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INTERNATIONAL [illegible] IN COMMERCIALIZING R AND D RESULTS [1]

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1/ The views and opinions expressed in this paper are those of the author and do not necessarily reflect the views of the secretariat of UNIDO

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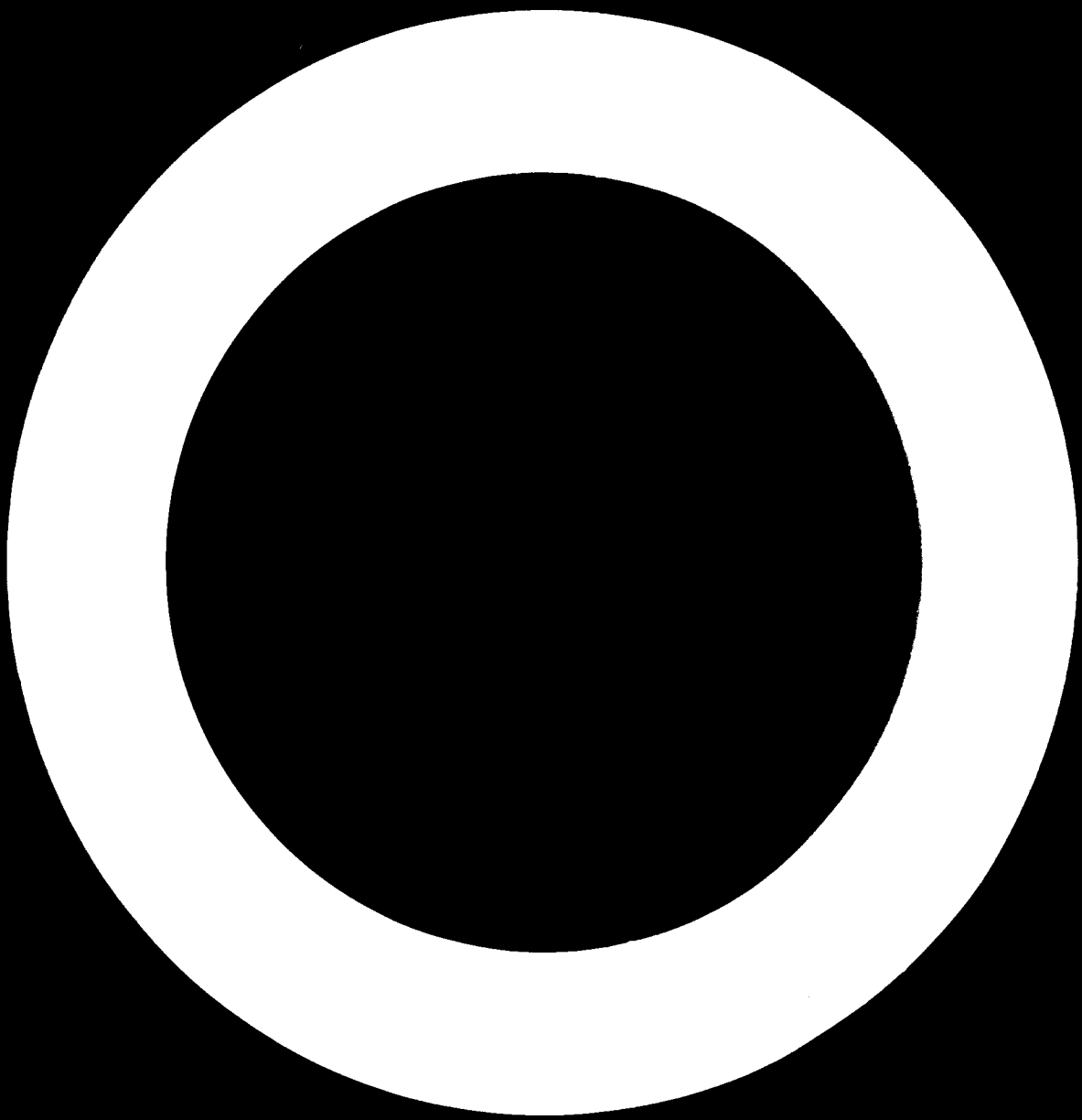
SUMMARY

In considering commercialization of research products, a distinction should be made between that intended as an addition or improvement to existing technology and a research product that is novel and may require a much more comprehensive introduction to the marketplace. A further distinction should be made between research products that are intended to enter and compete in the international markets, and products that are essentially intended for the domestic market.

The logical emphasis for research in developing countries for some years to come will be towards those products that are additions or modifications to existing technology, particularly in the manner of adaptations of local conditions to meet domestic purchasing power, climatic conditions, cultural preferences, manpower utilization and income distribution. Novel research products intended for international markets will require sophisticated technical, manufacturing and marketing evaluations and an international brokerage agency, preferably associated with the United Nations, will be helpful in seeking contractors to assist in the work.

The financing and managing of the commercialization of research products should be completely in the hands of parties responsible for the success of new product ventures.



INTRODUCTION

The commercialization of R and D results in the form of modified or novel products, processes, or equipment depends upon "pull" exerted by the buyers in the marketplace - unless the supply system is non-competitive and no choice of products is offered. The "pull" or market demand is determined by the need of the potential buyer, the advertising proproganda to which he is exposed and by what is "fashionable". Unfortunately the buyer often purchases what he has been told to buy or that which is fashionable, rather than what he really needs. But above all, the potential buyer can purchase only what he can afford, or somewhat beyond that if he decides to go into debt. Before considering international cooperation in the commercialization of R and D results, it seems appropriate to examine the type of R and D results and the market for which they are intended.

I. TYPES OF R AND D RESULTS AND THEIR MARKETS

In considering the R and D/Research Product interrelationships two general cases occur. The first is when the R and D result produces a modification and improvement to an established technology; the second case is when the R and D result is novel. The first, the modified research product, is the more common of the two and usually originates directly from the manufacturing environment or the marketplace. The sequence of stages is from the industrial operation to engineering, to development, and then to research. In other words, the problem or the need for improvement is first felt in the industrial operation - to improve the quality of the product being manufactured, to increase its rate of manufacture, to reduce the costs of manufacture, to improve its appearance and so on. The problem is then passed back to engineering which in some cases may not be equipped to solve it, in which case it passes back to the research stage. Since most technology in the world

is established technology, most industrial research passes through the above sequence and therefore establishes the basis for saying that most successful industrial researchers are those who are intimately associated with the marketplace.

R and D results of the modified technology type normally represent less apparent risk for the buyer or user and hence are more readily acceptable than are novel R and D results.

The commercialization of R and D results is dependent also on the type of market being entered, whether internal or domestic, external or foreign. For a developing country these two markets are quite different and the techniques for commercializing of R and D results to fit these markets differ also.

II. COMMERCIALIZING MODIFICATIONS OF ESTABLISHED TECHNOLOGY

A. The International Market

Areas and means for cooperation in the commercialization for the international market cover the securing of proprietary information by licensing and other arrangements,of manufacturing "know-how", of information on manufacturing systems, of financing, and of management and marketing capabilities.

One of the avenues open in the commercializing of R and D results is the formation of regional groups. Such a group is the Andean Group which includes Bolivia, Colombia, Chile, Ecuador and Peru which has been established to provide a common trade policy with other countries, for the integration of industrial promotion laws, for the setting up of standard legislation on foreign investment, trademarks, licences, royalties and other modes of technology transfer. The countries of Western Europe have seen the advantage of establishing a common marketing area.

In the foreseeable future the advanced countries are likely to show a continued reluctancy to substantially reduce tariffs and the formation of common market areas could be a means of reaching a more equitable trading position for developing countries. Thus common market areas might be established for Southeast Asia, Africa, North Africa and the Middle East with expansion of the Andean Common Market in Latin America.

Whether the establishment of regional common markets occurs, the process of phasing down production, particularly of assemblage operations in countries with high labour costs and the transferring of the production to less expensive, intermediately developed countries, will continue.

This trend which has been expanding in recent years with the manufacture of electronic equipment will likely continue particularly in manufacturing operations which cannot be readily automated and where the products are relatively high in value per unit of weight and can be transported economically.

The mechanism by which the foregoing will occur is mainly through the action of transnational corporations. These corporations will provide a package of technical "know-how", management capability, marketing capability and financial strength and are in a position to set up and put into operation facilities in new locations in minimum time.

The motivation of transnationals is to acquire sources of raw materials, labour, markets and return on investment. To gain the first three of these in the future, concessions will have to be made on the part of the fourth. In many cases the concessions will come about by hard bargaining with the developing countries being the reservoir of many of the raw materials desired and needed by the transnationals.

An important aspect in the transnational system for technology transfer and product commercialisation is the labour use. In the past the practice has been to utilise developing country nationals for manual labour input as contrasted to technical and managerial. An area for cooperation

... in the training of nationals for technical and managerial posts, so that the transnational companies take on more and more the aspect of a ... company as time proceeds. This has in fact been the case in ... a large country geographically with a relatively small population ... Transnational corporations have been effective in developing the country during the last 50 years at a rate that likely would not have been achieved in 100 or 150 years without foreign technology ... Today, transnational corporations operating in ... are Canadians from plants to board rooms.

... and further development has been the establishment of ... development corporation which, through Canadian investment, ... "localize" foreign operations. The first one has been the ... corporation which operates the largest known copper deposit ... On the other hand, other corporations which were originally ... owned, such as Canadian Pacific, have been brought into majority ... Canadian ownership by share acquisition by Canadians over the years.

... means of accelerating and expanding the interrelationship of transnationals with the national population in a developing country is through the medium of industrial research institutes in those countries which ... The industrial research institutes, more so than a university, have technically trained people with orientation towards application of ... Often the institute personnel are anxious and thirsting for experience of a practical nature and this can be afforded by transnationals in need of feasibility studies, pre-production studies, testing, adaptation work, technical repair and maintenance and on-going technical services. The cooperative interplay would provide not only an opportunity for training of industrial research institute personnel, but in cases could lead to transfer of nationals to the permanent staff of the transnational operation and the assuming of responsible technical and managerial positions.

WAITRO, as an international association of non-profit industrial research institutes set up for the strengthening of its institutional members in

developing countries, has been anxious to promote the "research contract" philosophy amongst its members in developing countries. As part of this philosophy, WAITRO is interested in extending the cooperative working relationship between transnationals and the scientists, engineers and technologists of developing countries. One of the greatest deficiencies in developing countries has been the lack of availability of opportunity for technically trained nationals to acquire useful on-the-job experience in industry. It is only through exposure to practical work that cadres of developing country nationals capable of industrial management can be trained. The most effective route for the commercialization of R and D results is through existing industrial operations. For many of the developing countries in which nationally owned industrial companies do not exist, the only immediate alternative is to use foreign-based companies. In many cases the operating arrangements that have been used by transnationals in the past must be liberalized in favour of developing countries. An awareness of this fact has been expressed in recent years by transnationals as well as developing countries.

B. The National Market

For the commercialization of R and D results as modifications of established technology, the national or domestic market does not demand as high or as rigid standards as the international market. Nevertheless research products entering the domestic market must be safe (food safe to eat, electrical and mechanical safety and so forth) and reasonably consistent in quality. Over a period of time the quality must rise, ultimately to meet foreign products which might otherwise capture the domestic market.

The products in this category are consumer goods such as clothes, utensils, household equipment, furniture, housing products, and foods of national character. The introduction of improvements to manufacturing practices must be through cooperation with local associations of manufacturers and trade unions. This is currently being carried out in

Singapore by the Singapore Institute of Standards and Industrial Research (SISIR) where a year-long campaign "Prosperity through Quality and Reliability Campaign" has been launched, involving 70,000 workers and 300 industrial companies. The cooperation of industrial manufacturers with a standards institute is essential; this problem is now being faced by ISIRI in Iran and is one of very general occurrence. In more advanced countries many areas of the industry have set up their own codes of quality which are strongly adhered to, for example, the dairy industry in the United States and the Canadian Standards Association covering electrical applicances.

International cooperation for establishment of standards is provided by a wide range of agencies, including UNIDO, national agencies such as the National Bureau of Standards (U.S.) which is holding a month-long workshop in October, 1975 and through training and linkage projects provided by WAITRO. The establishment of standards is a definite although indirect assistance in the commercialization of research products. This applies particularly to improvements to products already in commercial production.

International assistance for the commercialization of R and D products to meet domestic markets in developing countries is available through a number of specialized agencies such as the International Executive Service Corps which makes available for specific commercialization projects the assistance of retired successful American businessmen.

III. COMMERCIALIZING NOVEL R AND D RESULTS

A. The International Market

The commercialization of novel R and D results receives little international cooperation at the present time and what assistance does take place is often on an ad hoc basis. To meet this deficiency in some developing countries, s national development corporstion has been set up to finance development. For example the Nationsl Research Development Corporstion has been set up in Indis and operates much along the same lines as its older counterpart, the NRDC in the United Kingdom. These organizations have met with limited success to the present. Like most government operations, they are long on staff and red tape because they are funded from the National Treasury, and the time/dollar factor is low. A counterpart to these is ANVAR in France.

Another type of structure that has been set up to assist commercialization in advanced countries have been development corporations such as the Reaearch Corporation in the United States, the Canadian Patents and Development Corporation, and SERAI which carries out this function in Belgium. These agencies mainly act as licensing brokers for patents covering new inventions, although some will invest a limited amount of funds to bring an invention into commercialization. Normally the agency receives its remuneration as a share of royalties, usually in the amount of 25 to 60%, for its services. Most of these agencies do not have geographical limitations of their services and would likely handle the licensing of patents from developing countries. These agencies, however, often leave much to be desired as most novel research products require extensive pre-production engineering and feasibility before being ready for commercialization. The gap between a "laboratory research product" and a "commercial product" is often very large when measured in terms of time, money and frustration. In most countries, advanced and developing, this development gap for novel product commercialization constitutes a formidable barrier. In the advanced countries it is solved by a combination

... entrepreneur, a financier and a manager - all three are

... the commercialization of a novel R and D result may not be an existing large company. For example, two large pharmaceuticals have been licensed to manufacture a birth control ... developed by an Ecuadorian industrial research institute.

... suggested by a special international panel under arrangements ... Academy of Sciences, National Academy of Engineering of ... "Meeting the Challenge of Industrialization: A Feasibility ... industrialization institute", Lib. Cong. Cat. ..., Washington, D.C.) has proposed an institute to assist ... industrialization. The report circumlocutes ..., "networks" and "exchanges", but does not come face-to-face with ... in the practical, on-going sense. However ... the institute is in a formative stage and conceivably the ... may be a forerunner structure for research product commercialization ...

... future, when an increasing number of novel research results ... tend to come from the investigations of tropical and sub-... countries and to studies to overcome technological problems ... countries, a central information agency may be required to ... commercialization of the products. Such an agency could ... as a broker for placing feasibility, development and commercialization contracts relating to new products. In this way the information ... for evaluating, financing, managing and marketing in the world ... be maximized. Such an agency could be associated with the United ..., most logically as a part of UNIDO. Such an agency could be a ... group of people who have had experience with product development ... commercialization - not to undertake studies, but to be equipped to ... out studies to input sources throughout the world. Financing ... studies could be covered half by the developing country involved and

half by the United Nations (UNDP). Cost of operating the commercialization unit would be covered by a UN grant to UNIDO.

The financing of the commercialization of new research products would be considered on individual bases. Oil-rich countries would likely handle financing on their own. Countries grouped on a regional basis, such as the Andean Group, would likely handle financing through a group arrangement, such as the Andean Development Corporation. In some cases the manufacture would be under licence to an existing commerical company. In other cases government (nationalized) financing and management would be used.

It should be emphasized that the commercialization of research products should be guided by cost/benefit principles and therefore considered in a completely practical light. The financial involvement, both initial capitalization as well as for operation, is high and success is usually related to the operators of the new product venture being directly accountable for the financial success. The pursuit of R and D is in a much lower financial category and the accountability is often more diffuse than it is for commercial production. Production is an operation strictly for the professionals - not for the theorists.

B. The National Market

The commercialization of novel products in the national market may receive international cooperation from a number of agencies, both international and national, usually of a non-commercial type. The products that are most extensively backed are those which have a general benefit to the population of a country as a whole, such as the improvement of the nutritional value of foods, methods and products for disease control, for birth control, and for crop protection. In most of these areas the eight regional branches of the consultative group on international agricultural research are activley involved. These include: The International Rice Research Institute (IRRI), International Maize and Wheat Improvement Center (CIMMYT), International Institute of Tropical Agriculture

(IITA), International Center of Tropical Agriculture (CIAT), International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), International Potato Center (CIP), International Laboratory for Research on Animal Diseases (ILRAD), and the International Livestock Centre for Africa (ILCA). Commercialization is limited to the results produced in the respective institutes.

Funds are available from the World Bank and from regional development banks for the commercialization of research results in developing countries. The commercialization of novel R and D products that are not represented as a broad benefit to the population do not receive direct international assistance. The research agencies developing novel products may observe the methods used by their counterparts in more advanced countries, such as the use of satellite companies as practised by the Battelle Memorial Institute and B.C. Research. The actual commercialization of the products is largely left to the resources and entrepreneurial talent of the local research product developer.

RECOMMENDATIONS

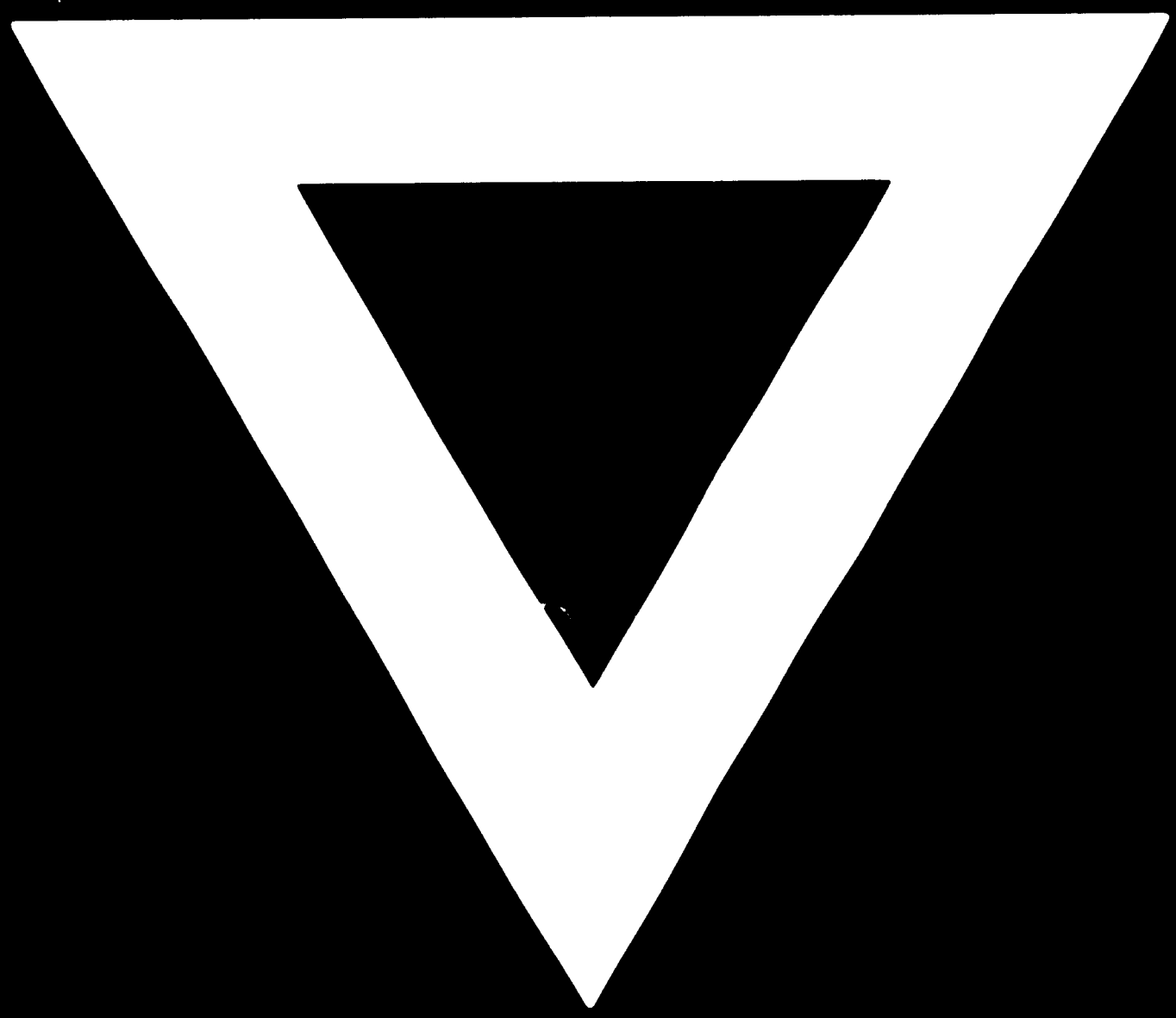
1. Research in developing countries should be directed towards adaptation of known technology. Most of the industrial operation of a country centers around known technology so that research of this type affords the greatest impact on a country's economy.

2. Research products for a domestic market are preferred in developing countries with high population to products distinctly geared to international markets.

3. Commercialization needs will be greatest for novel research results entering an international market. An international brokerage, associated with UNIDO, is suggested as a means of soliciting informational input from international sources.

4. The commercialization of research results does not lend itself to loose cooperation, but is a strictly business venture requiring defined roles, responsibilities, and returns on the part of the members of the partnership and a clear-cut accountability of the operators.

5. Formation of common market areas in developing countries of the world is suggested as a means of increasing trade.



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