Multinational R&D for Overseas

Examples of how technology developed by multinational corporations plays a major role in modernization of less-developed countries

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Virtually no attention has been directed to R&D by the multinational corporations specifically performed for products and processes for use outside the U.S. Traditionally, the great majority of the U.S.-based multinationals' R&D has been for domestic markets, with new products subsequently moving into overseas plants virtually unchanged. This perforce will continue to be the principal avenue for technology transfer for some time to come, at least for U.S.-based MNCs. But there is beginning to be significant outcroppings of overseas-oriented R&D, and prospects favor a substantial expansion.

There are several categories of R&D that lead to products for overseas use. One already been alluded is essentially duplications of U.S. products, where usually little is done except perhaps rearrange the chrome trim. A closely related cousin, and one of growing significance, is adapting a product or manufacturing process to utilize locally supplied (and often somewhat different) raw materials; or to use a more labor-intensive, less capital-intensive manufacturing process. These requirements often necessitate much additional development work, usually carried out in the overseas laboratories.

A more interesting category — of which several striking examples will be cited — is spinoffs of higher technology where adaptations of the original product produces something that is singularly useful for the less-developed countries (LDCs) — relatively more so than the U.S. market for which it was originally developed. And finally there is R&D undertaken primarily for new products for overseas use. Most of this is still based on so-called high technology, but a growing proportion appears definable under the umbrella of appropriate technology.

While this article will not undertake to categorize the several examples of overseas-directed R&D to be cited, it must be kept in mind that the driving forces within the different categories differ substantially, a factor to be taken into account when attempting to extrapolate into the future.

Just what has been going on in overseas-directed R&D? Certainly not an impressive amount that fits into the last-named category; that is, R&D tailored for new, non-U.S. products. But the total R&D dollars actually spent by the multinationals in their overseas laboratories for all purposes has reached rather impressive proportions — $1.3 billion in 1975, or 10% of MNC total R&D. (The Conference Board report on "R&D by Foreign Affiliates of U..S. Companies, 1966-75.") While only a third is in developing countries, the latter portion is on the increase.

To find out more specifically what the MNCs are doing, a canvass was made of senior R&D people in 25 or so of the largest U.S. MNCs having broad product lines. Most replies were consistent with the generalizations already made. There is much technology transfer via the traditional route of shifting U.S.-developed products into overseas markets and plants; but relatively little is aimed specifically for overseas use. Among the more significant examples of the latter are:

Housing: A major conglomerate has modified the basic U.S. mobile home for general purpose housing in the Middle East.

Communications: One of the largest corporations in communications and electronics is active in adapting satellites for educational uses and for general purpose communication by using small receiving stations in the villages of developing countries. They are also developing video discs for educational uses.

Power Generation: The same company is developing a system involving inexpensive plastic lenses to concentrate sunlight onto solar cells to make low-cost electricity from sunlight more practical in isolated areas of developing countries.

Agricultural Equipment: Two major manufacturers of agricultural machinery have evolved many adaptations of their basic equipment lines to serve the small peasant farmer. These include specially developed tilling equipment for crops not grown in the U.S. and greatly simplified construction so that farmers with relatively little mechanical background can handle their own maintenance.

Agricultural Chemicals: Some of the chemical companies supplying agricultural chemicals find that new products can often be adopted several years sooner in LDCs than in the U.S.

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Medicines: A major drug company seeks out drugs that are specific to animal or human afflictions that occur primarily in LDCs. One example is a trachoma vaccine for humans. Another is thiabenzadole as an anthelmintic for sheep, which has found wide application in Australia and South Africa.

Petrochemical Derivatives: A major oil company has developed sprays to control fungus on bananas and to prevent coffee rust. Surprisingly, they also developed a process for making paperboard from bagasse.

Desalination: A company specializing in high technology R&D hardware for military space requirements developed an alloy especially adapted to thermal desalination cycles where long-term corrosion and high-temperature problems made other metals unsuitable.

Rubber Products: One of the large rubber companies developed a floating large-bore hose, jacketed with foam, for offshore loading of oil tankers. Because the huge size of the newer tankers often prevents their using existing ports, offshore loading is expected to play a major role in providing such tankers with access to ports they could not otherwise serve. Another major rubber company developed a solid rubber "cap" tire that can be retrofitted over the wooden wheels of the 13 million bullock-pulled carts that are the staple of India's village transportation system.

Ethylene: A couple of the large chemical companies cited sugar-derived ethanol as a source of ethylene — an old process having a growing renaissance.

New Towns: The large oil companies have perforce been required to play pioneering roles in new town development — setting up entire communities with the best available technology to make a hostile environment as attractive as possible to those not very anxious to be there.

Two routes that have accounted for a growing tide of technology transfer — expecially in the last 10 to 15 years — have been licensing and joint ventures, which are often closely linked. The overseas licensing groups of the MNCs, as well as of independent licensing organizations, have expanded at a phenomenal rate, so that licensing has become a true "growth industry," and an increasingly competitive one as well. More and more of the highly developed countries are selling their technology, in the form of licenses, to the developing countries — especially those rich in commodities. And the MNCs are more willing than formerly to accept minority ownership positions in joint ventures, which are now much more often undertaken at the initiative of an LDC and with the MNC capitalizing its know-how in exchange for stock.

Here are several particularly significant examples where the R&D of multinationals has shown that it can fulfill a major need in the LDCs:

In the all-important food area is CPC International's Duryea, a low-cost, high-protein, corn-based cereal developed for Latin American countries, which required developing strains of corn especially adaptable to the soils and climate of the area. Another food product coming into production, though still high in cost in relation to LDC needs, is single cell protein from petroleum cuts, a product with great long range potential pioneered by British Petroleum and other western European research groups.

Transportation

In the field of transportation General Motors has developed a basic transport vehicle. This is a greatly simplified, lightweight, low-horsepower spartan vehicle that can be made in many forms — auto, small truck, general purpose farm carryall, or minibus. GM developed the BTV to be licensed for assembly by small entrepreneurs in LDCs, as well as in its own plants. It required relatively simple tools, and in some cases is being made at production levels as low as 100 cars per year. It is being manufactured in 18 locations, with the largest operation being in the Phillipines. The World Bank is also starting to foster development of all-purpose lightwieght powered vehicles.

An examplary illustration of how advanced technology can be modified to meet a major LDC need is the use of communications satellites for education. By far the largest undertaking in this area has been SITE, Satellite Instructional Television Experiment, begun in mid-1975 with a U.S.-built satellite moved to a spot over India and relaying to small, Indian-built earth situations. This dramatic demonstration of the potential of satellite TV in developing countries was based on installation of very small receiving stations, linked to conventional TV sets in 2,400 villages. Many types of educational information were transmitted to villagers who until then had been essentially shut off from the world. The TV sets quickly became the focal point in each village, and the instruction included the 3 Rs, farm practices, advice on food preparation and preservation, and many crafts. The technology that led to this true leapfrog step in educational practices represented the combined efforts of several MNCs, funded initially by NASA and later by COMSAT.

Growing Influences

Considering now a number of growing influences that should lead to greater emphasis by MNCs on R&D slanted toward LDCs:

1. There is the previously alluded-to growing insistence by LDCs to use locally-purchased raw materials; to use locally-manufactured rather than imported components; and, whenever a new product is to be made or new capacity to be added, to set up the process with a higher labor component and lower capital investment than that developed for the MNC's home plants.

2. There is, of course, a rapid rise in the numbers of technically trained people in the LDCs — perhaps not significant yet in the least-developed countries, but certainly in the majority of countries outside the highly-developed countries. A shift in local attitudes toward technology may be necessary to utilize their increased manpower resources.

3. There is a corollary growth in the proportion of R&D within the private sector of developing countries

in comparison to government-supported R&D.

4. Mention has already been made of the emergence of licensing as a "growth industry," which should be reflected in a much greater range of choices in both the nature of the technology and the *terms* of joint ventures which the LDCs initiate. A more active role in licensing has recently been undertaken by UNIDO, who took the innovative step of setting up an annual licensing fair, with thousands of attendees at the first UNIDO sponsored fair in Chicago in February 1977. UNIDO plans to hold it in different countries in forthcoming years.

5. There is certain to be an acceleration of "spinoff" technology — that is, outgrowths of sophisticated R&D that are particularly suited to the needs of developing countries. The relative role these new technologies play in the LDCs should prove in many instances to be greater than in the developed countries that spawned the technology. Nuclear energy is already proving to be a case in point. Inevitably, new energy technology based on so-called renewable resources — solar, wind, biomass fuels, etc. — can be expected to come into widespread use more rapidly in LDCs than in the advanced countries, both because their needs are greater and because costs will be much lower than for conventional energy sources. Similarly, some of the major innovations in water management — both for fresh water and for wastewater — are likely to be adopted more rapidly in LDCs, which do not yet have the large investment in these functions that the highly-developed nations have.

For quite different reasons, namely, those having to do with regulatory processes, codes, clearances, etc., many new agricultural chemicals and new drugs will become well established in the LDCs before they do in the nations that originated them. The same will probably prove true for factory-produced low-cost building modules and various forms of energy-efficient transportation, both of which will have hard sledding for years to come in the developed countries because of the tremendous investment in older technology in these fields and the resistance of the many sectors who see their livelihood threatened. Satellite communications, cited earlier for its educational potential, is expected to become a major factor in general communications of the LDCs within the next decade, bypassing the need for wire-conducted information transmission in many cases.

Thus, we will likely see more and more instances in the next generation where really advanced technologies, sometimes newly graduated from the laboratory, will influence the life style of the LDCs more significantly and more quickly than they do the developed countries simply because the attractive cost/benefit ratios of the new technologies will encourage the LDCs to invest in them in preference to the older, entrenched technologies of the developed countries.

A major development that should supplement those already mentioned to hasten this growing orientation toward LDC-slanted R&D is the pronounced shift in World Bank emphasis away from support of huge infrastructure-type projects requiring years to fruition, and toward smaller, labor-intensive, shorter-term projects that are diffuse and benefit small population segments much more quickly.

Finally, there is the almost explosive emergence of groups such as London's Intermediate Technology Development Group that are specifically dedicated to Appropriate Technology. Not only have such groups increased exponentially to the point where keeping track of them has become almost impossible, but there has been a recent spate of small journals generated to help get the word around. So almost overnight we have a worldwide movement, about which most people are now only barely aware, and into which many unrelated talents are rapidly being attracted.

One can only be optimistic about the ultimate result of lare amounts of experienced and sophisticated R&D to be applied in the next decade. A good example is Lehigh University's fledgling program on low-cost structural materials for LDCs, which is bringing top-flight research and engineering talent into problems of attaining much greater strength and durability levels out of plentiful, low-cost materials that are universally available. And a most unusual first is ITT's responsibility for setting up the Chile Foundation in Santiago. This nonprofit research organization has as its purpose the transfer and adaptation of technology that will benefit the people and economy of Chile. It is undertaking work in the fields of food, nutrition, telecommunications, and electronics, and is just now getting underway.

Taken in sum, these several factors add up to a high probability, in the author's view, for a rapid rise in R&D that will benefit the particular needs of the less-developed countries. Inevitably, the MNCs must play a major role in this, both because they will increasingly recognize their future stake in it and because they have by far the largest pool of technical talent.

While appropriate is probably the best word at present to describe the technology that will evolve out of much of this R&D, one can predict that such a large fraction of the output will be found to be appropriate that there will no longer be a need to distinguish between appropriate and other technology. In fact, it seems a reasonable prediction that a number of the emerging technologies will essentially leapfrog into the LDCs and take root there much faster than in the highly-developed countries that spawned them, with the eventual result that many of the presently less-developed countries will begin enjoying certain quality-of-life advantages far sooner than an extrapolation of past experience would have predicted.