

## **ROLE OF KFUPM IN TECHNOLOGY TRANSFER TO SAUDI ARABIA THROUGH UNIVERSITY- GOVERNMENT-INDUSTRY LINK**

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**ABSTRACT:** A closer ties among the university, government and industry have been accounted to be one of the major factors in the success of the positive economic growth of a developing country. Almost all the major and fast growing countries also known as 'ASIAN-TIGERS' of the far east region of the globe have exploited this relationship for their phenomenal growth. In this study, the same idea is used by introducing the concept of the technology transfer from the developed countries to the developing countries. The university-government-industry link is used in technology transfer through the inception of King Fahd University of Petroleum and Minerals (KFUPM) and its Research Institute (RI). Moreover, the creation of the Development and Manufacturing Center (DMC) within the Research Institute enhances the interaction of the local industries with the Research Institute as well as the university itself. In this study the role of DMC is explained in a comprehensive manner.

### **1. INTRODUCTION**

The idea of the technology transfer using the university - government - industry link is quite a well established fact. It has been appreciated and implemented globally. It is also proven to be the most effective and smart way of technology transfer from the developed countries to the developing countries. Using this relationship Taiwan, a far-eastern country, has created global interest by posing its remarkable growth and high economic stability[1]. A number of manufacturing industries have earned a reputation in the international market. The Taiwanese realized that to build the industries of the future, the industry requires a long term plan and the support from the government and the academicians from the various universities and which could not be achieved by simply purchasing and installing ready-to-go solutions. One such example is the implementation of the advanced manufacturing technology using the university-government-industry cooperation in Taiwan [1]. Another example, using the same university-government-industry link is the establishment of Computer Integrated Manufacturing (CIM) systems in USA [2] and in Singapore [3]. The need of CIM was identified by US academic institutions, industry and the government to train engineers in this particular discipline. This idea was floated by the National Science Foundation through organizing various seminars. As a result of these seminars, the leading industries and academic institutions expanded their graduate and undergraduate programs to accommodate this modern manufacturing systems engineering [2]. In another study, the strategic planning of university of Alberta, Canada was studied and as a result recommendations were made to the *provincial government to increase the support for the graduate and undergraduate programs* [4] which may provide more trained personnel's as well as development of facilities in the latest disciplines. Like Taiwan, Thailand is also one of the fastest growing countries with

quite a number of State Owned Enterprises (SOEs). These SOEs are either wholly owned by the government or completely controlled by the government. In order to enhance the performances of these SOEs the corporate planning strategies like marketing, finance, investment, production and human resources were considered [5]. The enhancement of the human resources which include the management and the management information system was considered top priority. Such requirement of the human resources are fulfilled by the academic institutions.

In this study, the innovative concept of the Development and Manufacturing Center (DMC) of the Research Institute at the King Fahd University of Petroleum and Minerals, Dhahran, which utilizes the same university-government-industry Link is considered. It was created by the University Board in 1986 to design and build advanced programs, systems, and equipment ensuring efficient and effective technology transfer and its adaptation in the Kingdom [7]. The center possesses expertise in a wide range of design and development, modeling and simulation, and computer, electronics and communications areas. In the center, a high level of expertise, backed by an array of state-of-the-art facilities, is available to the government as well as corporate clients ranging from small to large studies for specific and immediate applications. This link helps the ever growing industries as well as the new ambitious off-set program to create advanced manufacturing capabilities through joint entities with the giant western companies.

## **2. ROLE OF KFUPM AND ITS RESEARCH INSTITUTE**

In the middle-east, a successful story of methodology and manufacturing know-how of an effective technology transfer has been established in Saudi Arabia. In order to keep up-to-date scientific and technological developments and to cope with future challenges, the Kingdom had to develop a system to absorb the suitable and competing technologies. This was accomplished by setting up industrial research facilities in various universities to provide consultation of technical know-how and develop expertise in the Kingdom. The KFUPM has always been at the forefront playing a significantly leading role in the development and transfer of technology in the Kingdom. The Research Institute (RI), an integral but semi-autonomous part of KFUPM, was established in 1978 with the objectives, to study, conduct research, and develop solutions from the modern technology to problems encountered in the Kingdom as needed [6]. Thus, RI is the foremost and unique Research and Development Center in the Kingdom for the basic and applied research conducted under contract for the Government, industry and the private sector. The KFUPM, in general, and the RI in particular, have been recognized internationally as a Gateway to the Kingdom in the technology transfer process. To enhance and improve the rate of the effective technology transfer and to facilitate a firm footage to the newly growing industries all over the Kingdom the Development and Manufacturing Center (DMC) was created by KFUPM.

## **3. SCOPE OF DMC IN KFUPM/RI**

The Research Institute conducts internally funded as well as externally funded studies. The internally funded projects are conducted to study and develop new emerging areas in the latest fields. The externally funded projects are those which are either specified by the government sector, industries or private sector. The studies are mostly performed for the client-oriented specific problems. As a result of these studies various viable products are developed. But after the completion of these studies, further development of the products are either left alone or shelved due to lack of financial support. One of the objectives of the DMC is to consider these

products and develop them to the prototype stage so that it could further be manufactured and marketed with the help of local industries or international collaboration. In general, the DMC plays a catalytic role in engineering evaluation of a problem, providing research and development consultancy to the government as well as corporate clients, by absorbing advanced technology, upgrading and tailoring the equipment according to the requirements. The center also plays a significant and effective role in applied industrial research by suggesting the optimum solutions to the problems encountered in the industries.

#### **4. FRAMEWORK OF DMC**

The advent and establishment of DMC has further strengthened the existing link of University with the local industries, by putting together the available resources as well as manpower, know-how and expertise. In essence, the DMC is playing a significant role in utilizing the resources, manpower, expertise for the industrial development of the local industries. The DMC has a bilateral interaction with the various colleges of the University, different divisions within KFUPM/RI, the local industries and the government as well through KFUPM/RI. A functional organization of the Development and Manufacturing Center is shown in Figure 1. It is very well illustrated that the DMC enhances the said link further and its interaction with the government as well as with the local industries. The DMC is broadly divided into the following three major interactive programs:

- o Design and Development Program
- o Modeling and Simulation Program
- o Computer, Electronics and Communications Program

Details of these programs are mentioned in the following subsections.

##### **4.1 Design and Development Program**

The major thrust of this program is the prototype development, fabrication of systems, and equipment as well as providing design consultancy. The main focus of the Design and Development Program at large is the development and realization of the electronic hardware solutions for customer specified requirements. The orientation is thoroughly biased toward requirements of the local industry and government institutions. The facility is well equipped to take electronic data acquisition designs from concept to a finished product. It has the expertise to transform concepts into schematic circuits using workstations. Moreover, it is further converted to printed circuit layouts from which printed circuit boards are produced on site.

##### **4.2 Modeling and Simulation Program**

The main objective of the Modeling and Simulation program is to provide consultancy in modeling and simulation related problems to the local industries. A number of models have been developed at KFUPM/RI during several studies and quite a significant number are either not used or frequently used. The role of this program is to pick up those models which have market viability and to further develop them into prototype stage. Ultimately, they will be recommended for full scale production, and for patent as well as licensing. Being in the developing stage, the program is also going to consider those disciplines which have yet not been explored. Apart from the existing areas such as electrical and electronics, natural resources systems, socio-economics and econometrics, manufacturing systems, and ecological systems, few more potential disciplines like system dynamics, management information

system, system controls, power distribution, artificial intelligence, demographic, manpower and educational planning are considered. Apart from that it also assists in evaluation and implementation of latest technology for optimum usage of resources' utilization and industrial processing.

### **4.3 Computer, Electronics, and Communications Program**

The main objective of this program is to enhance the computing and communication facilities, development and improvement of software and hardware, cost optimization, upgrading, organizing seminars, and introduction of new software and hardware. It also facilitates the development of a multitude of communication software which is geared towards specific clients with certain performance, security, and speed requirements. Eventually the developed code is implemented as a software package and finally the hardware implementation of the developed package is also accomplished.

## **5. EXPOSURE**

After the inception of DMC, a number of seminars were organized for various colleges, departments of KFUPM and for rest of the divisions of the Research Institute itself. The scope and services offered by DMC to the rest of the university community as well as the industry was very well elaborated. The idea was received quite enthusiastically and researchers from the various departments have started making overtures the DMC. Lately, KFUPM organized the FIFTH INTERNATIONAL CONFERENCE ON MICROELECTRONICS under the auspices of IEEE Saudi Arabian Section, HUGHES, King Abdulaziz City of Science and Technology, AEC, SABIC, and AL-Alamiah during December 13-16, 1993 [8]. During the conference, a panel discussion was organized to discuss and assess the prospects of electronic industries and the know-how in the middle east. The panelist present were world renowned figures in the area of microelectronics; including Dr. M. I. El-Masry, Director, VLSI Research Group, ECE department, University of Waterloo and Dr. Y. El-Mansy, INTEL, USA. The activities of DMC at KFUPM/RI were also introduced during the panel discussion. It was very well appreciated and widely welcomed in the discussion.

## **6. CONCLUSION**

In this study, the university-government-industry link has been developed with the inception of the Development and Manufacturing center at the Research Institute of King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia and has been presented. The existing facilities at DMC and KFUPM were cited. Its role in the transfer, absorption and adaptation of technology to the kingdom has been highlighted. The expansion and development is still under way. The KFUPM houses an array of excellent facilities more are under the process of establishment. These newly developed facilities are going to open lots of new avenues for the industrial development in the Kingdom of Saudi Arabia.

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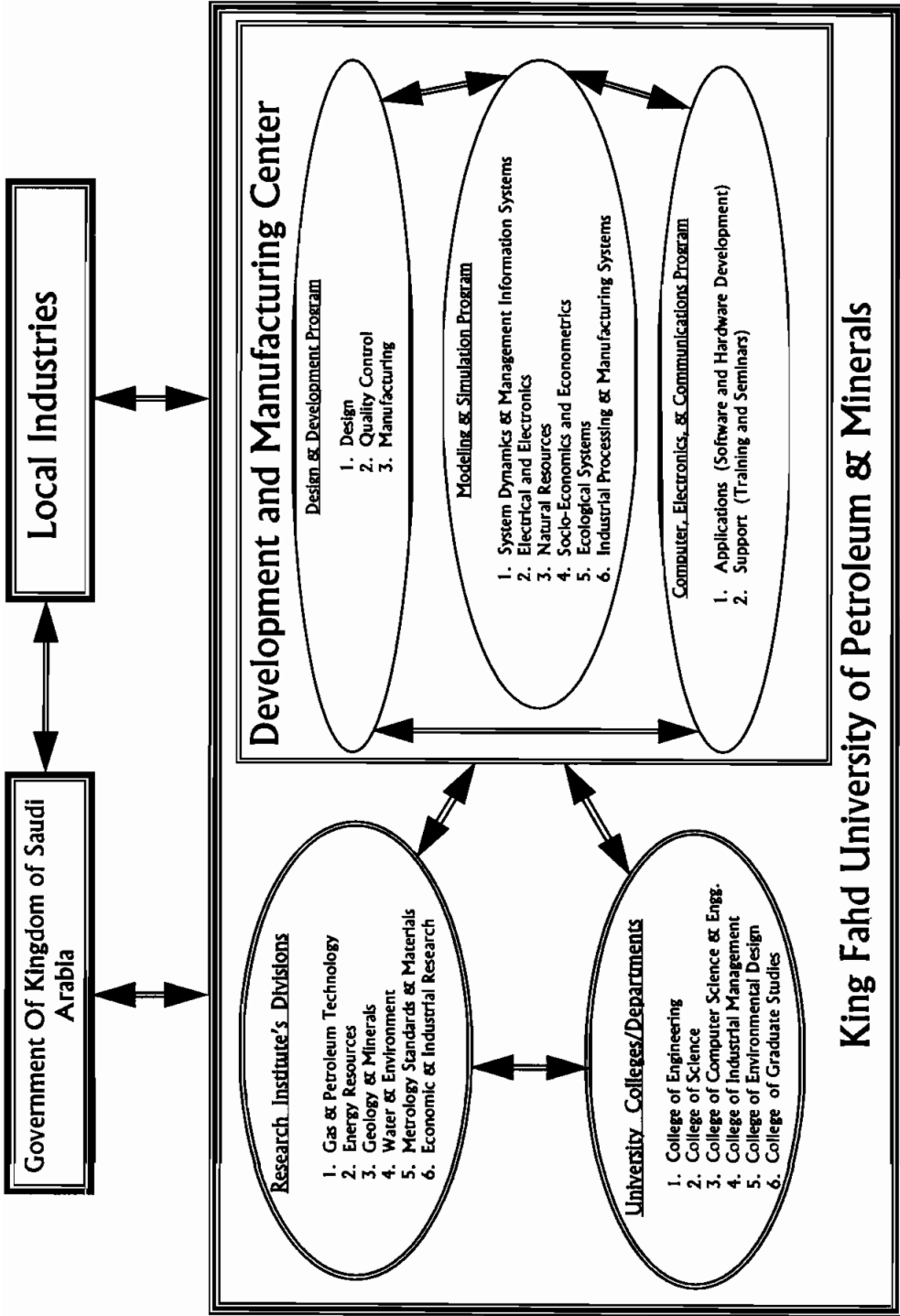


Figure 1 Functional chart of Development and Manufacturing Center