

TECHNOLOGY TRANSFER AND SMALL-MEDIUM SCALE ENTERPRISES IN DEVELOPING COUNTRIES

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Abstract

Traditionally, universities are set up for research in basic/applied sciences as well as education of future scientists, engineers and technocrats. The issue of technology transfer is completely strange to many institutions in the developing countries

This paper discusses the problems and challenges of university-industry technology transfer with particular attention to small and medium scale enterprises (SMEs) in the developing countries. Some proposals are made for a viable and effective transfer of technology from the universities to the SMEs.

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INTRODUCTION

In the developed countries, the small and medium-scale enterprises, SMEs, constitute about 70 per cent of the production sector in terms of employment offered, hence are the engine of growth in their economies. In the United States of America, for example, over 70 per cent of the input of their automobile industries is the products of their small firms (Nwite, 1996). The situation is similar for India and, particularly, the emerging Asian economies, known as the "Asian Tigers". Encouragement of SMEs has been regarded, in these countries, as an integral part of industrialization of most other less developed countries (LDCs). India, in particular, has been able to make a giant stride in her industrialisation process through the development of small-scale industries.

Some common features of SMEs in developing economies include, amongst others (Kirkpatrick et al, 1984; Sanusi, 1994; Nwite, 1996; Giwa, 1997)

- low initial and operating capital outlay;
- ease of entry and exit;
- amenability to business advisory services;
- high local value-added;
- employment creation potentials;
- dispersal of industries, and
- amenability to competition.

It is, therefore, not an understatement that a promising and flourishing SME system would solve some of the industrialization problems of developing countries, including raw materials development. However, the gap between researchers in higher institutions of learning and the industrial concerns, who are both operating as separate "islands", have been detrimental to the

industrial development of the developing countries. Industrialists accuse researchers of always working on matters irrelevant to the industry while the researchers accuse the industrialists of not showing any interest in their work.

Traditionally, universities are set up for research in basic/applied sciences as well as education of future scientists, engineers and technocrats. The issue of technology transfer is completely strange to many institutions in the developing countries. The researchers, as a result, concentrate more on publication of technical papers that will give them positive assessment towards their career progression due to the publish-or-perish assessment criteria. No wonder many of the engineering departments in the polytechnics and universities are littered with prototypes of equipment, appliances and devices that could have been of immense use to the communities if such prototypes are further developed to the finishing stage.

This paper discusses the problems and challenges of university-industry technology transfer with particular attention to small and medium scale enterprises (SMEs) in the developing countries. Some proposals are made for a viable and effective transfer of technology from the universities to the SMEs.

TECHNOLOGY TRANSFER

The two primary activities in a conventional university setting are education and research. The research outputs are expected to contribute to the socio-economic development of the communities, particularly in the local environment. For example, the agricultural technology departments are to carry out research in areas that will be beneficial to the local farmers before such research output could be considered useful. The Electrical Engineering department should be able to design and fabricate simple and cost-effective devices that the communities could appreciate. Unfortunately, research ends within the walls of the university since universities, by

law, are not allowed to engage in commercial activities. Hence, such research efforts end up as prototypes because the immediate communities may not be aware of the existence of such efforts. The researcher, on his own part, is promoted if he can write some technical journal or conference papers out of the work.

The third activity that the universities could embark on for their research work to be appreciated is marketing the research results to the relevant industry. This innovative activity involves creating awareness among the potential users of the research result and who would come forward to “purchase” the developed technology based on laid-down procedures and guidelines and as agreed to by both the researcher and the user. Science and technology are moving so fast nowadays that their economic applications are becoming increasingly multidisciplinary. The basic research and development (R & D) going on in the universities are essential for long-term development; however, selling or transferring the developed technology to the industry would be of tripartite benefit to the university, the industry and the community that is eventually making use of the technology. The industry and the community would be aware of the capabilities of the research institution that will also derive some financial benefit from the technology transfer. The industry will also benefit from the commercial applications of the research results while it also offers employment to the community.

TECHNOLOGY TRANSFER CONSTRAINTS AND CHALLENGES

A number of constraints militating against successful transfer of technology to the SMEs in developing countries could be identified. Among these are low level of funding, government’s ownership of research institutions, the discouraging role of the industries, inadequate public awareness on research capabilities, and effect of importation.

FUNDING

Most of the universities in the developing world are owned and run by government agencies, federal or state. The amount of research grant made available to these institutions is so meager that it is hardly enough to design and fabricate the prototype of the equipment. Even the research institutes specifically set up for basic and applied R & D hardly survive paying salaries and emoluments of their staff, talk less of obtaining adequate research grants. Since these establishments are not expected to commercialise their research output, little research is going on in these institutions.

VISIONS OF UNIVERSITY AND INDUSTRY

Traditional university structures don't facilitate technology transfer. An industrialist, in his case, would not invest his money in a risky venture like R & D whose outcome is uncertain.

LOW AWARENESS OF CAPABILITIES OF UNIVERSITIES

The public sees the universities as institutions just playing their primary role of educating where future scientists, engineers and technologists are trained. Little do they know that serious research works might be going on within such institutions. This has come to be because of the non-commercialization posture of the universities. Even the international conglomerates that know the importance of research would prefer to rely on their home country. The SMEs themselves are far from the research institutions due partly to poor publicity on the part of the research institutions and partly to the low level of literacy of most SMEs.

LACK OF PROFESSIONALISM

The SMEs most of the time do not appreciate the beauty of professionalization; individuals and groups go into areas they know little about; at least not enough to be able to make substitute when the need arises. Lack of a sound understanding of areas of industry will result to a poor appreciation of technical advice and research needs from research institutions.

PROPOSALS

Technology Transformation

It is strongly believed that technology transfer from the universities to the SMEs should start with the transformation of technology that is in existence. Such transformation can take any of the following two paths:

- Modernising the traditional technology such as a change in energy source from human to water power or electricity;
- Making modern technology traditional which can be achieved by, for example, subdividing the existing production line into individual processes with the individual workers trained to be skilled in a particular production process.

What is being emphasised here is that the SMEs in developing countries do not have to adopt the most modern technology. Rather, with the assistance of the relevant university faculties/departments, the current technology in use could be practically looked into, analysed and improved upon with the locally available technology.

RESTRUCTURING OF SMEs

SMEs can be highly innovative and competitive. However, organizational difficulties and the lack of economies of scale can diminish their ability to make the best technological and economic decisions in varying circumstances. The authors believe that a form of reorganization of the SMEs may be of great help. For, it is easier to deal with a group of SMEs involved in similar ventures and/or production processes than individual members. Such groupings include

- Dairy producers
- Juice processors
- Leather works (e.g. bags, footwear)

- Bakeries (e.g. bread, confectionaries)
- Pharmaceuticals
- Agricultural tools and implements .e.t.c

This will avoid individuals approaching the universities and other relevant government agencies for necessary assistance. Such an organized approach is expected to yield more effective results, both technologically and economically.

Establishment of University Spin-off

Foundation of new technological base firms within the university is one of the best possibilities for transferring these university technologies to SMEs. With revolutionary new technologies, it is often difficult to find interested industry partners, spin-off firms work best if proposal encouragement and well designed measures are available to interested researchers.

STRATEGIES

The three major stakeholders in the successful transfer of technology from the universities to the SMEs are the universities/research institutions, the SMEs, and the government (local, regional and/or national). Each of these stakeholders has their distinct role to play; but, their activities should be coordinated for the mutual benefit of all.

Universities/ Research Institutions

The university is the knowledge-based society in which any existing technology is developed upon, or a new technology is evolved. In relation to the SMEs, it will be in the best interest of all for the universities to concentrate more on the SME technology in their localities because of easy adaptation and accessibility as well as relevance to the local economy. Thus, the following step-by-step approach is recommended

- To identifying and understanding the needs of the local community;

- Prioritizing the identified needs;
- Seeking research grants;
- Design and construction of the project;
- Testing on location; and
- Improvement on the project
- Organization of specific training programme allowing interested companies to brush up their technological knowledge.
- Organization of open days, road shows, and information events, where companies can gain a first impression of the university's capabilities.
- Offering the use of particular sophisticated research equipment which a single company cannot afford.

SMEs

The SMEs have a major role to play in the effective transfer of technology from the universities to the SMEs. In particular, the SMEs should

- Come together as more organized units, based on types of products/processes involved.
- Attend trainings, seminars and workshops organized by universities and research institutions for improved knowledge.
- Take advantage of consultancy services offered by relevant agencies and be interested in new technology.
- Set targets for themselves and meet such targets, realizing that big multinationals today started off as small scale enterprises.

Governments

The role the government has to play would encompass the determination of the forms of

economic activities to be encouraged, the identification of those SMEs justifying financial assistance, and the organisation of package of support system to the entrepreneurs. Financial institutions, on their own part, also need to be encouraged to promote more rigorously the SMEs through attractive incentives such as proactive lending.

Conclusions

Technology drives the new economy; the universities provide critical feedstock in terms of talented people, new knowledge, and innovation technology. The SMEs are the engine of any developing nation. There is no doubt that technology transfer from universities to the SMEs is the developing countries hold the key to technology advancement and economic emancipation.

To play an active role in economic development, changes must occur particularly in nurturing the SMEs. It is therefore a challenge to all stakeholders to make a difference in few policy and programmes at their disposal.

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