MOT Education in Developing Countries: A Case Study from the Gulf States

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Abstract

The Technology Management Program in the Graduate School of the Arabian Gulf University in Bahrain is the only full-time MOT educational program in the whole of the Arab World. Through its ten years of existence in the unfamiliar and unprecedented environment of a "regional" university, it had a rather chequered career that provides a number of useful lessons for similar endeavors in which interest is growing in the Region and various higher education institutions are contemplating establishing MOT courses or programme.

This report attempts a critical review of the development of this unique program. It deals in particular with interactions of a number of critical factors: mission and objectives, modes of operation, curriculum development, recruiting faculty, and quality of student intake and links with other institutions and with the business community.

The impact of the socio-cultural background on the development of this program will next be analysed, as an introduction to the metamorphosis the program has to go through to address the needs of the Gulf states as they move into a global environment that calls for drastic and painful changes in long-established patterns of thinking and action.

Introduction

In 1986, one of the serious shortcomings of American industry was identified as the lack of competence in the management of technology (MOT). This triggered a continuing debate on what MOT is, what distinguishes it from other management disciplines, how best to master it effectively, and eventually how best academics can contribute to its development and promotion. The definition of MOT in the 1987 classic report of the National Research Council links engineering, science and management disciplines "to plan, develop and implement technological capabilities to shape and accomplish the strategic and operational objectives of the organisation".

MOT as a relatively new concept is evolving with time. The series of International Conferences on MOT organised by the University of Miami provided a worldwide forum for the evolution of the concept, adding new dimensions and addressing a multitude of emerging issues. The conferences showed a wide spectrum of points of view, whether those of employers or educators. These have been changing as perspectives developed, experience was gained and in response to worldwide developments. The debate on MOT education and research naturally addressed how best to adapt academic curricula to employer expectations, how best to organise well-focused continuing education programmes, and how best the two sides could work together in addressing new issues.

It is a historical fact that, so far, the debate has involved mainly the stakeholders in industrialised countries spreading from the USA to Europe and further afield. There has been little participation from developing countries, and even less from their academic institutions. The issues debated in the "West" have hardly been addressed in any depth against the socio-economic, cultural and educational backgrounds of developing countries. Within the field of MOT education and training, there are as yet very few universities that offer courses in MOT in developing countries. Consequently, there is very little experience in MOT education in these countries. A quick glance at the previous IAMOT conference held for the first time in a developing country, Egypt, and in which a considerable number of speakers and participants were from developing countries is proof, if proof is needed, of this situation.

Noteworthy amongst the papers presented at this, the eighth IAMOT conference, was a survey of views amongst stakeholders in developing caontries on MOT in their countries (Beruvides, 1999). This survey was conducted during the previous IAMOT conference. There were a mere seventeen respondents, mainly from academe (11). Still, this was a worthwhile initiative of IAMOT which will hopefully be pursued more systematically and in more depth. Developing countries are desperately in need of effective management of technology. IAMOT, as an international body has to address the situation in developing as well as developing countries. This has prompted the author, who has recently come out of retirement to upgrade the only MOT programme in the whole of the Arab world, to address this millenium conference which sees MOT as "The key to prosperity in the Third Millenium".

Background

The Arabian Gulf University (AGU) is a regional university established in the early 1980s by the Gulf States. At the time, all Gulf states had their own national universities. Naturally, the question raised at the time was: why have another university? AGU was designed from the start as an unconventional university that addresses regional needs in novel ways. It has two wings. One is a school of medicine at the undergraduate level training a new generation of doctors in new ways (the case study approach now spreading slowly throughout the world). The other wing is the Graduate School, which is our concern here. The school was designed along programmes, rather than traditional disciplines or specialisations. The programmes were to be "problem-oriented", addressing the current needs of the Gulf states. This emphasised two things: the multidisciplinary of the programmes and their transient nature. Because they are problem-oriented, the programmes needed several disciplines in the faculty. An existing programme could be wound down or a new one started, as needs of the region change. Amongst the needs identified by the core group that prepared the original feasibility study in 1982 was "technology management". A programme for this was amongst the original design. Unlike other programmes that were abandoned or postponed when cost considerations called for a reducation in the number of programmes, MOT remained on the final list of programmes that were started in 1987. The author, who was a member of the Board of Trustees at the time, has never ceased to wonder at the foresight of the pioneers who started this "odd" university, their foresight and advanced views that were way ahead of their contemporaries. By some twist of fate, it was this foresight that has made the path of progress of the university, in general, and this programme, in particular, far from smooth. It currently lies behind most of the problems he is facing today as programme manager.

The last ten years, since courses started in the programme, have been rather turbulent. There have been four programme directors, a Sudanese, an Englishman, an American-Arab and, for the last two years, an Egyptian. There have been as many changes of course as there have been programme directors. Enrolment has been irregular and has been mainly from one state outside Bahrain. The programme still relies heavily for teaching on part-time secondment from various academic and research institutions. For supervising research students, a network of professors from several Gulf states is carrying the main burden. Full-time faculty has risen last year from two to three! Attempts at recruiting have been going on for some time, but without great success. All the same, 39 students passed the exams of the diploma of higher studies, and 54 obtained an M.Sc. the topics of the dissertations of these ranged from technological problems in fisheries management to industry and the service sector.

The socio-economic environment in developing countries

Situations in developing countries vary considerably from one country to another. Various typologies have been attempted to describe developing countries. Some are based on percapita GDP, some on population density, abundance of natural resources, stage of development, status of educational system, scientific technological capacity, or system of governance, to name but some. What is meant here is a country that relies almost completely on technological imports, mainly in their embodied forms as machinery, equipment or products, systems providing various types of services, or management and marketing systems. Such a country usually relies heavily on foreign expertise across the whole spectrum of activities leading to acquisition and/or operation of the technological imports. Needless to say that even within this definition there is a variety of situations, particularly in the size, diversity, education, or experience of the national manpower involved in importing, installing and operating imported technology

The usual "Science-Technology-Production" subsystems of the national technology system are in most cases not properly integrated, if not disconnected (fig.1). National science usually has some links with international science, but hardly any with the technology subsystem. The technology subsystem is split into a fast-dwindling traditional one and a nascent, not very effective modern one. Neither has much interaction with the production system, which relies almost entirely on foreign technology systems. The author has addressed this issue some 20 years ago in a UNIDO expert group meeting (El-Kholy, 1978). The situation has changed somewhat since then, but this characterisation remains more or less valid in most cases.

Under such conditions national science is generally marginalised, and national R&D in the proper sense of the word (and particularly development) non-existent.

The Role of Technology Management

The immediate task of technology management under such conditions is to ensure the proper execution of the following functions:-

- Selection of technology, or rather technological products,
- effective negotiation and contracting for their acquisition,
- installation, operation and maintenance of the imported technology/ products, and
- adaptation to local conditions (environmental, human…. etc).

However, any society naturally seeks to upgrade national capabilities including its technology system. Issues such as competitiveness, innovation,…etc immediately come to mind. These should remain on the national agenda and efforts should not cease to address them as the technological scene develops.

This situation is fundamentally different from those in industrialised countries or the so-called newly industrialising countries (NICs). Experience in technology management education in these countries is not generally relevant to the type of situation described above. However, this does not mean that technology management is a luxury. It is in fact a crucial need. Suffice it to state here that developing countries, whether rich or poor, have invested huge national resources in these technology imports and that it has become blatantly clear that such investments have not resulted in the benefits expected from them. With globalisation and the liberalisation of investments, movement of goods and services and the resulting disbanding of protective measures of national business enterprises, a large number of industrial and service enterprises have become a national liability. They could neither be scrapped nor upgraded at reasonable cost.

The MOT Programme at AGU

1- Review of past experience

In the spring of 1988, AGU undertook a comprehensive review of experience over the first decade in the life of its Technology Management Programme. On the basis of this review and the changing regional climate, the Academic Committee was asked to carry out an in-depth redesign of the programme: its main orientations, curricula, and methods of delivery. We need not go here into the details of the analysis of past experience. Suffice it to list below briefly, the more significant results:

- The programme lacks a clear articulation of its purpose and nature. It has often been confused with business administration or engineering management
- As a full time course of study, most students, being on state scholarships, came from government departments. Few students came from the public/mixed sector or private enterprises, if at all.
- Because of its multidisciplinary nature, some students were ill-prepared by their previous studies to benefit from the programme and some could not even pursue their studies.
- Weak or absent links with the business community resulted in little impact or credibility of the programme in the region
- High turnover of leadership and changes in orientations resulted in instability

2- Revised orientations:

After three months of deliberation, and several contacts with a number of organisations and personnel in business, professional bodies and academic institutions, in the Gulf region, the Arab World and abroad, the Academic Committee reached the results briefly stated here:

2, 1- **Conceptually: Technology management** was defined as "the planning and implementation of the sequence of operations, covering searching for technologies (or technological products), evaluating them, negotiating and contracting for their procurement, operating them efficiently, improving on them, and building on experience gained in these

operations to enhance indigenous capabilities in technology management, as defined above, and eventually, technological innovation

- The Objective of technology management programmes in educational establishments is to develop the capabilities of candidates who join these programmes in carrying out the operations involved in harnessing technological inputs to the needs of society:
 - effectively (i.e. to achieve maximum social or individual benefit, and to reduce to the minimum any harmful impacts of the acquired technology or products), as well as,
- efficiently (i.e. according to plan, at minimum cost, and on time).

- The Technology Management Programme in the Arabian Gulf University (TMP/AGU) is tailored to the specificities of the socio-economic context in the Gulf, where the main concern is with foreign technologies in fields ranging from large scale, technologically-sophisticated projects, to small and medium enterprises (SMEs), both in "hi-tech", knowledge-intensive fields in the production and service sectors, as well as less technologically complex fields. The Gulf region is witnessing marked growth in the service sector and a shift from the dominance of public sector enterprises to more involvement of the private sector. This emphasises the changes in the role of the state in technological development in the Region at large. The TMP/AGU needs to be particularly sensitive to the special needs of those joining it from the Region and their educational backgrounds and past experiences:-

- At the diploma level, the course is meant for those who are currently in positions of responsibility dealing with technological issues in a particular sector, those expected to assume such positions, or those who are interested in pursuing management careers in technology in different environments. The curriculum provides the basic skills needed in technology management, particularly at enterprise level. It covers both the scientific–analytical and the socio-economic tools needed

- At the M.Sc. level, apart from a number of advanced courses in the basic skills, a range of electives addressing current or future technological issues is also offered. Students are expected to prepare and defend a thesis on some practical real-life technology subject from within the Region.

- The "continuing education" training courses, are designed and implemented jointly with a broad spectrum of business groups, so as to be closely linked to the current, or anticipated, demand for specific skills and expertise. Involvement of other Gulf and/or foreign institutions and individuals will be a main feature of these activities.

- The TMP/AGU is particularly aware of the fact that societal needs in the field of technology in the Gulf are continuously changing with the evolution of national development plans, and the way in which technology itself develops.

2,2- **Strategically**: It was concluded that enhancement of an ongoing programme can best be carried out in a number of phases. Each phase should represent a feasible advance that will not cause too drastic an upheaval in the workings of the programme. Three phases were roughly outlined:

- improvement of the level and content of the study courses in the full time study stream of students,

- delivering outreach short courses, first on the basics of MOT, and later on, addressing particular topics on existing or anticipated needs of personnel in the field, in specific sector applications of new technologies
- starting an evening study stream leading to the same degrees as the full time stream, to suit the circumstances of personnel working in the field.
- Moving on to distant learning making full use of modern IT delivery methods.

3- *Implementation*:

3,1- Implementation of the first phase started in the academic year 1998-99. The outlines of the curricula for the diploma and the M.Sc. are given in Appendix I.

3,2- A recruitment campaign was started and is still ongoing. Out of a short list of five, one full professor was appointed. It is hoped that at least two more faculty will be on board by the end of the year.

3,3- Early in the academic year 1999-2000, plans were completed for the delivery of seven short courses (3-4 days), during the year 2000, at the rate of one every month, covering the basics of technology management.

3,4- The AGU Senate has recently approved starting evening courses leading to the diploma and M.Sc. starting in the academic year 2000-01.

Conclusions

1- Technology management acquires a different meaning in developing countries that still rely mainly on imported technology in its embodied forms.
2- Consequently, the design of curricula and choice of research topics has to respond to the different needs of such a situation.
3- Effeetive MOT courses should adapt in their planning and delivery to the circumstances of people working in the field.
4- A pioneering initiative in the Arabian Gulf University has recently been upgraded in an attempt to reflect the specific situation in the Region.
5- Other develping countries in similar circumstances need to start without delay MOT courses of study and research adapted to their needs.

Appendix I : Outline of Revised Curriculum

1- For the diploma (one year, two semesters)

- Four core courses are delivered at the rate of two each semester:
  Technology selection - Technology acquisition- Technological project implementation - Technological innovation:

- Supporting courses on:
  - quantitative methods (two semesters)
  - research methods (one semester)
  - research seminar (one semester)
  - basic economics/finance (one semester)
  - basics of management (one semester)

- Diploma project on a technology- related aspect in a Gulf enterprise.

2- For the MSc. (second year, two semester):
Students obtaining a GPA of at least 3 in the Diploma exams and considered by the Academic Committee as suitable candidates can proceed to the M.Sc.

For the M.Sc., students have to attend:

- one compulsory course on information technology.
- One elective (for a start, three electives are offered, viz, production management, quality management, or environmental management).

Furthermore the last semester is spent working on, and finally defending, a thesis on an approved topic.

3- Emphasis in delivering the courses is on clarifying concepts, encouraging independent learning, and intensive interaction with faculty. This is made possible by the limited number of students in one class.

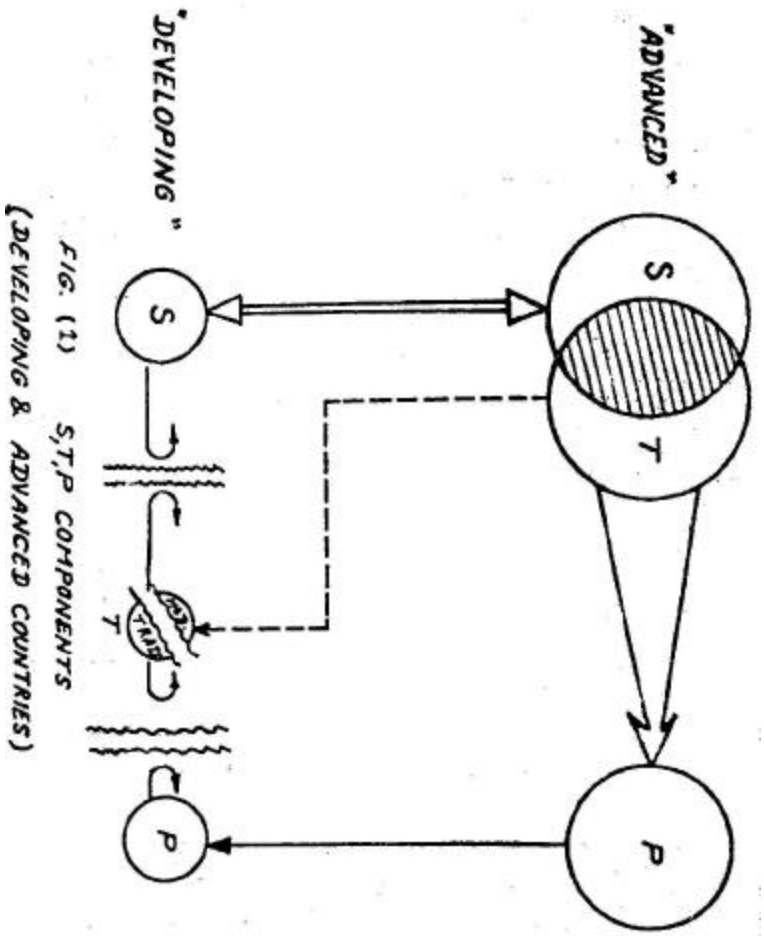

FIG. (1) S,T,P COMPONENTS (DEVELOPING & ADVANCED COUNTRIES)

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Author's Profile

Osama A. El-Kholy is emerituras professor, Cairo University Currently, he is the Sheikh Isa bin Salman Al-Khalifa Chair of Technology Management Programme, and Director of the Programme in the Graduate School, Arabian Gulf University. He has been actively involved in industrial development in the Arab region and consultant to the United Nations Industrial Development Organisation (UNIDO) for quite some time. More recently he has been senior consultant to the Executive Director of the United Nations Environment Programme (UNEP) and closely linked to its Industry & Environment Office in Paris.

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