Directorate of Patents
5. Directorate of Technology
6. Institute of Atomic Energy Research
7. Institute of Space Research
8. Institute of National Resources and Environment
9. Institute of Astronomical Research
10. Institute of Petroleum and Petrochemical Industries
11. Institute of Electronic Research

The General Directorate of Information Systems support research and development by providing appropriate information to engineers, researchers and experts in the Kingdom through on-line searches from its own databases and from selected foreign databases. This unit operates the following databases:

1. On-going research projects
2. English bibliographies
3. Arabic bibliographies
4. Manpower
5. Union list of periodicals
6. Current awareness
7. KACST-funded projects

Despite the fact that acquiring information and technology is not restricted to one agency in the country, KACST leads other organisations by importing information in S & T fields. The reasons for this are highlighted by Manzi (n.d.) as follows:

1. KACST as an independent organisation is highly prepared for information transfer. It has a good information system that allows for access and acquisition of information with little expense.
2. KACST's responsibilities involve making many agreements with domestic as well as foreign scientific and technical institutions to aid with Kingdom projects and programmes.

3. KACST's responsibilities involve developing many projects and conducting many studies that are important to the country's development.

In order to advance S & T programmes in Saudi Arabia, KACST as a representative of the Saudi government has entered into several projects agreements with other nations, some of which were signed with the USA such as those with the Department of Energy (DOE) in the field of solar energy, with the National Science Foundation in the field of S & T co-operation, with the National Oceanic and Atmospheric Administration in the field of remote sensing and with the National Aeronautics and Space Administration in the field of space-related S & T.

In addition, KACST has entered into co-operative agreements with scientific institutions in other countries such as Germany, France, Canada, Taiwan and South Korea. Co-operative activities with these nations include arabisation of technical terms, astronomical observatories, fresh-water fish culture, space sciences and solar energy.

KACST has undertaken many important efforts concerning information and technology, some of which include:

1. developing Saudi Arabian manpower by employing Saudi students and training them in conducting workshops in USA as well as inviting, at KACST expenses many scholars in information science to visit the country and give lectures or contribute to workshops.

2. encouraging librarians and information specialists in the country to achieve complete policy for co-operation between libraries and information centres in
information sharing. Some of the KACST's efforts in this area include the inter-library exchange programmes, union catalogue, bibliographic standards and rules, list of S & T subject headings and English-Arabic Multi language S & T Thesauri and Dictionaries.

3. establishing a national computer network, KACSTNET, which links many libraries and information centres in Saudi Arabia.

4. creating databases in different areas that are important.

(Manzi, pp. 24-25).

In support of KACST's contributions towards improving information services in Saudi Arabia, Saleh Al-Athil, director of KACST, declared to an Al-Riyadh newspaper recently that information technology transfer is among the top priorities of KACST's roles. He indicated that KACST has granted SR. 15,791,828 for scientific research in the information field alone.

Though the tradition of scientific research at KU dates back to the year 1966, an organised institutional mechanism to co-ordinate and support Faculty research did not exist prior to 1979. Nevertheless, evidence of Faculty research is clearly available in the First volume of the Research Abstracts (1966-84) series which consolidated 18 years of University research. This volume incorporates a total of 1,335 abstracts representing the fields of Medicine, Science, Engineering, Arts and Humanities, Social Sciences and Agriculture showing the total research through self sustaining resources.

Viewed in perspective, the period between 1985-86 and 1989-90 could be designated as a growth-intensive phase in Research Administration’s drive to build a strong foundation of research at KU upholding quality and demonstrating its critical value for national priorities. The progress during this phase would not have been possible
without a parallel growth in research expenditure which doubled from KD 1.3 million in 1981-82 to KD 2.8 million in 1980-90. Though University budgetary allocations for research continued to grow from KD 1.4 million in 1981-82 to KD 3 million in 1989-90, this amount accounted for only 3.6% of the total KU budget for the period 1989-90. When viewed against the designated goals of a more advanced phase in Faculty research development, this amount, though relatively small nevertheless exhibited an upward budgetary allocation for research, reflecting a promising trend in institutional support for research advancement. KU, provided an empirical measure of scientific endeavours from the small beginnings advancing to a peak in 1990. (KU Research Reports and interviews). The planned transition to a more advanced phase in research development was going well, which was brought unfortunately to a devastating halt due to the Gulf war.

For this study questions were posed asking for the details of the number of research and development projects for the previous two years in the specific research field activated by the survey organisations/institutions and also the kind of research projects and also ongoing projects in the previous two years. (Table 5.4)

<table>
<thead>
<tr>
<th>Internally funded</th>
<th>Externally funded</th>
<th>Joint research</th>
<th>Total R &amp; D budget</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

However, the response included only one financial year. Overall, KFUPM takes the lead by 86 (22.8%) internally funded research projects, 42 (33.3%) externally funded research projects and 16 (21.6%) joint research projects funded nationally, regionally and internationally. These figures also included the work carried out by an independent Research Institute located on the campus. KFUPM is followed by KISR with 110 (29.2%) internally funded projects, 5 (4.0%) externally funded projects and 28 (37.8%) joint research projects which is distinctive as a purely functional research institute. However the KSU which takes the big chunk of SR 18,486,000 (Table 5.2)
produced only 30 (8.0%) internally funded research reports followed by 18 (14.3%) externally funded and only 6 (8.1%) joint funded. From the other universities only KU is prominent in R & D activities by producing 64 (17.0%) internally funded, 22 (12.5%) external funded and 8 (10.8%) joint funded research reports. The R & D research activity at KAAU was not very attractive with 32 (8.5%) internally funded, 12 (9.5%) externally funded and 4 (5.4%) joint research projects. The most shocking figures came from KFU which takes a bulk of 0.74% for the R & D budget from the total university budget and being a special subject university reported only 11 (2.9%) internally funded projects, 6 (4.8%) externally funded research projects and only 2 (2.7%) joint research projects. KACST, basically a funding agency, did report 12 (3.2%) internally funded, 6 (4.8%) externally funded and 5 (6.8%) joint research projects. Both the new universities reported low figures of R & D activities which is understandable, i.e., AGU basically a medical teaching University reported only 4 (1.1%) internally funded research projects and SQU in Oman reported only 2 (0.5%) internally funded research projects. However, the status at UAE University with 6 (1.6%) internally funded, 3 (2.4%) externally funded and no joint funded research reports, QU’s report of 12 (3.3%) internally funded, 8 (6.3%) externally funded and 3 (4.1%) joint research projects and the report by UAQU of 8 (2.1%).

Assistant Director Research at KAAU believed that:

R & D activities in the GCC states have remained primarily a public sector domain. Most GCC States have established national policy-making bodies whose primary functions are: planning, priority setting of R & D agenda and partial financing of R & D activity carried out by R & D performing institutions. Most of these bodies are in the form of ministries and/or councils often dealing with all the components of S & T system which compromise higher education, R & D and technical services.

The other three performers of R & D in the GCC States are: the autonomous R & D institutions, university based centres or departments and R & D units in the large or medium industries. The R & D units in the industry sector are not institutionalised in independent structural units.
### TABLE 5.4

**R & D ACTIVITIES**

<table>
<thead>
<tr>
<th>INSTITUTES</th>
<th>IF</th>
<th>%</th>
<th>EF</th>
<th>%</th>
<th>JR</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGU</td>
<td>4</td>
<td>1.10</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>KU</td>
<td>64</td>
<td>17.00</td>
<td>22.00</td>
<td>17.50</td>
<td>8.00</td>
<td>10.80</td>
</tr>
<tr>
<td>KISR</td>
<td>110</td>
<td>29.20</td>
<td>5.00</td>
<td>4.00</td>
<td>28.00</td>
<td>37.80</td>
</tr>
<tr>
<td>SQU</td>
<td>2</td>
<td>0.50</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>QU</td>
<td>12</td>
<td>3.20</td>
<td>8.00</td>
<td>6.30</td>
<td>3.00</td>
<td>4.10</td>
</tr>
<tr>
<td>KAAU</td>
<td>32</td>
<td>8.50</td>
<td>12.00</td>
<td>9.50</td>
<td>4.00</td>
<td>5.40</td>
</tr>
<tr>
<td>KACST</td>
<td>12</td>
<td>3.20</td>
<td>6.00</td>
<td>4.80</td>
<td>5.00</td>
<td>6.80</td>
</tr>
<tr>
<td>KFU</td>
<td>11</td>
<td>2.90</td>
<td>6.00</td>
<td>4.80</td>
<td>2.00</td>
<td>2.70</td>
</tr>
<tr>
<td>KFUPM</td>
<td>86</td>
<td>22.80</td>
<td>42.00</td>
<td>33.30</td>
<td>16.00</td>
<td>21.60</td>
</tr>
<tr>
<td>KSU</td>
<td>30</td>
<td>8.00</td>
<td>18.00</td>
<td>14.30</td>
<td>6.00</td>
<td>8.10</td>
</tr>
<tr>
<td>UAQU</td>
<td>8</td>
<td>2.10</td>
<td>4.00</td>
<td>3.20</td>
<td>2.00</td>
<td>2.70</td>
</tr>
<tr>
<td>UAEU</td>
<td>6</td>
<td>1.60</td>
<td>3.00</td>
<td>2.40</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

**Source:** Questionaire 1-8
The Chairman of Engineering at QU expressed that:

The bulk of R & D activities in the GCC States is performed in public sector institutions organised either independent of ministries of governed by them. Research is also the second function after teaching in all the universities in all the GCC States. However, only few universities have given priority to research in their programmes and therefore, research has remained a marginal activity in the majority of the GCC universities.

Vice Dean of Research at KFUPM rightly pointed out regarding GCC that:

Traditionally, research activities in the universities are carried out in departments. These departments were established to perform one or more of the three functions, namely teaching, research and services. The vast majority of these departments are engaged primarily in teaching, even though some do carry out research. Much of the performed research was traditionally initiated by staff members and was performed with little or no funding support from source outside the normal department budget.

Vice Rector KU revealed that:

The scientific research at KU owes its emergence to the University’s mission of higher education that provides for parallel growth of research. Implicitly in this mission is the functional duality of the University, responsible on the one hand for transmitting, preserving, generating and dispersing knowledge and on the other, for promoting research creativity. These functions constitute the fundamental basis of University’s policy of progress to excellence with the belief that the State’s only institution of higher education has a national obligation to prepare the human resource vital for progress and induce a habit of scientific thinking crucial to development. The background clarifies the University’s commitment to research and allows a retrospective review of the growth of Faculty research in diverse disciplines.

The Director of Research at SQU proposed that:

Each university should centrally determine standards in the area of system and networking to ensure compatibility, etc., on the campus. Senior people from the computer centre, library and academic computing departments should co-ordinate activities in this area.

In order to enhance R & D activities the Director of Computer Centre said that:

All staff and campus students must possess basic skills associated with the use of information technology. It should be the responsibility of each department to ensure that an appropriate basic level of skill is attained by its students and
that the regulations of each undergraduate and postgraduate course of the university state the skills in IT which will be taught and assessed. Each university must move towards one desk workstation per member of staff.

He finally concluded that:

Make great institutional efforts to support development of new teaching and learning tools that will be possible with the application of new information technologies. This may be provided by the course work development in different subjects.

With regard to the dichotomy between Basic and Applied Research, there appeared to be a division of opinion.

According Dean of Engineering at Kuwait University:

In general, university faculty felt that at that time there was an almost exclusive national emphasis on applied research whereas they would have preferred more of a balance through the addition of basic research projects. Conversely, the general sense among planners was that basic research was a luxury that did not contribute to national development needs. However, this contradiction could be resolved if basic research were not seen as abstract fundamental research of no practical relevance, but rather as long-term research on issues related to the specific concerns of the regions, whose results would help make far reaching scientific and technological changes in the not too distant future. The perceptions were borne out by the analysis of research projects undertaken by GCC universities.

Based on questionnaire analysis, interviews and reviews of reports in section 5.6 revealed that in most of the GCC countries, research activity is not linked to development. Most often, research is carried out in the universities or in research institutes established for that purpose. Often because of lack of national and regional network planning relationship between the active economy and research centres, researchers are linked to research demands outside their countries as most of the senior researchers are expatriates. Most often a scientist will carry on a research activity just because he may use, continue and benefit from the financial support or recognition by a university or a government in one developed country or another. The
research activity thus carried out becomes linked to the aims and interests of the
developed country or another with the result that the research done in GCC countries
end up giving at the expense of their own development both their resources and their
manpower to those countries that are already well-developed, thus making their
relative under-development even greater. This scenario is not acceptable after the Gulf
War.

5.7 R & D CO-OPERATION

The researcher asked for agreements started with organisations/institutions for R & D
activities. No formal replies were given by the authorities, but based on interviews
with academic and other authorities the researcher observation and analysis will follow
at the end of this section.

KFUPM Research Scientist revealed that:

By and large, that there was no institutional mechanism to ensure a cohesive
research community. Dissemination of knowledge of colleagues’ research was
generally restricted to those working in the same area. What was not notable
in this regard, however, was the universally recognised need for informal and
non-institutional communication between and among researchers, planners and
industrialists. The enthusiasm expressed by all concerned about such informal
and even *ad hoc* dialogues showed the extent to which it was perceived that
institutionalisation would lead to centralisation and to bureaucratisation. They
urgently felt the need for flexible channels which would facilitate discussion
between university researchers and industry as well as between policy planners
and university researchers. It was also felt that in the particular case of
KFUPM that the Research Institute functioned as a conduit between the
university and industry but did not include planner. (KFUPM researcher and
faculty interviews).

A major determinant of the extent and importance of faculty research was seen to be
social. The lack of public awareness led to a reduced emphasis on research, as did the
level of outside commitments. There were few avenues of publicising research locally
and non-technically and little institutional recognition was accorded to the researchers,
whose financial enhancement was also not commensurate with their work.
The role of GCC universities in this regard is negligible and depressing. Although most of the faculty believe that community involvement was necessary, there were no formally enunciated university-community or university-city goals or relations. Neither the university leaders and administrators nor the community leaders seriously perceived that the university could be a major catalyst in the social and economic development of the communities within which they were located.

Dean of Engineering KSU felt:

that with regard to the socio-cultural environment, the deadlock between the university and the bureaucracy had a negative impact. Not only did outdated procedures hinder current research but the prospect of long delays and uncertain decisions actually pre-empted new projects from being offered to the university particularly from the industrial sector, which needed quick results.

Based on analysis and interviews it was revealed that the general attitude towards research from those outside the university was perceived as negative by most of the respondents. It was felt that the industrial sector needed to be convinced of the viability of university research. Some even felt that the university should actively market its "products" to industry in order to bridge the gap that currently exists between them. This gap was traced to the tendency to have foreigners as technical managers of industrial enterprises in GCC. This meant that institutional links with the universities were less than they would have been if GCC manpower themselves were in charge of the technical aspects of industry.

Institutional innovations and reforms must be made to bridge the existing gap between the government and the university on one hand and the university and community on the other. In this respect, the university/community can play important roles and dynamic leadership should emerge from the university community itself.

It has been generally observed that GCC universities function mostly in isolation from the mainstream problem of social and economic development of GCC. The linkages between GCC universities and GCC countries national development plans and industries are weak and without any systematic and directed goals and plans. Most
of the respondents concur with the fact there are no significant institutional mechanisms in place to foster and strengthen the relationships between the university and government and university and industries in GCC. Although it is generally felt that the universities should play an active role in GCC countries national economic plans and development, most experts think that the major responsibility to build this relationship lies with the GCC government and the bureaucracy. This practice is not at all feasible after the Gulf War.

5.8 R & D PRODUCTION

For this study a question was asked about

*the conferences, meetings, seminars and workshops organised by the institutions /organisations:*

- Conferences attended by your staff
- Conferences, meetings, seminars and workshops organised
- Papers presented by your staff
- Patents registered by your staff
- Books completed by your staff

When one considers the actual record of systematic dissemination of such research, the situation becomes even worse. For instance, only 98 publications resulted from GCC scientific research projects within the period 1981-1986 in the major scientific journals, according to the Arabic Gulf Magazine for Scientific Research published by the Science Department of the Arab Bureau of Education for the Gulf States.

It was observed that publications abroad benefited outsiders more than they did GCC society since access to journals was limited and local journals were inadequate (at a meeting of Presidents of Gulf States Universities held in Bahrain in 1982 it was emphasised that there were only 32 specialised journals for all the Arab States). As a result, there is little evaluation of research, either in a public or a private form.
In the analyses that follow, unpublished materials are to be discussed under the following headings:

a) Reports and
b) Patents, Standards and specifications.

Local, national or international conferences, congresses symposia, seminars, etc., are held each year in large numbers. Their proceedings are published especially those held at an international level. The proceedings contain reports on varied topics discussed at the conferences: research and development work carried out, state-of-the-art reports, reports of committees, policy issues or commentaries on publications appearing elsewhere, etc.

No formal response was given for this section to the questionnaire by institution’s authorities, however some of the observation and analysis which came out from interviews and the literature review are stated below:

KSU Chairman, Electrical Engineering revealed that:

King Saud University’s major areas of interest involve pure scientific research. The university has special centres for hydraulic engineering, drug analysis and control, oil, soil and salinity problems and solar engineering. The College of Engineering Research Reports are devoted almost entirely to research work being done by engineers at KSU.

Senior Advisor at the KFUPM elaborated that:

King Fahad University of Petroleum and Minerals’ major areas of concern, as its name suggests, are petroleum and mineral research, solar energy and science policy.

He further added that:

The Research Institute (RI), an independent centre affiliated with KFUPM, has conducted solar research and has carried on a variety of other research projects by Saudi engineers responding to the needs and long range goals of Saudi Arabia. The institute has the most modern scientific equipment and the latest in computer technology. It has about one hundred laboratories. Through
RI facilities, KFUPM engineers and scientists have investigated areas such as water desalination, hydrogen production and solar cooling.

Vice Rector, Research at KAAU proclaimed that:

among King Abdul Aziz University's specialised research centres are the Institute of Applied Geology, the Research Development Centre, the Institute of Oceanography, the Institute of Meteorology and a Solar Energy Research Institute Centre.

Director Research AGU:

believed that the major part (60-70%) of economic growth achieved by the industrial market economies is due to the generation and application of S & T knowledge in the production of goods and services. On the other hand, economic growth in the GCC state has been driven more by quantitative inputs than by S & T. Economic growth has been achieved by most GCC states during the past four decades, but this growth has been due to income generated from the export of natural resources or income from external resources.

Assistant Director KISR pointed that:

The size of R & D performed by universities is difficult to assess the several GCC States due to the irregularity in the documentation of the source of funding of R & D activities. It is true that the government is the major and in many cases the sole financing source of R & D activities in the GCC States. However, performers of R & D activities are of two types i.e. the State governed institution and the universities which are State institutions but they enjoy more autonomy than ministry governed institutions.

Regarding network development the Director, Training KFUPM said that:

With regard to the GCC situation, there is evidence that, although the mid-1980's saw much network development on GCC university campuses, constraints are still hindering the effective utilisation of these IT facilities. There is an absence of any IT committee structure within the university organisation. The university computer centre was the only department with an IT committee structure within the university organisation. Communication between academic departments and the computer centre is in most cases not well established and is typically very limited and unstructured. Absence of network facilities from most of the academic departments and staff offices and lack of appropriate training programmes, have limited users' (staff, students and administrators) awareness of and ability to use IT equipment. Thus, integrated computerisation has yet to appear on the campus. The connection
with the mainframe computer has not been made and conditions have militated against establishing campus-wide network systems and due to a large amount of data on the library and information system the main computer centres are reluctant to co-operate fully.

Director Computer Centre KFUPM added that the campus should:

develop fully effective networks with access available in and between departments, all offices, teaching rooms and laboratories. The network systems must have the ability to interconnect all kinds of computer-based information services (e.g., library, computer centre).

He further added that:

an IT committee structure plan is urgently needed in GCC universities to develop an IT infrastructure on the university campus. Good communication between the academic, library and central computing services is required to alleviate the existing (users’ networks, etc.) problems on the campus.

Universities should be used widely by scientists and engineers for research and other information activities. The universities should serve as repositories for researchers’ works, which allows them to play a major role in assisting industry. The co-operation in research efforts between universities and industry includes exchange of information, dissemination of research findings and increasing the speed of reaching end-users.

Co-operative industry-university research can be viewed as a two-way information exchange process in which technological information resulting from research flows from the university to industry and from industry to the university. In this process, supportive government organisations and programmes very often may encourage and facilitate information flow between industry and the universities.

In the case of Saudi Arabia, universities play a limited role in Saudi industrial R & D. Of the seven existing universities, four are active in research related to STI. These are KSU, KFUPM, KAU and KFU.

The following observations are based on the analysis and interviews in sections 5.2 to 5.8 and also confirmed in literature review sections 3.2 to 3.4 and 3.6 to 3.10 it
appears that GCC universities will need to devote a lot of effort and time in establishing an effective IT and networking in the country. If universities do not start this development immediately, they will face problems due to the spread and diversification of the IT and networking appropriate for use on campuses even for R & D activities.

It has been observed that the breadth and scope of such research projects undertaken in universities in the region leave much to be desired. Most of the research can be categorised as 'research exercises', according to a statement issued by the Presidents of Gulf States Universities in 1985. Many of the research projects reported in Arabic are more of a translation than original research and most of them remain confidential although they are not relevant enough to become policy. Others are conceived and undertaken by university students in fulfilment of requirements for higher degrees and by junior faculty as a pre-requisite for promotion.

The notion that research has to develop within the university network is a controversial one and perhaps the compromise solution reached in the GCC context is to institute semi-autonomous category research centres within the individual universities. However, the researcher's interview data seems to indicate that such a measure does not altogether resolve the problem of integrating research with broader university objectives and goals. In fact, this intermediary structure appeared in the view of some to further alienate the university research network from any organic connection with national development goals and the concerns of both industry and the community. The problem that has arisen within this alternative should prompt us to seriously reconsider, in particular the dichotomy between basic and applied research in the GCC.

The lines of development for the future should be clear: specific, localised and appropriate long-term research has to be generated. Such research must actively engage in the issues that surround the lives of the community as well as industry. The dichotomy between basic and applied research must be dissolved and short-term
problem-solving research must not be given priority of place in the university. Researchers must receive encouragement and incentives to conduct research oriented towards national development goals and their input must be heard at the planning stage. Trans-national mechanisms of co-operation and mutually beneficial research linkages should be established and nurtured, both regionally and outside the region. The issues and directions are well-known, but the specific ways in which they should be implemented and the particular internal priorities attached, as well as the non-university independent variables that should be addressed, require a much more detailed analysis than the existing literature provides.

In general, the respondents felt that university research in science and technology was too oriented towards Applied Research geared specifically to problem-solving and not sufficiently in keeping with the broad perspectives of research on basic issues or long-term development. The area singled out for the most consistent criticism was the lack of a budget for scientific research within the university which was therefore dependent on ad hoc contributions from governmental sources. This is particularly true in Saudi Arabia and Kuwait where most of the funding for applied research comes from KACST and PAAF/KFAS respectively. There was a sense that no clear vision or long-term prioritisation of research was discernible either at the university or inter-university level and systematic resource allocation was minimal. KACST mandate was invariably utilised for quick solutions to the urgent problems.

Within the academic community, research was viewed with a certain ambiguity. As a criterion for promotion, it still held importance, yet it seemed that institutional constraints as well as the lack of financial and other rewards mitigated against the continued emphasis upon quality research.

In more specific terms, the most frequently perceived obstacle to the improvement of research in science and technology remained the lack of fiscal autonomy within the university system. The result of budgetary allocations made once a year is that the university has no financial flexibility for change within this fiscal period. No funds
earned by the university for the conduct of seminars and colloquia can be spent since all financial dealings must be mediated and allocated through the Ministry of Finance. University projects within the government system are not reimbursed and the university cannot receive outside donations. Very recently, under the Fifth Development Plan (1990-1995) in Saudi Arabian universities have been given limited permission to accept outside donations.

These bureaucratic and financial obstacles to the development of university research were identified across the board in GCC. In addition, some of the respondents concluded that industry was reluctant to work too closely with the university for fear that red-tape and organisational constraints would impede efficiency. In fact, the procedural network in place at present remained inflexible and old-fashioned according to some. They felt that the only viable alternatives were to increase the financial and procedural autonomy of the universities with regard to scientific research to be undertaken with outside (i.e., for industry) collaboration. In many cases, prior approval of projects had to be obtained from the Ministry of Higher Education. Even urgent medical research encountered obstacles as wide ranging as customs regulations concerning the import of essential materials and procedure rules which necessitated the obtaining of three bids for supplies before decisions could be made.

It was often reiterated that fees for university-organised colloquia or scientific symposia, though collected by the university, could not be spent, nor could universities accept donations from corporate sponsors for the benefit of the university community at large.

In assessing the changes which have taken place in university research over the past five years, the respondents identified two different elements which contributed to complicating the scenario. It would appear that the output of research has increased purely as an increase of faculty from abroad, but cut-backs in funding and other institutional support such as research supplies and journals have led to decline in per...
capita research.

The relative lack of autonomy at the university level, both in terms of the disbursement and collection of funds as well as in more direct academic concerns such as colloquia, visiting lectures and so on, hampered research in the eyes of the academic community. As a result of excessive centralisation, red-tape and bureaucratic delays, the efficient use of time and resources was hindered. The need was expressed for alternate non-formal channels of communications and collaboration between and among the academic community, industry and planners. In the area of teaching, it was felt, administrative, clerical and other, strictly non-academic, duties took up a lot of time and energy thus eating into research time.

In the GCC context, research will play a growing role in the universities as they become aware of their essential objectives. If it is agreed that there should be motivation to innovate and check on things in society, they will both produce knowledge and create fresh, regulating models. Research cannot therefore be allowed to develop in separate independent centres even if such independence seems sometimes conducive to its development. But since such expansion tends to demand that scientists use an interdisciplinary and even trans-disciplinary approach, research acts as a unit which must be organised and orchestrated and where everyone should have their place. The university must not seem to be the country cousin. It should on the contrary be the home of scientific research which will inspire society’s future leaders.

In the university structure, just as there can be no gap between research and teaching, there should not be any between basic and applied research. There is an enlightened realisation that if it is to be meaningful, science can afford less and less to be cut off from its applications. It is these applications which, by the complexity and increasing size of the problems they have to solve, advance science along the road of interdisciplinary development and constantly create new cross-road sciences, such as cybernetics, computer science or the environmental sciences. Future research workers
should be trained in this spirit and be accustomed to working in teams, as this is an obvious prerequisite for any interdisciplinary research.

It has been observed (based on literature review in section 3.4, analysis in chapter five plus interviews, review of reports and development plans revealed) that the breadth and scope of such research projects undertaken in universities in the region leave much to be desired. The notion that research must develop within the university network is a controversial one and perhaps the compromise solution reached in the GCC context is to institute semi-autonomous category research centres within the individual universities. However, researcher’s interview data seems to indicate that such a measure does not all together resolve the problem of integrating research with a broader university objectives and goals. In fact, this intermediary structure appeared in the view of some to further alienate the university research network from any organic connection with national development goals and the concerns of both industry and the community.

It is necessary to link research action to national development. However, if the industrial facilities of a country are continuously imported as turn-key institutions, there will be no way for research to be sought, developed and used by such industries, since they will remain dependent on outside know-how and spare parts.

Based on questionnaire analysis, interviews in section 5.2 and 5.5 reveal that the awarding of consultancies to expertise outside the region negates all efforts made by establishing research institutes and developing trained manpower. Exporting the problems to be solved outside is as harmful as exporting raw material and would lead to further under developments.

Consequently, if research is linked to development, automatically the results of such a research will be applied to useful ends. Thus, local research should be linked continuously to the changing needs and encouraged as a priority with respect to imported research. In case a certain category of know-how is to be imported, this
should be done through GCC scientists and engineers in the research institutions of the GCC World. Reliance on GCC trained manpower in research is a necessary condition for the development of the GCC and reliance on indigenous research is a necessary condition for long-term industrial progress (based on literature review 3.4 and analysis 5.2).

Within the academic community, research was viewed with a certain ambiguity. As a criterion of promotion it still held importance, yet it seemed that institutional constraints as well as the lack of financial and other rewards mitigated against the continued emphasis upon quality research.

Another core issue which needs to be addressed by the GCC policy makers is related to the problem of modernising the institutional features of the GCC knowledge system. This means that the particular social, cultural, historical and economic context of the GCC must determine what is particularly appropriate for maximising its research potential. In terms of specific and concrete empirical case studies from the developing regions, however, evidence of successful scientific and technological research strategies are hard to come by in the literature. The role and performance of GCC universities in this regard has been less than satisfactory. The total size of the high-quality indigenous scientific and professional community in GCC is still very small. GCC universities and the GCC governments development efforts are still heavily dependent on expatriate scientific and professional manpower. GCC countries spends a large amount of money on education without realistic planning. This is more necessary now after The Gulf War.

It is also generally felt that universities do not have the autonomy — administrative and financial — to bring about the institutional reforms needed to strength the university’s role in building a high quality local scientific and professional manpower base in GCC. With regard to the dichotomy between Basic and Applied Research, there appeared to be a division of opinion. In general, university faculty felt that at present there was an almost exclusive national emphasis on applied research whereas
they would have preferred more of a balance through the addition of basic research projects. Conversely, the general sense among planners was that basic research was a luxury that did not contribute to national development needs. However, this contradiction could be resolved if basic research were not seen as abstract fundamental research of no practical relevance, but rather as long-term research on issues related to the specific concerns of the regions, whose results would help make far reaching scientific and technological changes in the not too distant future. The perceptions were borne out by the analysis of research projects undertaken by GCC universities.
CHAPTER SIX

6 STATUS OF ACADEMIC AND RESEARCH LIBRARIES AND INFORMATION CENTRES IN THE GCC

6.1 INTRODUCTION

In the GCC countries the scientific and technological libraries exist in a number of settings:

(1) in universities with science and engineering programmes;

(2) in corporations which have scientific or technical products or services e.g. ARAMCO, PETROMIN, SACECO, Kuwait Oil Company, etc.);

(3) in the national laboratories (e.g., Saudi Standard Organisation, etc.);

(4) in government agencies with the scientific/technological mission (e.g., the Kuwait Institute of Scientific Research, the King Abdel Aziz City of Science and Technology etc.);

(5) in the scientific professional societies (e.g., Saudi Engineering Council etc.);

(6) major public libraries (such as King Fahad Public Library, etc.).

The libraries and information centres in the GCC exist to provide particular information needs for their institutions/organisations. The primary functions are information retrieval, current awareness, collection development, collection control and document delivery. The primary functions will be discussed in more detail on the basis of the questionnaire posed to the libraries and information organisations in the GCC.
countries. How well the primary functions are performed, is often dependent on secondary functions such as management, space planning, automation and staffing. These secondary functions are discussed on the basis of the questionnaire administered. Although almost every science and technology library will perform these basic functions at some level in each setting, one or more functions may be emphasised over the other. For instance, in the academic setting, collection development and collection control may claim more importance than information retrieval and document delivery, relying on the user to help himself. In contrast, in the information centre environment the collection is often small, (also according to the survey in this study) with document delivery and information retrieval performed at a comparatively higher level. Most science and technology libraries fall somewhere in between theses two extremes. In all libraries the functions are closely interrelated.

**In general perspective the model Figure 1.3 section 2 will be tested and discussed regarding:**

The processing of information which involves acquiring, organising, analysing, storing and disseminating information by such institutions as libraries, information centres, documentation centres, information analysis centres, clearinghouses, referral centres, data banks etc.

In this chapter proposed a series of models elaborated by the researcher in chapter one section 1.5, regarding library and information services will be tested in each section for adoption and implementation in STI environment.

As the study in hand is a combination of NATIS and users needs study, it was appropriate to test and discuss model Figure 1.5 comprehensively throughout this chapter in the relevant sections.
This model Figure 1.5 is divided into five main components. The first three components cover the information resources, information services and information technology which represent the major components of the national information model system. The fourth component of human resources and the fifth, the national co-operative plans were necessary due to limited R & D production and human resources at universities and S & T research institutes in all the countries of this region.

The Gulf War and its impact on the library resources in the GCC has been added into the main text of chapter six in relevant sections to clarify latest status. Furthermore, an update status up to mid 1996 is being discussed to continue relevance through further interviews, literature review and questionnaire data conflated and treated as essentially qualitative materials in each section. The theoretical model has been tested throughout the study for adoption and implementation. However due to the nature of this inter-disciplinary study three final models in relevance to theoretical model framework of this study will be comprehensively covered in concluding analysis in chapter eight. This relevance of the results is the basis on which the national / regional plans will be based in chapter nine. The researcher besides suggesting solutions also recommended a sub-system of national scientific and technical information for the GCC as an alternative.

The discussion and analysis of the of the Gulf War and its impact on libraries and information services in the GCC countries in general and Kuwait in particular is based on the analysis of several articles published in the special issue of the “Journal of Information Science,” of 1992 which was edited by S. Salem. The tables describing the destruction of library and information resources are reproduced from the original source. The analysis is further elaborated based on interviews by the researcher conducted in 1994 and 1995 by visiting Saudi Arabia and Kuwait library authorities and professionals from other GCC countries and authorities of the GCC librarianship at regional and international conferences between 1992 to August 1995, also updating
the facts and figures as late as August 1995 limited to the libraries covered in this study.

The tables regarding the effect of the Gulf War are illustrated from the original source shows the effects of the Iraqi aggression on the library and information infrastructure in Kuwait in different sectors such as university libraries, special libraries, school libraries, destroyed and missing collections, equipment, furniture and manpower, (nationals as well as foreigners) but the researcher will limit his analysis on the libraries covered in this study.

The library and information status in a scientific and technical environment is to serve the R & D clientele for the provision of up-to-date information in any format. These notions were discussed and analysed in the literature review, chapter three, sections 3.3 to 3.10, highlighting the contributions of several authors. A number of authors cited in literature review section endorsed one simple fact, that special subject libraries are an information resource or facility. It follows that the growth of these facilities represents a growth in the totality of a nation’s information resources. And the corollary growth follows with the number of mission or discipline oriented establishments, universities, industrial set-ups, research institutes and national laboratories that are in existence.

The responses of questionnaire number two about library and information centres will be analysed in this section. The major issues regarding the resources, services, automation, manpower and various subjects will be considered. The library and information centres status section contains the following subdivisions:

1. Objectives.
2. Physical planning and structure.
3. User categories.
4. Staff and training.
5. Collection development.
6. Co-operation and depository.
7. Automation.
8. Services.

As the fieldwork was completed in 1990, the continuing relevance of the results are updated and discussed with further literature review, interviews and personal visits which are conflated in sections. The comments, interviews, summaries of the GCC Deans and Directors annual or special meetings, annual reports and other written and oral communications will be conflated and analysed with the sections related. The respondents were asked to “comment freely” on how they think a scientific and technological information system could be developed in GCC. A comprehensive analysis with descriptive facts and figures with the help of Tables, regarding the Gulf War and its impact on the library resources in the GCC has been conflated in specific sections of this chapter for relevance.

OBJECTIVES OF LIBRARY AND INFORMATION SERVICES:

GCC universities do set high objectives for their libraries and information services setting aside high budgets. Most of the libraries do have very ambitious objectives. The objectives of Kuwait University and King Saud University are stated below as models which are largely followed by all the other GCC universities and NSTIC’s objectives are also stated as a sample.

Kuwait university libraries objectives are:

to provide adequate library services for students and academic staff to meet study and research requirements. It should serve the Kuwait community by providing library and cultural services to meet local needs and by collecting materials concerning the national heritage and disseminating information about it; acquire the maximum amount of selected scientific and cultural literature and exchange the University’s publications for those of foreign scientific institutions and universities, particularly in
the Arab world; to collaborate with other libraries by training their staff in modern library methods as required

(Badar and Kalandar, 1970, p.2)

The objectives of King Saud University are:

to provide the academic community with comfortable facilities with which to utilise the information and documentation services, for the libraries to facilitate scholarly research, to make known the results of scholarly research by keeping up to date collections, to co-operate with libraries in the Kingdom and abroad.

(KSU, 1985, p.1)

And KISR’s National Scientific and Technical Information Centre’s (NSTIC) major objectives are:

1. To function as the national focal point of specialised subject oriented information centre and libraries in the country and as the national depository library for the technical and statistical reports.

2 To be responsible for collecting, organising and disseminating scientific and technical information to meet the information needs of the research divisions at KISR and outside.

3. To co-ordinate information activities and services among specialised and subject orientated information and libraries, linking them in the communication network for exchange of documents and information.

4. To promote co-operation among specialised information centres and libraries in the area as of standardised bibliographical controls for information materials.
5. To function as the regional scientific and technical information centre for the Gulf area.

6. To organise, promote and develop technical training programmes for information specialists and special librarians at national and regional level.

(Behbehani, 1981, pp.95-96).

Organisation charts of four universities and KISR are presented in Figures 6.1 to 6.5.

6.2 PHYSICAL PLANNING AND STRUCTURES

The major issue that frequently centres on the organisational patterns of science and technology libraries, is the placement of the library in the organisation. This is of great interest in the R & D environment and although there is continued interest in the question no meaningful pattern has emerged about where libraries are placed.

One of the primary ways is to locate the library as centrally as possible. The issue is whether to centralise or decentralise service. The centralisation/decentralisation debates have been of
FIGURE 6.1 UAEU LIBRARY ORGANISATION CHART

United Arab Emirates University
University Library Organisation Chart

Director of University Libraries Department

Library Advisor

Technical Affairs

Deputy Director

Administrative Affairs

Public Services

Female Students Services

Male Students Services

Zaid Library Reader's Services

Technical Services

Acquisition

Arabic Books

Non-Arabic Books

Periodicals

Reproduction Section

Gift and Exchange

Library

Branch Library

Books & Reference

Periodicals

International Organisations

Publication

Classification and Cataloguing Section

Government Publications

Manuscripts

Information Centre

Branch Library

Branch Library

Branch Library

Branch Library

Branch Library

Branch Library

FIGURE 6.2 QU LIBRARY ORGANISATION CHART

QATAR UNIVERSITY
UNIVERSITY LIBRARIES ORGANISATION CHART

Assistant to University President

Library Development Committee

Director University Libraries Department

Library Advisor

Deputy Director

Administration and Finance

User Services for Female Students

User Services for Male Students

Technical Services Division

Periodicals and audio-visuals Division

Information Services and Research

Selection and Acquisition

Gift and Exchange

Bibliographies

Periodical registration

Indexing and Abstracting

Reader’s Services

On-line Search Services

Research Services

Library Automation

Guidance and Reference Services

Circulation

Bibliographical Services

Students Services

Special Collections

Source: Organisation chart obtained from the Department of University Libraries, QU
FIGURE 6.3  KAUU LIBRARY ORGANISATION CHART

King Abdulaziz University

The Dean

Director of Library Affairs

Data Banks Service

Administration Affairs

Deputy Dean

Deputy Dean for studies and development

Branch Libraries

The Special Collections

Techn. Affairs

University Thesis

Maps

Microfilm & Microfiche

Audio-visual Materials

Arabic Serials

Non-arabic Serials

Loan

Develop. Collect.

Reference

Loan

Library Guidance

Branch Libraries

Idexing

Collect. Organisation

Binding

Photo Copy Services

Accounting

Seminar Rooms

Exhibitions

Security

Public Relation

Warehouse

Special Orders

Secretary

Adm. Affairs

Affairs

S.cholarship

Media

HZN

Curriculums

Exhibitions

Branch Libraries

Audio-visual Materials

Government Printed Material

Hanscripts & Rare Books

The Holy Mosques Collection

Private Collections

Red Sea Collection

The Holy Mosques Collection

source: King Abdul Aziz University Library.

FIGURE 6.4 KFUPM LIBRARY ORGANISATION CHART

Source: King Abdul Aziz University Library.
**FIGURE 6.5** KISR-NSTIC ORGANISATION CHART

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**TECHNICAL SERVICES DEPARTMENT**

- Prepare acquisitions budget and acquire Arabic and English books, periodicals, technical reports, patents, CD-ROMs, standards and other library material based on KISR Researchers' needs to develop NSTIC information resources.
- Catalog and classify Arabic and English books. Process periodicals, CD-ROM, standards, patents, technical reports and other library material.
- Create and maintain bibliographic records in an electronic format according to international standards.
- Develop a specialized collection in science and technology relevant to Kuwait.
- Enhance NSTIC information resources through a gift and exchange program.
- Develop cooperative programs with other libraries in Kuwait and Gulf region for shared acquisitions and cataloging, including Union catalogs, Interlibrary loan and Document delivery.

---

**INFORMATION TECHNOLOGY DEPARTMENT**

- Implement and manage an integrated library automated system in NSTIC.
- Coordinate with other KISR divisions, information centers in Kuwait and the region in the creation and operation of an information network.
- Design, develop and manage a records management system in KISR.
- Coordinate with other KISR divisions and relevant organizations in Kuwait and the region in the formulation of non-bibliographic databases.
- Design and develop an information network for Special Librarians in Kuwait and the region.

---

**INFORMATION SERVICES DEPARTMENT**

- Provide scientific and technical information services to meet KISR and Kuwait local needs.
- Plan and develop an information literacy program for NSTIC users.
- Develop a business plan and establish contract agreements with local organizations for NSTIC services.
- Provide bibliographic and non-bibliographic information services about Kuwait in the field of science and technology.
- Encourage the national role of information and promote and disseminate of scientific and technical information.

---

**THE POSITION ON THE CHART DOES NOT REFLECT THE LEVEL OF THE JOBS IN THE ORGANIZATION**

---

Total Approved Positions:
Approved by Director General
Date Approved:
most interest in the academic setting, where the question of whether or not to have a separate science and technology library or a subject branch often arises. Now that a reference librarian can from one terminal, search the library's catalogue on-line, catalogue material and also search thousands of commercial databases, all with nothing but a terminal and a telephone, the librarian should be located close to the users.

Does your library/information centre have branches?
Yes  No

If your answer to No.2 is yes how many? Name them:
KU is the single university with no Central Library, but has fourteen faculty, departmental and branch libraries. Now they have ten year plans to merge these fourteen libraries into three main libraries. Almost all the universities do have branches from as low as two at SQU to as high as 11 at UAEU and 10 at KFU.

Table 6.1 gives the current status of central and branch libraries in the GCC environment which is rapidly changing and it seems that by the turn of the century the status will be quite different with more centralisation with the new campus building emerging on a permanent basis and financial constraints also assisting a centralised economic programme.

Only five universities KU, SQU, QU, KFU and KFUPM have adequate in their space facilities. However, all the other universities and institutes which have acquired more and more library materials, due to the flow of financial resources in the 70's and mid 80's are facing space problems and in some instances are also getting out of control. (Table 6.2)

The fact is that 7 out of 12 libraries are inadequately accommodated as against 5 with adequate space

Furthermore, by the year 2000 some of the libraries which are now adequately accommodated will lose that adequacy unless electronic information resources dominate. This pattern of
inadequate physical accommodation goes across the whole spectrum of the institutional groups. During his field trip, the researcher came across a number of libraries of both universities and research institutes with large collections of books, local, foreign, government publications and research reports which were left sprawling on the floor, apparently unattended to. These library materials could scarcely be used because of their inadequate accommodation and their form of arrangement. In a number of places collections were locked up in stores pending, because of the unavailability of “adequate accommodation” and of course technical processing. Some university library materials were temporarily cramped up in one of the hallways, so-called “temporary sites”.

There are a number of reasons behind this recurring issue of poor physical accommodation for libraries in the GCC. At government level, “librarians” are not likely to be consulted when plans for buildings are made. For one thing, the government prefers to recruit junior staff and non-professional librarians for the libraries and they are not capable of being consulted in decision-making processes. They accept whatever is offered to accommodate the library. This is made worse by the general conception that planners at government ministries have about libraries: small or medium-sized rooms where a few books and newspapers can be consulted while trying to have some rest.

Dean Engineering at KFUPM believed that:

Decentralised library systems are more justified in universities with very large and strong collections, but are difficult to apply with small and weak collections and where there is no effective means of co-ordination among the libraries within the university. Therefore, a centralised system seems to be more appropriate for the GCC university libraries, as they have large substandard collections and have problems of co-ordination.

(GCC-DD Meeting Minutes, 1994, p.4)
### Table 6.1

Central and Branch Libraries and Information Centres

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<th>INSTITUTES</th>
<th>CENTRAL LIBRARIES</th>
<th>BRANCH LIBRARIES</th>
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<tr>
<td><strong>KUWAIT</strong></td>
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<tr>
<td>KU</td>
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TABLE 6.2

PHYSICAL SPACE FOR LIBRARIES AND INFORMATION CENTRES

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</tr>
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<td>1</td>
</tr>
<tr>
<td>UAQU</td>
<td>2</td>
</tr>
<tr>
<td>UAE</td>
<td></td>
</tr>
<tr>
<td>UAEU</td>
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</table>

SOURCE: QUESTIONNAIRE 2 AND ANNUAL REPORTS
According to the Dean of KFUPM:

In the GCC each university should review its own system, taking into account its differences from the other, such as size of campus. Based on this review, a framework should be formulated by each university for itself, because each of them is so different from one country to another and even within one country, Saudi Arabia, where universities differs considerably. (Interview of KFUPM University Library Dean)

According to the GCC Universities Deans and Directors meeting of 1994, it was recommended that:

The usual reason for establishment of branch libraries is to provide a unique service and for facilities and materials to be closer to the users. Most of the branch libraries did not appear to be used differently from the central library or to provide unique services. Even on the question of location, the central libraries found more favour with users than the branch libraries. Therefore, it is recommended that the situation of each branch library should be reviewed in order to decide whether it should either be closed (with stock being transferred to the central library) or improved to provide appropriate service.

It was further emphasised that:

If the decision has been taken to retain or set up a decentralised system, the following considerations should be taken into account. Before establishing any new branch library on the campus, a study should be carried out to determine:

a. the real need for opening a new branch,
b. the availability of financial resources,
c. the characteristics of the community to be served and their academic and research activities.

(GCC - DD Meeting Minutes, 1994, p.6)

The Arab Gulf University Chief Librarian suggested that:

The study of the relationship between the location of the central library and the level of its usage should be done. It would help to know if the users in the GCC universities have difficulty with the locations of their central libraries, thus making them demand branch libraries. (Interview with the Chief Librarian, AGU)

The following observations are based on the analysis and interviews in section 6.2
above and also confirmed in literature review sections 3.7 and 3.10. On the basis of the model proposed in section 1.5 (Figure 3) with the decentralised libraries, the users are adequately served by easy access to information material while materials are processed in the central library. However, in some of the countries, especially in Kuwait, to keep the Faculty of Medicine Library and the Faculty of Allied Health Library separate from each other is of a disadvantage to their users.

Another problem situation is with NSTIC, where a Marine and Fisheries Library and Information Centre exists separately some twenty kilometres from the main NSTIC library, which was only connected to the main NSTIC network in mid 1996, via Internet. The same could be observed for many campuses with more than three branch libraries containing duplications of materials, wastage of man-power owing to recent financial constraints, it was not a cost affective organisation in the absence of any efficient network system. As noted in section 1.5 (Figure 5) scattered information sources naturally affects the information services. This action on the part of management in not justified especially with the after effects of the Gulf War, where resources and services could be better off, if combined centrally.

The establishment of universities and research institutes of science and technology in the GCC has become something of a status symbol in the region during the last two decades or so. Usually, a university is set up without adequate plans for general accommodation for the institution. A “temporary site” is often chosen and this is followed with a scramble among various departments of the institution for accommodation. Quite often the library loses to academic departments, administration and laboratories and libraries are promised an enviable accommodation in the long run.

In Kuwait in the university library sector the damage and looting done to the equipment during the Gulf War is as follows:
45 PC’s, 20 Printers, 24 Modems, 6 CD drives, 93 Photocopy machines, 338 typewriters.
After five years only CD-ROM drives has gone up from 6 to 12, however in all the other categories of equipment the university is still way behind.

Microfilm equipment (most of them being reader/printers). The total damaged or looted equipment was 509 machines with a cost of 1.25 million Kuwaiti Dinars. The most affected organisation was the department of libraries as it lost 185 machine. Table 6.3

Probably with new library automation system the university library at Kuwait will never need the same number of typewriters. (Table 6.3)

This major loss of microfilm equipment will never be replaced in near future. This sector of equipment will be rightly taken over by scanners/image processing systems.

The damaged and looted equipment in the 8 special libraries (Table 6.4) totals 180 machines with an estimated cost of a quarter of a million Kuwaiti Dinars and distributed as: 1 mini computer, 14 PC's, 43 terminals, 27 printers, 19 modems, 3 data entry units, 32 photo-copy machines and 45 microfilm machines. The most affected library was NSTIC.

But the major problem at Kuwait University was a start of same old planning and policy of having number of branch libraries instead of a strong Central Library. A good opportunity of this re-building plan again wasted after the Gulf War. However, the university management and not the library management are responsible for this action. After the Gulf War rebuilding of Kuwait University was not organised at a central location, but scattered campuses all over the city, forced the library management to establish libraries accordingly.

For the special library sector (Table 6.5) Salem revealed the following figures of losses 5017 references works, 181791 books, 353800 reports, 1.5 millions patents, 1333 theses, 4440 audio visuals, 816 microfiches and 1774 periodicals with
retrospective collections due to the Gulf War. The most affected library for the collections was the NSTIC as it was totally demolished.

The damage or the looted collections in Kuwait University (Table 6.6) totalled 24,410 reference books, 540,955 books, 8955 reports, 5095 theses, 6095 audio visuals, 49,973 microfiche and 5755 periodicals with retrospective volumes from the 1960's up-to the invasion date.

Regarding the major S & T library, the Abdel-Motey and Hmood identified the management of NSTIC's very ambitious plans for rebuilding the national scientific and technical information centres in Kuwait. The projected figures anticipated in 1992 and the actual figures collected by the researcher of this study until 1995 are elaborated for comparison.

(1) To build basic library collections:

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<thead>
<tr>
<th></th>
<th>Projected by authors</th>
<th>Actual by researcher</th>
</tr>
</thead>
<tbody>
<tr>
<td>Book and reference titles</td>
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<td>7,000</td>
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<tr>
<td>Periodic titles</td>
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<td>760</td>
</tr>
<tr>
<td>Technical report titles</td>
<td>220,000</td>
<td>200,000</td>
</tr>
<tr>
<td>Arabic titles</td>
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<td>800</td>
</tr>
<tr>
<td>Databases on CD-ROM</td>
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<td>27</td>
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<tr>
<td>International Standards</td>
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<td>11</td>
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</table>

(Motey and Hmood, 1992, p.443)
### TABLE 6.3

**DAMAGED & LOOTED EQUIPMENT AND THE ESTIMATED COST IN UNIVERSITY LIBRARIES (N = NUMBER, V = VALUE IN KD): KD = KUWAIT DINAR - 1 KD = £ 2.105**

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<tr>
<th>Type of equipment</th>
<th>Kuwait and Gulf Information Centre</th>
<th>Manuscripts Department</th>
<th>Faculty of Education</th>
<th>Faculty of Arts</th>
<th>Faculty of Jurisprudence</th>
<th>Faculty of Law</th>
<th>Faculty of Commerce</th>
<th>Faculty of Science</th>
<th>Faculty of Engineering and Petroleum</th>
<th>Libraries Department</th>
<th>Total</th>
</tr>
</thead>
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<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>PCs</td>
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<td>4,250</td>
<td>2</td>
<td>8,500</td>
<td>1</td>
<td>4,250</td>
<td>2</td>
<td>8,500</td>
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</tr>
<tr>
<td>Terminals</td>
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<td>-</td>
<td>-</td>
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<td>-</td>
<td>-</td>
<td>-</td>
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<td>2,550</td>
<td>2</td>
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<td>-</td>
<td>1</td>
<td>2,550</td>
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<td>Modems</td>
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<td>-</td>
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</tr>
<tr>
<td><strong>B. Photocopying equipment</strong></td>
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<td></td>
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<td></td>
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<td></td>
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<td>-</td>
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<td></td>
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<td></td>
<td></td>
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<tr>
<td>Reader/printer</td>
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<td>16</td>
<td>6,358</td>
<td>22</td>
<td>45,186</td>
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<td>122,196</td>
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### Table 6.4

**Damaged & Looted Equipment and the Estimated Cost in Special Libraries (N = Number, V = Value in KD): KD = Kuwait Dinar - 1 KD = £2.105**

<table>
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<th>Type of Equipment</th>
<th>ABECS</th>
<th>National Commission of UNESCO</th>
<th>Arab Planning Institute</th>
<th>Ministry of Planning of Ministries</th>
<th>Council of Ministries</th>
<th>NSTIC</th>
<th>Ministry of Oil: Technical Affairs</th>
<th>Ministry of Oil: Economic Affairs</th>
<th>Total</th>
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<td></td>
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<td>V</td>
<td>N</td>
<td>V</td>
<td>N</td>
<td>V</td>
<td>N</td>
<td>V</td>
<td>N</td>
</tr>
<tr>
<td><strong>A. Computers</strong></td>
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<td>3,200</td>
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**Source:** Journal of Information Science, 1992, 18 (6), 445-446
<table>
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<th>Type of collections</th>
<th>ALIESG</th>
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<th>Ministry of Planning</th>
<th>Council of Ministries</th>
<th>NSTIC</th>
<th>Ministry of Oil &amp; Natural Gas</th>
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<tr>
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<td>Faculty of Education</td>
<td>Faculty of Arts</td>
<td>Faculty of Jurisprudence</td>
<td>Faculty of Law</td>
<td>Faculty of Commerce</td>
<td>Faculty of Science</td>
<td>Faculty of Engineering and Petroleum</td>
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<td>V</td>
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<td>-</td>
<td>-</td>
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<tr>
<td>Microfiches</td>
<td>-</td>
<td>7,142</td>
<td>3,000</td>
<td>61</td>
<td>427</td>
<td>140</td>
<td>980</td>
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<td>100</td>
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<td>Indexes and abstracts</td>
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<tr>
<td>Other types</td>
<td>500</td>
<td>15,000</td>
<td>471</td>
<td>58,200</td>
<td>15,000</td>
<td>30,000</td>
<td>10,000</td>
<td>45,000</td>
<td>-</td>
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<tr>
<td>Periodicals (retrospective volumes)</td>
<td>15</td>
<td>1,600</td>
<td>181</td>
<td>19,300</td>
<td>464</td>
<td>80,580</td>
<td>986</td>
<td>172,102</td>
<td>10,000</td>
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<tr>
<td>Total</td>
<td>8,431</td>
<td>122,428</td>
<td>10,062</td>
<td>146,316</td>
<td>44,911</td>
<td>410,327</td>
<td>284,508</td>
<td>1,998,000</td>
<td>21,065</td>
</tr>
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</table>

DAMAGED OR LOOTED COLLECTIONS AND THE ESTIMATED COST IN UNIVERSITY LIBRARIES (N = NUMBER, V = VALUE IN KD; KD= KUWAIT DINAR - 1 KD = £ 2.105)
NSTIC is the only library re-purchased some of the equipment, but still at half strength.
Other libraries are also slowly moving in procurement of lost equipment.

6.3 USERS CATEGORIES
The question *Who are your users?* was posed. The following categories of users were stated in the questionnaire:

a. *Members of your institution*

b. *Registered users from other institutions*

c. *Civil servants*

d. *Undergraduate students*

e. *Postgraduate students*

f. *Open to general public*

g. *Others (please specify).*

With the almost non-existence of national libraries in most of the GCC countries and in the absence of any organised public library system in most of the countries, all the universities and KISR in Kuwait open their doors to all the categories of users mentioned from a. to f. above, with some reservations/restrictions. Some universities who charge fees provide all the services; however, the universities who do not charge provide use of library material within the institution premises only.

There are some respondents who would wish to see no scientific and technological information systems in the GCC because of the following misgivings: (KSU academic staff interviews).

The GCC countries do not have a "scientific" mind. National policy on information is non-existent; if it exists, it is conservative, ineffective and dormant.

Is the government ready to appreciate the role of librarianship for technological advancement? I think it may take centuries to know the importance of librarianship as a discipline in the GCC.

In the absence of any adequate network of public or national libraries
the users in the GCC countries are fully dependent on the university’s libraries. However, in most cases their information services programmes are not organised in a systematic manner.

As pointed out in model section 1.5 (Figure 4) there is an urgent need of coordination between users who are seeking information and services from the information sources, because information literacy is a barrier.

6.4 STAFF AND TRAINING
The strength of the library staff in the university environment is subjected to qualitative and quantitative assessment. However, there are some factors which have to be considered for staff development e.g. number of students and staff, curriculum structure, teaching methodology, research and outreach activities and of course starting collection, annual growth, number of branches and working hours. All these could be evaluated by a regular Users’ Survey of library users, which chapter 7 will deal with in this study. On an international scenario there are standards set by some of the major countries elaborated in chapter 3 and any one of them could be adopted according to the local, national and regional needs.

MODEL TESTED 1.5.4. Human Resources
To stimulate users to be self-sufficient and elevate the skills at national LIS to exploit national information resources and technology in the most effective and efficient manner through educational/training programme.

For this study it was asked to:

Please indicate the number of staff members in your library/information centre for the last 2 years in column:

| Professional | Non-Professional |

Table 6.7 demonstrates the fact that both the research institutes i.e. KISR and KACST did not report their library staff position. It is also premature to analyse the status of two newly-established universities, AGU and SQU. Surprisingly, both the new
universities had opposite trends.

The large percentage (80%) of non-professionals in the KU library system are understandable when compared to the number of branch libraries without a Central Library. However, with a Central Processing Unit manned by professionals, more persons are also required to cover the number of service points/counters. In addition, they also have a separate Security Personnel System on a contract basis which is not included in this figure of non-professionals. In spite of pro rota S & T department/faculty libraries personnel figures the researcher was suspicious about the low figure at KSU of only 15% non professionals with a total of 151 persons. During the visit to KSU, it was verified that this high figure of professionals was due to the Central Processing Unit at the Central Library which has a large number of professional qualified personnel. Many professionals were doing non-professional jobs with minimal assistance, mainly typing. The figures of professionals given, included one or two professionals nominated at faculty/department/branch libraries. No figures were given for non-professionals at the faculty/department/branch libraries. This was the status before the completion of the move to the new Dariya campus.

In the library and information services the professional range is from as low as one in the Medical School Library at AGU to as high as 128 in the large university system of KSU. All the other institutes/universities have between 14 and 46 professionals. There is quite a disparity between professionals and non-professionals in the system. The staff figures for KAAU was very low for the number of branches they have. These branches were predominantly non science and technological programmes and figures for the Central Library were not given with the difficulty of dividing the categories of staff at Faculty Science and Engineering libraries and S & T programmes at the Central Library. The staffing figures of KFU were very shocking considering being a special subjects university. The figure of almost 74% was very high. However, on the visit it was revealed that almost all the technical services were provided by the jobber, including the accession register forms and even cataloguing listings were a sheaf catalogue supplied by the jobbers. But, it is also ironic that at
a time when information handling techniques and technologies have become extremely sophisticated, the libraries of science and technology in the GCC rarely have information scientists or systems analysts.

According to the minutes of the meeting of GCC Deans and Directors of University Libraries, 1996 it was revealed that:

One of the major sources of difficulties has been the lack of professional leadership at the institutional level. Most of the positions of the chief of libraries have so far been held by non-librarians. In the beginning no senior local librarians were available when the libraries were established. Expatriate librarians were employed but were not given full administrative and financial authority. This was bestowed on a senior local officer in the university. The tradition was strengthened in Saudi Arabia in 1974 when the position of the Dean of Library Affairs was created. It was to be held by a faculty member for a three year term. Even now, only three out of seven Deans of Library Affairs in Saudi Arabia are professional librarians. Similar situation prevails in other GCC states. Non-librarians holding top authority positions in general lack the understanding of the problems faced by libraries. Their main interest continues to be in their teaching assignments. There is also a feeling that the three year period is too short to understand the situation and develop long-term plans.

Most of the libraries have a higher proportion of expatriate librarians than nationals on their staff. Although several universities offer bachelor’s and master’s degrees in library science, the number of librarians being produced is small. A good number of these graduates, mainly those who are intelligent, able and dynamic, do not join the profession due to its low socio-economic status. Librarians are grouped with administrative civil service cadre with low salaries and limited chances of promotion. There are a number of cases where young librarians with foreign master’s degrees have left the profession for more lucrative jobs within two years of their return. As a consequence of these factors, there is a chronic shortage of local librarians, especially so in supervisory positions. Foreign librarians are, however, being gradually replaced nationals at the beginning professional levels. On the other hand, university libraries
### TABLE 6.7

**LIBRARY STAFFING POSITIONS: PROFESSIONALS & NON-PROFESSIONALS**

<table>
<thead>
<tr>
<th>INSTITUTES</th>
<th>NO OF PROF.</th>
<th>NO OF NON PROF.</th>
<th>TOTAL</th>
<th>% NON-PROF.</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGU</td>
<td>1</td>
<td>3</td>
<td>4</td>
<td>75</td>
</tr>
<tr>
<td>KU</td>
<td>29</td>
<td>117</td>
<td>146</td>
<td>80</td>
</tr>
<tr>
<td>KISR</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>SQU</td>
<td>21</td>
<td>20</td>
<td>41</td>
<td>48</td>
</tr>
<tr>
<td>QU</td>
<td>46</td>
<td>18</td>
<td>64</td>
<td>28</td>
</tr>
<tr>
<td>KAAU</td>
<td>30</td>
<td>38</td>
<td>68</td>
<td>55</td>
</tr>
<tr>
<td>KACST</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>KFU</td>
<td>21</td>
<td>61</td>
<td>82</td>
<td>74</td>
</tr>
<tr>
<td>KFUPM</td>
<td>31</td>
<td>23</td>
<td>54</td>
<td>42</td>
</tr>
<tr>
<td>KSU</td>
<td>128</td>
<td>23</td>
<td>151</td>
<td>15</td>
</tr>
<tr>
<td>UAQU</td>
<td>21</td>
<td>30</td>
<td>51</td>
<td>58</td>
</tr>
<tr>
<td>UAEU</td>
<td>14</td>
<td>88</td>
<td>102</td>
<td>86</td>
</tr>
</tbody>
</table>

*Source: Questionnaire 2 and Annual Reports*
are losing experienced expatriate librarians by taking in fresh graduates with no experience at all. This trend has created an awareness among library authorities to look for ways and means whereby resources can be shared to reduce pressure on limited manpower.

(GCC - DD Meeting Minutes, 1996, p.5)

There is a visible shortage, even of expatriates, to fill in the managerial and specialised positions such as in information, database searching, reference service etc. A number of such positions remain vacant for long enough periods of time, which is a major area of library operations. The main reason for this is the absence of attractive salaries and security of jobs. Some universities have tried to alleviate this problem.

Dean of Libraries of SQU emphasised that:

In universities, the Dean of Library Affairs, should have responsibility and control over all the libraries within the university. Branch libraries should not operate independently of the overall system. This would let the branch libraries gain attention from the top library administration in the university and make the branches more a part of the university library system. All college librarians should be appointed by the Dean of Library Affairs in the university. He should also determine their responsibilities. (Dean’s interview)

The GCC-DD Meeting, 1996 further indicated that:

Each university should have a library committee consisting of a number of librarians from the central library and all the chief librarians on the branch libraries. The committee should meet regularly to discuss matters of concern to all libraries. This would keep the development of all university libraries, including the branch libraries, within overall library progress.

The primary line management of college/faculty/branch libraries should be to the central library. The role of the Deanship in college library management should be discussed and agreed with the central library. Agreement on the consultative role of the Deanship in college library management would avoid the problem conflict of authority.

(GCC-DD, Meeting Minutes, 1996, 6p)

The Director of Qatar University Library revealed that:
Changes in work patterns always tend to bring some opposition from the staff. This is particularly so in the GCC where expatriate librarians, owing to their general feelings of insecurity about their jobs, fear change. It is important in these circumstances that library managers involve other staff in the process of change. Resentment and fear amongst the staff would make implementation almost impossible.

Unfortunately, in the GCC situation, librarians might find many areas where administrative reform is beyond their control. If performance and standards of services are to be substantially improved, the library must obtain greater autonomy from the general university administration. Many decisions, concerning financial matters in particular, such as ordering tenders and budgeting are taken outside the library, often with little or no consultation with the library staff. Even quite routine matters may have to be referred to other officers of the university, so that librarians may have no idea as to what stage a particular process has reached. If the library staff are to provide an efficient service, they must have greater control over every aspect of their work. (Interview with the Director of QU Library).

The situation of the GCC library education and training is primarily based on answers to questionnaires and visits. In addition the minutes summary of the GCC Deans and Directors of Library and Information Services meeting recommendation of 1996 in respect to the issues of staffing, training and education were also used. The following observations are also, based on the deliberations of the GCC Library Executives at the Fourth Annual Conference for the Arabian Gulf Chapter/Special Libraries Association which are analysed in detail testing the theoretical model framework as identified in Figure 1.5.

The initiative for any improvements and the impetus to sustain the services will only come when the staff is aware of what can be achieved. This is where carefully programmed secondments to relevant foreign libraries become so important. Only then will local staff realise how tidy, well organised and relevant to user needs a library can be. Such secondments could be much more economic and effective than detached, theoretical masters courses or doctoral theses.

In planning any new library initiatives in this area, the language problem must never be forgotten. Wherever possible operations should be carried out in Arabic or, if this is not possible, the English language competence of a system’ user should be borne
in mind. Arabic is the language of most social and official communication in the
GCC and most local staff and students will have difficulty working in any other. It is
unrealistic to design new working
methods in English and expect the staff to carry them out as efficiently as they would have
done in their mother tongue.

In response to the question that:

*Does your library/information centre have any training programme (including study leave) for professionals,*

All the institutes/universities have an open policy for training in-house, at a national,
regional and at an international level which is a must for human resource development
in library and information services in the GCC countries. Because of the large
shortfall in professional library staff it is important that additional staff should be
appointed and more training opportunities be implemented.

As revealed in literature review section 3.10, Chaudhry (1996) reviewed the status of
library and information science education in the GCC, which was highlighted stating
the critical state of education in the GCC analysed in section 3.10.

At a Round Table session meeting of the Fourth Annual Conference for the Arabian
Resource Development in the Electronic Library Environment, the Director from the
UAE University Library recommended, that:

*Establishing a regional centre for continuing education of library and information professionals in the Arabian Gulf region is a very good idea. It is proposed that such a centre should organise short courses, specialised training programs and workshops. In our opinion, the financial support for the proposed regional centre should come from the governments of GCC states, while universities, libraries and professional organisations should contribute towards the design and development of programs.*

*It is desirable that the functions of the proposed centre of a more coordinative nature.*
It should be responsible to plan, design and co-ordinate continued education activities and does not necessarily have to be a place to conduct the training programmes. The training activities should preferably be conducted in the information institutions in the GCC states at different locations. This arrangement will also be cost effective and convenient. It is expected that activities which are organised on region-wide basis will have more participation. The proposed centre, however, should have a mandate from a regional governmental agency like the (Gulf Co-operation Council) to collaborate with information institutions in different Gulf states so as to organise continued education programme as and when needed. Regional organisations should assist in sponsoring participants for the centre programme. This can be managed in two ways. First, all the libraries should try to have a specific budget allocation for training and education. Second, efforts should be made to set-up a special fund at the GCC headquarters with contributions from all Gulf states. Grants may be given from this fund to participants without institutional sponsorships.

This section discusses the curricula of two typical GCC library schools and shows that they appear to train librarians as distinct from information scientists or systems analysts. Furthermore, the curricula in library schools of developing countries show, according to Saracevic (1986,p.48), “little [if any] relationship to STI national plans or systems or international interconnections made in STI services”. Computer aspects and advanced STI methods are lacking.

According to the Dean of KAAU Library:

It is essential therefore, to create an indigenous work force and to do this successfully in the GCC situation it seems necessary to provide library studies courses in each individual country. On the surface it seems uneconomic to try and create a library school in each state but the same could be said of medical schools, engineering colleges and even the universities themselves, yet as matter of national pride each country has them. (Interview with the Dean KAAU University Library)

The strongest reason for local library schools is that without them many women would be denied the opportunity to be trained as librarians because, families are reluctant to
allow their daughters to go abroad and study especially from the largest country of the region, Saudi Arabia. With fewer opportunities available to them in the commercial field women could form a significant part of the information work force if courses were available locally. It has been argued that locally educated personnel in developing countries lack the wider experience of those who have gone abroad and that they could complete their training without any wider experience of libraries than that available in their home country. This could be remedied, however, by carefully chosen, relevant post-graduate secondments. These would have more impact on a library school graduate than placing someone in an unfamiliar, foreign environment to study a new subject about which they know comparatively little.

Given the small numbers of students involved and the difficulty of obtaining good teachers, the best course would probably be a one year postgraduate diploma. The GCC universities have however, been reluctant to set up postgraduate courses because of the difficulties of maintaining standards, so library studies might instead have to form part of the four year bachelors degree.

Having argued so strongly for national library schools it must be said that the tiny native populations of Bahrain and Qatar could only probably produce a handful of students each year for a full library course (as opposed to the minor option on offer at present in Qatar). As a compromise Bahrain’s new policy on staff development could perhaps be copied elsewhere. Every year a few Bahrain is are selected for overseas qualification in the library science on the basis of their professional motivation and respectability. On their return they are rewarded with excellent paid position in the mainstream of the university library system.

The feasibility of different forms of library courses in the GCC and the future manpower requirements of the area will need very close study. It seems essential, however, that something should be done soon to provide local education and training, if university and other libraries are to progress at all.
Rahman (1996) gave a descriptive status of library education as described in literature review chapter three section 3.10.

A critical examination of the course outlines of a number of graduate schools of library and information science in the United States, Canada and Japan in the literature reveals a dichotomy between the educational programmes in these advanced countries and those in the developing countries. In the former, emphasis is laid on such courses as information storage and retrieval, library automation, the principles for the operation of computers and their application for information retrieval, the structure and processing of information, information science and technology, the transmission of information, science and technical terminology, etc. These contrast with the more library-oriented courses on library routines, bibliography library organisation and administration, cataloguing and classification, knowledge and use of library resources, all of which dominate the curricula in the GCC library schools. The modern trend towards data banks and information organisation replacing academic and special libraries and cultural information and media organisation replacing public libraries must also be reflected in library education courses in developing countries. Thus courses in documentation, library automation, computer information storage and retrieval systems and information science, must be included.

KAAU Department of Library Science offers a four year undergraduate degree programme leading to a BA degree in Library Science which requires 120 credit hours including several general courses required by the university. In addition KAAU also offers a two year programme leading to a Master’s degree in Library Science. Qatar University offers a joint programme with the department of history and Librarianship leading to BA degree requiring 70 credits from history, 30 in library science and 20 in other subjects (KAAU Annual Report 1990, p.30 and Qatar University Annual Report 1988-89, p.11).

The following observations are based on the analysis and interviews in section 6.4
above and also confirmed in literature review sections 3.2 to 3.4 and 3.7, 3.9 to 3.10.

Human resources are a major problem. In the absence of any national or regional Library and Information Services Manpower Development Plans the situation is very unorganised. In the first place, highly qualified expatriates are not attracted due to the status provided. When some of them accept the challenge they are misused or underused by being given the jobs of non-professionals including typing.

In case of qualified nationals, they prefer to be a managers/directors of an information environment in an organisation not related to library or information science and therefore, in an year or two the knowledge of library and information science becomes redundant.

Highly qualified professionals also either opt for teaching assignments or take any top position in public relations or an information sector, not directly related to library and information science which is a total waste.

Unless a satisfactory education and training programme is implemented in the GCC, (one of the major component of a strategic approach model of human resources identified in model in chapter 1 section 1.5,) the staff will not be able to stimulate users to be self-sufficient and elevate their skills at national LIS, to exploit information resources and technology in order to provide better services by providing orientation and training to the users.

The manpower of the libraries was affected by the invasion seriously, as 35 persons were not back to work in the university library sector (Table 6.8) in Kuwait after the liberation and they are divided as follows:

8 technical librarians, 10 assistant librarians, 8 operators, 9 secretaries. Most of this manpower belonged to the department of libraries at the Kuwait University. (Salem, 1992, pp.425-426)
Even after five years after the Gulf War the staff position especially in the professional sector at Kuwait University is at half strength. The staff positions for the libraries is the lowest priority by the management at the university.

The special libraries lost manpower because of the Iraqi invasion. The 8 libraries lost 29% distributed as: 14 librarians, 6 assistant librarians, 2 operators/clerks and 7 secretaries. The most affected library was NSTIC Table 6.9. (Salem, 1992, p.426). NSTIC is also at half strength of the staff in 1996 in comparison of what it had before the Gulf War. The introduction of CD-ROM network and other electronic services is changing the pattern of information usage. But poor maintenance of these systems and lack of users orientation as most of the staff are not aware of the new technology for implementation.

The status of manpower has worsened tremendously after the Gulf War both in quantity and quality. There is a severe shortage of local professional librarians with good experience and strong subject background. Even expatriate librarians with special skills are hard to find. Overall, the library staff are inadequate in both terms of quantity and quality.

Kuwait University and other libraries in Kuwait were the hardest hit to recruit quality staff and quite a variation between professional and non-professional staff.
TABLE 6.8
SITUATION OF MANPOWER IN UNIVERSITY LIBRARIES AFTER THE IRAQI INVASION

<table>
<thead>
<tr>
<th>Missing jobs after the invasion</th>
<th>Kuwait and Gulf Information Centre</th>
<th>Manuscripts Department</th>
<th>Faculty of Education</th>
<th>Faculty of Arts</th>
<th>Faculty of Jurisprudence</th>
<th>Faculty of Law</th>
<th>Faculty of Commerce</th>
<th>Faculty of Science</th>
<th>Faculty of Engineering and Petrol</th>
<th>Libraries Department</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Librarians</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>2</td>
<td>-</td>
<td>1</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>Assistant librarians</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>2</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td>Clerks/operators</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>1</td>
<td>-</td>
<td>1</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>8</td>
</tr>
<tr>
<td>Secretaries</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>Total</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>4</td>
<td>6</td>
<td>11</td>
<td>35</td>
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</table>
### TABLE 6.9

**SITUATION OF MANPOWER IN SPECIAL LIBRARIES AFTER THE IRAQI INVASION**

<table>
<thead>
<tr>
<th>Missing job after the invasion</th>
<th>AREUOS</th>
<th>National Commission of UNESCO</th>
<th>Arab Planning Institute</th>
<th>Ministry of Planning</th>
<th>Council of Ministries</th>
<th>NSTIC</th>
<th>Ministry of Oil: Economic Affairs</th>
<th>Ministry of Oil: Technical Affairs</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Librarians</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>7</td>
<td>-</td>
<td>-</td>
<td>15</td>
</tr>
<tr>
<td>Assistant librarians</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>5</td>
<td>-</td>
<td>-</td>
<td>7</td>
</tr>
<tr>
<td>Clerks/operator</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Secretaries</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>6</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>3</td>
<td>3</td>
<td>8</td>
<td>1</td>
<td>-</td>
<td>12</td>
<td>-</td>
<td>4</td>
<td>31</td>
</tr>
</tbody>
</table>
The current supply of library and information workers in Kuwait is deficient in number and necessary skills. The majority of library and information staff are para-professionals. The shortage of library and information workers in Kuwait is very real and will increase sharply by year 2000. To address this shortage a number of changes should occur in to (a) the level of library and information science education should improve, (b) current staff should be given intensive training, (c) salaries and incentives should be improved, (d) work conditions and environment should be improved, (e) professionals and subject specialists from other fields should be recruited and (f) a national committee should be established for information manpower planning.

Director, KAAU Library rightly specified that:

It would of course be a difficult task to set up useful library courses in each GCC state. If good librarians are hard to find in the GCC, good library educators would be harder to recruit. There is no point in importing teachers who would simply repeat the same courses that the students have received, had they gone to other Arab or GCC countries. It would be necessary to involve very closely librarians already working in the country and therefore, aware of local needs and problems both in the curriculum design and where possible the actual teaching of courses. In the long term experienced local librarians could then be sent abroad for training in library education, probably a more productive use of funds than sending students abroad for initial qualification.

(Interview with Director KAAU Library)

Kuwait University is planning to start a new programme in September 1996 according to an announcement to the media by the Rector of the Kuwait University at the Opening Ceremony of the Fourth Annual Conference for the Arabian Gulf Chapter/Special Libraries Association 16-18 April 1996. State of Kuwait. Human Resource Development in the Electronic Library, which was further confirmed by the Director of Kuwait University Library in interview with the researcher.

The importance of manpower for better services cannot be ignored. A second fact to
mention is that of the size — in men and materials — of the national information system. The fact cannot be overlooked that the system has to involve a large staff and extensive information materials. Once again, the size and dimensions of the national system at this level will depend on national situations and national resources. As information workers become adapted to the system they are operating, as resources begin to grow and as the population of users increases and perhaps, as overall national policies begin to impinge on the need for increased supply of information, then the national system is bound to increase its scope.

National scientific and technological information systems requires a high calibre of people to operate it. First and foremost, there must be a national zeal to do the work, a self-realisation of the place of information in the overall development of the country and the workers at the helm of affairs must possess at least an under-graduate degree in a subject area backed up with postgraduate professional qualifications in information and library science.

But, it is also ironic that at a time when information handling techniques and technologies have become extremely sophisticated, the libraries of science and technology in the GCC rarely have information scientists or systems analysts.

The need has been expressed for more local librarians in GCC in all the Education Development Plans. The problems is to find recruits to fill student vacancies in the library schools: students who are offered admissions to do professional library studies fail to take them up. In other words, the library schools are not producing enough high calibre graduates to meet the target of GCC information manpower.

Based on analysis and interviews it is revealed that the provision of adequate staffing is a must to create effective libraries. Apart from their direct effect on services, able staff also attract more respect and are in consequence in a better position to negotiate for bigger budgets, new equipment and improved status. The greater their status, the more likely they are to build a productive working relationship with the faculty staff.
It is tempting to see the answer to the staffing problem in the recruitment of large numbers of western-educated expatriates. Although a certain number of them will be needed over the coming years, they cannot be seen as a long term solution. For one thing, it is a government policy in all these states to reduce the size of the expatriate work force and give senior jobs to nationals where possible. Even apparently well-educated and experienced expatriate staff have their drawbacks, the most obvious being that, they will always go back home in the end. They may be repeatedly replaced but each replacement needs a period of acclimatisation and adjustment to the new country after which he usually produces a new set of plans, which may or may not build on the foundations of his predecessor. When an expatriate leaves much local knowledge goes with him. Counterparting (when a local is appointed to work with and be trained by the expatriate with the intention of eventually taking over the job) rarely works well in the GCC. The library situation may quickly revert to what it was before the expatriate was replaced.

6.5 COLLECTION DEVELOPMENT

In the last two decades there has been a remarkable development in higher education with regard to the student population i.e. number of university teachers and growth in postgraduate programmes and increased research activities. This development was accompanied with growth and increase in the resources of the university libraries. Like the university library in the western countries, the collections of the university libraries in the GCC countries consist of various types of library materials, including the three main collections of books, periodicals and special collections. These collections are divided into two main sections, Arabic and English.

MODEL TESTED 1.5.1. Information Sources

To select, procure and organise information resources in science and technology in a cost effective manner to serve at a national level.

The size of the collections in the university library varies from one library to another. There are several factors which may influence this size. These are: the size of the
university itself, the number of students and teachers it serves, the level of studies, and the educational nature and research activities of the University.

Collection development includes selection, acquisition, weeding, preservation and other aspects of the content of the collection. A well-selected collection is the most efficient source of information.

Institutes were asked in the questionnaire to indicate in the columns provided by marking (X)

the order in which you have the highest number of materials. (Note that 1 is higher than 2 and 2 is higher than 3 and so on.

a) Natural Sciences  
b) Engineering and technology  
c) Medical and Pharmaceutical  
d) Agricultural Sciences

Naturally AGU (Table 6.10) being a medical college has only a strong priority in the collection development of medicine and pharmaceutical fields which is also shared by KFU, KISR, KACST and KFUPM (a strong S & T university) had number one priority in Engineering and Technology for their collection development. However, in spite of being a very general subject universities without a strong R & D base QU and UAEU. They had also number two priority in science and technology for the collection development. This was followed by AGU, SQU, KAAU and UAQU had a number three priority.

At the time of this research AGU was purely a Medical University, but they had plans to establish faculties of science and engineering. The figures of SQU, KAAU and UAQU are overall dismal in the science and technological collection development. However, this position at the KAAU was surprising because it has the largest Faculty
of Engineering Library in the system.

KU, KFU and KSU had a number four priority in the science and technological collection development, however both the engineering and science libraries at KU and KSU are well stocked with strong collection. In comparison the case of KFU is justified, because it is a university which specialised in Medical, Agriculture and Architectural programmes.

The case of the KFUPM as a very strong S & T university with the highest priority for S & T collection is fully justified.

A majority of seven institutes/universities led in the science collection as number one priority collection i.e. KU, SQU, QU, KAAU, KSU, UAEU, UAQU followed by priority two by AGU, KISR, KACST and KFUPM. KFU in Saudi Arabia has the lowest priority third, in this area, the reason for which is also valid as in the case of Engineering and Technology mentioned above.

Only SQU and KFU are strong in Agricultural Sciences, but that too at number two priority. In spite of having faculty of agriculture in the region, followed by KU, QU and KSU as number three priority and other institutes/universities as number four areas of priority. With the majority of GCC countries being arid lands, extra efforts and money is put into agriculture R & D programmes for growing staple foods and also beautifying the environment with horticulture/greenery programmes.

According to the GCC Deans and Directors Meeting minutes of 1995:

members and experienced librarians play a critical role in collection development. University libraries in the GCC countries are less than fortunate in this respect. Lack of faculty interest in collection development is not uncommon. The number of faculty members who actively participate in the selection process is very limited. There is another extreme where some faculty members work on the basis
## TABLE 6.10

**PRIORITY GIVEN TO LIBRARY RESOURCES IN SELECTED FIELDS**

<table>
<thead>
<tr>
<th>INSTITUTIONS</th>
<th>ENGINEERING TECHNOLOGY</th>
<th>SCIENCE</th>
<th>MEDICINE &amp; PHARMACEUTICAL</th>
<th>AGRICULTURE SCIENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BAHRAIN</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AGU</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td><strong>KUWAIT</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>KU</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>KISR</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td><strong>OMAN</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SQU</td>
<td>3</td>
<td>1</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td><strong>QATAR</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>QU</td>
<td>2</td>
<td>1</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td><strong>SAUDI ARABIA</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>KAUU</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>KACST</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>KFU</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>KFUPM</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>KSU</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>UAQU</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td><strong>UAE</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>UAUEU</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

**SOURCE:** QUESTIONNAIRE 2.5 RESPONSE
of "anything goes". As a result of these two extremes, the librarians spend a lot of time in pursuing members who are inactive and in cutting back items from those recommended by overactive faculty members. It is felt that librarians tend to do more selection than faculty members. This requires adequate and experienced library staff with strong subject background. Such librarians are simply not available in the region.

It is safe to say that the quality of collection development has been less than desired due to the reasons mentioned above.

(GCC - DD Meeting Minutes, 1995, p.3)

In spite of the remarkable growth in the university library collections in the GCC countries, there is no evidence of any evaluation studies being carried out to examine and measure the adequacy of the growth, in meeting the various needs of the universities. An evaluation of these collections will give a critical analysis of the library’s operations and programmes. It can help the university to explore the complexity of library activities by revealing how close library and teaching problems are; it can also locate the weak and strong areas in the library’s collection. The adequacy of a university library collection, however, cannot be measured and judged without taking into consideration the basic stock of the book collection, student population and the number of university teachers.

One of the senior professional from King Saud University rightly specified that:

Most of the GCC universities, especially the Saudi universities, have a separate division for textbooks, responsible for acquiring and distributing textbooks, to all the university students. All the university libraries acquire extra copies of each textbook which are kept in the central library and the branch library concerned with the subject. These books are used to support the curricula which are taught in the university. Though they are not part of the library collection, but they are counted as part of library statistically and financially at several universities.

(Interview with Head, Acquisition, KSU)

The Deans and Directors Meeting of 1995 further elaborated on the selection policies of GCC university libraries:

Collection building in the Gulf needs to take greater account of the main end-
user, that is the student. The amount of research carried out in these universities is small and realistically they should be seen as primarily first degree level teaching establishments and the collection needs to be geared accordingly.

A written selection policy should help to give librarians greater control over the contents of the libraries which they are seeking to improve. Developed in close partnership with academics it should ensure that all departments are treated fairly and improve library/faculty relationships to the benefits of the whole university community. Librarians may find their status improved and academics and students should get a better service from the library.

(GCC - DD Meeting Minutes, 1995, p.5)

The Dean of KAAU specifically pointed out an organisation structure of the selection policy by stating that:

The main aim of the selection policy must be to provide a library which will enable the students to get the most out of their university studies. Even in Gulf universities, in some departments at least, teaching methods are changing with individualised learning becoming more important, and many students have to prepare some type of project at some point in their undergraduate career. This trend increases the demands of libraries and makes it all the more important, that students are not discouraged from using them. Given the students' lack of experience of libraries it is essential that the university libraries are organised so that they are as easy to use as possible. A good selection policy should help ensure that a large proportion of library stock is relevant to the students needs. In schools, students are given only one prescribed textbook to read per subject. They are likely to find it very hard when faced with a number of books in a university library, all with the same classification number, to select those that are truly relevant to the work in hand and from which they can gain some benefit given their linguistic and academic capabilities. If these students are faced with a large number of books which they have little hope of understanding, they may soon become wary of using the library at all. There may well be a case for undergraduate collections at least for first and second year students. In nothing else, these would force academics to consider what is practical for students to read in the same time available. Administrative procedures can make the weeding of older, less well used stock difficult, This could at least be shifted to the "postgraduate" library. Undergraduates would not of course be excluded from the more advanced sections, which they need for project work, but in their early routine contracts with the library they should, in some way, be protected. (KAAU Dean interview).

There are other ways in which the stock could be organised to make student access
easier. In the case of some Gulf libraries the first and most basic improvement would be to tidy them. Periodicals collection in particular tends to get out of hand and binding delays are often so long that librarians prefer to leave the separate parts.

The book budgets of libraries are in general, inadequate and have seen sharp cuts during the last ten years due to a fall in oil revenues. This has resulted in a sharp decrease in the current intake of monographs and periodicals. All libraries have developed backlogs of unprocessed materials, particularly Arabic materials due to the absence of a centralised or commercial cataloguing service and a shortage of experienced cataloguers. This situation is deteriorating further because expatriate cataloguers are gradually being replaced by fresh local graduates.

According to GCC Deans and Directors Meeting minutes of 1995 it was recommended that:

Selection of materials for the college libraries should be the responsibility of colleges librarians; however, to avoid unnecessary duplication, all acquisitions for the branch libraries should be made through the central library. For this purpose a programme of co-operative acquisition should be established in any university with more than one library.

(GG - DD Meeting Minutes, 1995, p.7)

The following observations are based on the analysis and interviews in section 6.5. This was also confirmed in literature review sections 3.2 to 3.4 and 3.7, 3.9 to 3.10 After reviewing the situation of GCC collection development based on answers to questionnaires, visits, plus the minutes summary of the GCC Deans and Directors (GCC-DD) meeting recommendations of 1995. The status in respect to the issue of collection development, the major observations and analysis follows and also suggestion for an alternative sub-system in chapter nine.

The university libraries which maintain branches in their colleges in general acquire multiple copies; one copy for each concerned location. Some of these libraries purchase multiple copies without any consideration of location. Also quite a large proportion of these collections cover journal volumes and non-book materials.
Most of the collections are also weak in retrospective materials. Since 1985, current acquisition of all forms of materials has dropped sharply due to the decrease in financial resources.

In the absence of any collection development policies in most of the institutes covered in this study, even the core reference collection is not organised, which is a great disadvantage to users. There are many situations of reference collections merged with the main collection and dispersed at different places. For instance it is common on the OPAC's, reference materials are not identified on the systems. The main collection depends on the jobbers or the titles recommended by faculty and staff without any professional evaluation policy. The reasons are, shortage of staff, especially the professional subject specialists and professional acquisition librarians and of course, the absence of national bibliographies in the GCC countries.

The concept of effective and efficient information services is not fulfilled without the adequate information sources (based on model 1.5).

6.5.1 BOOKS

The book has limited accessibility compared to other documentary sources (e.g., the periodical).

We may now put into perspective some of these figures from some of the libraries under survey by examining them under certain standards. However, we must bear in mind that standards are for adequate, not ideal programmes.

It may be necessary to test these criteria on all the GCC universities. Except for the newly established AGU in Bahrain and SQU in Oman all the universities book collections are well established at least quantitatively. (Table 6.11)

Unlike most of the developing countries GCC countries are blessed with a collection of a large number of books. The highest number of books per student is
approximately 150 and this is the situation in the special S & T library, i.e. KFUPM, whereas the least number of books per student is approximately 9 at the newly established SQU. However, all of the other universities have adequate, between 24 to 49 books per student, to cater especially in the cases of the universities where students and academic staff depend heavily on the availability of books.

The total number of 3,731,248 books for 12 institutes/organisations serving 88,260 students and 8,918 staff is quite impressive. But, with consideration of serving 82 branches of faculty/departmental/remote areas branch libraries and a separate collection for Girls' Branches, the total number of books does not make an impressive figure in the end, due to many duplicates or multiple copies.

Both the newly established universities AGU (Bahrain) and SQU (Oman) reported figures for only one year reporting 14,712 and 9,000 books respectively. The former for one year and the latter for only three months beyond the starting collection.

Almost 100% increase in book collection figures (from 73746 to 130191 for KFU) was explained by the fact that three new branches were established at Al Hassa and the last minute funding was provided by the management to procure books. These were supplied by jobbers in a rush and with multiple copies. Their figures also included text-books provided by the university to students and teachers for their course work. The university book shop is controlled by the university library and managed by highly qualified and experienced librarians doing clerical jobs of inventory and delivery.
### TABLE 6.11

**NUMBER OF BOOKS HELD BY GCC INSTITUTES**

<table>
<thead>
<tr>
<th>Names</th>
<th>Students</th>
<th>Staff</th>
<th>Year 1</th>
<th>Year 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGU</td>
<td>368</td>
<td>68</td>
<td>-</td>
<td>14712</td>
</tr>
<tr>
<td>KU</td>
<td>12500</td>
<td>955</td>
<td>517781</td>
<td>538938</td>
</tr>
<tr>
<td>KISR</td>
<td>-</td>
<td>560</td>
<td>40151</td>
<td>42000</td>
</tr>
<tr>
<td>SQU</td>
<td>1000</td>
<td>300</td>
<td>-</td>
<td>9000</td>
</tr>
<tr>
<td>QU</td>
<td>5281</td>
<td>453</td>
<td>155476</td>
<td>235585</td>
</tr>
<tr>
<td>KAAU</td>
<td>20077</td>
<td>1147</td>
<td>488771</td>
<td>549190</td>
</tr>
<tr>
<td>KECST</td>
<td>-</td>
<td>342</td>
<td>4880</td>
<td>5450</td>
</tr>
<tr>
<td>KFU</td>
<td>1050</td>
<td>500</td>
<td>73746</td>
<td>130191</td>
</tr>
<tr>
<td>KFUPM</td>
<td>4500</td>
<td>780</td>
<td>674190</td>
<td>681000</td>
</tr>
<tr>
<td>KSU</td>
<td>32000</td>
<td>2733</td>
<td>1212321</td>
<td>1270495</td>
</tr>
<tr>
<td>UAQU</td>
<td>11034</td>
<td>1080</td>
<td>380220</td>
<td>382093</td>
</tr>
<tr>
<td>UAEU</td>
<td>-</td>
<td>-</td>
<td>160000</td>
<td>165000</td>
</tr>
</tbody>
</table>

**SOURCE:** Questionnaire and annual reports

**Notes:**

AGU and SQU replied only for one year
KECST is a research institute with no students
UAEU information on students and staff is not available
The healthy book collection figures, which rose from 488,771 to 549,190 in one year was limited to the S & T Faculty libraries at KAAU. However, S & T collection at the Central Library was not reported.

The minimal rise from 380,220 to 382,093 books reported by UAQU is very poor by any standard for a university with a strong PhD. programme in many non- S & T subjects. The major reason revealed was the shortage of funding.

KFUPM being a special S & T subject university with a strong R & D oriented Research Institute serving 4,500 students and 780 staff has a well balanced collection of 674,190 books (including a microfilm collection — the only institute which reported this) i.e. 150 books per students and 864 books per staff member. This figure is out of proportion in comparison with other library collections, however in spite of several request figures for just books this was not provided as the total count is kept also for microfilm/microfiche boxes which were included in the counting. The researcher on his visit found the collection well organised and with a well written Collection Development Policy with the participation of faculty in book acquisition contributing to a well balanced collection.

A comparison was made between the two largest collection libraries of Saudi Arabia and one in Kuwait - KU with no Central Library but 14 branch Faculty libraries having a collection of 517,781 books serving 12,500 students and 955 staff. Unfortunately all these collections were completely ransacked during the Gulf War and KU is in the process of rebuilding their collection. But with special subject Faculty branches with special subject collections there are not many duplicates.

In contrast KSU with one Central Library and eight branches/faculty libraries the collection of 1,212,321 books serving 32,000 students and 2,733 staff covering a network of long distance campuses plus a number of faculty libraries in Riyadh, there are a large number of multiple copies. It was also revealed by a senior expatriate
member of the staff that in the early 1980’s, with the abundance of money there was tough competition between the Serials and Acquisition sections to fill the empty shelves as soon as possible without a collection development policy. The Serials Department kept on collecting bound volumes of back issues of periodicals and some salesman pursued the Serials Department to purchase a Series of periodical items. On the other hand, the same salesman would go to the Acquisition Department and would sell the same Series titles as books. With no formal co-ordination between the departments there was a lot of duplication.

It may not be easy to standardise the number of books a special library has to have in order to make a standard collection. The mission of special libraries varies as well as their size and the scope of subject coverage. At the same time, it may be interesting to compare the book stock of the research institute libraries in this study with that of special libraries standards. To be specific the collection at KISR is 40,000 compared with KACST which has a collection of just 5,450 books.

The following observations are based on the analysis and interviews in section 6.5.1. The same notion was also confirmed in the literature review Chapter three, sections 3.2 to 3.4 and 3.7, 3.9 to 3.10 in this study.

One of the most noticeable features of the book collections in the GCC university libraries is the volume of duplications in these collections. This is due to the acquisition policies followed by some university libraries with regard to the number of copies acquired which varies between 1 and 6 copies. There is no doubt that such policies should be reconsidered, especially at the present time when financial resources are limited. The number of copies acquired should be proportional to the demand for each book. On the other hand, one benefit of duplicate materials is to be able to exchange them for other materials through an effective exchange programme.

Book collections are the major information source in almost all the institutions in this study except in the two information centres the NSTIC and KACST. In the 80’s with
the over-flow of petrodollars, books were added haphazardly and many multiple copies were ordered to fill in the empty shelves for the newly established libraries. Due to an over load of work in technical services, many of these books were either put on the open shelves without processing, or were dumped in storage for years without processing. It means that information users are not provided information sources efficiently due to absence of a quality and an organised collection.

The dissatisfaction expressed is enough to justify a change in any over-emphasis on the acquisition of books. The provision here is that their acquisition must be supplemented by the continuous and comprehensive acquisition of faster electronic access to information materials.

6.5.2 PERIODICALS

The periodical as a form of library material is considered one of the most important and valuable information sources for the university and research institute libraries. They provide up-to-date information which can not be obtained through books; they cover the most current events and recent developments in most subject fields.

For a long time books served as the main medium through which writers expressed their opinions or thoughts as quickly as they could. With the passage of time they declined in importance as the vehicle for the prompt publication of scientific research and ideas. They yielded place to a type of periodical publication — the journal — the implication of which has been extensively treated in this section. Table 6.12 shows the stock of periodicals possessed by 11 of the 12 libraries/information centres in the survey. But a few facts need to be pointed out straight away. In the initial replies from more than eight institutes it appeared that these respondents misunderstood the terms “title” and “volume” as used in library and information science.

Perhaps the questionnaire was not very explicit: “Total number of periodical titles received up to 31 December for the last two years”. Responses showed that in some cases, the numbers of periodical titles stated were quite out of proportion with the
number of books possessed. A typical case is that of a KISR which gave its book
stock as totalling 40,000 volumes and periodical titles as 60,000. A confusion in the
terms, volumes and titles, was suspected and therefore follow up queries and
clarifications were made to obtain correct analysis.

However, it may be assumed that no confusion occurred; the limitations of the use of
the questionnaire as a valid research method must also be admitted. On these grounds
it is easy to see in Table 6.12 that 11 libraries have a total of 33,305 periodical titles
to which they subscribe. The range is from as low as 800 titles in the case of a
Research Institute to a high of 8,874 titles in a multi-campus university. Among the
four well established universities only KU periodical subscriptions rose, from 5,495
to 5,733.

Both the newly established universities AGU and SQU reported only one year’s
periodicals, the first year of their establishment subscription of 495 and 1,350
respectively. With the limited number of first year students enrolled for the first time
in these two universities and the limited number of initial faculty members the high
ratio of 7 periodicals per staff members at AGU and 5 at SQU was understandable.
This was matched equally by the figure of 6 periodicals per staff member reported by
KU which speaks highly of the unique R & D activities and programme.

QU and three Saudi universities KFUPM, KAAU and KFU reported 4 periodicals per
staff. However, as in the case of book collection figures the dismal figures of only
2 periodicals per staff at the UAQU university confirms the poor budget position at
the university. At one of the later visit to this university it was revealed that for two
years in a row periodical subscription was stopped. In 1994 the researcher who
visited UAQU discovered that the only
6.12

NUMBER OF PERIODICALS HELD BY GCC INSTITUTES

<table>
<thead>
<tr>
<th>Names</th>
<th>Students</th>
<th>Staff</th>
<th>Year 1</th>
<th>Year 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGU</td>
<td>368</td>
<td>68</td>
<td></td>
<td>495</td>
</tr>
<tr>
<td>KU</td>
<td>12500</td>
<td>955</td>
<td>5495</td>
<td>5723</td>
</tr>
<tr>
<td>KISR</td>
<td>-</td>
<td>560</td>
<td>800</td>
<td>880</td>
</tr>
<tr>
<td>SQU</td>
<td>1000</td>
<td>300</td>
<td></td>
<td>1350</td>
</tr>
<tr>
<td>QU</td>
<td>5281</td>
<td>453</td>
<td>1838</td>
<td>2046</td>
</tr>
<tr>
<td>KAAU</td>
<td>20077</td>
<td>1147</td>
<td>4835</td>
<td>4958</td>
</tr>
<tr>
<td>KACST</td>
<td>-</td>
<td>342</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>KFU</td>
<td>1050</td>
<td>500</td>
<td>2243</td>
<td>2173</td>
</tr>
<tr>
<td>KFUPM</td>
<td>4500</td>
<td>780</td>
<td>3162</td>
<td>2131</td>
</tr>
<tr>
<td>KSU</td>
<td>32000</td>
<td>2733</td>
<td>8874</td>
<td>6554</td>
</tr>
<tr>
<td>UAQU</td>
<td>11034</td>
<td>1080</td>
<td>1953</td>
<td>1955</td>
</tr>
<tr>
<td>UAEU</td>
<td>-</td>
<td>-</td>
<td>2260</td>
<td>2337</td>
</tr>
</tbody>
</table>

SOURCE: Questionnaire and annual reports

Notes:
AGU and SQU replied only for one year
KACST - Details of periodicals were not provided
UAEU information on students and staff is not available
periodicals available on the shelves, were provided either by the faculty and staff, or
else were received as part of institutional membership.

According to the Head of Periodicals Department of King Saud University who said
that

Except for scientific titles, Saudi libraries are not very strong in periodicals. This is
especially so for culturally related titles. Generally, a correlation exists between
availability of periodicals and the institutions' level of development. Most periodicals
acquired are English titles dealing with modern sciences and issued in the industrialised
world. (KSU Library staff)

The following observations are based on the analysis and interviews in section 6.5.2.
This was also discussed and confirmed in literature review sections 3.2 to 3.4 and 3.7,
3.9 to 3.10. Since periodicals play a very important role in the support of the
university’s research activities, the availability of a well stocked and complete
periodical collection is essential for the success and efficiency of these activities.
Additionally, such a collection will be a vital element in an effective resource sharing
programme among university libraries. Therefore, questions with regard to the
adequacy of periodical subscriptions in meeting the faculty demands for back sets and
the percentage of periodicals titles for which the GCC university libraries have
complete back sets were formulated to identify the extent of periodical collections in
these university libraries.

The Serials Department at that time did not consider buying microforms for bound
volumes due to the intention to fill the shelves without anticipating future space
problems. Almost in all the institutions of the GCC the major portion of library budget
goes towards periodical subscriptions. In the early 80’s a large collection of
periodicals including back issues mostly in print form were acquired to fill in the
empty shelves without evaluating their usefulness. With the shortage of budget cuts
in the in the last five years drastic cancellations were done on periodical subscriptions
and very few new title additions to serve new academic and R & D programmes, in
some cases, 30 to 60% cancellation of access. Due to the shortage of space the back
issues are shifted to storage. Also, due to the shortage of budget the back issues are
not even bound.

6.6 CO-OPERATION AND DEPOSITORY

The review of the situation of GCC co-operation and depository status is based on answers to questionnaires and interviews with the library personnel. In addition the minutes summary of the GCC Deans and Directors (GCC-DD) meeting recommendations of the 1990, in respect to the issues of co-operation and depository developments. The following are the observations and analysis and also suggesting possible alternatives.

MODEL TESTED 1.5.5. National Co-operative Plan

To design the national information policy in science and technology at national levels for effective decision making by providing a framework to create and execute co-operative national projects and programmes.

In the questionnaire it was asked:

Is your library/information centre a document/book depository
for any of the following?

a) National, i.e. right of legal deposit for your country.
b) Regional i.e. right of legal deposit for any of the GCC countries.
c) United Nations agencies e.g. UNESCO, FAO, WHO, etc.
d) None
e) Other (please specify)

There were equal numbers of yes and no about depositories at the national level. However only two of the largest universities in Saudi Arabia KAAU, in Jeddah and KSU, in Riyadh are national depository libraries. In the other four countries having a single university system, there was a national depository on paper, but it was not fully implemented. It is a dilemma that none of the institutes are a full depository at the regional level, except AGU, KISR and KACST which were partly depositories at
a regional level for a few specific subjects. However, seven out of twelve institutes are active as depositories on an international level for, e.g., agencies such as UNESCO, FAO, WHO. (Table 6.13).

In the absence of national library systems in the region and the non-existence of national bibliographies, several professionals and researchers of the region rely heavily on the “Accession List Middle East” produced by the Library of Congress, instead of getting the material from the GCC countries in which they are published. The material is also quickly maximise the use of limited resources through co-operative programmes. It is believed that if realistic co-operative programmes are initiated now, library authorities and concerned agencies will support these wholeheartedly. According to the personal observation of the researcher in the case of KISR, which has a mandate to have a Kuwait collection specific for science and technology in the form of a separate “Kuwait Information Centre”, this was closed down due to funding problems and the collection was merged with the general collection in August 1995.

According to the Manager, Automation Department, NSTIC:

However, as far back as 1976, The National Scientific and Technical Information Centre (NSTIC) of the Kuwait Institute for Scientific Research (KISR) embarked on a project to publish a Union List of Scientific and Technical Periodicals in Kuwait representing thirteen libraries. The idea behind this effort was to identify the periodical holdings of all the major libraries in Kuwait so that the process of resource sharing could begin. The success with the production of the Union List in Kuwait encouraged NSTIC to include periodical holdings from major libraries in the Gulf. As a result in 1977 a Regional Union List was published including eleven libraries and twelve branches from Iraq and three libraries with twenty branches from Saudi Arabia, covering twenty eight subject categories. In 1980 NSTIC also undertook the publishing of a Union List of Arabic periodicals in Kuwait. In 1980, the Regional Union List was expanded to include sixteen
### 6.13

**Availability of a Depository Status for National, Regional and International Organizations**

<table>
<thead>
<tr>
<th>Institution</th>
<th>4:1</th>
<th>4:2</th>
<th>4:3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bahraín</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AGU</td>
<td>NO</td>
<td>*YES</td>
<td>NO</td>
</tr>
<tr>
<td><strong>Kuwait</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>KU</td>
<td>YES</td>
<td>NO</td>
<td>YES</td>
</tr>
<tr>
<td>KISR</td>
<td>NO</td>
<td>*YES</td>
<td>YES</td>
</tr>
<tr>
<td><strong>Oman</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SQU</td>
<td>YES</td>
<td>NO</td>
<td>YES</td>
</tr>
<tr>
<td><strong>Qatar</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>QU</td>
<td>YES</td>
<td>NO</td>
<td>YES</td>
</tr>
<tr>
<td><strong>Saudia Arabía</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>KAAU</td>
<td>YES</td>
<td>NO</td>
<td>YES</td>
</tr>
<tr>
<td>KACST</td>
<td>NO</td>
<td>*YES</td>
<td>NO</td>
</tr>
<tr>
<td>KFU</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>KFUPM</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>KSU</td>
<td>YES</td>
<td>NO</td>
<td>YES</td>
</tr>
<tr>
<td>UAUQ</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td><strong>UAE</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>UAEU</td>
<td>YES</td>
<td>NO</td>
<td>YES</td>
</tr>
</tbody>
</table>

- **4:1** National, i.e. right of legal deposit for your country.
- **4:2** Regional i.e. right of legal deposit for any of the GCC countries.
- **4:3** United Nations agencies e.g. UNESCO, FAO, WHO, etc.
- * Limited

*Source: Response Questionnaire 2:4*
libraries from the United Arab Emirates. In 1983 the Regional Union List was published in a COM (Computer Output on Microfilm) format. It was realised that on an on-line database of the Regional Union List would be very effective and meaningful if the data were in the MARC format. After the liberation of Kuwait, having lost everything, NSTIC started from scratch and to date it has a complete Union Catalogue of the journal holdings of Kuwait University, Kuwait Fund and the NSTIC in MARC format. (Interview with Manager, Automation, NSTIC)

The decrease in financial resources, resulting in the reduction of current intake of periodicals and monographs, has put additional pressures on libraries forcing them to One of the objectives of the GCC libraries is to initiate programmes for the better use of national resources through rationalisation, avoiding duplication and joint economic and industrial ventures. It is no surprise then that it was the GCC Secretariat which sponsored the development of a formal inter-library loan system to be adopted by the member countries. It is believed that any viable library co-operation programme will receive full support of the GCC Secretariat. The Gulf War has forced the GCC countries to develop their resources, services and programmes much more closely than they had considered ever before. The feelings of closer co-operation have been strengthened by this event. This changed environment will definitely encourage and nourish library co-operation in the region. The need for library co-operation among the GCC countries has always been recognised in theory, but not in practice.

At the Arab Gulf regional level, efforts have been made to introduce an inter-library loan system. An ILL system sponsored by the Arab Bureau of Education for the Gulf States (ABEGS) was approved by the Council of Ministers of Higher Education of the Arab Gulf States in April 1982. It has never been fully implemented due to various problems, such as lack of up-to-date bibliographical tools, lack of good publicity and low turn-around response from libraries. There is also a fear of loosing documents in transit which discourages libraries of sending books/reports by mail.

The existing arrangements for the inter-library loans services are not based on formal agreements. However, at the GCC level, there have been encouraging efforts to establish a formal inter-library loan system among all the libraries of the region. There are several methods which may be used to provide the monographic materials
on inter-library loans services. These include: (a) an original copy on loan; (b) photocopy to be kept by the borrowing library: and (c) microform copy to be kept by the borrowing library.

According to the minutes of the Meeting of the GCC Deans and Directors of the University Libraries in 1990 it is elaborated that:

1. Inadequate local libraries are likely to generate a little demand. Reference to documents are generally picked up from abstracting and indexing journals and if local libraries do not possess reasonable collections of these, few references will be identified.

2. A local library may not be geared to deal with requests for documents it does not have, because there is no system for supplying them, because they are unaware of possible sources of supply, or because the machinery for requesting is inconvenient or inefficient.

3. Even if there is an inter-lending system, its performance may be so poor that it discourages use: delays of several weeks or months, with no great probability of ultimate satisfaction, are likely to deter many would-be-users.

4. The user himself may be required to pay the costs of any loan or photocopy obtained.

   (GCC-DD, Meeting Minutes, 1990, p.6)

Another library administrator from KU calls for:

the exchange of accessions lists and information bulletins among scientific and technological institutions; the maintenance of a union list of holdings of institutional libraries; and existence of good communications links among institutions concerned; and the adoption of fairly uniform standards and practices.

   (KU Library Administrative Officer Interview)

Another respondent from QU said:

A first step is that efforts should be made toward the establishment of a standard format for bibliographic interchange, Union list/union catalogue. (QU Senior Librarian interview).

The following observations are based on the analysis and interviews in section 6.6 above and researcher visits. They are also confirmed in literature review sections 3.7 and 3.9 to 3.10. It is ascertain that due to the size of the GCC countries and a limited
output of science and technology, research and development information which they can afford is available on an international level. However, on the basis of the study exchange of information on the national and the regional level is not utilised fully. It is a must to establish national/regional co-operative plans leading to regional information subsystems for example Saudi Arabia in medicine, U.A.E./ Oman in agriculture and food resources, Kuwait in petroleum industries etc. As identified in model section in 1.5 (Figure 1.4), all the joint efforts have to be made on a national or a regional level, since their problems are identical and information sources needed will be similar, then why waste resources by duplications. Instead, all the efforts should be made to fill the gaps and acquire information resources for effective and efficient services on national and regional levels.

The decrease in the financial resources, resulting in the reduction of current intake of periodicals and monographs has put additional pressures on libraries forcing them to maximise the use of limited resources through co-operative programmes. It is believed that if realistic co-operation programmes are initiated now, library authorities and concerned agencies will support them.

But, is there any evidence of this retarding effect in the development of scientific and technological information systems in the GCC, arising from insufficient contact with information sources by information workers? The evidence does exist, however indirectly. It has been sufficiently shown in the present work by a count of what has been described as “Total incidence of libraries” that libraries rarely make contact with institutional and individual sources of information at a frequency for even basic inter-library loan services at national or regional level.

6.7 AUTOMATION

As a generalisation, automated information-handling in universities can be seen as passing through three stages. The first is concerned with stand-alone activities. It overlaps with the third stage, which involves networking. This, in turn, overlaps with
the second stage - the provision of information services over the network. All these stages require expenditure of money, but the second and third stages also require a continuing input of effort by skilled manpower. From the viewpoint of a developing country, networking may therefore represent a jump in complexity which is as difficult to bridge as that involved in the original introduction of computers.

Like all other modern machines computers have become very popular in the Gulf and it is often possible to obtain funding for them that might not be available for more traditional methods. Amongst those administrators with little experience of working with computers, there is often an optimistic belief that they will solve all problems overnight and that cataloguing backlogs, typing delays and filing inaccuracies will soon disappear once the computer is installed. Computers could be of great benefit to Gulf libraries but the gains are entirely dependent on the decisions taken at the start of each automation project. More important than the system chosen is probably the ability and willingness to pay for, attract and keep the staff who run it.

MODEL TESTED 1.5.3. Information Technology

To activate an automated system exploiting the contemporary information technology and co-operative library networking using multimedia.

Cornish (1995) highlighted information technology perspective in changing environment as analysed in section 3.6

After reviewing the situation of the library automation in general and the GCC in particular based on answers to questionnaires, visits, literature review in chapter three and interviews with library personnel covered in this study, plus the minutes summary of the GCC Deans and Directors (GCC-DD) meeting recommendations of 1991 specifically which they have been discussing for the last ten years, the status in respect of the issue of library automation developments and the deliberations at the Fourth Annual Conference for the Arabian Gulf Chapter/Special Libraries Association 16-18 April 1996. State of Kuwait. Human Resource Development in the Electronic Library
Environment, the major observations and analysis follows and also suggesting alternatives.

For automation in GCC institutes/organisation covered in this study the following questions were asked:

*Do you use computers in your library/information centre?*

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
</table>

*Which of the following activities in your library/information centre are automated or planned for automation?*

<table>
<thead>
<tr>
<th>Automated for Automation</th>
<th>Planned for Automation</th>
<th>Date Starting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acquisition</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cataloguing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inter-library loan</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Circulation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Serials</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SDI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current awareness</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Union lists</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bibliographies</td>
<td></td>
<td></td>
</tr>
<tr>
<td>None of the above</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Others (please specify, Table 6.14)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

All the institutes answered yes to the questionnaire with regard to the usage of computers by library staff for library and information services. However, several of the institutes answered that they had active computerised activities. In fact, when checked on visits, some of them were still in the testing stage. Nevertheless, the analysis is based on the answers to the questionnaire.

Automation in acquisition is used by AGU, KISR, SQU, KACST, KFUPM and KSU.
(only current materials). Other institutes reported that it was in the planning stage.

According to the Director of Information KACST:

Most of the university libraries in the region have either automated their operations or are in the process of doing so. An on-line computer communication network system (GULFNET) for the GCC states is already operational. Most of the university libraries are already linked-on line with each other through this network and use this as a means for message transfer and for using database searching services provided by KACST. (Director Information, KACST interview).

The GCC Dean and Directors of University Libraries meeting minutes of 1991 states that:

A union catalogue for all library holdings should be established in the central library. If this catalogue was to be computerised then the on-line public access catalogue (OPAC) could be available not only in the central library, but access to it could be made through terminals at all the branch libraries in the campus. Such an on-line catalogue would enable users to know what is available in any library in the university.

It further adds that:

The central library should take the lead role in implementation of any automated systems not only for its own use, but also in the branch libraries, in order to have a uniformity of IT policy in the entire university library system and also to avoid the unnecessary duplication or incompatibility of automated systems.

(GCC-DD Meeting Minutes, 1991, p.4)
6.14

LEVEL OF AUTOMATION OF LIBRARY AND INFORMATION CENTRES

<table>
<thead>
<tr>
<th>Names of Universities</th>
<th>(A)</th>
<th>(B)</th>
<th>(C)</th>
<th>(D)</th>
<th>(E)</th>
<th>(F)</th>
<th>(G)</th>
<th>(H)</th>
<th>(I)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arabian Gulf University</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Kuwait University</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Kuwait Inst. Scient. Res.</td>
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<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Sultan Qaboos University</td>
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<td>1</td>
<td>0</td>
<td>1</td>
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<td>2</td>
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<tr>
<td>Qatar University</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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</tr>
<tr>
<td>King AbdulAziz University</td>
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<td>2</td>
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<td>2</td>
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<tr>
<td>KingAbdulAziz Centre S&amp;T</td>
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<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>King Faisal University</td>
<td>2</td>
<td>2</td>
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<td>2</td>
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</tr>
<tr>
<td>King Fahad UPM</td>
<td>1</td>
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<td>1</td>
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</tr>
<tr>
<td>King Saud University</td>
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<td>1</td>
<td>2</td>
<td>1</td>
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<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>UmmalQurah University</td>
<td>2</td>
<td>2</td>
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<td>2</td>
<td>2</td>
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</tr>
<tr>
<td>UAE University</td>
<td>2</td>
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<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

(A) Acquisition
(B) Cataloging
(C) Inter library loan
(D) Circulation
(E) Serials
(F) SDI
(G) Current Awareness
(H) Union lists
(I) Bibliographies

**SOURCE:** QUESTIONNAIRE 2 AND ANNUAL REPORTS
According to the Vice Dean of UAQ University:

It is likely that most libraries will opt to buy in a complete system. DOBIS/LIBIS seems to be the one generating the most interest at present perhaps because of the example of the University of Petroleum and Minerals’ successful installation of this system. KFUPM has however, relied heavily on expatriates to install DOBIS and to maintain it. Here again language is a problem because of the difficulties of dealing with technical matters in Arabic and there is a danger that the field will become the preserve of expatriates, thus prolonging Gulf professional dependence. The sophisticated systems analyst work will no doubt always require those with a wider education and experience than the Gulf can provide whatever their nationality. (Vice Dean UAQU interview).

KSU senior staff looking after Library Automation programme commented that:

The problems of the Saudi university libraries stem from a lack of co-ordination among the libraries and absence of national planning and insufficient number of professionals and the present state of shrinking budgets. Therefore, network base is the answer which needs a strong institutional leadership, adequate financial support and establishment of a national library to run a co-operative system. (KSU Staff interview).

Qari (1996) as revealed in section 3.10 discussed and analysed information technology especially at KAAU, Jeddah, Saudi Arabia.

NSTIC library automation specialists said:

There is a lack of standardisation in such areas as hardware, software, treatment of processing, vocabulary and information retrieval language. (KISR library specialist interview).

The following observations are based on the analysis and interviews in section 6.7. This was also confirmed in literature review sections 3.5 to 3.6. It is revealed that the library and information automation leading to network is a blessing for the GCC countries, which have a very advanced and reliable telecommunications system.
But the major problem is national or regional network planning. It will be more feasible to acquire similar automation systems to acquisition of systems which have been successfully pre-tested in a bilingual environment especially an Arabic/English environment. The introduction of CD-ROM technology for print indexes and abstracts are a major step forward, but again, duplications on national level can not be justified. A well organised national CD-ROM network plan could be developed leading to a regional plan, because the subscriptions for the CD-ROM are still very expensive. With recent Internet connections the door of CD-ROM usage can be open for each and every user.

Technically it was observed that due to competition instead of co-operation between central computer centres and the libraries on the campuses and poor co-ordination it becomes hazardous for the successful running of the library network within the university. This problem has to be rectified before a national or a regional network can work. As identified in model Figure 1.5, an effective and efficient service depends on quality sources an efficient network.

A major problem was the recruitment of some inadequately trained expatriate library automation specialists. Their necessity for on the job learning led and continues to lead to some pro decisions. For example, in the case of KFUPPM, a so called pioneer of library automation in the region has to depend on the help of Data Processing Centre (DPC) at the university to implement the DOBIS/LIBIS system. The personnel at the DPC obviously had difficulty in understanding the MARC formats for cataloguing. The DOBIS/LIBIS system (a giant a giant unfriendly expensive system) which failed in Europe and North America was wrongly chosen through lack of automation expertise and lack of forethought in a bi-lingual environment, become a guinea pig testing centre in Saudi Arabia especially for the Arabic materials. However, two institutes in Kuwait and one in Saudi Arabia signed with for the VTLS library automation programme in 1994. But unfortunately the VTLS was unable to keep up the promises of implementation on time both due to technical problems and complexity of an Arabic material database.
Care must be taken to make the routine operations comprehensible to all staff. In this way not only will they be able to make a greater contribution to all aspects of the library’s work but also they will not feel alienated by their exclusion from the new technology. If automation is decided upon, a great deal of advanced planning is needed for the system to work well and be of a maximum benefit. Certain key factors need consideration:

1) As a first step, decisions must be made as to what precisely the system is required to do. This checklist of requirements can then be matched against the capabilities of the systems available. This should both assist in choosing the most suitable system available and put an end to unreal expectations of what computers can achieve.

2) Although, in the long-run a computer installation should reduce the demands on qualified staff time in the areas in which it operates (an important factor in an area where skilled manpower will perhaps always be in short supply). In the short-term staff requirements will probably increase. An advance analysis must be made of the number of new staff that will be needed and of their skills. Discussions should then take place with the university authorities about grading and salaries for the posts. A realistic assessment must then be made of the likelihood of being able to recruit suitable staff for the money and conditions on offer. If staffing seems likely to be a problem then a less sophisticated systems may have to be considered.

3) Arrangements will have to be made for training staff already employed by the library in working with the new utilisation. Decisions must be made on whether in-service training will be made available to non-nationals, especially if they travel abroad.

Suitable expatriates are not attracted by the money offered and nationals are not attracted by the nature of the work. Any new computer system will however, require high level programmers and accurate operators as well solutions to staffing problems. Despite all the drawbacks, each Gulf university library will probably move eventually
to an automated system, largely in an attempt to find a lasting solution to their major organisational problems but also as a means of improving status both within the university community and in the region as a whole. (Computer courses are very popular in the Gulf so the information technology aspects of library work might attract more able candidates to the profession).

6.8 SERVICES
In the GCC countries there has been a rapid growth in higher education in recent years and an accompanying growth of library facilities. Many institutions have developed independently and sometimes in competition with one another. However, more recently there has been greater financial restraint and their independence has limited the service the university library can give. As they can no longer continually expand their own resources and since they share many common problems, they need to cooperate to maintain and expand the standard of service. There is no doubt that with the recent political events in the Gulf region, the need for practical resource sharing programmes now, more than ever before, needs to be emphasised.

MODEL TESTED 1.5.2. Information Services
To promote and disseminate consistent and prompt information, exploiting information networks of all types and forms at local, regional and international levels having adequate facilities.

In the dissemination of information, a library/information centre renders services to its users in a number of ways: providing literature searches, reference services, answering inquiries of an informative and technical type, and giving advisory or consulting services, etc. Some of these services are shown in Table 6.15 The degree of emphasis given to each service is also shown and will form the subject of this section.

The functions and the number of libraries and information centres which perform these are identified, together with the relative emphasis’ is given to each service. Finally
Table 6.15 specific situations of two institutional groups are examined — the universities and institutes information centres, with emphasis on science and technology, including Medicine and Agriculture. (Table 6.15).

Once a book is acquired and technically prepared by the university library, it is also the library’s duty to ensure effective use of this book. This is usually done through the user services department or division in each library. Since the main objective of the university library is to provide effective services to its users, achievement of such an objective will be measured by the standard of the services provided. However, the real success of a university library does not lie in the size or variety of its collections, but in the extent to which it meets the needs and demands of its users.

The question for this study was the request to indicate the degree to which the library/information centre renders the following services:

- Provision of answer to technical questions
- Consultancy/consultancy services
- Critical reviews
- Organising seminars, conferences, workshops, etc.
- Reference/literature searching
- Routing of current periodicals
- Routing of current content pages
- Selective dissemination of information (SDI)
- State-of-the-arts report
- Translation services
- Others (please specify)
### 6.15

**LIBRARY AND INFORMATION SERVICES PROVIDED BY GCC INSTITUTES**

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**SOURCE:** QUESTIONNAIRE 2 AND ANNUAL REPORTS
6.8.1 TECHNICAL QUESTIONS

The provision of answers to technical questions is a service in both the university libraries and research institutes, but only four university libraries out of ten in this study consider themselves as providing this service. Provision of answers to technical questions is the second most popular service rendered by the libraries and information centres after the Reference and Literature Searching. Irrespective of the degree of service rendered, we find that all the 12 libraries render reference/literature search services and 6 libraries provide answers to technical questions. Six libraries have no activity in the provision of answers to technical questions. However, the fact that overall 50% of libraries provide this service is quite remarkable in the GCC environment. It must be noted however that KU, KISR, KACST and KFUPM provide this service at the highest level while SQU provide it at the medium level and AGU at the lowest level. No activity was reported by QU, KAAU, KFU, KSU, UAQU and UAEU. This report was quite surprising in the case of the subject specialist KFU, even though there is scarcity of professional staff, which was mentioned in section 6.4, who are mostly utilised in non-professional jobs, e.g. people with MLS and double MA's in Library and Information Science working in student book shops, doing inventories and issuing books once in year.

In the present circumstances, various decentralised systems in all the library systems covered in this study, indicated that all the material is not handy to answer technical questions, even if the staff is well qualified in the subject area to do so. Secondly most of the reference desks, which are the first contact point are manned by non-professionals who definitely do not understand the technical questions in the first place. Except in the case of a subject information specialist at NSTIC, the concept of subject information specialists does not exist in other institutes, where R & D personnel could go for technical queries. The overall problem is that the decentralised library system on all the university campuses do not have fully integrated library information systems so as to analyse technical questions or even give profession answers using all of the on-campus resources. Furthermore, the absence of any national or regional information network (like GULFNET not yet fully implemented)
makes the queries even further harder. Even the basic information tools like the Internet are not available in most of the GCC university libraries. All these situations really make it hard for the informational professionals to answer technical questions so as to satisfy the engineers and scientists they are serving in the overall framework of the model proposed in Figure 1.5.

6.8.2 CONSULTANCY

KISR, KACST and KFUPM are the only three institutes providing consultancy and translation services. All three reported providing this service at the medium level. However, KACST and KISR also provide the services of routing of periodicals, content pages and other services.

This result should not surprise us because consultation and advice as a major service only to an Information Analysis Centre, minor to an information centre, rare to a special library, referral centre and clearing house and no activity for a documentation centre. (Table 6.9)

From the foregoing comparative account, it is easy to see that a greater amount of activity is found among the libraries in the research institutes than is the case in the university libraries. It would appear that the main service is literature searches in the universities, whereas in the research institute libraries, the range of services is extensive and the degree to which they are rendered is also high.

Though consultation is provided by only one specialised university, KFUPM in Saudi Arabia and in two R & D information centres i.e. NSTIC in Kuwait and KACST in Saudi Arabia, the provision of consultation is not pro-active i.e. consultancy is not provided to specific national clients on fee basis and to industries or organisations on regional or national levels. Again the ability of the professional staff to do consultancy work is questionable. How can this be achieved in the absence of marketing or business plans of libraries and information centres in the GCC?

6.8.3 CRITICAL REVIEWS
No response was given by any library and information centres on this service.

6.8.4 SEMINARS, CONFERENCES AND WORKSHOPS
In the present study both the research institutes and three university libraries indicated that they conduct seminars, conferences and workshops as a major activity, three as minor and two as rare and two gave no response. That is to say that most of the libraries organise conferences and seminars to some degree. The second highest figures of 83% reported for this activity were falling just behind the status of the Reference Service, with five of them (KU, KISR, KACST, KFUPM and KSU) who reported the activity at the highest level, AGU, SQU and UAEU reported it at the medium level and the rest of the universities i.e., at KAAU and KFU reporting at the lowest level with no response from QU and UAQU. With the presence of well decorated auditoriums either within the libraries or on the campus this activity is very significant in building the image on the campus or at a national level. Successful professional activities could be beneficial for the development of not just the image but also of a good marketing source to build up the status of the library and information professionals at a national and regional level.

6.8.5 REFERENCE AND LITERATURE SEARCHING
Reference/literature search appears as the most popular service rendered by the libraries in this study. All the institutions regard it as a primary or major activity. The corollary of reference/literature search is the provision of answers to general inquiries or even to technical questions. But the provision of reference/literature searches can come in a number of ways.

With respect to the form of output, literature/reference search belongs to the bibliographical systems which supply bibliographical references and these references can be retrospective or current. It is then against this background that the degree of services rendered by the GCC libraries of science and technology must be viewed.

The only reported service by all the institutes and organisations in this study was the
Reference and literature searching services which all of them reported at the highest range. Reference/literature searching services is the number one activity by all the institutes covered in this study followed by provision of answers to technical questions by all except QU, KAAU, KFU, UAQU and the UAE.

During the researcher's field visits to the area and during discussion with the professional staff, it was revealed that most of the professional experienced staff do not like to sit on the reference desk and most of the enquiries are dealt with by the non-professional local or expatriate staff. The library professional staff are only consulted by faculties. But some of the professional librarians insisted that the enquiries were predominantly from students, who are the major visitors, mostly having questions about directions, asking about sections and subjects. However, the researcher did not agree with them as one of the duties of the professional librarian is User Education or Library Orientation which they cannot fulfil if they stay away from the reference collections and their users at the enquiry desk. All the professional staff from Technical Sections, the Public Services Section and also from Automation including the Management should spend some time on the reference desk to really get to understand the needs and problems of the users which would definitely help them to make correct professional decisions.

Each university has a reference collection which includes various types of reference materials such as: encyclopaedias, dictionaries, bibliographies, atlases, guides, indexes, etc.

Quite often the literature searches are done for the production of bibliographies and it has been noted that it is a major activity of the libraries in this study. However, in practice KISR was the only institute which produced a significant number of bibliographies in the region in a year and others only published occasionally.

Reference collection is the heart of any library information service. In most of the GCC institutes reference collections are not organised at one place. Some of the
reference materials are not available during all the hours when the libraries are open. So in many cases even the professional reference librarians are not aware of the reference materials available in the collections, in particular most of the government documents which are not even identified on OPAC's including reference materials in most of the cases.

Due to a very little professional interaction between the reference librarians and the users the information needs of the R & D personnel are rarely identified — which does affect both the services and collection development.

The reference and information services in the university library is considered one of the basic and effective services provided to the library users. All the libraries provided full information with regard to the reference and information activity. Although the reference sections are functioning effectively and the reference collection includes a considerable volume of reference materials, it is surprising that the university library does not maintain any statistical information regarding the number of reference volumes nor does it keep records of the number of reference questions handled per day, which would undoubtedly be helpful to evaluate the reference and information services provided by the library.

6.8.6 PERIODICALS ROUTING
Routing of new issues of periodicals to research personnel constitutes the second most popular service rendered by only two of the research institutes/information in this study but by none of the university libraries. This service introduces an element of familiarisation with the clientele and may be more effectively rendered by research institute libraries than by those of a university. The reason is that a research institute library is apt to have fewer users than a university library has. Both the research institutes reported providing this service at the medium level. This argument tends to conform with the high number of libraries in the research institutes which render this service as an activity compared to the number among university libraries.
Periodicals take away the major part of the library budget between 30% to 60% depending on library to library. But the cost effectiveness of this expense is questionable, particularly in the GCC environment where most of the universities are just junior colleges and not full status universities, as in the west. This has been proved by analysis of R & D in chapter 5.

The first question arises. Is there a need for subscriptions to expensive periodical collections? Probably a core collection and some general periodical subscription would suffice. Second, a union list of periodicals may help. Third, at national and regional levels most of the duplications could be avoided. Fourth, articles from very specialised journals could be retrieved from BLDSC or other suppliers.

6.8.7 CURRENT CONTENT PAGES ROUTING

The current awareness includes all those things that the library can do to keep its clientele aware of new literature. It includes selective dissemination of information (SDI), lists of new acquisitions and displays of new books and periodicals.

Only three institutes are offering current content pages routing services actively at a medium level range which is understandable. This service is active in both the research institutes as well as at the newly established university SQU (Oman). One form of current awareness service which has been described earlier is the routing of current periodicals. The purpose of the routing of the current content pages is to ensure that information users are alerted about the appearance of useful materials. The service is often accompanied by a duplicating service supplying prompt and not too costly copies of the available materials. The range of the service is also extensive and may include SDI (to be discussed below), a periodical listing of books and/or periodicals currently received (accessions lists), technical reports locally produced, references to newly accessed reports, patents, etc., which are considered useful to users.
The researcher on his research trip witnessed routing of electronic current pages of at KACST in Saudi Arabia and in hard copy form at KISR in Kuwait.

At KACST the routing of current content pages is done electronically, whereas the limited research staff receives content pages from the selected periodicals. With limited numbers of the periodicals the process runs smoothly, according to one of the users. However, with the recent availability of content pages on Internet this service becomes redundant due to time difference: periodicals received, censored and processed locally.

NSTIC faces similar problems and in addition only five periodicals current pages are distributed to the selected professional research staff.

6.8.8 SDI

SDI is the service to keep R & D staff constantly aware of the contents of newly acquired documents. The users submit a query in the form of a detailed narrative. From this, an information specialist constructs a search profile the user’s interest profile consisting of a series of search terms and statements. These may be single words, subject headings, class marks, descriptors from a thesaurus, a keyword, name of a journal, names of authors of the works sought or their references, the name of an institution or organisation and so on. Each user’s interest profile is stored.

All documents, external publications, internal publications and author accessioned by the information service, are scanned for characteristics in the user’s interest profiles. A relationship between an incoming document and the user’s interest profile is determined by matching the profile with a similar one established for the new document. This matching may be manual or computerised. User’s profiles which are found to be similar above a certain limit are selected and the others are rejected. Those selected represent the recipients of that new document.

An instrument of notification, which may be an abstract of the document, or, in some
cases, a photocopy of the document itself, is used to inform a selected recipient of the existence of that document.

An instrument of response serves a number of purposes. With it, the recipient replies to indicate that the document is not relevant; is relevant, but not needed; can be referred to someone else who might benefit from it; or is relevant and needed. No response would indicate a rejection of the document in some cases. If the document is accepted, a request for a copy of the document is indicated. In the case of a referral, a profile of the new (potential) recipient is created. The feedback from the instrument of response helps to make necessary adjustments in the profiles of the users within the store of the SDI system.

The Selective Dissemination of Information (SDI) service in both the research institute libraries and the newly established SQU (Oman) deserves some attention as an important aspect of current service. This service also followed the pattern of Current Content Pages Routing, the same institutions reporting and at the same medium level of 2.

SDI is again active in both the special information centres NSTIC and KACST, which are also the major centres for on-line search activities. KFUPM also provides this service on a limited basis and SQU a newly established university has taken the start to provide SDI services only at a management level.

6.8.9 STATE-OF-THE-ART-REPORT
State-of-the-art reviews as well as critical reviews are exclusively major activities for information analysis centres extensively. However, there is an absence of an information analysis centre in this study. Three libraries including two research institutes and one university library indicated state-of-the-art reviews as a minor service activity. No library indicated critical reviews as a major activity. Furthermore, of the high number of libraries, nine had no activity in these services, which is an additional confirmation that it is a function
of information analysis centres. From the foregoing discussions, it becomes tempting to adopt the conclusion that more activity is seen in the research institute libraries than in the university libraries, (the fourth highest in service rendering activities) which is quite encouraging.

In the absence of any information analyst or subject specialist the limitation of the state-of-the-art-report services in the GCC is understandable.

6.8.10 TRANSLATION SERVICES

The importance of translation services must be emphasised further by reference to the multiplicity of languages now in use in the publication of scientific and technological materials. The magnitude of the problems posed by the language factor in the dissemination of information can be appreciated.

Both the research institutes KISR and KACST and KSU reported translation services as part of their activities. However, on the researcher's field trip it was observed that though KSU in Riyadh do have a very extensive Translation Bureau Department, it is a training and service section for Saudi ministries and other government sectors.

6.8.11 OTHERS

The research institute libraries demonstrate an emphasis on newspaper (or press) cuttings/clippings. This activity has equal emphasis with document retrieval and provision of photo duplicating facilities as a major activity.

Some respondents laid down some pre-conditions which must be fulfilled before a scientific and technological information system in the GCC can be developed. These can be achieved:

By educating our policy makers and planners on the importance of timely development: by recognising the fact that there should be a "body of experts" to advise the government on information matters with the aim of formulating a national
policy on information; and by giving librarianship and information science pride of place in our educational system.

Users’ awareness of the existence of scientific and technological information must be enhanced through sustained campaigns.

It requires national discipline before scientific and technological information systems can be set up in GCC (Researcher’s discussion with the library staff at KAAU).

Access versus ownership is the priority for the library and information services today and this trend will continue till the accomplishment of a virtual library. KFUPM in Saudi Arabia and NSTIC in Kuwait are working in this direction but they are also facing major problems to accomplish a sound system.

The overall analysis of the GCC library and information services reveals (based on questionnaire 2 section 6.8 analysis) that, both the research institutes KACST in Saudi Arabia with 90% and KISR (Kuwait), with 80%, render the services but not necessarily at the highest level. For example KACST, reporting 9 out of 10 services, provides services at the medium range level for 6 of them except for reference, technical and organising seminars which are at the highest level with no reporting for consultancy. This is a surprising revelation, because KACST is basically a consultancy watch dog institute at a national level, but it may be that the Information Directorate do not have that mandate, in spite of doing some remarkable data processing and network work both at the national and regional level. Almost the same pattern was followed by KISR, who though are supposed to be the model scientific and technological information centre in the region failed to provide these two services. SQU, a relatively new university took the lead in providing 60% of the services though at a medium level except for the basic Reference Services which were at the highest level. SQU was surprisingly followed by KFUPM reporting provision for only 50% of the services. In spite of being a special subject university with strong R & D activities it reported the highest level activity for technical answers, reference and
organising seminars and medium level for consultancy, the only reporting university and the same for state-of-the-art reports.

There were comparable figures for both AGU, a special subject university and the distinguished KU university, reporting 30% for each, which was a big surprise as the former is a newly established university and KU is well established, but a decentralised system of libraries at KU may be the major reason for providing minimal services. The figures of 20% each at UAEU, KFU and KAAU followed the trend as expected, but the dismal reporting of only 10% provision of reference service at QU speaks for itself. However, in the end the researcher realised that circulation of books, photo-copying services etc., the basic services which are commonly provided by any library, was not asked about in the questionnaire, because the major purpose of the study was not quantitative but qualitative.

One respondent was particularly concerned about the acquisition of documentary materials emphasised that:

I would like to see the establishment of a National/Regional Periodical Centre that will acquire comprehensively in the same manner as the British Library Lending Division, periodicals, technical reports, proceedings of conferences, etc., in all fields of science and technology. The Centre should be supported by a strong photocopying service so as to be able to supply, promptly, photocopies of articles on demand to other academic and research libraries. It should be capable of tapping with the resources of mechanised information retrieval system on behalf of other libraries and in due course establish its own mechanised information storage system. (KAAU Assistant Professor interview).

The Director of NSTIC rightly implied that:

The way in which information is being stored, accessed and disseminated has changed fundamentally. In the light of these changes NSTIC has developed an information strategy leading to 21st century, setting out how it (NSTIC) proposes to meet the needs of both information providers and information seekers for effective and efficient service. The main strategy is to adopt an access as opposed to holding a large collection. (NSTIC Director’s Policy Statement, 1996).

According to the Senior System Analyst from the Vice Dean of Automation, Office
of KAAU:

Each university library performs a variety of activities and provides many types of services and programmes to its users. On paper co-operation among libraries are common in the areas of inter-library lending, gift and exchange, photocopying and union list and catalogues. Only minimal efforts are given to inter-library co-operation and co-ordination. The solution is automated co-operative library network as feasible if there are no lacking of human resources, co-operative planning, institutional leadership, bibliographic control, standards and communication. (KAAU Library staff)

NSTIC Information Technology Specialist rightly incited that

The integration of networked information into library services has been a measured process of systematic research and strategic planning is progressing since 1991 pursuing an aggressive programme of automation to introduce electronic information provision into NSTIC operation and services which enhanced information services and staff expertise In spite of both financial and staffing constraints. (NSTIC Information Specialist interview).

As revealed in section 6.7, and 6.8 also identified in literature review in 3.10 plus interviews NSTIC in spite of being a national centre the budget is only limited on the institute level. Charging for the services both within the institute and at the national level is being considered for implementation but is not always easy in any third world country and especially so in affluent societies where people and organisations who are used to free information. Therefore, the change from the charge fees is not always easily acceptable. As in the case of Kuwait University, NSTIC is also working at more than 50% less staffing than before the war. NSTIC also took the leadership role in re-assessment of the library and information resources in Kuwait, but was also the first institution to start re-building information resources leading to an electronic information system in the country.

Salem (1992) also revealed that:

The University libraries services were affected tremendously. In the university library sector information services were affected too and all operations were frozen (Table 6.16). Many of the basic services are still not available even after five years. The major reason being again the creeping of several branch libraries without a strong central library without a strong internal network.
The major components of information services were seriously affected in the eight special libraries in Kuwait after the Gulf War. Photocopying and borrowing of available materials were the only two major activities. Most of the other services like reference, automated searching, SDI, current awareness and bibliographical information provision was provided in a few selected institutes and in others were completely inactive. However, the major special library NSTIC in Kuwait which is one of the institutes covered in this study took the lead in providing all the services beginning as early as 1993. (Table 6.17)

In Saudi Arabia funding was also the major problem. During the researcher’s visit to UAQU, Mecca in 1994 and also confirmed by the senior library staff, it was revealed that two years in row no subscriptions were paid for the journals. The only journals available in the library were received from Membership Subscriptions or donated by the staff who received them directly. At KAAU the conditions were not very bright, according to the professional staff as revealed during interviews.

Kuwait University Technical Services Department revealed and also confirmed in interviews and analysis with teaching staff that at Kuwait University more periodical subscription were cancelled for the year 1994-1995 and that the growth of book collections is rising steadily. However, instead of building core collections for different faculties, once again several separate Faculties Libraries are creeping up on six separate campuses with all kind of materials and the concept of a Central Library still does not exist in the University Library System for which the University Administration would be responsible by rebuilding new Faculties separate from each other. The Library Administration is forced to set up libraries according to the needs. However, the Faculty of Medicine Library at Jabriya is connected with the Mubarak Hospital while the Faculty of Applied Medicine and Nursing Library is located on the campus in Shuwaikh. Both the students and faculty find these collection on two different campuses very inconvenient and there is also wastage by duplication in staffing and some collections.
As confirmed in interviews and questionnaire analysis in section 6.4, the biggest problem which the University faces is the recruitment of professional staff. In the first place, faculty status is not given to the Library Staff, unless they are Ph.D.s. The national PhD holders are not willing to work in the library system, as there could be only one Dean or Director of Libraries, so almost all of them preferred to join teaching positions. The recruitment for professional expatriate positions is more serious. Due to budget positions, the university was not able to attract Ph.D. even during good days before the invasion and the things are more serious now. The Libraries Department are compelled to hire professionals which are not their top choices, as more than 95% of the professionals decline the offer to come on at the salary and status being offered. The position is similar at NSTIC in Kuwait. This position will not change in the foreseeable future unless better status is provided to the professionals. This situation also persists in most of the libraries in Saudi Arabia in particular and in almost all the GCC countries generally.

Unfortunately the contributions from FID and IFLA were limited to lip service and the recommendations elaborated earlier. As indicated by delegation from some of the member countries at international conferences, that “Kuwait is a rich country and be able to buy information services on fee basis from any where in the world”. Experts are willing to come over for consulting projects. Even the brotherly countries in the region were not willing to donate the duplicate copies from their collection or even spare a copy of government publications which were originally gifted by the Kuwaiti government to the libraries in the region (Kuwait Library administrator interviews).

However, UNESCO did participate actively for the development of Information Policies in the region.

Based on analysis in sections 6.1 to 6.8 and with the further impact of the Gulf War in the GCC, no library demonstrated the classic example of fragmentation of efforts more than large university libraries within the same city/country even in Saudi Arabia. This is best illustrated by the libraries in Saudi Arabia. Earlier in KSU, then Riyadh
University, libraries had a number of Faculty Libraries separately which were ultimately merged into one collection in the new Darriya campus.

Besides distance, poor physical infrastructure, etc., inter-library co-operation between libraries which are close to each other is not always strong. Libraries in the GCC area face a number of difficulties in collection development due mainly to the lack of bibliographic aids. Library collections in general are inadequate compared to the needs of users and are weak in retrospect.

According to a senior member of KSU Library staff comparing the Saudi university libraries with library standards it is observed that:

a) There is a great shortage of librarians in the central libraries.

b) The library collections in both central and branch libraries fall far short of the recommended standards.

c) There is enough finance available for the libraries but none of them has an independent budget.

d) The library building area is mostly satisfactory, specially in central libraries

( KSU Senior Assistant Librarian interview )
### 6.16

SITUATION OF INFORMATION SERVICES IN UNIVERSITY LIBRARIES AFTER THE IRAQI INVASION (B = BEFORE INVASION; A = AFTER INVASION)

<table>
<thead>
<tr>
<th>Type of service</th>
<th>Kuwait and Gulf Information Centre</th>
<th>Manuscripts and Department</th>
<th>Faculty of Education</th>
<th>Faculty of Arts</th>
<th>Faculty of Jurisprudence</th>
<th>Faculty of Law</th>
<th>Faculty of Commerce</th>
<th>Faculty of Science</th>
<th>Faculty of Engineering and Petroleum</th>
<th>Libraries Department</th>
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<td>*</td>
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*Source: Journal of Information Science 18(6), 425-446 (1992)*
### SITUATION OF INFORMATION SERVICES IN SPECIAL LIBRARIES AFTER THE INVASION (B = BEFORE INVASION; A = AFTER INVASION)

<table>
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<th>Ministry of Oil: Economic Affairs</th>
<th>NSTIC</th>
<th>Council of Ministries of Planning</th>
<th>Ministry of Planning</th>
<th>Arab Planning Institute</th>
<th>National Commission of UNESCO</th>
<th>ABEGS</th>
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<tr>
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<td>A</td>
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<td>B</td>
<td>A</td>
</tr>
</tbody>
</table>
The absence of official standards for GCC libraries in general and the university libraries (which Isa, (1982) proposed in his PhD thesis) in particular, causes lack of direction toward the achievement of their goals. Therefore, GCC universities should work out standards for their libraries and also the realistic means for their development, in the light of these standards, with suitable modifications of international standards so as to meet local and regional needs, using Isa's standard as a base to implement them according to the needs of each country.

The lack of a national library association is one reason for the absence of standards and also for the poor national planning and co-ordination on library matters. Because of the importance of the library budget, which influences all library services and operations, each library should have its yearly independent budget. This would greatly assist in planning and development by the libraries.

The Director of KAAU Library specified that:

1. The heavy dependence on textbooks in instructional activities.
2. The language used in instructional activities in most of the universities is Arabic.
3. Low levels of academic research activity in these universities.
4. The lack of encouragement from the university teachers for the students to use the university library's resources to the full extent.
5. The student's attitudes, especially at undergraduate level, towards the university library. (KAAU Director Library interview).

The following observations are based on the analysis and interviews in sections 6.2 to 6.8 and also confirmed in literature review sections 3.6 to 3.10. It is revealed that, whatever their deficiencies, the university libraries of the GCC remain the region's principal stores of recorded information. If however, they are to provide a useful service to their parent institutions and even begin to contribute to national and regional development, some improvements must be made. If the bureaucracy could be bypassed, talented staff attracted by better pay and conditions and regional co-operation organised to develop appropriate information systems, then effective libraries could be created. However, plans to improve the GCC university libraries must be concentrated on the realities of the situation.

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The first and foremost important consideration is where the impetus for change is to come from? Planning in all the GCC countries is centralised and for major changes and initiatives to receive substantial support, it is imperative for development that the central government should be persuaded of the importance of libraries and information services. Although, over the years government statements have paid lip-service to their importance, no concrete action has been taken to improve matters, such as improving salaries and career structures for librarians or implementing national information planning. While the libraries are in their present condition, planners are unlikely to realise their value as a national resource and will continue to overlook their needs. It is only after the libraries start to make an important contribution, that they will begin to attract a large share of government funds. The initiative for change must therefore, come from within the universities themselves, with the library departments working in close co-operation with sympathetic faculty and senior university officers.

It only requires one person of sufficient standing in each university to start the process. It is not realistic to expect that all the bureaucratic delays can be swept away overnight or that librarians will ever be equated with doctors or engineers; however, quite small changes could have a big impact on services.

This section covered the status of library and information centres covered in this study, analysing the questionnaire two concerning the ways of improving library services which are feasible in the current GCC environment and constrained financial climate.

It is important to set obtainable objectives, so that people do not become frustrated and money is not wasted on materials and equipment that cannot be fully exploited. It has been suggested that the best way to identify what is feasible in a country, is to look at the best in that country and aim for similar standards in the institutions to be improved. In some of the Gulf countries the university libraries probably are the pinnacle of current achievement. In the region as a whole, the libraries of the University of Petroleum and Minerals (Saudi Arabia, now King Fahad University of
Petroleum and Minerals) and the Kuwait Institute for Scientific Research provide examples of good library practices, especially in the field of information technology.

Regarding training and education it is important that the staff should be given on-the-job training. The library staff must also be given time off from work to attend relevant courses already being run by the university, such as English language and computing. Attracting the right calibre of people to library work will always be difficult. Only as people begin to experience improved library services, will they come to value the library profession and wish to join it for the right motives.

To assist in designing relevant library school curricula and to ensure that staff available are put to the best possible use, future manpower needs will have to be analysed to take into account not only absolute numbers but types of skills required. The aim would be to prevent projects being started, for which there are no available staff with relevant skills and to allow staff to be organised in such a way that the best use is made of their professional skills.

Improving the provision of materials needed by users, calls for an evaluation of acquisition policies and inter-library loan services have to be carefully evaluated to see how they are affecting the availability of materials. The identification of information sources, of what information is more frequently used by scientists and engineers and the tendencies of use of sources and channels, would help the library to review and redefine these policies. Since self-sufficiency, total information availability is not possible even in the most advanced countries, so developing information networks and resources sharing programmes between institutions with common goals and interests, should be given high priority in the planning of library services.

The importance of manpower for better services cannot be ignored. A second fact to mention is that of the size of the national information system in terms of manpower and materials. It is a fact that the system has to involve a large staff and extensive information materials. Once again, the size and dimensions of the national system at
this level will depend on national situations and national resources. Initially, the functions of a national system have to be scaled down. As information workers become adapted to the system they are operating, as resources begin to grow and as the population of users increases and perhaps, as overall national policies begin to impinge on the need for an increased supply of information, the national system will be bound to increase its scope.

The researcher observed during visits and in interviews discussion with experts in the GCC, the following problems during his research trips to university libraries and research institutes information centres.

1. greatly intensified pressures from various sources.
2. declining ability of libraries and information centres to meet the needs of the clientele.
3. lack of goals and planning.
4. inability to accommodate educational changes quickly.
5. declining financial support.
6. questioning of centralised controls.
7. need for effective resources sharing and computerisation.
8. prevalence of traditional authoritative styles of management.

It was observed that due to financial constraints of budget cuts in education and research sectors the management is facing the problems of:

a) increases in demands for accountability from various agencies;
b) departure of foreign experts;
c) stabilised or declined budgets during period of increased expenditure;
d) inflationary costs;
e) ill understood effects of initiatives; and
f) the absence of national or non-regional system of information co-ordination.
The establishment of universities and research institutes of science and technology in GCC has become something of a status symbol in the period of the 70's/80's. Usually, a university is set up without adequate plans for general accommodation for the institution. A “temporary site” is often chosen and this is followed with a scramble among various departments of the institution for accommodation. Quite often the library loses to academic departments, administration and laboratories and is invariably promised enviable accommodation in the long run. However, the movement toward the paperless society means we cannot concentrate only on the physical environment. The user who can search the library catalogues from his or her office, send requests for material via electronic mail and have the information delivered to the office (let alone down-loaded to the users terminal) may well perceive the library as accessible even if he or she is physically quite removed from it.

The application of modern information technologies in library and information services in GCC is not up to the standard. For example, there is little evidence of the application of the computers and the only evidence of their use in a few isolated university libraries suggests that use is sporadic without anything to prove that such use is widespread in those libraries.

Even in most of the ministries and key organisations in Kuwait libraries were not established after the Gulf War till 1996. In some cases libraries are merged with the public information / public relations departments without a staff of library science background.

The final analysis and concluding recommendations enhance the importance of Regional Network and Strategy of National Information Network suggested by the researcher in the study for revival of information resources and services in GCC, by fully implementing electronic library network system in the region.
CHAPTER SEVEN

USERS PERCEPTIONS OF GCC UNIVERSITY AND RESEARCH LIBRARIES AND INFORMATION CENTRES

7.1 INTRODUCTION

In the previous two chapters we have examined the general characteristics of research and development activities of science and technology and the status of science and technology libraries in the GCC countries. In this chapter scientists/ engineers and academic staff perception as users of information and factors impinging on their ability to use and obtain information, will be discussed in its widest sense, as well as the time they spend on various information activities. Various factors generate an information need, for example, the type of work being undertaken, the discipline in which one is working, the knowledge of and availability of material. The manifestation of this information need is the identifying, finding and using of the information itself. Information seeking and its use is a very personal thing - some people do it, others do not. Some people are by nature curious and anxious to learn all they can, while others have no desire to do so at all.

The series of proposed models that show how information is used and identified the variables that affect the use of information in STI environment. The theoretical model will be tested throughout this chapter for adoption and implementation. However due to the nature of this inter-disciplinary study three final concluding models in relevance to theoretical model framework of this study will be comprehensively covered in concluding analysis in chapter eight.

For information users needs the model developed in Figure 1.4 is specifically used for this chapter for adoption and implementation. The main idea is to use it to examine the impact of different types of information-seeking behaviour on the use of the information resources. From this model the method and technique were derived for deciding on and improving appropriate questions to be asked, such
1. What are the major sources of information that R & D personnel use and to what extent do institutions depend on such sources in providing information?
2. What are the main types of information provided by institutions and how relevant is this information to users' needs?
3. In what form do institutions provide this information and what are the main services and facilities available to the users?
4. What steps do institutions take to enhance users awareness for effective and efficient use of information?
5. Do institutions take initiative to develop their information services?

Furthermore, an update status up-to mid 1996 is being discussed to continue relevance through further interviews, updated with The Gulf Ware effects, literature review, latest annual reports reviews and questionnaire data conflated and treated as essentially qualitative materials in each section. This relevance of the results is the basis on which the national / regional plans will be based in chapter nine. The researcher besides suggesting solutions also recommended a sub-system of national scientific and technical information for the GCC as an alternative.

The responses about library and information centres use will be analysed in this section. The use of the central library as well as the branch libraries by R & D personnel, different types of users in different universities and various subjects will be considered. The usage section based on questionnaire three contains the following subdivisions:

1. Users status and background
2. R & D productivity status
3. Problems in getting information
4. Information sources retrieved
5. Reasons for visiting

The respondents were asked specifically, if they had got most of the information from their library and information centre and their general comments for improvement in library and information centres in the GCC. The comments, interviews and other written and oral communications will be conflated and analysed in the sections related. The direct or indirect effect of The Gulf War will also be discussed in the relevant sections.

It had been intended in the earliest version of the questionnaire to have a question requesting details on the precise information requirements of the respondents. A list of types of information was given but in the event these proved too imprecise, ambiguous or specific to those taking part in the pilot studies. Thus, in the revised questionnaire they were reduced to three main categories -

Problems in getting information,
Frequency of getting information, and
Main reasons for visiting library/information centre.

It must be obvious that the sources types by most of the authors which were discussed in chapter three literature review are also somewhat general. Most of the categories were included in the list in the researcher's original questionnaire and it is instructive to speculate on why they were not liked by the respondents to the pilot studies. There may have been a problem of language with some terms, e.g., conceptual, with the respondents not knowing how to define it or what was contained within it. Possibly several of the categories overlapped or could be seen to overlap after all data on new materials or processes could be considered as facts. More likely, the respondents were daunted by the fact that they would have to think about the answer to the question. In any case, they would often have required many of the different types of data at one time.

7.2 USERS STATUS AND BACKGROUND
In the third questionnaire, the following five questions were asked:

*Your position title.*

*What is the field of your research work ?*

*What was your previous work environment ?*

- Government
- Industrial
- Academic
- Other

*Do you use the library/information centre more or less now than you did a year ago?*

- Now
- More
- Less
- About the same

*On average how often do you visit the library/information centre per week ?*

- Once/week
- 1-2 times
- 3-5 times
- 6 times

Out of 60 respondent 32 (53.3%) a bulk of the category of respondents were Pure Scientists; like Biologists, Mathematicians, etc., and 19 (31.7%) were Applied Scientists like Civil, Mechanical, Chemical, Electrical, Petroleum Engineers etc., followed by Medical fields including 7 (11.7%) from the field of Medicine and Dentistry and lastly 2 (3%) from the field of Agriculture.

Most of the common ranks were, Professors, Assistant Professors, Associate Professors and Lecturers including Deans, Chairpersons and Directors.

However, in case of KISR the position titles were Research Scientist, Research Associate etc. To be specific, the breakdown of the posting in percentage is as follows:

12 Associate Professors and Lecturers position each form 20% followed by 11 Professors forming 20% followed by 8 Assistant Professors i.e., 13%, which forms the major total bulk of posting.

Out of 60 respondent 43 were in the above categories analysed with the residual of only 17 left as follows:
Four Research Associates, two each of the Deans, Chairmen, Directors, Research Associates and Assistant Research Scientist, And one each of the Assistant Research Specialist and Assistant Lecturer.

Almost 32 (53.3%) responded that they had previous academic experience. However 10 (16.7%) people responded with previous government experience. This was equally followed by 9 (15%) each coming from industrial and varieties of other previous work environments including no experience.

On the question that do they use the libraries more, less or as same as before, 26 (43.3%) responded using more than a year before followed by 15 (25%) less than before and 19 (31.7%) about the same as a year before.

On the question of the frequency of using the library and information services only 8 (13.3%) responded visiting library once in a week or less. The majority of the categories of 29 (48.3%) visited libraries and information centres 1-2 times a week followed by 13 (21.7%) responded visiting libraries 3-5 times a week, lastly followed by 8 (13.3%) the most frequent users visiting libraries and information centres six or more than six times a week. On random sampling at three institutes it was revealed that this last category of people mostly come almost daily just to read newspapers or use library photocopiers.

Since the Gulf War there is an urgent need that the faculty should be involved in library collection development because they know what materials are the most needed for teaching and research, as normal disorganised collection development is tolerable.

The present research did not ask for amounts of time directly, but from interview findings, 75% respondent did not spend as much time as they would like on information seeking, which was revealed during interviews. People in research institutes were more satisfied with the time they spent.
Questionnaire analysis section 7.2, plus interviews and literature survey in sections 3.8
and 3.9 reveals that scientists visited more regularly than engineers and those in
supervisory positions visited less often than those in non-supervisory positions. Staff
in research institutes also tended to visit the library less often than staff in universities.
Scientists, particularly in research institutes, spent more time information seeking than
engineers - though only one third of these scientists and one quarter of the engineers
were satisfied that they spent enough time.

The present survey shows that those in supervisory positions tend to visit less than
those in non-supervisory positions to keep themselves abreast of new developments.
But, is there any evidence of there being a retarding effect on the development of
scientific and technological information systems in the GCC arising from insufficient
contact with information sources by information workers? This evidence exists
however, indirectly. It has been shown in the present work by a count of which
libraries rarely make contact with institutional and individual sources of information
even for basic inter-library loan services at national or regional level.

As illustrated in Model Figure 1.4 if the main component of information
producers i.e. the users are reluctant to utilise information sources and identify
the shortfall of information collection, than information system cannot develop
systematically on the national level.

7.3 R & D PRODUCTIVITY STATUS
In GCC context Ashoor and Chaudhry (1993) studied the Publication Patterns of
Scientists Working in Saudi Arabia analysed in chapter three section 3.10 together
with contributions of several authors and also joint interviews of Deans/Directors of
library and information systems and academics from several GCC universities.

For this study the questions asked were:
How many national, regional or international conferences have you attended during
the last two years?

How many papers have you presented at conferences for the last two years?

For the last two years:

a) How many papers have you published?

b) Proposals, reports for internal and external and sustaining research you have
   written? (Table 7.1).

The staff from AGU and SQU, both being new universities along with KACST did not
respond with their R & D productivity activities. In case of national, regional or international
conference attendance the range was as high as 22 (17.5%) from KFUPM to low as 10 (7.9%)
each from KU and UAEU. The largest university system the KSU in Riyadh, Saudi Arabia
reported 20 (15.9%) attendance at national, regional and international conferences followed
by 16 (12.7%) from KAAU, again a very large university system. 12 (9.5%) each from KISR,
QU, UAQU showed a similar trend with the surprisingly lowest attendance of 10 (7.9%) each
from KU and UAEU. The mean average of 14 attendances from the total of 126 national,
regional and international conferences reported by only 8 universities and 1 research institute.

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### 7.1

**R & D Productivity**

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<th>INSTITUTES</th>
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<th>(C)</th>
<th>C-%</th>
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**Source:** Questionnaire 3 and Annual Reports
For the status of papers presented at conferences again KFUPM took the lead by 12 (15.8%) papers in contrast to as low as 2 (2.6%) by QU, KFU, UAQU and UAEU. However, the best average came from the KU and KISR. In case of KU, out of 10 attendances 8 papers were presented and in case of KISR out of 12 attendances, 8 papers were presented with the percentage of (10.53%), a quite successful rate. Again one of the largest university systems KSU staff responded with only 6 (7.9%) papers presented from among the 7 who responded from KSU, followed by 4 (5.3%) responses by 6 members of staff from KAAU. However, the most dismal reporting was by 6 respondents from KFU who reported only 2 (2.6%) papers presented.

Again in the case of papers published, personnel from KFUPM took the lead with 32 (17.9%) papers, followed by KISR with 28 (15.8%) and KU with 24 (13.4%). The largest university system in the study, KSU published only 22 (12.3%) papers. However, the low of 10 (5.6%) at QU and 12 (6.7%) at KFU was not very encouraging. In the median range the figure of 16 (8.9%) reported by KAAU with the special KFU having an edge reporting 12 (6.7%) of papers published. The most encouraging figures came from UAQU (Saudi Arabia) 18 (10.1%) and 17 (9.5%) from relatively the newest UAEU from the United Arab Emirates. The mean of 19.9 from the total of 179 papers published verifies the notion of “publish or perish” specially in the academic environment.

In case proposals/report writing KISR with 38 (46.3%) took the distinguished lead, followed by KFUPM with 12 (14.6%) followed 8 by (9.8%) by KSU by low of 3 (3.7%) and 2 (2.4%) by UAQU and UAEU. The most dismal report came from KU reporting only 4 (4.9%) proposal/report writing from one of the major research oriented universities in the region. Again low figures of 6 (7.3%) reported by one of the larger university systems compared to 5 (6.1%) from predominantly teaching QU from Qatar. Again KFU, a special subjects university, didn’t fare any better by reporting only 4 (4.9%) of proposal and report writing. R & D funding has been
slashed after The Gulf War and so the usage of library and information services has diminished.

7.4 PROBLEMS GETTING INFORMATION

It was questioned that:

*Do you face any of the following problems in getting the information you need for R & D projects? Please assign a value between 1 (rarely) and 6 (very often) to each relevant problem:*

- Not available in library/information centre
- Delay in getting it
- In microform
- No references found
- Too much available
- Information is confidential
- Other (please specify)

The result of this question is analysed and tabulated in Table 7.2.

The heavily R & D oriented staff at KU, KISR and KFUPM complained about the unavailability of materials in library/information centre as very high indeed, but in contrast to their low figures for delay in getting it, it is quite impressive, the sign of adequate document delivery service or inter-library loan from overseas resources specially from BLDSC. In comparison QU, KAAU, KFU, KSU and UAQU also complained intensely about unavailability and delays in getting information materials.

Again in this case QU, KAAU, KFU and UAQU revealed materials as confidential but, at the same time complained of non availability in the library/information centre. Most of these as classified documents are not easily accessible even internally for the staff.

In the overall analysis of the data the average mean of only 2.13 reported by the total
number of people surveyed is not bad at all. KU with a mean of only 1.86 was the lowest, while the highest of 2.45 was analysed for KFU. In contrast both the universities are of different categories, however, KU with number of faculties and also general education programmes with a number of branch libraries, reported the least problems.

Which also enhances their R & D productivity. In comparison, the high figures of problems in getting information at KFU, a special subjects university with twin city campuses also revealed a dismal picture in the overall R & D productivity. Other universities which reported a high figure of 2.31 was KAAU. KISR, the only special subjects research institute reporting in this study, shows mean figure of 2.21, in spite of having one of the most organised information centres providing the maximum services, demonstrates the demanding standards of R & D staff in this institute. Mean figures for other institutes were stable just above 2.00.

As far as the major kind of problems faced by the researchers in this study the minimum mean was 1.18 for “too much available”, but in contrast the highest mean of 2.83 “not available in library/information centres”, reveals the demanding pattern of overall R & D staff and also questions the collection development policies of the universities and organisations concerned. All the three major R & D institutions KISR, KU and KFUPM, reported high figures 3.50, 3.75 and 3.50 but also revealed the lowest mean of 1.00 each for “too much available”. In contrast the four institutes QU, KAAU, KFU and UAQU reporting the mean of 1.33 each for “too much available”, did not show very high mean for “not available in the library”. which speaks of their R & D calibre.

Although the subject specialisation of certain universities is generally known, there has been no official information or research study carried out with regard to the.
### 7.2

**DIFFICULTIES EXPERIENCES IN GETTING INFORMATION**

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**Mean**: 2.83 2.47 2.61 1.61 1.18 2.41 1.81 2.13

**SOURCE**: QUESTIONNAIRE 3 AND ANNUAL REPORTS
of the library collections in these universities. The availability of such information is vital, especially when an inter-library co-operation programme among these university libraries is taken into consideration. This is more important due to the effect of the Gulf War.

Chairman Physics Department indicated:

that the majority of GCC rely on information published in English as much more than they rely on information published in Arabic. However, as the non-English speaking groups, GCC seems to under use or not use at all materials published in other languages. Therefore it is assumed that GCC adopted English as their first language to get advances in their fields by “reading” books, articles, reviews, etc., decline according to the amount of information that will be published in other languages. It is also possible that the GCC are losing a significant amount of information and interaction because of dependence on English language materials.

He further added that:

In respect of decentralised systems, branch libraries should provide a service of the same standard as in the central library, librarian quality, library services with the use of information technology.

The analysis of the problems which is more likely to confront the engineers during the process of acquiring and using information, indicates that there is a gap between the provision of information (by engineers information system) and the use of information (by engineers). Given the aim of bringing engineers into greater contact with the information needed, two main routes can be taken. The first one is directed towards the engineer himself. Its objective is to enhance his sophistication in information use. The second route is to make information more accessible. This is not an easy task but it is not an impossible one either.

To avoid unnecessary demand for establishing branch libraries, the central library should work to improve its coverage of specific needs of its community (longer library hours, more liberal loan policy, faster reference service, etc.).

Figure 1.4 identified information seeking model in R & D. It cannot function in
R & D environment as analysed in section 7.4 due to limited use and also identified also in literature review section 3.7. Therefore, the job of information system development becomes harder.

As confirmed in sections 6.5.1 to 6.5.2 and analysed above in section 7.4 plus interviews and confirmed by the Ashoor (1992) article, it was found that economic accessibility is one of the main problems faced by engineers when using information. Engineers have to undertake financial burdens because libraries cannot provide the materials needed. If more money could be made available and independent budgets could be organised these problems could be minimised, but due to The Gulf War are very bleak. But the perception of needs and the understanding of these needs by the decision makers and those who influence decision making of the value of libraries is also vital, which is completely absent in the GCC environment as revealed during interviews.

7.5 INFORMATION SOURCES RETRIEVAL

There is often a difference in education between the scientist and the engineers. Because, the scientist goes through a longer more academic educational process and in addition there may be a difference in their information use and needs patterns. The scientist sees himself as belonging to an amorphous group of fellows who share his research interests and attitudes regardless of their organisations, whether in an academic or non academic environment. In contrast, engineers and technologists are part of the organisations that are product/profit-oriented and which control the work to create or improve products. The mission-oriented organisations (as opposed to discipline-oriented) do not permit, for competitive reasons, free information flow between members engaged on propriety research and people outside the organisation. Because of the nature of his work, which is not contributing to theoretical advances and an increase in general knowledge, the engineer will tend more to publish his results in internal reports and memos rather than in journals read by the scientific and technical community at large. He is thus results-oriented rather than information-oriented. As a consequence of this, the engineer is not closely connected to the
formal information media and thus has no real reason to read journals. Indeed “technical” journals are usually incomprehensible to him. Technologies do have their own journal systems, like science, but the literature does not cumulate and build on itself the way science does. It contains fewer references to other work and the work reported serves to document end-products rather than to announce theories.

Scientific and technical information (STI) sources external to an organisation play a predominant role in supplying information in the idea-formulating phase, while internal sources play the more important role in the problem-solving phase.

The inquiry made was:

*In what frequency do you obtain needed information from the following sources? Please assign a value of between 1 (rarely) and 6 (very often) for each relevant source.*

*Colleagues in your own section/division*
*Colleagues working on same project/topic*
*Colleagues in the organisation, not in your section*
*People outside organisation*
*Library and information centre staff*
*Online literature searches*
*SDI*
*Reference books*
*Textbooks/manuals*
*Conference papers*
*Trade literature*
*Journal articles*
*Reports/working papers/progress documents*
*Standards/specifications/patents*
*Library/information centre announcement lists*
*Current contents pages*
The analysis of this question is tabulated in Table 7.3.

On the question of what frequency do you obtain needed information from the various sources, KISR, KFUPM and KU took the lead in getting information from colleagues in their own section or division which have a comparatively high standard of expatriate manpower to depend on and shown as very low at QU due to a majority of staff from one nationality (Egyptian) with professional competitions and more teaching loads leading to fewer interactions between colleagues. Larger university systems with scattered campuses at UAQU, KSU and KAAU also have the same problems of interaction between colleagues. The comparative lowest figure from KFU is understandable because both the campuses are quite far away physically from each other.

Again KU, followed by KISR and KFUPM, took the lead in getting information from colleagues working on same projects/topics. Across the board the dismal picture of information retrieved from colleagues working on the same projects/topics from all the other universities (except the position reported by QU) is a complete reverse response to that reported in the first reason and that too, from the university which is basically a teaching university with comparatively low R & D productivity.

In the overall analysis the main source of retrieving information was from journal articles, the mean being 3.63. The next in order (the mean of 3.39) was getting information from library
### 7.3

**Level of Use of Different Information Sources - All Institutes**

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**Source:** Questionnaire 3 and Annual Reports
and information centre staff. Because of the decentralised library systems in almost all the GCC countries, with few users at a time friendly staff with less pressure could satisfactorily respond to all the queries of all the users on time. The figure of 3.30 mean for abstracting/indexing services mainly from hard copies usefulness speaks about the sizeable collection of reference section including abstracts and indexes in hard copy which was necessary at that time when CD-ROMS were not really introduced and the on-line facility was available only at few places. The mean of 3.17 was the next highest figure was for “getting information from colleagues working on the same project/topic”. However, in the overall analysis this practice could be dangerous if most of the colleagues are not regular visitors to the library and information centres.

In the majority of the sources of information retrieved, almost half of the mean average was between 2.14 to 2.90. The highest of 2.90 in this category was “conference/proceeding papers” followed by 2.89 for “textbooks/manuals”. On-line literature searches are available only at Kuwait institutes and at both the newly established universities in UAEU and SQU. Only two universities KFUPM (on full strength) and at KAAU (partly for staff only) had on the site on-line services. All the other institutes in Saudi Arabia depended on KACST for providing on-line services through their home base libraries. The mean average was 2.80 for this category.

The next in order was a mean of 2.70 for receiving information from colleagues in their own section/division, 2.64 was the mean for retrieving information from colleagues in the organisation, not in their section. However, comparatively the mean figure of 3.17 for receiving information from the colleagues working on the same projects/topic was logical.

Trade literature mean of 2.60 showed surprising low figures of 2.50 and 2.55 from KISR and KU respectively. The main reason for this was that most of the trade literature was kept in Purchasing and Technical Sections of Administration which do not have open access.
The figures of 2.41 mean for the usefulness of reference books raised the question of quality collection development of reference materials.

The researcher also attempted to compare the two groups of institutes retrieving information from the sources at their disposal. (Table 7.4). In one category were highly R & D oriented institutes categorised like KU, KISR and KFUPM and on the other the rest of them were categorised i.e., QU, KAAU, KFU, KSU, UAQU. Different figures in both the groups verify the trend of information seeking behaviour difference.

Regarding channels used to acquire information the Director Research Institute KFUPM said that GCC in academic institutions communicate more with internal people than with people external to their organisation. However, the majority of GCC limit their communication to colleagues from the same institution.

The following observations are based on the analysis and interviews in section 7.5 and also confirmed in literature review sections 3.8 to 3.10.

The biggest problem reported by respondents (though only a small number) was the delay in getting information - though not necessarily from the library - and that there was often too much of it. The usual nature of the contact is technical discussions for problem solving with hard facts being the information, mainly transferred in a face-to-face encounter in the office or laboratory, or with the colleagues. Although communications with close colleagues was the norm, the staff in universities had twice as many contacts with people outside their own establishments as did staff of RI - though overall the amount was fairly low. The present study tried to ascertain whether the proportion spent was, in the respondents’ estimation, a little slice of their time or a large slice. It transpired that scientists and engineers did not spend large amounts of their time communicating.
### 7.4
LEVEL OF USE OF DIFFERENT INFORMATION SOURCES - SELECTED INSTITUTES

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**SOURCE:** QUESTIONNAIRE 3 AND ANNUAL REPORTS
The channel of information most used and preferred was face-to-face, personal interaction of the informal type, rather than formal meetings. The main reasons for this preference were the speed, ease and flexibility of it, together with the fact that it provided instant feedback for clarifications and understanding.

Generally, very few scientists and engineers admitted to have problems or barriers to communicating. The problems most mentioned were to do with the location of the person one wanted to contact. It could be that he was not located in the immediate vicinity or was in fact located at a distance geographically. Despite the fact of staff members being Arabs, their native language was not English, however, it was not a barrier in view of the importance of English as a second language. In fact every one of the respondents spoke English even though for all of them it was not their mother tongue. Virtually all read English as well. Engineers tended to speak and read more foreign languages than scientists and those in non-supervisory positions tended to speak and read more languages than those in supervisory positions. Almost 90% of the respondents communicated regularly for work purposes in Arabic, however the majority of the R & D productivity was in English, because this survey was only limited to the nationals of the respective countries.

Being lax in his reading habits and not good at communicating, especially with non-specialists and outsiders, the engineer often turns to certain individuals to get access to the flow of information from outside the organisation. Known as gatekeepers, such people have broader ranges of contacts with others outside the confines of the organisation, read more journals and are generally better educated and higher performers.

Clearly, if an engineer does not read much, then to rely on the knowledge of other engineers is a severe handicap, since they will not be current and aware of the latest developments either. Scientists on the other hand, who as a group wish to remain at the forefront of their field and to be recognised for their endeavours and published work, keep themselves up-to-date and abreast of their fields by reading more, building
on previous work and by being in contact with others in their field through invisible colleges. Since computer output can be in the form of printout, it is valid to consider computer files as a written source of information. Respondents in the “other” category, which includes computer scientists, use computers most often. Not much use is made of computer files by scientists and engineers, although scientists in research institutes tend to use that source the most.

In general, the ones using their own sources most frequently were in the ‘other’ class, though more engineers than scientists in research institutes use their own sources, virtually twice as many scientists than engineers in research institutes tend to use their own sources or files.

The library does provide facts and resources for ideas. However, the type of facts or data which engineers, in particular, wanted was day to day information relating specifically to the large-scale projects they were working on and which the library could not possibly, make available unless it was itself actively involved in every project. Also required was real-time data, experimental data, plans, policy, projections and experience. The majority of respondents felt that the library should not supply this kind of information since it was too specific. Information that was unavailable from the library or information centre tended to be acquired primarily from colleagues (in fact this was the case for any information whether available from the library or not). Where literature was used this tended to be reports, journal articles and conference papers. Journals and books were the literature sources mainly used for keeping up-to-date.

Computerised databases and SDI were rarely used either as a source of information or for keeping up-to-date. One third of the people replying were unaware of these sources of information in their fields - engineers in particular. Over half felt that they did not adequately cover the sources in their fields - engineers and scientists being the same. Those in supervisory positions tended to be less aware and hence did not cover them adequately.
As in other studies conducted in developed and developing countries, in the GCC personal files, records and collections are among the most frequent sources consulted by scientists and engineers to acquire knowledge for their work. Also in agreement with the literature, a major percentage of GCC consult internal collections rather than external locations to acquire information for their work.

In the GCC the situation is different in some important respects. In terms of information handling via computers there is still a need for the provision of more equipment and the more efficient use of computers within the academic community. Access to computer activities has tended to concentrate on one type of computer, usually the microcomputer, which is not networked in many academic departments. The small range usage of computer by the GCC staff, can be explained to a great extent by this. For example, use of electronic communication (e-mail, etc.) was by a small percentage. After The Gulf War there is consensus among the library and information science professionals that they have to move seriously from traditional to electronic information services.

**Information seeking by users as illustrated in Figure 1.4 in R & D environment can only systematically organised, if users are willing to identify shortfall by using resources to develop information systems on national and regional level.**

### 7.6 REASONS FOR VISITING LIBRARY AND INFORMATION CENTRES.

The reasons for visiting library and information centres was asked in the following form:

*What are your main reasons for visiting the library/information centre? Please assign a value of between 1(rarely) and 6 (usually) for each relevant reasons:*
Read new books  
Read newspapers  
Read journals  
Browse  
Request literature searches  
Do Online literature searches  
Counsel/meeting librarian/information specialist  
Browse documents (e.g. book/journal/report)  
Return document  
Consult reference book  
Work quietly  
Other (please specify)

The response to what are the main reasons for visiting the library/information centre data is analysed and tabulated in Table 7.5.

The overall mean of 3.32 was the highest for reading new books a reason for visiting library/information centres. There was quite a contrast of up trend of this usefulness around and above 5.0 mean for KU, KISR, KFUPM, QU compared to the low trend of only 2.00 at KFU and UAQU.

Browsing documents (e.g., books/journals/reports) was the next highest mean of 2.42 reported by the respondents followed by the mean of 2.34 for consulting reference books and 2.27 for reading journals.
### 7.5

**REASONS FOR VISITING LIBRARY AND INFORMATION CENTRES**

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**SOURCE:** QUESTIONNAIRE 3 AND ANNUAL REPORTS
However, the mean figures of less than 2 for six out of eleven reasons for visiting libraries and information centres reported by the respondents verifies that some of those categories could be done in their own offices and others can be done by Farrash, i.e., messenger boys who also serve tea around the clock. Some of the reasons explained with the mean figures are as follows:

- Return documents (1.99) - done by messenger boys
- Request literature searches (1.83) - by internal mail
- Work quietly (1.78) - in own offices
- Read newspapers (1.53) - in own offices
- Do on-line literature searches (1.62) - not available at many institutes
- Counsel/meeting (1.62) - mostly by phone

But, is there any evidence of this retarding effect on the development of scientific and technological information systems in the GCC arising from insufficient contact with information sources by R & D personnel?

In the previous section, the types of information required by the scientists and engineers in the study were examined. Where do they get this information from?

The sources of information were requested in two questions. Question 3 (8) asked with what frequency do you obtain needed information from the given sources? Question 3 (12) asked Would you say that you get most of the information you need for your R & D work from your library/information centre, if not from where do you get it?

Respondents were also invited to give general comments on ways to improve information and information flow in their organisations. Just over one third actually did so and the results are presented and analysed conflated both qualitatively and quantitatively. What respondents wanted most improved was the library services and facilities.
This was followed by the suggestion that there should be a greater interaction with other divisions in the organisations (it will be recalled that the amount of inter-divisional information was on the low side) so that greater familiarity with the activities of the organisations could be gained. It was believed progress reports would help in this respect. Also important was the need for an automated office to eliminate the paperwork; included here was the request for more secretaries to assist in the routine paperwork.

Assistant Professor from KAAU responded that:

All libraries in the university campus should be open to all members of the university and not restricted to particular users, such as their own college members.

That should ensure an equality of services to all university community members and would increase the utilisation of the library resources. (KAAU Faculty Member interview).

Another researcher from KFUP - Research Institute praised that:

The introduction of on-line search services for use in academic and research institutions in the Gulf region can be seen as a remarkable progress towards research and information activities in the region. At the present time, on-line search service has become one of the most vital elements of the academic and research institutions of the region because it provides an instant access to information. (KFUPM Research Institute researcher’s interview).

Dean of Engineering from SQU pointed that:

In the GCC, there is a need to develop an effective national academic network system along similar lines. In general terms, a plan for GCC must envisage that IT will become integrated into every academic staff office, from which there will be immediate access to computing, network and information activities.

Director Information KACST added that:

The GCC governments will, correspondingly, need to focus its activity on the key issue of developing national network planning. Although regional networks, primarily
GULFNET (supported by the Saudi government) exist at present, they are not providing all the necessary information services needed by scientists and engineers. One of the reasons is that not all the GCC universities have yet been connected to GULFNET and for those which have, the connections do not yet involve the entire campus. Another reason is that existing speeds on GULFNET are insufficient for effective communication between scholars in a national network setting. Finally, GULFNET has only a restricted range of services.

He further added that:

Regional planning entails the provision of a high-speed network between campuses so that all scholars can interact with each other in an improved way and access a wide variety of information activities. Thus the existing GULFNET must be upgraded to meet the requirement. This means that the connection of regional networks, which include interconnections between LAN's of educational institutions, libraries, research institutions and other organisations, must be appropriately organised. This is the reason for designing a framework model for establishing a network system in GCC.

The Director of Computer Centre from KFUPM added that:

Each university should expand the level of resources available to support the use of computers in teaching, for instance, by establishing a unit such as a Centre for Computer Based Learning. From this centre, library, computer centre and academic computing departments can co-operate to provide course work and training materials for staff and students, to enable them to use computers in their teaching/learning environment.

The Dean of Agriculture KFU agreed that:

Each university should support an initiative on course work which will include a request for funding training infrastructure for IT based learning materials across the university. Funding should be allocated to computing services such as library, computer centre and academic computing departments for training purposes.

He further added that to enhance R & D each university should:

Develop and implement full-integrated IT policies and procedures for the whole campus. This will guide the universities in exploring new avenues for purchasing, planning and funding IT and services.

He concluded that:
Putting this relationship in place would force each university to do some of the necessary thinking about the funding of IT and the expectations of the service. People from different organisations - the Director of Computer Centre, the Dean of Library, the Director of Audio-visual Centre and the Head of Department of Computer and Information Sciences - can contribute to policy development by co-operation.

The Director Computer Centre KFUPM recommended to:

Develop a university organisational IT committee structure, based on well-defined functions, duties and responsibilities, to attain campus IT goals and objectives. This should lead to an examination of the value of appointing a single head of IT within the new organisational structure to ensure the necessary co-operation between IT-related groups.

He concluded that:

Each university must undertake this development through the merging of computer centre, library and audio-visual centre in one integrated body with one head namely the Vice-Rector for Information Technology. This should lead to a closer interaction between academic, library and computing centre information service.

The Chairman Geology Department KAAU pointed that:

Unlike many developing countries, GCC has sufficient funding available to provide its university scientists with reasonable access to computers. At the same time and in common with most developing countries. GCC does not have adequate skilled manpower to run computer systems with maximum efficiency. At the current level of activity, this is not crippling: if a stand-alone micro fails, it can always be replaced by another. However, at the networking level, it is essential that the system should be kept running. For example, electronic mail must work reasonably well and quickly, or it is not used at all. It may therefore, be that GCC use of IT for communication purposes will develop more slowly.

Assistant Professor KAAU complained that:

Both central and branch libraries should make users aware of all the services, especially unusual ones, such as availability of any local databases and access to international networks, in order to maximise the use of library services.

The Chairman Chemistry Department revealed that:
Study is needed to determine the influence of the curriculum and methods of teaching plus R & D programmes in the Saudi universities on the use of their libraries. This would indicate if there are any special services which can be provided only by the college or branch libraries.

KAAU Assistant Professor who is the member of University Library Committee pointed out that:

The university libraries which maintain branches in their colleges in general acquire multiple copies; one copy for each concerned location. Some of these libraries purchase multiple copies without any consideration of location. This is true of Arabic publications. It is my observation that the number of copies of Arabic titles may vary anywhere from 3 to 6. Also quite a large proportion of these collections cover journal volumes and non-book materials. It seems reasonable to conclude that the title count of monographic volumes will be no more than one-third. Most of the collections are also weak in retrospective materials. In the last years, current acquisition of all forms of materials has dropped sharply due to the decrease in financial resources.

According to the Dean Faculty of Science, Kuwait University

Recognising the value of scientific information in research, the Government in GCC should create a Scientific Information Bureau (SIB) to collect and process S & T information and disseminate it to the concerned R & D scientists. It should be a central agency to collect scientific and technical information from various published and unpublished sources, process it in different usable forms and disseminate. It should be responsible for developing a database and an information system in science and technology and coordinate the library and information activities as a whole. It is also expected to carry out R & D work in information science relevant to R & D needs. (Dean Faculty of Science, KU interview)

The Dean of KFUPM Engineering added that the major functions of a library should be as follows:

a. Collection, processing and dissemination of information. For this purpose it has to build up a large document collection and disseminate the information by preparing indexes, abstracts, digests and state-of-art reports. It should provide CAS and SDI services to its clientele and keep them up-to-date with regular publications like:

- Patents information Alert,
- Reports Abstracts,
- Science Abstracts from English / Arabic Languages Journals
b. Literature searches,
c. Compilation of union catalogue of S & T libraries and
d. Translation Bank, Training and Consultancy, Reprography and printing.

The Senior Information Specialist from NSTIC said:

To meet the enormous information needs of the scientists at universities and research institutes, etc., for creating a database of scientific, information and for on-line searching and information retrieval, available Computer-based SDI and retrospective information services should be provided and on-line access to international databases should be developed at all the universities.

A computer based information network of Information Retrieval System covering libraries and technical information centres of the GCC laboratories and establishments should be planned. Under this plan, details of the documents received by them should be sent to R & D personnel for inputting into the central databases and the out prints should be sent to the concerned laboratories, establishments. This system should ensure that scientists are intimated as and when documents of their interest will be received in these libraries. The system should provide project-oriented and mission-oriented information as well.

It should also organise short term courses in areas such as information science, computer-based information service, indexing and abstracting.

The Director of SQU Library suggested the following objectives:

1. to develop collections of relevant sources of information services in the field of science and technology;
2. to render all appropriate and feasible information services in the field of science and technology;
3. to develop appropriate linkage with the information systems and services organised in the country;
4. to establish a national repository for reports and scientific works of the nation (both published and unpublished) and be a channel through which this information is made available within and outside the country;
5. to contribute to advancement in information science and technology including documentation and library science through research and other activities;
6. to adopt and promote appropriate technologies and management practices to enhance capabilities and productivity of information networks and services in the country; and
7. to participate effectively in international information exchange of scientific matters.
To achieve these objectives, GCC-STIN (proposed by the researcher) should provide several services such as document supply, preparation of specialised bibliographies, translation, reprography, printing, preparation of audio-visual materials for scientific instructions and current awareness services. It should provide reference and bibliographical services and act as a referral centre for S & T information to R & D institutions and industries in the country.

Dean of KAAU Library School pointed that the objectives of the National Information System should be:

1. Provision of national information services to meet the present needs of users, generators, processors and disseminators of information.
2. Optimum utilisation of existing information services and systems and the development of new ones.
3. Promotion of national and international Co-operation and liaison for exchange of information.
4. Support and provide active encouragement for the development of facilities for education and training in information science and technology.
5. Support and promote research and development and innovation in information technology.

Another UAEU Vice Dean of Research stated that:

the establishment of an information network, the participants of which will include the National Library as the main centre while the universities, research centres, all data and information analysis centres and instructional media centres form the branches. The network has to be hierarchical in operation with national, regional and local enter. The network will be designed in such a way as to facilitate the exchange of bibliographic data and distribution of library and audio-visual instructional materials. (UAEU professional interview).

According to the KFU staff who very openly outlined the fundamental role of government in the establishment of any information system:

There must be a national policy by the government.
There should be a designated corporate body to handle the system.
Legislation is the surest way to be certain of the autonomy and regular funding of a national scientific and technological information system. (KFU Library Staff interview)

Another AGU Dean of Science suggested:
general outlines on how a scientific and technological information system in GCC can be developed. In brief, one suggests that there should be a national policy, there should be a corporate body to handle the system; there should be sufficient funds for manpower employment; equipment, materials and other infrastructure should be zoned for material collection and for storage and dissemination should be created; ministries, private enterprises should be organised on subject interests and facilities bases.

In the section below major issues and concerns that emerged during the study’s interviews are analysed from the two group of audience, first: Deans and Directors of GCC libraries who came to attend the AGC-SLA Conference 1996 and second a group of faculty staff from GCC countries who came to attend the Science and Engineering Education Conference at the same time. Statistical analysis was not possible due to the format of questions. However, to allow for parallel analysis of comments, the discussion below is structured around two major topics. First, the question whether there was a need for a national / regional information policy and the second is related to information availability, accessibility and utilisation which is the major theme of this study.

Initial reflections often focused on whether a national information policy was necessary for the GCC countries. Some individuals suggested that a country like Saudi Arabia is in a unique position that may not be shared by other countries. Aside from its unique economic, environmental, social and political characteristics, Saudi Arabia is distinguished by its Islamic culture, which constitutes the basic and initial foundation of its society (even reluctance to use of INTERNET fully on national level without restriction). Being the land where Islam was founded, Saudi Arabia is committed to safeguard Islamic values and principles within its boundaries, as well as to define them world-wide. These values and principles are also the base for all developmental efforts taking place in the country. Over the past twenty years, the country has adopted a system of comprehensive planning to guide the development process in a co-ordinated and balanced fashion. Saudi Arabia is now entering a second planning stage, after a twenty year period during which most of the country’s
basic infrastructure was built.

Taking all this into consideration and assuming that information is as indispensable a component of development as any other, several participants asked whether information services are parallel to what the GCC countries have achieved. Many felt that despite recent developments in the field, information services in the GCC have not experienced the same rate of development as other sectors. Some tended to view information services as operating like forms rather than functions of real services, with a tendency among interviewees to share the same view in this regard. However, questions remain as to how thoroughly these services are being provided; how accurate, reliable and effective they are; and whether these services are comprehensive in terms of country-wide distribution and coverage of all the areas of knowledge. In addition, the substantial lack of co-operation and co-ordination among information agencies and institutions was also a major concern among interviewees.

Returning to the initial question, almost all those interviewed felt the urgent need to formulate a national and or regional information policy for the GCC. This policy, as viewed by many respondents, should be general in form and should aim at laying the foundations for co-ordinated and effective collection, organisation and use of information. As one respondent put it, formulation of a national information policy should centre around these major components, which must be incorporated in a way that recognises the traits distinguishing one nation from another. For example, in Saudi Arabia, overall policies are guided by Islamic values and principles and therefore, the overall goals and objectives of a national Saudi information policy must be derived from these values and principles.

Further the policy should reflect the increased need for effective collection, organisation and use of information.

Analysis of the above mentioned components of information needs is somewhat complicated, because these components are highly interrelated and many common
issues and concerns exist among them. Although, the initial question on information availability focused on specific standards that could be adopted for collecting information necessary for development. It was hard to come up with specific standards because there were wide differences of opinion among interviewees as to what constitutes necessary information for development. However, one practical approach may be to prioritise sectors with respect to information needs, based on the thrust of national development plans. This “top-down” approach, as one individual viewed it, involves assessing information needs in each sector by taking into account the forms and types of information resources, the levels and categories of information users and the purpose and functions of information in supporting specific needs.

Other operational issues raised by participants dealt with the co-ordinated mechanisms through which unnecessary duplication can be avoided. Currently, the actual collection of information resources in the GCC is done by various information agencies which, according to one senior official, is not harmonised so as to form the information elements needed for national development. This problem may be closely associated with the lack of a planned and organised effort to co-ordinate the functions of various information agencies. One possible way to ensure such co-ordination is to designate an appropriate agency for co-ordinating information activities, including information collection for various agencies functioning in many priority sectors. These agencies might include both government-run institutions and those belonging to the private sector.

Several issues concerning information accessibility were raised during the interview. Although some respondents viewed most of the GCC countries as having inadequate elements of information organisation (e.g., bibliographic control of government publications,) many others expressed directly or indirectly their deep concerns about the lack of effective documentation and dissemination. One aspect of information accessibility related to the services required to organise information. Among the most important of such services frequently mentioned by participants were indexing, abstracting and compiling union lists of holdings necessary for resource sharing and
co-operation. Different opinions concerning who should provide such services were expressed by the participants and the idea of involving the private sector in information services was among those considered. While many individuals considered the private sector to have a positive contribution to develop added-value information services and products, others believed that the quantity of information generated within most of the GCC countries was not sufficient to warrant such involvement. Some others also believed that since government regulates and controls information flow, private sector involvement in information field may be blocked. Despite this situation, some library administrators emphasised the private sector's role in acting as an information broker in the country, while government information agencies can continue carrying out other added-value information services and products (e.g., indexing and abstracting services).

Another issue raised during the interviews related to the structure of information distribution and dissemination services. As one respondent indicated, most large information systems in Saudi Arabia are located in one region (Central region) and due to the lack of effective distribution and dissemination mechanism in the country, there seems to be a geographical distance between the products and services of systems and potential users. This problem in fact raised two issues. One dealt with the concept of information marketing, which is almost completely ignored in the GCC countries. The other issue related to new possibilities for exploiting recent developments in information technology as an effective means of information processing and dissemination.

Aside from basic information technology, such as the production of simple indexes, union lists and printing of bibliographies and catalogues, many individuals stressed the need to build local databases appropriate to indigenous needs. The databases, whether developed by government and/or the private sector, would serve specific purposes, such as bibliographic and information retrieval, inter-library loan and resource sharing. However, problems associated with the desirability of establishing such networks were discussed as well, most of which related to personnel and technical issues. While
some individuals believed that only Saudi Arabia now maintains a growing technical and human base for developing indigenous information technology, others doubted that the country has such a base and in other countries the situation is quite variable.

Nevertheless, some interviewees suggested Co-operation by Saudi Arabia as a big brother with the other GCC countries having the necessary expertise as a possible option to overcome many of these problems.

Most issues regarding information utilisation were related to the users. It was quite evident to many individuals that information users constitute the weakest area as far as information use is concerned. Several causes related to this problem were mentioned. Most respondents agreed that the tradition of using information resources is not well developed in the GCC and that the skills and knowledge of those using information to solve specific problems are low. This causes under-utilisation of information systems and services available in the country. Moreover, some interviewees raised other issues that contribute to the seriousness of this problem. As one individual indicated, there is a lack of methods appropriate for studies of user needs, including specification of these needs in terms of particular developmental goals and local conditions. Another concern related to user education and training. Although, some efforts have been established in this direction, most agreed that user education programmes in the GCC are sporadic and lacking in effectiveness. A third major concern dealt with the promotion and marketing of information services and products. It was quite evident to many interviewees that lack of methods of information marketing, including market research, limits information utilisation. Some individuals suggested that GCC library and information professionals should have well established public relations programmes, which would contribute to increased information use.

Regardless of the GCC economic situation, it was felt by all interviewees that certain policies related to the cost of information should be established. Several issues were raised regarding this point. Some interviewees argued that introducing charges to
users may lead to a social division of information rich and information poor. However, others suggested that individual users on the one hand may have to be responsible for a major part of the cost of information provided and on the other hand the government could be the major contributor to covering such costs. This issue raised the concern of whether the general public would accept such a policy. Some library administrators argued that charging fees to individual users may result in resistance on the part of the users. Other issues associated with the cost of information included (1) whether fees contribute to the quality of information obtained, (2) whether they should be applicable to all categories of users and (3) whether they should cover all types of information services or only specific services, such as on-line searching. Another issue raised by some library administrators related to whether fees obtained for services should be given to institutions providing these services. In the case of all the GCC countries it is the Ministry of Finance which is responsible for collecting incoming funds due to government agencies. The structure of the financial system does not allow government agencies to reap financial benefit for their services; rather when this happens any money collected must go to the Ministry of Finance at the national level.

The following observations are based on the analysis and interviews in sections 7.3 to 7.6 plus extensive individual and group interviews above, the overwhelming conclusion from analysed the results is that the main source of information needed on a one-time basis, on a continuing basis or for keeping up-to-date, is colleagues and the main channel - i.e., personal contacts of the respondents, normally obtained needed information from colleagues in their own division. For information not available from the library people, turned to personal contacts, the originator and contractors. To keep regularly up-to-date with what it is confirmed that people is going on in their field preferred talking with colleagues at work.

Almost three quarters of the respondents said they could not get the information they needed from the library - particularly engineers in universities and research institutes. But one has to understand the kind of information required by staff before judging the
A fairly common complaint was that there was simply not enough time to spend on information seeking, background reading, real research work, because of the time taken for teaching and paper-pushing. There was also a plea for more training courses so that staff could be aware of the latest developments and techniques in their fields. To this end greater encouragement was sought to attend conferences and to write papers for external publications.

In circumstances like these, it becomes more real than apparent to have the feeling that these are not the sort of libraries that can subserve the information needs of an active scientific community. There is the need therefore to reconstitute the libraries in order to strengthen their functional abilities. It may be appropriate to draw one conclusion here: it is functional inefficiencies such as these that constitute some of the main impediments to orderly and co-ordinated scientific and technological information system in GCC.

All the GCC countries are particularly in need of practical know-how, in techno-economic context which is well digested and capable of being applied directly towards practical ends both in R & D and industrial base.

A senior Information Specialist from KFUPM pointed that:

Firstly, it does not make sense to me to separate a national documentation centre from the national library. This is wasteful in resources and involves unnecessarily complicated planning to co-ordinate their activities. My second comment concerns responsibility for the national collection and availability for materials. It is all too readily assumed in most countries that this can be most economically done by drawing on existing resources and linking libraries together in a co-operative network. I think this is a fallacy in all but very highly developed countries with large numbers of major libraries, such as the USA In my view, national collecting and national availability (within which I include inter-lending) is best concentrated on one centre, which should be the national library. The problems and costs of setting up efficient co-operative
systems are far greater than the resources required to build up strong central collections which can supply the marginal needs of the country’s libraries. It may be far more economic to rely on international lending than to plan complex national systems to make available peripheral. (KFUPM Senior Information Specialist Interview).

Results from this research indicate that interpersonal communicating among engineers as means of acquiring information is mainly between engineers from the same institution and that people closest within an organisation are consulted most. Engineers would probably benefit from personal contact within their institutions if a central index of current research and development projects, conducted within their institutions could be made available. The majority of engineers seldom or never consult people external to their institution. This situation might improve if guides to current research and projects conducted in institutions external to the engineers were locally available.

As analysed in section 7.2 and illustrated in Model Figure 1.4. In the absence of a national information network the users needs cannot be fulfilled satisfactorily, however, the low usage in always a deterrent against the information systems development.

This has become more apparent after The Gulf War. The drastic reduction in funding for R & D has declined the usage of library and information services, as separate funding for marketing R & D is not available. On the other hand there has been a sharp increase in enrolment of local students in all the GCC countries, as the funding for scholarships to study abroad has decreased drastically after The Gulf War. This has increased the use of libraries and information centres by the undergraduate students.

The establishment of a scientific and technological information system is based on the presumption that there must be a number of scientists, engineers, technologists, etc., to use the services. This premise therefore introduces the user factor. It may then be regarded as a wrong approach to conceive such a system without some foresight for
a regular supply of scientific people.

It must be remarked how similar are the requirements of both engineers/scientists and academe in the two types of institutes studied. This would appear to run counter to others, quoted in this literature, who have noticed distinct differences between the two professional categories; however the present finding does support the researcher's major hypothesis that academic/national research libraries and information centres did not help to improve the research and development activities in science and technology in the GCC countries in all the cases.

The evidence seems, therefore, clear - despite the value to the technologists of maintaining a high level of activity in technical reading, regular reading is not the way that engineers obtain solutions to current problems.

Most engineering problems require original solutions to be worked out on the bench rather than got from literature; and when they so require information they are far more likely to turn to colleagues. One reason for this is that reading requires a high degree of effort and concentration on the part of the user. Another reason is that engineers tend to use the most accessible source of information whether or not it supplies the needed quality or whether or not it is the most accurate. This source is normally a colleague. The engineer working on practical problems, often needs a solution right away to help with the immediate job in hand and cannot wait to ponder the ramification and postulates as a scientist often can. Thus, he may not have the time, at that moment, to go and search the literature for references to previous work and so he is quite prepared to accept ideas from a colleague he considers an "expert". In a study conducted by Engineering Index, Inc., it was recorded that reviewing systematically the state-of-the-art findings upon which the data are found few scientists would do this. Their reputation is built up on the research and theories they have promulgated, to a world-wide, critical audience. It is also built upon their contribution to scientific understanding rather than some piece of equipment or device they have constructed and which is of limited value and interest.
The implication is, therefore, that the engineer requires information of a more factual nature, referring to specifications, codes of practice, design rules and failure criteria. Engineers, however, do read but for general interests, to keep up-to-date in their own fields and to answer specific questions. They largely ignore the valuable dynamic knowledge that is available.
CHAPTER EIGHT

8 REVIEW OF MAJOR FINDINGS, CONCLUDING ANALYSIS, CONCLUDING SUMMARY AND RECOMMENDATIONS

8.1 INTRODUCTION

It is now pertinent to re-state the major research questions to guide this study as enunciated in Chapter One, listed below, with an analysis of the data, review of major findings and recommendations.

8.1.1 RESEARCH QUESTIONS

The main research questions to guide this study were as follows:

a) Are academic/national research libraries and information centres fully assisting the enhancement of the research and development activities in science and technology in the GCC countries?

b) Is there a need for the establishment of a science and technology information network in GCC countries on a regional co-operative basis?

c) Are national/ regional links being established between the academic departments, research institutes in the universities, industry and government?

d) Is there a necessity for information resources to be procured in all formats using leading edge technology in a cost-effective manner so as to benefit all at a national and regional level?

e) Do information provision institutes/organisations need to render and exchange uniform and prompt information, utilising information networks at local, regional and
international levels?

8.2 REVIEW OF MAJOR FINDINGS

8.2.1 RESEARCH AND DEVELOPMENT ELEMENT.

Under R & D trends, it was stated in section 5.3 that only one university in Saudi Arabia comprehensively covers all the questioned faculties for the practical purpose for this study; science is covered by all the twelve institutes in this study; and the others cover two to three faculties except the newly established Arabian Gulf University in Bahrain which had a Faculty of Medicine to start with. However, apart from two specialised subject universities i.e. KFU and KFUPM and two national research institutes, one each in Kuwait and Saudi Arabia, and the AGU (Medical School), all the other universities' major programmes are undergraduate studies with the exception of Kuwait University, where a major part of undergraduate programmes are provided at the colleges of applied education known as Public Authority of Applied Education and Training (PAAET)

Regarding the budget position for R & D in the GCC, it was shown in section 5.4 that the budget position of some of the institutions showed quite a disparity. With the exception of Kuwait University, all the other universities have the major role of teaching undergraduate students. Most of their programmes are in Arabic with a predominantly Arabic-speaking faculty with a heavy burden of teaching large undergraduate classes and administrative work, and very limited time for research and development.

About the R & D personnel, it was stated in section 5.5 that the total size of the high-quality indigenous scientific and professional community in GCC is still very small. GCC universities and the GCC governments' development efforts are still heavily dependent on expatriate scientific and professional manpower. As far as research and development activities covered in section 5.6 and R & D Co-operation in section 5.7,
the status is deplorable and any national co-operative plan for R & D is completely absent.

With the funding cuts after The Gulf War the research trend in all the Universities was depleted considerably and there is now more emphasis on undergraduate teaching. Because of the shortage of funding and more competition to acquire it, there is an urgent need for national co-operative plans for R & D activities.

8.2.2 LIBRARY AND INFORMATION SERVICES IN GCC

GCC universities set up high objectives for their libraries and information services and they set aside high budgets to this end. Most of the libraries have very ambitious objectives. The details of Kuwait University and King Saud University were stated in chapter 6, section 6.1 and were followed by all the other GCC universities as revealed from their annual reports.

As elaborated in section 6.2, the current status of central and branch libraries in the GCC environment, is rapidly changing, and it seems that by the turn of the century, the status will be quite different, with more centralisation; the new campus buildings emerging on a permanent basis and the current financial constraints will also justify centralisation of libraries.

With the non-existence of national libraries in most of the GCC countries and in the absence of any organised public library system in most of the GCC countries, all the universities and KISR in Kuwait have an open door policy for entry, but services are limited for the users who are not affiliated with the institutes.

The staffing and training position was elaborated in section 6.4, which revealed that in all the GCC countries, there is a lack of high-calibre people to operate it. First and foremost, there must exist a national zeal to do the work, a self-realisation of the place of information in the overall development of the country, and the workers at the helm
of affairs must possess at least a first degree from a university in a subject area backed up with postgraduate professional qualifications in information and library science.

All the institutes/universities have an open policy for training in-house, at the national, regional and international level, which is a must for human resource development in library and information services in the GCC countries.

Regarding library resources, which were covered in sections 6.5, 6.5.1 and 6.5.2 the majority, i.e., seven institutes/universities, lead in science collections as the number one priority. Unlike most of the developing countries the GCC countries are blessed with a large number of book collections. But, taking into consideration the 82 branches of faculty, departmental, remote areas branch libraries and the separate collection for Girls' Branches, the total number of books does not make an impressive figure in the end, due to many duplicates or multiple copies. There were also a large number of duplicates of the same series title acquired both by the Acquisition and Serial departments. The Serial Department at that time did not consider buying microforms for bound volumes due to their intention of filling up the shelves, without anticipating the future space problems, which the KSU faced later. That is the reason that the researcher found a large collection of materials stored in bulk in remote areas due to lack of space until the new Dariya campus was established. However, a large collection of books waited in backlog for technical processing for more than 5 to 8 years. Many of them are old editions which are not even worth processing.

As elaborated in section 6.6, it was revealed equal numbers of yes or no of depository at national level. Only two universities Saudi Arabia have national depository libraries. Four other countries which having a single university system are also national depository. It is a dilemma that none of the institutes is a full depository at a regional level. However, seven out of the twelve institutes are active as a depository on an international level, for example agencies such as UNESCO, FAO,
WHO etc.

As far as automation is concerned, as covered in section 6.7, all the institutes answered yes to the questionnaire regarding the usage of computers by the library staff for library and information services although several of the institutes did answer active computerised activities. In fact, when checked on visits, library automation programmes in most institutions were still at the testing stage, however, the analysis is based on the answers to the questionnaire. The researcher confirmed during visits with some senior members of staff that this misleading answer was to justify some of the expensive posts filled by the so-called library automated experts, including a Vice-Dean of Automation at one university, which took the longest time to implement automation.

The status of information services as revealed in section 6.8 shows that the provision of answers to technical questions was the second most popular service rendered by the libraries and information centres, with reference and literature searching being first. Most of the libraries also organised conferences and seminars to some degree.

Reference/literature search appears to be the most popular service rendered by the libraries in this study. All the institutes regard it as a primary or major activity. The corollary of reference/literature search is the provision of answers to general inquiries or even to technical questions. But the provision of reference/literature search can come in a number of ways.

The routing of new issues of periodicals to research personnel constitutes the second most popular service in this study was rendered by only two of the research institutes' information centres in this study but by none of the university libraries. The current awareness includes all those things that the library can do to keep its clientele aware of new literature. It includes selective dissemination of information (SDI), which is active in both the research institute libraries and the newly established SQU (Oman).
Both the research institutes KISR and KACST and KFUPM responded translation services as part of their activity. However, on a research field trip, it was observed that King Saud University in Riyadh did have a very extensive Translation Bureau Department as a training and service section for Saudi ministries and other government sectors. Even after five years of The Gulf War many library and information services are not in full strength in most of the GCC countries. But the status is more serious in selected Saudi universities and in all the institutes in Kuwait.

8.2.3 LIBRARY AND INFORMATION SERVICES USERS RESPONSE IN THE GCC

As revealed in section 7.2, the users' status and background, most of the common ranks were Professors, Assistant Professors, Associate Professors, and Lecturers, including Deans, Chairpersons and Directors. However, in the case of KISR, the position titles were Research Scientist, Research Associate, etc. Almost 30 responded that they had previous academic experience. However, 27 reported that they had previous government experience and the rest followed by industrial experience and other categories. On the question about whether they use the libraries more, less or as same as before, 26 responded that they use them more than before, followed by 14 with less than before, and 18 the same as before.

On the question of frequency of use of the library and information services, only 7 responded with less than one visit per week, with the most frequent users 13 using more than six times a week. Twenty-eight was the highest number of users, using the libraries from 1 to 2 times per week and the rest using 3-5 times per week.

The first set of heavily R & D-oriented staff at KU, KISR and KFUPM complained about materials not being available in the library/information centres. In contrast, the figures for KU, KISR and KFUPM for delays in getting material were quite low, an indication of an adequate document delivery service or inter-library loan from overseas' resources, especially from the BLDSC.
In comparison the second set of institutes, QU, KAAU, KFU, KSU and UAQU revealed that material was not available in library/information centres; complaints about delays in getting materials were numerous, which revealed poor document delivery service by the second set of institutes compared with the first set of institutes above.

Again, in this case, QU, KAAU, KFU, UAQU revealed that too much is available, but at the same time complained of materials not being available in the library/information centres which is a sign of poor collection development policy. A lot of material was available, but not the relevant materials wanted by the staff.

The principal variables illustrated in theoretical models in Chapter One Figures 1.3 – 1.5, which were tested in Chapters Five, Six and Seven for adoption and implementation will be finally co-ordinated in the final analysis.

8.3 CONCLUDING ANALYSIS

This section 8.3.1 to 8.3.4, is organised to answer research questions in this study, related to the models Figure 1.1 to Figure 1.5 analysed throughout in chapters 5, 6 and 7 and summarised in section 8.2.1 to 8.2.3. These concluding analysis are based on the three questionnaires which were conflated with extensive interviews and minutes summaries of the last twelve years of the Meetings of Deans and Directors of GCC university libraries as qualitative material. Expert opinion recorded in the literature review chapter three, has served to fill in the gaps, supplement, elaborate and provide rationale wherever needed.

8.3.1 NATIONAL INFORMATION SYSTEM STRUCTURE:

As revealed in the analysis and interviews in section 6.2, the solution to the problem of accommodation for libraries lies in the minds of administrators but unfortunately
planners do not realise the importance of libraries. Libraries are not less important than a science laboratory in a university or a pilot plant in a research institute. Libraries should be considered of equal importance in the scheme of affairs in government, in academic circles, in economic institutions and in industry. Only when this is realised shall libraries begin to have as much accommodation as any other department in any institution (based on analysis 6.2 and literature review 3.7 and 3.10).

As analysed in section 6.4 and section 6.6, due to the constraints of financial resources and the absence of professional experts, libraries and information centres in the GCC countries faced a lot of problems in providing quality service, recruitment and retention of the best staff, collection development programmes and library cooperation, because everybody wanted to become larger and larger without national and regional planning. Some of the reasons which the researcher would like to identify and which were shared by several GCC library executives are:

university plans and library plans are often poorly related, frequently due to the absence of a comprehensive academic library plan or planning system and the absence of the routine involvement of the librarian in the university planning process;

university libraries generally do not make use of effective planning techniques, such as the formulation of clearly defined programme areas and objectives and the study of alternative methods for achieving those objectives.

The researcher observed the following problems which were confirmed by interviews with experts in GCC during his research trips to the university libraries and research institutes’ information centres, especially in the last visit in 1994.

1. greatly intensified pressures from various sources;

2. the declining ability of libraries and information centres to
meet the needs of the clientele;
3. the lack of goals and planning;
4. the inability to accommodate educational changes quickly;
5. declining financial support;
6. the questioning of centralised controls;
7. the need for effective resources sharing and computerisation and
8. prevalence of traditional authoritative styles of management.

It was confirmed by analysis in chapters five and six together with interviews, that due to the financial constraints of budget cuts in education and research sectors, the management is facing the problems of:

1. an increase in demands for accountability from various agencies;
2. the departure of foreign experts;
3. stabilised or reduced budgets during a period of increased inflationary costs;
4. the poorly understood effects of initiatives; and
5. the lack of a national or regional system of information co-ordination.

The establishment of a scientific and technological information system is based on the presumption that there must be a number of scientists, engineers, technologists, etc., to use the services. This premise therefore introduces the user factor. It may then be regarded as the wrong approach to conceive such a system without some foresight as to the procuring of a regular supply of scientific people (based on literature review 3.7; 3.10 and analysis and interviews in sections 6.8 and 7.5).

8.3.2 LIAISON FUNCTIONS OF INFORMATION SYSTEM

From analysis in sections 6.5 to 6.5.2 and section 6.8 plus interviews, it appears that the pattern of collection development by the libraries in this study is that of an over-emphasis on books and journals. Functional inactivity can result in information
resources not being collected, collated, organised, stored, retrieved, transformed and disseminated. Dynamic information activity has been shown to be a weak point of the information systems studied here. It can then be said that these instances prove that some of the retarding effects in the development of scientific and technological information systems in the GCC are functionally inherent in the existing systems (based on analysis/interviews in sections 6.5, 6.5.1 and 6.5.2 and literature review section 3.7 and 3.10).

It is difficult to conceive of an information system which can achieve any measure of development in the face of these odds. It demonstrates that there is a relationship between the lack of contact with information sources and the retardation in the development of an information system.

From the foregoing discussion, it is easy to appreciate the dimensions that networks have assumed, even though it is not possible to cover every aspect of the subject. Naturally, this complexity brings with it problems of governance and management conflicts. It should be treating the issue of governance at considerable length, outlining the purpose of governance and discussing the impact of technology on library network governance and the effect of economic change. Operational services such as interlibrary loans are bound to be expensive both in cost and in time. Because systems are not the same, it may take time to locate and process a request (based on analysis and interviews in sections 6.6, 6.7, 6.8, 7.6 and literature review in sections 3.7 and 3.10).

Scientific and technical information (STI) sources external to an organisation play a predominant role in supplying information in the idea-formulating phase, while internal sources play the more important role in the problem-solving phase for the usage of STI and information-seeking behaviour (based on literature review sections 3.3, 3.4, 3.7, 3.8 to 3.10 and analysis and interviews in section 7.2).

As analysed and from the interviews in sections 5.5 and 7.4 to 7.6, the GCC
information consumers in the field of science and technology suffer from the inadequacy of the information system and from the lack of co-operation and coordination, which hinders the availability of scientific and technical information. In the GCC countries, scientists and engineers tend to duplicate research or delay their tasks because of the inadequate operation of the scientific and technical information system. Also, industries tend to introduce only low-level technology because of inadequate dissemination of scientific and technical information. The ability to expand information activities efficiently and to strengthen indigenous information capacities, therefore hinges on the establishment of the systematic information system. Such an improvement in the understanding is contributing to better planning and control - elements which are essential to future progress and development.

This model Figure 8.1 correlates with components of the national science and technological information system illustrated in Figure 1.3 as a theoretical framework model. This assumption was tested and proved in sections 6.2 to 6.8 and 7.2 to 7.7 analysed, with interviews and also using evidence in literature survey covered in chapter three. The study and analysis correlates completely with the model framework and negates the research question 1.6 (c) that

national/regional links are being established between the
academic departments, research institutes in the universities,
industry and government.

Figure 8.1 represents an information system for the GCC. Its distinguishing characteristic is the liaison function which includes (a) an intermediary function between the demands of information users and the information sources and (b) direct contact with the users.

Emphasis must be given in the GCC on STI for up-to-date information for R & D and industrial base, and to the transfer of technical knowledge for practical uses. This transfer operation will occur only when the receiver actually uses or at least is capable
of using information or technology that becomes available.

**8.3.3 OPERATION OF INFORMATION SERVICES:**

As analysed and using interviews in section 6.8 in the dissemination of information, a library/information centre renders service to its users in a number of ways: providing literature search, reference services, answering inquiries from an informative, technical type, and giving advisory or consulting services, etc. The degree of emphasis given to each service was shown in section 6.8. From the analysis, it is easy to conclude that a greater amount of activity is found among libraries in research institutes than is the case in university libraries.

This model Figure 8.2 correlates with the components of the information seeking model in the R & D environment illustrated in Figure 1.4 as a theoretical framework model.

This assumption has been tested and proved in sections 6.2 to 6.8 and 7.2 to 7.6 analysed with interviews and also evident in the literature survey covered in chapter three and correlates with the model 1.4 and proves the research question in section 1.6 (e) that:

> information provision institutes/organisations need to render and exchange uniform and prompt information utilising information networks at local, regional and international levels.

The biggest problem reported by respondents (though only a small number) was the delay in getting information (revealed in section 7.4) — though not necessarily from the library — and that there was often too much of it.

The usual nature of the contact is technical discussions for problem solving, with hard facts being the information mainly transferred in a face-to-face encounter in the office.
or laboratory with colleagues. Although communications with close colleagues were
the norm, staff in universities had twice as many contacts with people outside their
own establishments than did staff of Research Institutes — although overall the
amount was fairly low (revealed in section 7.5).

Previous studies in literature review (Sections 3.8 to 3.10 ) have shown that a very
high proportion of a worker’s time was spent on information activities. The present
study tried to ascertain whether the proportion spent was, in the respondents’
estimation, a little slice of their time or a large slice. It transpired that scientists and
engineers did not spend large amounts of their time communicating. In general, staff
in Research Institutes spent a greater proportion of their time in all the major forms
of communications activity, while scientists spent a greater amount of time in written
information than did engineers (based on analysis in sections 7.2 and 7.4 to 7.6 of
questioner three and interviews).

8.3.4. DETERMINATION OF USERS NEEDS:

As analysed and with interviews in section 7.2 and 7.5 to 7.6 and revealed in findings
in section 8.2.3, it must be remarked how similar the requirements of both engineers/
scientists
FIGURE 8.2
INFORMATION SERVICES OPERATION
PRODUCERS AND USERS OF INFORMATION

SOURCES
- EXPERTS, ORGANISATIONS, INFORMATION CENTRES
- LIBRARIES, DOCUMENTS,
- GUIDES TO SOURCES ETC

SELECTION AND ACQUISITION

INFORMATION PROCESSING

STORE OF ACCOMMENTS
AND PROCESSED RECORDS

SEARCH AND RETRIEVAL

PREPARATION AND DISSEMINATION

OUTPUT

INTEREST NEEDS AND QUESTIONS

INTEREST AND QUESTION PROFILE

CONTROL
and academe are in the two types of institutes studied. This would appear to run counter to others, quoted in the literature, (Sections 3.8 to 3.10) who have noticed distinct differences between the two professional categories; however, the present finding does support the researcher’s major hypothesis that:

**academic/national research libraries and information centres did not help to improve the research and development activities in science and technology in the GCC countries in all the cases.**

However, what distinguishes engineers from other professionals, is the high value they place on the information right around them. Most engineering problems require original solutions to be worked out on the bench rather than got from literature; and when they require information they are far more likely to turn to colleagues. One reason for this is that reading requires a high degree of effort and concentration on the part of the user. Another reason is that engineers tend to use the most accessible source of information whether or not it supplies the needed quality or whether or not it is accurate. This source is normally a colleague. The engineer working on a practical problem, often needs a solution right away to help with the immediate job in hand and cannot wait to ponder the ramifications and postulates as a scientist often can. Thus, he may not have the time, at that moment, to go and search the literature for references to previous work and so he is quite prepared to accept ideas from a colleague he considers an “expert”.

The implication is, therefore, that engineers require information of a more factual nature, referring to specifications, codes of practice, design rules and failure criteria. Engineers do read but for general interest, to keep up-to-date in their own fields and to answer specific questions. They largely ignore the valuable dynamic knowledge that is available to them through on-line databases.

If contact with so many sources of information — institutional and individual is weak
or infrequent, as has been shown in this study, then the seriousness of the information-gathering habits of these libraries must be questionable. An effective transfer of information is based on strong contacts with information workers and information sources. The absence of these will have a retarding effect on the development of an information system.

S & T information contributes directly to the economic development of a country. Scientists and technologists cannot function properly without having access to up-to-date information in their respective fields. The bulk of such information is being generated in developed countries. Providing access to this information in the GCC for scientists and technologists, is no doubt, a challenging task (based on analysis section 7.5 and literature review 3.3 and 3.4).

This model Figure 8.3 correlates with the components of a model proposed in Figure 1.5 with the components of a national science and technology information system. This assumption has been tested in sections 7.2 to 7.6 plus analysed with interviews, and also there is evidence in the literature survey covered in chapter 3.7 and 3.10 which proves the question raised as a hypothesis that:

there is a need for the establishment of a science and technology information network in GCC countries on a regional co-operative basis with a distinct national NATIS.

Figure 8.3 illustrates the operation of an information service. Interest and Question Profiles act as a control which keeps the function of selection, acquisition, retrieval and dissemination of information sources in line with the needs and interests of the users. Personal requirements and qualifications: the success of setting up the GCC national or regional information system for the users is determined mainly by the availability of specially trained staff. Scientists and engineers, with experience in industry, and industrial economists work co-operatively with
FIGURE 8.3 FRAMEWORK FOR DETERMINING USERS' NEEDS.
information scientists and professional librarians to identify information needs, to locate, acquire and process sources of information and to analyse, digest and disseminate information to solve specific problems and to keep users aware of technological advancement. Such personnel, from the GCC-SIST with experience in industry and an interest in information work, could alternate between the information activities and their departments’ activities. In some cases, the information specialist becomes a member of a project team. He is assumed to be responsible for bringing to the attention of team members new concepts and techniques, as well as for preparing special literature searches.

The conclusion from the analysis of the result is that the main source for needed information (on a one-time basis, or on a continuing basis for keeping oneself up-to-date) is colleagues, and the main channel is personal contacts, the respondents normally obtaining needed information from colleagues in their own division. For information not available from the library, the respondents turned to personal contacts. To keep regularly up-to-date with what is going on in their field they preferred talking with colleagues at work. One might be led to imagine that the resources of the libraries in institutes were not too good. Almost three-quarters of the respondents said they could not get the information they needed from the library — particularly engineers in universities and research institutes. But one has to understand the kind of information required by staff before judging the library.

The concluding analysis proves the researcher’s hypothesis in research questions section 1.6 (a and d) that the need for the academic/national research libraries and information centres to assist, in all cases, to enhance research and development activities in science and technology in the GCC countries and a necessity for information resources to be procured in all formats using leading-edge technology in a cost effective manner so as to be of benefit at a national and a regional level.

The concluding analysis proves the researcher’s hypothesis in research questions 297
The need for the academic / national research libraries and information centres to assist the enhancement of the research and development activities in science and technology in the GCC countries, and

a necessity for information resources to be procured in all formats using leading-edge technology in a cost effective manner so as to benefit all at a national and regional level.

8.4 CONCLUDING SUMMARY

The present study finds that there are two major factors responsible for the poor performance in general among the GCC universities in the area of scientific research. One set of factors is related to research infrastructures. Most of the respondents during interviews pointed to the lack of adequate instrumentation and laboratory facilities and research budgets. The second set of factors is related to the general perception of the GCC elite and the policy makers about the role of the university. As in many other developing societies, the unfortunate practice hitherto followed in the GCC has been one of executing major development projects through advanced country consultants/contractors on a turnkey basis. Since the project agreements are generally without a specific clause requiring foreign participants to ensure effective un-packaging and transfer of relevant technology, the local S & T sector has remained deprived of the opportunity of providing a meaningful input to these important projects and improving its own capability in the process. Many excellent opportunities have thus been lost for upgrading the professional skills of the GCC technical personnel. As a matter of fact, in the first four decades following the Second World War, very few developing countries displayed enough foresight and determination to insist on real technology transfer while entering into such agreements/contracts with advanced countries or multi-national corporations. However, the climate has changed very considerably during the last few years and the developing countries have now become fully conscious of the vital need for the acquisition of technical expertise as
well as modern technology (Chapter Five and section 8.2.1).

From the findings discussed and the concluding analysis, a core set of policy issues can be identified — the issues which need to be seriously addressed for further development and reform of the universities in the GCC countries. One of the core issues is the university autonomy. The GCC universities, like those of other developing countries, are externally and authoritatively managed by their governments and their bureaucracies. The lack of adequate administrative and financial autonomy in the universities inhibits the growth of significant reform efforts from within (Chapter 5 and section 8.2.1).

The problem of autonomy is created mainly by the fact that the GCC universities are government-owned institutions. The universities are about 90%-plus financed by their governments. It is highly unlikely that, in the near future, this situation will change to any great extent or in any noticeable way. So a significant policy question which emerges is "How is autonomy possible within the present structure of relations between the university and the governments of GCC?" One of the institutional innovations commonly found in this respect is the establishment of a separate corporate body which can act as a bridge between the government and the university.

Another core issue which needs to be addressed by the GCC policy makers is related to the problem of modernising the institutional features of the GCC knowledge system. Institutional innovations and reforms must be made to bridge the existing gap between the government and the university on one hand and the university and community on the other. In this respect, the university/community can play important roles, and dynamic leadership should emerge from the university community itself.

Another issue which needs to be explored and addressed is "How can a culture of professionalism be made dominant within the academic and research sphere of the GCC universities?" In this regard, the government can play the role of facilitator by
modernising the research infrastructure, granting the university autonomy and creating new and wider opportunities for international scientific co-operation and communication. The catalyst for the growth of a professional culture, however, should be the GCC national scientists and intellectuals themselves. It seems that today there is a great need for the mobilisation of a "critical mass" of scientists and intellectuals within the GCC universities. It is this critical mass which can lead to what is called a "scientist movement" in GCC countries. Without a vigorous "scientific movement" from within, no reform efforts by the GCC government could effect qualitative change and transform the GCC universities.

The effects which the findings of this study have on the development of scientific and technological R & D systems in GCC can be grouped under three sub-headings.

(a) the effect of weak and infrequent contacts on the part of research workers with each other on a national and a regional level;

(b) the effects which are functionally inherent in official governmental attitudes toward those factors that are essential for the development of scientific and technological R & D and

(c) the effects which are functionally inherent in the organisational set-up of the existing R & D systems.

Many smaller resources, a lack of planning and co-ordination are some of the findings already associated with research and development of science and technology in the GCC. These have a retarding effect on the development of an information system and, as far as the study goes, they are functionally inherent in the organisational set-up of the existing systems. It can be due to the inadequate accommodation and the inability of the research workers to determine what is required, especially on projects managed by non-specialist native officers. In other circumstances, the size of the
laboratory, the size of its clientele, its physical set-up, the calibre of professional manpower and the application to professional function are not justified. All these are cases which are demonstrable in the existing R & D systems in the study.

Nothing weakens a system more than uncoordinated and fragmented efforts. This is a specialised finding associated with the existing R & D system in this study: the evidence of too many small systems existing close to one another and sub-serving similar functions have been shown in this study. This is a problem of organisation inherent in institutes which do not make for an effective development of S & T systems within a nation or region.

Nothing can retard the development of scientific and technological R & D systems in the GCC more than their incompatibility, due to the application of non-uniform standards. Should systems become ultimately mechanised problems are bound to arise unless uniform standards are adopted such as:

- profiles set up for an information system based on:
  - a comprehensive list of the scientific community, their specialities and contact addresses;
  - a list of scientific and technical consultants in the country;
  - a list of on-going research projects in science and technology throughout the country and perhaps also a list of retrospective researches in an annotated form.

All these lists must be given the widest distribution possible and should constitute the main reference materials for the scientific and technological information sources and resources in the country.

In small-sized countries, these compilations are easy to accomplish and especially if communications systems are efficient as in the case of GCC where all the countries except Saudi Arabia are similar in size. Besides the production of research and new
scientific knowledge, a modern university is also being increasingly called upon to actively participate in national economic development both in developed and developing countries. In developed countries, the universities themselves are restructuring in response to global economic and technological competitiveness.

Based on the discussion and findings in the study, the plans suggested in chapter 9 and the proposed subsystem for the region might be applied to the implementation of current and future policies of STI in GCC with a framework of recommendations. The plan emphasises the need for a STI infrastructure on a GCC level of management and sharing system and calls for the close co-operation and co-ordination of a national and regional STI system, as well as the establishment of nation-wide STI in all the GCC countries. This has already started in Saudi Arabia and Kuwait via STI network online system to promote STI communication. To accomplish the above, the plan proposes networking among all the universities and other R & D institutes and empowering GSTIN as a regional STI network system for the provision of STI.

8.5 RECOMMENDATIONS

8.5.1 LIBRARY AND INFORMATION SERVICE ELEMENT

On the basis of conclusion mentioned in sections 8.3.1 to 8.3.4 and review of major findings in section 8.2.2 and analysis together with interviews in chapter five, six and seven it is recommended that effective funding of scientific and technological information systems in the developing countries (especially GCC) is therefore possible within the following network:

i) regular and sufficient subventions from government sources on the provisions that government understands that information is an essential ingredient in economic development.

ii) official recognition that in times of financial crisis in a region, timely and adequate information for industrial, managerial, economic and political
decision-making can stimulate economic development and aid financial recovery.

iii) official recognition that industrial projects, development plans, schools, colleges, government establishments, etc., need to be planned and developed side by side with the information requirements of the establishments.

iv) official recognition that the information requirements of a nation need to be planned and costed in the network of an overall national development plan.

v) prompt release of financial allocations made for information requirements.

vi) commercialisation of information resources by providing information for prices to projects and groups which have high demands for data, e.g., industrial and business communities.

vii) seeking and accepting assistance from foundations, private organisations in or out of the region, international organisations and bilateral aids from governments. The history of library development in the developing countries is replete with assistance from international organisations, philanthropic organisations, foundations, governmental agencies, etc., in the form of direct funding, technical assistance, manpower supply and development, overseas scholarships, donations of books and library materials, etc.

The first pre-requisite for the establishment of such an information network will be for the GSTIN to invite both individual consultants and consulting firms operating in their home countries or abroad, alone or in association with their counterparts in industrialised countries, to register themselves with the network. The GSTIN in turn will maintain an updated Register of these consultants and consulting firms with full particulars of their fields of expertise, qualifications and experience and addresses. Upon request from any member country for the services of a consultant or adviser for a given job, the terms of reference of which will have been previously clearly delineated, the GSTIN may recommend a panel of suitably qualified consultants, giving their qualifications and experience in detail. The final selection of the consultant will be the responsibility of the country which has made the request.
GCC countries desirous of acquiring S & T are thus mainly dependent on the co-operation of the advanced nation, so the GCC countries must necessarily establish the framework of such a co-operation. This could be accomplished on much more favourable terms if GCC nations were to pool resources and create the requisite mechanisms for the purpose on a collective basis.

As evidenced from analysis in sections 6.2, 6.4, 6.6, 6.8, 7.5 and finding summary in sections 8.2.1 to 8.2.3 and concluding analysis section 8.3.1 and discussion above correlates with theoretical models Figures 1.1 and 1.5 there is an urgent need to identify the major factors, operational requirements and main functions for the national information system.

Primary factors contributing towards a National Information System.

1. Legislation and government support.
2. Assigning national responsibilities among the information agencies.
3. Securing adequate financial resources.
4. Intensive staff training at all levels.
5. Adherence to international standards.
6. Strengthening the resources of libraries.
7. Stimulating information awareness and use.
8. Analysis of users needs.
9. Establishing administrative controls for the system.
10. Defining a national information policy.

Primary functions of a National Information system:

1. Compiling a national bibliography.
2. Indexing and abstracting national literature.
3. Developing standard bibliographic tools and services.
4. Information analysis and synthesis.
5. Selective dissemination of information to scientists and engineers.
6. Referring user to pertinent information agency.
8. Designating and strengthening:
   a. Subject resource centres.
   b. Regional resource centres within the country.
9. Co-ordinating system activities.
10. Establishing and enforcing bibliographic standards.
11. Establishing and enforcing standards for service.
12. Planning and directing the system.
13. Exploring use of modern technology, e.g. computers.
14. Fostering Co-operation with other national and international systems.
15. Announcing and distributing government reports.
16. Translation services for lesser known languages.

Additional factors which should contribute towards a national information system are:

(a) Identifying a national co-ordinating body for all information activities in the country;
(b) Designating a national focal point for international activities in the information field;
(c) Studying the benefits and services available from international sources;
(d) Rationale for linking national and international information system.

The most important steps to be taken to develop a simple, cost effective system, well-conceived and well-executed for the GCC are:
1. Develop local and national services consistent with the methodologies and standards of international systems.
2. A certain level of library sophistication is needed within the country before it can participate in and benefit from larger systems.
3. Establish a national focal point, with the necessary powers, for national information policy, planning co-ordination and contracts.
4. Establish priorities, preparing plans, defining realistic objectives and setting out flexible system design.
5. Analyse the relevance of information supplied by other systems to the national needs of the GCC.
6. Analyse to what extent the GCC countries may be dependent upon, benefit from and contribute to these systems.
7. Establish contacts with other national and international centres and seeking expert assistance in some defined needs and subject areas which are vital to the GCC.
8. Establish bi-lateral and multi-lateral co-operative agreements.
9. Participate in regional and international activities, projects, seminars, courses etc.
10. Study carefully and analysis of costs and benefits to be derived from proposed links to other systems.
11. Ensure compatibility of policies, procedures, operational standards, system design, information languages and computers.
12. Apply international standards and guidelines to ensure compatibility between national and international systems.

From the analysis and interviews in sections 6.5, 6.5.1, 6.5.2 and 6.6, findings in sections 8.2.2 to 8.2.3 and the concluding analysis in section 8.3.2, correlates with theoretical models proposed in chapter one Figures 1.3 and 1.5 it is demonstrated that GCC countries should shoulder National Responsibilities for:
1. Depository for national literature.
2. Depository for technical reports.
3. Developing standards bibliographic tools and services.
4. Abstracting/indexing national scientific and technical literature.
5. Compiling union lists and administering interlibrary loans nation-wide.
6. Collection and dissemination of:
   a. Industrial standards
   b. Patents
7. Compiling directories for referral services
8. Planning and directing the national system
9. Co-ordinating the systems activities
10. Establishing and enforcing standards of services
11. Fostering Co-operation with other national and international systems
12. Announcing and distributing government reports
13. Translation services for lesser known languages.

From findings summarised in section 8.2.2 to 8.2.3 and the concluding analysis in section 8.3.4 demonstrate that there is an urgent need for an overall Operational Requirements of a National Information System must entail co-operation and co-ordination of its component units correlated with the models identified in chapter one Model Figures 1.4 and 1.5.

1. Interlibrary lending.
2. Preparing union catalogue.
3. Preparing union lists of serials.
5. Shared national collection development by dividing responsibilities for in-depth purchase of material.
6. Standardisation to facilitate bibliographic access to materials.
7. Promoting broad participation of the component units in the planning and implementation of the system.
8. Legislation to enforce co-ordination.
9. Establishing communication systems.
10. Compensating designated resource centres for servicing nation-wide reference and research needs.
11. Reciprocal borrowing privileges.

8.5.2 LIBRARY AND INFORMATION SERVICES USERS ELEMENT

On the basis of conclusions mentioned in section 8.3.1 to 8.3.4 and the review of major findings in section 8.2.3, correlates with models identified in chapter one (Figures 1.4 and 1.5) it is recommended that the main functions of GCC information systems should be the documentation and information work consisting of scanning the materials published anywhere and in any language, picking out the useful material and listing it in an orderly manner for the benefit of scholars and users. The information work consists of evaluation, analysis of documents and provision of state-of-the-art reports and automation, etc. Basically the following functions must be provided:

(a) Help the scholars, planners and decision makers to formulate their interests precisely.
(b) To locate the material which they require, directly or indirectly for their work in their respective fields by scanning catalogues, bibliographies, indices, CD-ROMs, online, Internet etc.
(c) To procure the published material from all over the world.
(d) To provide the desired copy by any machine means of reproduction.
(e) To arrange for translations from one language to another.
(f) To compile indices on subjects related to research and development in science and technology providing the nature of information contained in various documents.
(g) To provide current awareness in various fields of science and technology.
(h) To publish special bibliographies on subjects of science and technology.
(i) Any other information related to research and development in science and technology.
In order to provide effective and efficient information provision it is suggested that the most efficient means of acquiring processing and disseminating information should include:

1. Identification and study of the information needs of users;
2. Provision of budget increases for the collection of materials;
3. Establishment of a national science library that can cover comprehensive materials available;
4. Identification of international information centres, associations, societies, publishers marketing, investigation industries and other sources in order to access comprehensive technical information;
5. Provision to users of access points by using new information technology;
6. Provision of an efficient information storage and retrieval system;
7. Computerisation of information systems for the distribution of information;
8. Creation for distributors of various information channels such as NTIS, JICST and BLDSC through the use of new information technology;
9. Provision of information from foreign databases with translated abstracts in Arabic and translation of GCC databases into English to make possible an international information exchange;
10. Qualitative improvement in the efficiency of databases produced by several GCC information centres;
11. Delegation of responsibility to a central information agency for developing databases produced in GCC and creating a GCC thesaurus in several fields, instead of delegating these roles to various information entities;
12. Training of information professionals with a strong subject background in the areas of science and technology, to be involved in managing information flow, specifically in developing a GCC thesaurus in specialised areas, standardising vocabulary, indexing and abstracting;
13. Planning by the policy makers at a national level of an information network, an electronic library so that information can be accessible on computers;
14. Interfacing the scientific and technical information network with a national computerised education and research network;

15. A major role for the government in developing and updating information retrieval languages in the areas of specialised science and technology;

16. Co-ordination of acquisition and cataloguing among specialised information centres under the co-ordination of national information agency;

17. Improving the GSTIN information handling activities through:
   a. GSTIN acting as a service - oriented agency;
   b. GSTIN location under the GCC for the control and co-ordination of scientific and technical information activities;
   c. Development by GSTIN of a variety of information sources and provision of services efficiently.

The exploitation of knowledge is one of the most important means of maintaining and raising the living standards of citizens. Innovation and exchange of information among the GCC countries is a precondition for maintaining or achieving international competitiveness by economical use of human and natural resources on a national and regional basis.

What matters now is to arouse the interest of potential users and experts of research and development in science and technology in all its possible applications. The world of today is witnessing revolution actively involved in the phenomenon of the twentieth century and the changes in all fields of modern society (government, science, national economy, education, research and development in science and technology etc.). Mankind in general and GCC areas in particular is experiencing the most rapid and comparatively largest change, but they are lacking trend in intellectual and social achievement. The constantly increasing role of information in the development of national economics has made information a vital resource.

This information has become a major factor in the formulation of policy decisions...
national governments, private and public organisations and industrial enterprises especially in the GCC. The scientific and technical information has often been described as the life-blood of progress in a technically advanced country. And certainly, not just for an advanced society it also a sine qua non for any developing country that wants to catch up technologically.

From the study it is revealed that a quantitatively huge collection is not the answer to provide qualitative information services. Over ambitious collection development and egoist plans are not the answer for STI development. So the question arises what is the answer? The answer is an ELECTRONIC LIBRARY SYSTEMS based on strong networks including CD-ROM networks, interactive automated library system networks and INTERNET extensively is a must alternative for the 21st century.

8.6 RECOMMENDATIONS FOR FURTHER STUDIES
A number of topics identified during the study process merit further investigation. The following are some of the suggested topics:

1) Reasons for GCC scientists, engineers and academe citing little non-English STI;
2) User studies of GCC scientists, engineers and academe in different subject fields comparison of those findings for collection development and network;
3) User studies of GCC scientist, engineers and academe who do not publish in order to understand their STI use patterns and problems;
4) Analysis of information gathering behaviour and ways to lessen information overload;
5) Types of sources from which GCC policy makers obtain information used in policy formulation and review;
6) Degree to which GCC policy makers utilise research findings for policy formulation and review;

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7) Receptivity of GCC policy makers to policy research, policy principles and the inclusion of research in long range planning; and
8) Identification of appropriate types of technology and their applications for information retrieval by GCC scientists, engineers and academe;
9) Receptivity of GCC scientists, engineers and academe to technology e.g., computers, computer networks, CD-ROM and electronic mail and identification of the types of technology that will have high receptivity among GCC scientists, engineers and academe.
CHAPTER NINE

9. PROPOSED ACTION PLANS FOR SCIENTIFIC AND TECHNOLOGICAL INFORMATION NETWORKS IN GCC: REGIONAL AND NATIONAL AND INFORMATION SUBSYSTEM AS AN ALTERNATIVE.

9.1 REGIONAL INFORMATION NETWORK PROPOSAL

If the six GCC states could co-operate and co-ordinate in terms of scientific and technological group activity in the region, a good start would have been made towards co-operation and co-ordination between the regional research centres of the member states so as to serve the entire Region, especially by seeking to pool its manpower as well as promoting co-ordination between its programmes. The need to increase the manpower mass of the entire Region to the critical level necessary for development should encourage the states of the Region to get together for a common purpose and action that should be defined by their common will.

GCC countries through co-operation, would become more effective and competitive in scientific and technological achievement.

Institutional structures for science and technology for the entire GCC would then become feasible so as to co-ordinate the efforts of the regional institutions towards a common and sustained GCC action.

The GCC countries should consider to establishing a GSTIN (Gulf Science and Technology Information Network) which could become the nucleus of a common GCC institutional network. However, its effectiveness will remain limited if the will to work together as part of the GCC is lacking among the GCC States.

Moreover, enhancing the GCC identity of the GCC States is a necessary condition for any GCC regional level institutional structures for science and technology to be
established and function properly. Unless regional institutions based on such a GCC common identity are functioning properly, GCC institutions at the level of the entire GCC remain weak and their role in the development of the GCC remains marginal.

The large institutions at the international and local levels tend to concentrate on global and national problems. Problems specific to the regional areas tend to be neglected. As a result, science and technology fail to become established at the grass-roots level thus the application of the results of research lags behind. GCC countries should make deliberate efforts to establish units and field experiment stations to tackle important regional problems. Preference should be given in selecting the sites in order of priority and specialisation, set up jointly for the benefits of S & T. Technologies developed at the regional level are more likely to be appropriate to the regional local situation than those super-imposed from above.

In other words, if an information system is to be developed for a developing region how does the network ensure that government plays its role?

What kind of the network will ensure the development and growth of the physical information resources?

How can the resources be organised for effective dissemination?

What is the right network for developing professional manpower?

Finally, what type of network is best for ensuring a regular supply of scientific information users?

The researcher proposes the regional and regional strategy plans which would answer all the above questions without going into the details of network technically i.e. hardware, software etc., as this would comprise a quite separate domain for this study.
9.2 REGIONAL STI PLAN

9.2.1 INTRODUCTION
GCC organisation must form a regional consortium of national organisations responsible for national scientific and technological information plan and establish a Gulf Science & Technology Information Network (GSTIN) project.

9.2.2 GOALS
The goals of GSTIN member countries should be to participate in the assimilation of scientific and technological information developments of the GCC member countries by developing sharing of information resources and circulation, interchange and use of information among the member countries and their institutions. The Network aim should be to develop a system of co-operation and co-ordination in the field of information among member countries through inter-linking their national, regional and subject sub-systems information centres and libraries which specialise in science and technology.

9.2.3 CONCEPTUAL FRAMEWORK:
GSTIN should conceive the following:

A system for retrieval, dissemination, processing and storage of information to enhance strategic planning, decision making and programmes for planners, policy makers, executives and researchers among S & T groups of member countries.

A well co-ordinated, dispensed information system, i.e. network of networks, with a number of national, regional and international focal centres hosting database information with each other.

9.2.4 OVERVIEW
GCC member Countries must establish working co-operation and co-ordination in the following different areas:

1. Initiation of two working groups to organise the endeavours of the member Countries in the fields of Pure and Applied Sciences.
2. A high level co-ordinating advisory committee and working group of participants from different national and regional institutions in the member countries as well as participants from international agencies will implement the project and its activities related to co-ordination of efforts among such institutions.

3. Different possible areas of co-operation and co-ordination with several other national, regional and international institutions pertaining to all the aspects of the network development will be discussed by GSTIN.

9.2.5 MEMBERSHIP

GSTIN is envisaged as a co-operative project for all the GCC member countries, as follows:

1. Co-operate to strengthen the GSTIN Project
2. Designate and support the National STI Network
3. To develop databases in line with the national policies.
4. Establish the national information Network and provide access to GSTIN users.
5. Cultivate and organise the resources of the Country into the information system.
6. Devise policies for the national information system and its services.
7. Allocate a budget for the planning and development of the project.
8. To increase manpower training and development.
9. To promote information systems and all relative aspects of systems development.

Surveys are important for the purpose of planning and designing development projects, working improved techniques of the exploitation and provision of essential information to persons engaged in R & D work. The survey institutes in the GCC countries do not lack modern data-processing equipment, but do lack requisite expertise - how to
handle complex technical information expeditiously and meaningfully. Particular emphasis should, therefore, be laid on the development of modern data-processing techniques and training of personnel in their use in order to develop both GSTIN and NSTINS.

9.3 NATIONAL INFORMATION NETWORK PROPOSAL

9.3.1 INTRODUCTION

A network for the development of scientific and technological information in the developing countries, particularly in the GCC, has many facets. It must be clear now that the effectiveness of an information system depends on its infrastructure, which revolves around three main areas:

(a) the government
(b) the physical information resources, and
(c) the users.

The most crucial network for the development of scientific and technological information systems in the GCC will be the organisation of the existing information systems so as to evolve into a national system. It is pertinent to discuss some operational considerations in order to provide the proper setting on which a suitable network can be established. In that circumstance, the questions arise: what type of information system is envisaged? What are the options in the context of GCC? Are there any social, political and geographical factors which must be considered?

With respect to types of information systems at least three types can be adopted, namely, a centralised system, a decentralised system and a combination of centralised and decentralised system. All have their advantages and disadvantages. In a centralised system, a central or national body is the outcome and all library and documentation centres are linked to it. A system such as this ensures that there is no
duplication of resources by libraries/information centres which are situated close to one another. This implies that central acquisitions are the rule rather than the exception: exchanges between information centres are very practicable; and compatibility of systems, especially in bibliographic organisation, is assured. A centralised system works well in small to medium sized countries and so remains suitable for the GCC. In addition to these, a centralised system is very workable in a region in which social infrastructures such as telecommunications, postal services and electricity supply are as reliable as they are in all the GCC countries.

9.3.2 NATIONAL STI NETWORK PLAN

9.3.3 INTRODUCTION

Information and knowledge-based resources have been recognised as major ingredients for national development as we move from the 20th century into the 21st century. In principle, all the GCC countries acknowledge the importance of information by adding a new programme together with the other major national programmes. The nation’s mission should be to serve the National Scientific and Technical Information needs, by establishing a countrywide National Scientific and Technological Information Network (NSTIN) as follows which could serve all the major academic and special libraries listed in the appendix to really complete a strategy on national levels with national NSTIN as a central node:

- Bahrain (BSTIN)
- Kuwait (KSTIN)
- Oman (OSTIN)
- Qatar (QSTIN)
- Saudi (SSTIN)
- UAE (USTIN)
9.3.4 GOALS
Each nation’s goal should be to render an up-to-date and prompt information to advance Scientific and Technical Research and Development in the national public and private sector, by exploiting the current technology in information science and communication for supporting the scientific and technical decision making process in the country. NSTIN should endeavour the formulation of the national information policy to promote co-operative programmes at the national level, following the objectives below with planned output for NSTIN in all the GCC countries.

9.3.5 OBJECTIVES
The objectives are the same as those which the researcher identified in section 1.5 as a theoretical framework of the study. However, in order to implement these objectives planned output actions are required which the researcher identified in sections 9.3.5.1 to 9.3.5.5.

1. Information Sources
To select, procure and organise information sources in science and technology preferably in electronic format using up to date state of the art technology in a cost effective manner to serve at the national level.

2. Information Services
To promote and disseminate consistent and prompt information, exploiting information networks at local regional and international levels to fulfil the national scientific and technical information requirements to inspire user self-confidence and to capitalise on available resources and technology.

3. Information System
To activate an automated system exploiting the contemporary information technology and co-operative library networking complying to international standards, to render best access to bibliographic (full-text, multimedia) and non-bibliographic databases to support scientific and technical determination progress at the national level and to
facilitate the use of management resources in an optimum manner.

4. Human Resources
To stimulate users to be self sufficient and elevate the skills at the national IS, to exploit national information resources and technology in the most effective and efficient manner through an educational training program.

5. National Plan
To design the national information policy in science and technology at national levels for effective decision making by providing a framework to evolve and execute co-operative national projects and programmes.

9.3.5.1 Information Sources

Planned Output Actions Required:

1. Establish the collection development policy and revise as needed to reflect national NSTIN users needs.
2. Select, acquire and organise within the budget framework the main scientific and technical information resources in various format, electronic (preferably), microform or print.
3. To plan a programme for the selection, acquisition and organisation of a comprehensive collection of national science and technology programmes.
4. Appraise and activate the procurement of additional resources from diverse channels such as gifts, donations and exchange programmes.
5. Utilise international utilities as RLIN and OCLC for online cataloguing and share local records with other international libraries.
6. Associate and assess the devising of effective agreements with other libraries on the national level for acquisitions, cataloguing, inter-library loans and document delivery and also for other related projects such as a union list of periodicals, Authority file and Arabic MARC; using Electronic Mail.
9.3.5.2 Information Services

Planned Output Actions Required:

1. Identify, analyse and prioritised research areas in national and GCC strategic plans. Develop a profile of all available information resources pertaining to each other.
2. Identify and access bibliographic and non-bibliographic databases available at national, regional and international levels.
3. Develop promotional, training materials about national NSTIN services and functions to keep the users informed about the latest activities at national NSTIN.
4. Develop a procedure that utilises the latest communication technology in providing current awareness for national NSTIN users, e.g. e-mail, bulletin.
5. Conduct a prospective users survey to develop and enhance national NSTIN products and services.

9.3.5.3 Information System

Planned Output Actions Required:

1. Examine and operate the bilingual (English/Arabic) integrated library management system with real-world data. The system should include the following modules
   - Acquisitions
   - On-line cataloguing
   - On-line Public Access Catalogue
   - Circulation Control System.
   - Serials management.

2. Execute the Arabic cataloguing module for Arabic materials using and developing Arabic MARC standards. Document the MARC related developments of Arabic cataloguing, to incorporate these in the MARC cataloguing rules of Arabic materials.
3. Produce relevant cataloguing tools such as authority files for Names and Subjects in Arabic, utilising the cataloguing module.

4. Render national NSTIN users with access to all materials catalogued in both English and Arabic in NSTIN including books, technical reports, serials, machine readable files, special files. National network of CD-ROM databases furnish access to full text storage and retrieval of S & T organisations/institutions' reports.

5. Develop and extend with the revision of the Union List of Serials Databases which include holdings from S & T universities, institutions/organisations at national NSTIN level to lay the foundations for resource sharing and other network related activities.

6. Join in the formation of policies, methods and procedures for the integration of network related activities between national S & T institutions/organisations.

7. Initiate a user group for the library management system at national level.

9.3.5.4 Human Resources

Planned Output Actions Required:

1. Provide training for staff in the use of several modules which include the cataloguing and creation of item records of English and Arabic materials, online Public Access Cataloguing of English and Arabic databases and on the storage and retrieval of full document files and CD-ROM databases at a national level. Training should also be provided in the use of non-bibliographic databases and use of the Internet.

2. Approach International organisations for fellowships and manpower exchange programmes for professional positions.

3. Evolve an internship program about national NSTIN STI services and activities for LIS present and prospective students.
4. Develop special education training courses for top levels of management such as courses on project management, strategic plans and other decision-making skills.

9.3.5.5 National Programs

**Planned output Actions Required:**

1. Conduct a study to ascertain the status of information /library handling with scientific and technical information in the country to expedite the formation of the national information policy.

2. Study and analyse the existing legislation related to information handling in the country and present the findings and recommendations.

3. Organise a national conference in scientific and technical information policy, to include depository law, standardisation, intellectual property set.

4. Provide training courses to managers of information centres on a national level to promote information skills.

5. Provide contract services to organisations that plan to establish or strengthen their information centre.

6. Formulate an agreement for co-operation of resource sharing via library networking between all STI national points.

7. Acquire funding for national scientific and technical information projects and programmes, e.g., survey, Arabic authority File, Arabic Marc format from national and international organisations.
9.4 INFORMATION SUBSYSTEM FOR THE GCC SCIENCE AND TECHNOLOGY (GCC-SIST)

An alternative subsystem model of information for the GCC Science and Technology is suggested to be activated along with the regional and national networks suggested above.

A combined system scheme based on subject sectors whose activities are co-ordinated by a central, sub-system with functions as such as making policies, funding the subsystems, staff development and with subject specialised networks in different GCC countries.

The differing complex regional structure of the GCC in different scientific and technological R & D productions on a national level necessitates the establishment of a subsystem for specific fields which are important or typical for the region in each country, disciplines such as agriculture, medicine and petroleum since in reality, no country can achieve the establishment of a full fledged National Library of Science and Technology. The functions of the subsystems will be to collect, organise, analyse, synthesise and disseminate information according to the subject areas assigned speciality and to provide a rapid flow of information of the most recent achievements in their respective specialities.

The following factors, of planning and design methodology developed will be considered in developing guidelines for planning a subsystem in the GCC.

- Objective
- Organisational structure
- Information coverage and scope
- Functions to be performed
- User community and their needs
- Personal requirement and qualifications
9.4.1 OBJECTIVE:
The overall objective of the GCC-SIST in the GCC is to support technically the research and development and industrial programme needs of the region through:

1. Improving and expanding the flow and transfer of appropriate S & T information and industrial technologies from existing sources all over the world to the practical needs of the country's the region.

2. Acting as an intermediary for the region by drawing on the subject knowledge of specialists and exploiting all types of literature to the profile of each country in the region in their subject assigned areas.

3. Adapting and analysing technical information and appropriate technologies to the regional context and requirements.

4. Conveying this information and technologies to the ultimate consumer in a form that the users could absorb and assisting them in their application to their practical problems.

9.4.2 ORGANIZATIONAL STRUCTURE:
The organisational structure allows the GCC-SIST to function in an autonomous fashion while it is still guided and supported by the policies and services of the national and regional information system. The mission of the subsystem, in relation to the national/regional system, is to supplement and expand in-depth information services according to the specific needs of the GCC. In this respect the subsystem performs the function of information analysis within the national information system. The goal of the subsystem is the analysis and filtering, digesting and repackaging of information covering a specialised field in order to meet the needs of specific clientele.
Where the tasks of the GCC-SIST for information would be co-ordinated with other subsystems and components by the national system leading to a regional system, the services of technical libraries and information centres would be co-ordinated by the GCC-SIST for information.

9.4.3 INFORMATION COVERAGE AND SCOPE:
Information coverage and scope of GCC-SIST covers information for R & D and industry and management, on raw materials and finished goods, on product design and industrial equipment, on standards, patents and other regulations. Sources of information are the following:

1. Personal knowledge and experience of the information specialists and the scientific and technical experts in academic, government and research institutions.

2. Scientific and technical published literature (books, journals, technical reports, trade literature, conference papers, patents, standards, catalogues, CD ROM/on-line databases, directories, Internet, etc.)

3. Internally prepared practical data or written material analysing and digesting information according to the needs of the region collected from each country.

4. Technical information services of other countries of the world.

All the GCC countries are particularly in need of practical know-how, in techno-economic context which is well digested and capable of being applied directly towards practical ends both in R & D and industrial base.

Emphasis must be given, on GCC-SIST information for R & D and industrial base, to the transfer of technical knowledge for practical uses. This transfer operation is occurs only when the receiver actually uses or at least is capable of using information
or technology that becomes available. Similarly, technological transfer as the application of know-how primarily through the medium of people who, on the one hand, have knowledge of and access to relevant publications and on the other have knowledge of the users’ problems, needs and limitations, and can communicate to the user what he needs and can apply.

GCC-SIST be concerned with the application of technology to specific problems and for specific users, in government, education and industry, rather than with accumulation of information per-se. They should be primarily active intermediaries in a world-wide circuit, tuning into each national (or regional) centre to relevant foreign sources of technological information and operating know-how and ensuring adaptations of this technology to local needs as well as its effective application by domestic users.

9.4.4 FUNCTIONS

To function as a successful intermediary and technological transfer agent, the GCC-SIST information specialist keeps in close touch with the current thinking and problems users identify as useful technologies and adapts them for practical application. “Technology per se”, has little or no value until it is applied to a process, product, in which case it becomes a must to seek the most appropriate technology compatible with the user’s resources (financial, human, material goals and competition for national and regional industrialisation).

To carry out the above mentioned functions, the following activities are to be undertaken:

First — Technical inquiry service: responds to direct requests initiated by the users from the region in an attempt to find answers to difficult questions which are not easily found in the literature and which require considerable searching and synthesis of information. The response refers to specific items of pertinent information and gives a professional opinion of the probable solution.
Second — Establishing contacts with the users through visits paid by the GCC-SIST
information specialists. Such visits play an important part in assessing the exact needs
of industry and in helping clients seek solutions to their problems. Visits also help
in stimulating a demand for information and in assisting in the utilisation of
knowledge. These people, it appears, are most effective for transmitting technical
information and also for transferring advanced technology from research
establishments to industries which can exploit it. It is also feasible that person-to­
person dialogue between staff members of the GCC-SIST and the users are the most
effective means for the transfer and interchange of technological and managerial
know-how, as well as ensuring proper follow-up of the information supplied and
feedback to the institutional sources of information at the national and regional level.

Third — Technological Developments Awareness Service: will be concerned with
finding solutions to problems not only for GCC SIST users, but it will also continually
seeking new ideas. This kind of information service initiates, on a periodic schedule,
awareness of research and technological developments of potential value to the region
and will allow the GCC-SIST to reach more users than it would by responding to
direct requests. A technological transfer service to become really successful should
progressively change its initial passive role concerned mainly with the solution of
apparent problems into the more active and even aggressive role of a pro-active
promoter of new technology by applying itself to create an ever-growing demand for
it.

The users of the GCC-SIST experiences should be encouraged to register their specific
interests so that checklists of articles can be sent to them on a continuing basis
according to their interests. Publications disseminated for current awareness purposes
should as far as possible, be prepared in terms suitable for the technical capability of
the recipient, similar to the Technical Information Service of the National Research
Council of Canada which issues selected items called “Tech Briefs” for the purpose
of stimulating innovation in Canadian industry. A Tech Brief is a piece of useful
technical information selected by scanning journals, books, brochures and reports. Users stating their particular areas of technical interest by submitting an interest profile registration to receive regular up-to-date list of titles of Tech Briefs containing the key words in their field of interest. They are provided with free copies of the Tech briefs upon request. Such requests provide a feedback on the type and nature of information that is of interest to users. To complete this individualised service, the most frequently requested items are grouped into group checklists which are sent to all industries in Canada.

9.4.5 USER COMMUNITIES AND THEIR NEEDS:
User communities and their needs — The main categories which will use GCC-SIST information are:

- Ministries and government departments engaged in the task of formulation of economic and industrial plans, policies and procedures.
- Institutions with implementation responsibilities such as industrial development Co-operation, financial institutions, investment promotion agencies.
- Technological and scientific institutions.
  - Universities and colleges.
  - Business, trade and industry bodies.
  - Techno-economic and consultancy service organisations
  - General public investors.

9.4.6 PERSONAL REQUIREMENTS AND QUALIFICATIONS
A variety of institutions such as special libraries, information centres, university, research, professional and trade association libraries will serve these users who have different information requirements through GCC-SIST.

Question Profiles act as a control which keeps the function of selection, acquisition, retrieval and dissemination of information sources in line with the needs and interests
of the users. Personal requirements and qualification: the success of setting up the GCC-SIST from national to a regional subsystem of information for the users is determined mainly by the availability of specially trained staff. Scientists and engineers with experience in industry and industrial economists work co-operatively with information scientists and professional librarians to identify information needs, to locate, acquire and process sources of information and to analyse, digest and disseminate information to solve specific problems and to keep users aware of technological advancement. Such personnel, of the GCC-SIST with experience in industry and interest in information work, could alternate between the information activities and their departments' activities. In some cases the Information Specialist becomes a member of project team. He/She is assumed to be responsible for bringing to the attention of team members new concepts and techniques, as well as for preparing special literature searches.

Ideally, the rational of information specialists must be high enough to permit each information scientists to be assigned to help a particular project theme of functional group of users. It is imperative that three to four percent of the employees working in research and development should permanently engage in documentation and information activities.

9.4.7 FINANCIAL BASES:
Financial bases: In order to function successfully the GCC-SIST service must receive adequate financial support from all the GCC countries in recognition of the vital role that information plays in the process of industrial development. It is as important as providing funding for education, public health, transport, communication and similar infrastructure facilities in public interest.
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APPENDIX A

QUESTIONNAIRES ENGLISH/ARABIC WITH COVERING LETTERS
Dear Sir,

I am a doctoral student from the University of Loughborough, UK. My dissertation attempt to formulate strategy for planning a national and regional scientific and technical information information system for the six GCC countries: Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and United Arab Emirates limited to strategy for the networks.

In my study special attention would be given to the organizational structure, the operational requirements, the steps to be taken for linking the proposed system with other national and regional and international systems, and the priorities for implementation with objectives and action plans.

As I am aware that different patterns of national information systems exist in different countries, due to varying national and regional conditions and levels of development, I will attempt to study both the library resources and library services in the GCC countries and its impact on research and development limiting to science and technology.

I will greatly appreciate your cooperation in completing and returning the enclosed questionnaire at your earlier convenience to the address above.

Thank you for your cooperation.
I am writing a dissertation on the topic "Research and development in science and technology in six GCC countries: role of information centers and libraries". I hope you will be willing to cooperate in this project by completing the enclosed questionnaire.

As you are aware, there has been a growing interest in the development of national information systems. A national information system, as defined by J. Polinierie, is "basically a coordinated network of existing information resources, which brings to specific categories of users the information relevant to their needs and abilities."

One reason for the growing interest in the development of national information system, as pointed by D.H.Kraus and others, is that "a national information system supports the planned development of the national economy and society". Another reason cited by V.C.Penna is that without national information systems "it is unlikely that these [developing] countries will much longer have access to world scientific literature." A third reason for developing national information systems is the recognition that "stronger and more unified systems organized on a national basis are essential to significantly improve library and information services."

Recognizing the need for and potential value of a national information system, my dissertation attempts to formulate strategy planning such a system on national level leading to regional system for GCC countries limited to science and technology.

As libraries would be an essential component in the system, I will greatly appreciate your cooperation in completing and returning the enclosed questionnaire at your earliest convenience. Please send it to the address above.

With regards.
QUESTIONNAIRE 1

QUESTIONNAIRE ON ACADEMIC AND NATIONAL UNIVERSITIES AND INSTITUTES OF RESEARCH AND DEVELOPMENT IN SCIENCE AND TECHNOLOGY

GENERAL INFORMATION

NAME:

Founding Year: Chief Executive:
Parent Organization:

Number and names of division/departments of science and technology: (please specify)

Finances:

Annual budget for the last years in local currency.

Personnel:

Number of people engaged in R & D activities last two years:

Managerial staff
Scientific staff
Technicians
Administrative staff
RESEARCH & DEVELOPMENT ACTIVITIES

Number of research and development projects for the last two years: (please attach a list of all the completed and ongoing projects)

Research projects:
Internal funded:
External funded:
Joint research:
Total R&D budget:

Field of research (please specify e.g. agricultural etc.

BILATERAL AGREEMENT:

Agreements started with organizations/institutions for the years:(please attach list )

OTHER ACTIVITIES;

Conferences, meetings, seminars and workshops organized:

Conferences attended by your staff:
Conferences, meetings, seminars and workshops organized:
Papers presented by your staff
Patents registered by your staff
Books completed by your staff

Please mail to me annual reports and brochures or handouts of your organization/institute. Thanks.
QUESTIONNAIRE ON LIBRARY AND INFORMATION CENTER

1. Name of the library/information centers:

2. Does your library/information center have branches?
   Yes  No

3. If your answer to No.2 is yes how many? Name them:

4. Is your library/information center a document/book depository for any of the following:
   a) National, i.e. right of legal deposit for your country.
   b) Regional i.e. right of legal deposit for any of the GCC countries.
   c) United Nations agencies e.g. UNESCO, FAO, WHO, etc.
   d) None
   e) Other (please specify)

5. Please indicate in the columns provided by marking (X) the order in which you have the highest number of materials. (Note that 1 is higher than 2, and 2 is higher than 3, and so on.
   a) natural Sciences
   b) Engineering and technology
   c) Medical and Pharmaceutical
   d) Agricultural Sciences

6. Please indicate the number of staff in your library/information center for the last 2 years in column:
   Professional  Non-Professional

7. Does your library/information center have any training program (including study leave) for professionals?
   Yes  No

8. Please indicate the budget for the last two years.

9. Total number of books in stock on 31 December for the last two years:

10. Total number of periodical titles received up to 31 December for the last two years:

11. Do you consider the present space by your library/information center is adequate?
   Yes  No

12. Indicate the degree to which your library/information center renders the following services:
   Provision of answer to technical questions
   Consultancy/consultancy services
   Organizing seminars, conferences, workshops etc.
   Reference/literature searching
   Routing of current periodicals
   Routing of current content pages
Selective dissemination of information (SDI)
State of the art report
Translation services
Others (please specify)

13. Do you use computers in your library/information center
   Yes    No

14. Which of the following activities in your library/information center are automated
    or planned for automation:
    Automated    Planned for automation    Date starting
    Acquisition
    Cataloging
    Inter library loan
    Circulation
    Serials
    SDI
    Current awareness
    Union lists
    Bibliographies
    None of the above
    Others (please specify)

15 Does your library/information center engage in inter library loan services?
   Yes    No

16. How many registered users you had for the last two years

17. Who are your users?
   a) Members of your institution
   b) Registered users from other institutions
   c) Civil servants
   d) Undergraduate students
   e) Postgraduate students
   f) Open to general public
   g) Others (please specify)

18. Please comment on how you think a scientific and technological information
    system can be developed in your country/region. You may bear the following in
    mind: National policy on information; the importance of information as a resources
    of R&D activities in your country/region. (please use extra sheets of pages if
    needed).
QUESTIONNAIRE 3

QUESTIONNAIRE OF LIBRARY AND INFORMATION CENTER USE.

1. Your position title
2. What is the field of your research work?
3. What was your previous work environment?
4. How many national, regional or international conferences have you attended for the last two years?
5. How many papers you have presented at conferences for the last two years?
6. For the last two years:
   a) How many papers have you published?
   b) Proposals, reports for internal & external and sustaining research you have written?
7. Do you face any of the following problems in getting the information you need for R&D projects? Please assign a value of between 1 (rarely) and 6 (very often) to each relevant problem:
   - Not available in library/information center
   - Delay in getting it
   - In microform
   - No references found
   - Too much available
   - Information is confidential
   - Other (please specify)
8. In what frequency do you obtain needed information from the following sources? Please assign a value of between 1 (rarely) and 6 (very often) for each relevant source.
   - Colleagues in your own section/division
   - Colleagues working on same project/topic
   - Colleagues in the organization, not in your section
   - People outside organization
   - Library and information center staff
   - Online literature searches
   - SDI
   - Reference books
   - Textbooks/manuals
   - Conference papers
   - Trade literature
   - Journal articles
   - Reports/working papers/progress documents
   - Standards/specifications/patents
   - Library/information center announcement lists
   - Current contents pages
   - Abstracting/indexing services
Final reports at meetings
Own work or sources/files
Other (please specify)

9. On average how often do you visit the library/information center per week?
   Once/week   1-2 times   3-5 times   6 times

10. What are your main reasons for visiting the library/information center? Please assign a value of between 1 (rarely) and 6 (usually) for each relevant reason:
   Read new books
   Read newspapers
   Read journals
   Browse
   Request literature searches
   Do Online literature searches
   Counsel/meeting librarian/information specialist
   Browse documents (e.g. book/journal/report)
   Return document
   Consult reference book
   Work quietly
   Other (please specify)

11. Do you use the library/information center more or less now than you did a year ago:
   Now   More   Less   Above the same

12. Would you say that you get most of the information you need for your R&D work from your library/information center?
   Yes   No

   If you have answered No
   a) Would you please indicate what kind of information you cannot get from your library/information center.
   b) From where do you normally get this information
   c) Do you feel the library/information center should be able to supply this kind of information
      Yes   No   Why

Any other comments for improvement in library/information center.
استبيان حول المؤسسات الأكاديمية والجامعات ومراكز البحث والتنمية في مجال العلوم والتكنولوجيا
البيانات العامة

1- الإسم:

2- سنة الإنشاء:

3- المنظمة/ الهيئة التابعة لها:

4- اسم المستند:

5- عدد الإدارات والأقسام واسمائها:
   - 1
   - 2
   - 3
   - 4
   - 5

6- مصادر التمويل (الميزانية) :

7- الجهاز الوظيفي:
   - عدد الأشخاص المعنيين في البحث والتطوير في السنوات الأخيرتين:
   - عدد أفراد الإدارة التنفيذيين
   - عدد الأفراد المتخصصين في العلوم
   - عدد أفراد الإدارة العليا

8- نشاطات البحث:
   - عدد مشاريع التطور والتطوير خلال السنوات الأخيرتين
   - (يرجى إرفاق قائمة بكافة البيانات المتعلقة بالمشاريع التجارية)
مشروعات البحث

ا. الممولة داخل المؤسسة
ب. الممولة من الخارج
ج. المشروعات المشتركة
د. إجمالي ميزانية البحث والتطوير

6- الإتفاقيات الثنائية

- الإتفاقيات الدولية
- الإتفاقيات الإقليمية
- الاتفاقية المحلية

10- نشاطات أخرى (تذكر رجاء)

- المؤتمرات، الحلقات، الندوات، ورش العمل)
- عدد المؤتمرات التي شارك بها العاملون في المؤسسة
- عدد المؤتمرات والندوات وورش العمل التي قامت المؤسسة بتنظيمها
- عدد أوراق العمل التي قدمها العاملون بالمؤسسة
- عدد الأوراق التي تم نشرها من قبل العاملين بالمؤسسة
- عدد براءات الاختراع التي سُجلت للعاملين بالمؤسسة
- عدد الكتب التي تم وضعها من قبل العاملين المؤسسة
استبيان حول للمكتبات ومراكز المعلومات
اسم المكتبة / مركز المعلومات

هل توجد فروع للمكتبة

نعم □ لا □

إذا كانت الإجابة (نعم) على السؤال السابق، فما عدد الفروع التابعة لكم، وما هي اسماؤها؟

من أي نمط تعد المكتبة / مركز المعلومات

□ مركز للتوثيق الإقليمي
□ مركز للإيداع القانوني
□ مركز لوثائق الأمم المتحدة
□ مركز لوثائق مجلس التعاون

في أي المجالات التالية تتركز مجموعات المكتبة / مركز المعلومات

1- العلوم الطبيعية
   ب- الهندسة والتكنولوجيا
   ج- العلوم الطبية وعلم العقاقير
   د- العلوم الزراعية

عدد الموظفين العاملين بالمكتبة / مركز المعلومات

- المقيمين
- غير المقيمين
- هل تقوم المكتبة / مركز المعلومات ببرامج تدريبية متخصصة
  - نعم
  - لا

- الميزانية خلال السنوات الأخيرة

- عدد الكتب المتوفرة ضمن مجموعات المكتبة / مركز المعلومات
  - الكتب العربية
  - الكتب الأجنبية

- عدد الدورات التي تشارك فيها المكتبة / المركز
  - الدورات العربية
  - الدورات الأجنبية

- هل المساحة الحالية للمكتبة / المركز كافية
  - نعم
  - لا

- خدمات المكتبة التي تقدمها المكتبة / المركز
  - خدمات الاستشارة
  - خدمات الدراسة والتقييم
  - خدمات إقامة الجلسات والندوات وورش العمل
  - خدمات البحث في المراجع
  - خدمات البحث في الدورات
  - خدمات عرض قوائم المحتويات
12- هل يوجد نظام للكمبيوتر في المكتبة / مركز المعلومات

نعم ☐
لا ☐

14- أي من النشاطات التالية تتم باستخدام الكمبيوتر

tوزيع ☐
الفهرسة ☐
الإعارة بين المكتبات ☐
الإعارة ☐
السلاسل ☐
البحث الالكتروني ☐
الإحاطة الجارية ☐
القواعد الموحدة ☐
البليوجرافيات

نشاطات أخرى (تذكر رجاء)

15- هل تشتريك المكتبة / مركز المعلومات في برنامج الإعارة بين المكتبات

نعم  لا

16- عدد المستفيدين من خدمات المعلومات بالكتبة / مركز المعلومات

17- فئات المستفيدين من خدمات المعلومات

أعضاء من المؤسسة
أعضاء من مؤسسات أخرى
مستفيدين من موظفي الخدمة المدنية
طلبة جامعيون
طلبة دراسات عليا
من جميع فئات الجمهور
فئات أخرى (تذكر رجاء)
APPENDIX B

LIST OF INSTITUTES FOR FURTHER RESEARCH STUDIES
LIST OF ORGANIZATIONS / INSTITUTIONS IN GCC FOR FURTHER STUDIES:

BAHRAIN

Arab Gulf University
Bahrain National Oil Company (BANOCO).
University of Bahrain
College of Health Sciences Bahrain
Gulf Polytechnic
Budaiya Experimentation Station
Materials Testing and Research Section
Public Health Laboratory

KUWAIT

Kuwait University
Agriculture Experiment Station
Kuwait Foundation of Advancement of Science
Kuwait Institute of Scientific Research
Public Authority of Higher Education
Arab Center of Medical Literature
College of Technological Studies
Telecommunication and Air Navigation Institute
Public Authority of Agriculture & Fisheries

OMAN

Sultan Qaboos University
Central Medical Library
Institute of Health Sciences
Marine Science and Fisheries Center
QATAR

University of Qatar
Soil Research Station

SAUDI ARABIA

King Abdel Aziz University
King Fahd Center for Medical Research
Research Center for Economic Development
Bureau de Reshearches Geologiques et Minerales((BRGN)
Saudi-Sudanese Red Sea Commission
Meteorology & Environmental Protection Agency
International Airport Project
Islamic Foundation of Science, Technology and Development
Jeddah Oil Refinery Company
Arabian Aerosurvey Company
Umme el Qura University
King Abdel Aziz University.
Islamic University Medina
Royal Commission of Jubail & Yanbu (Yanbu branch)
King Fahd University of Petroleum and Minerals
Research Institute
King Faisal University
Bees Research Center
Research Center of Water Studies
Research Center of Agricultural Experiments
ARAMCO
Royal Commission of Jubail & Yanbu(at Jubail)
International Airport Authority
Owedah Establishment
AlHassa Irrigation & Drainage Authority
Saudi Arabian Fertilizer Company
Saline Water Conversion Corporation