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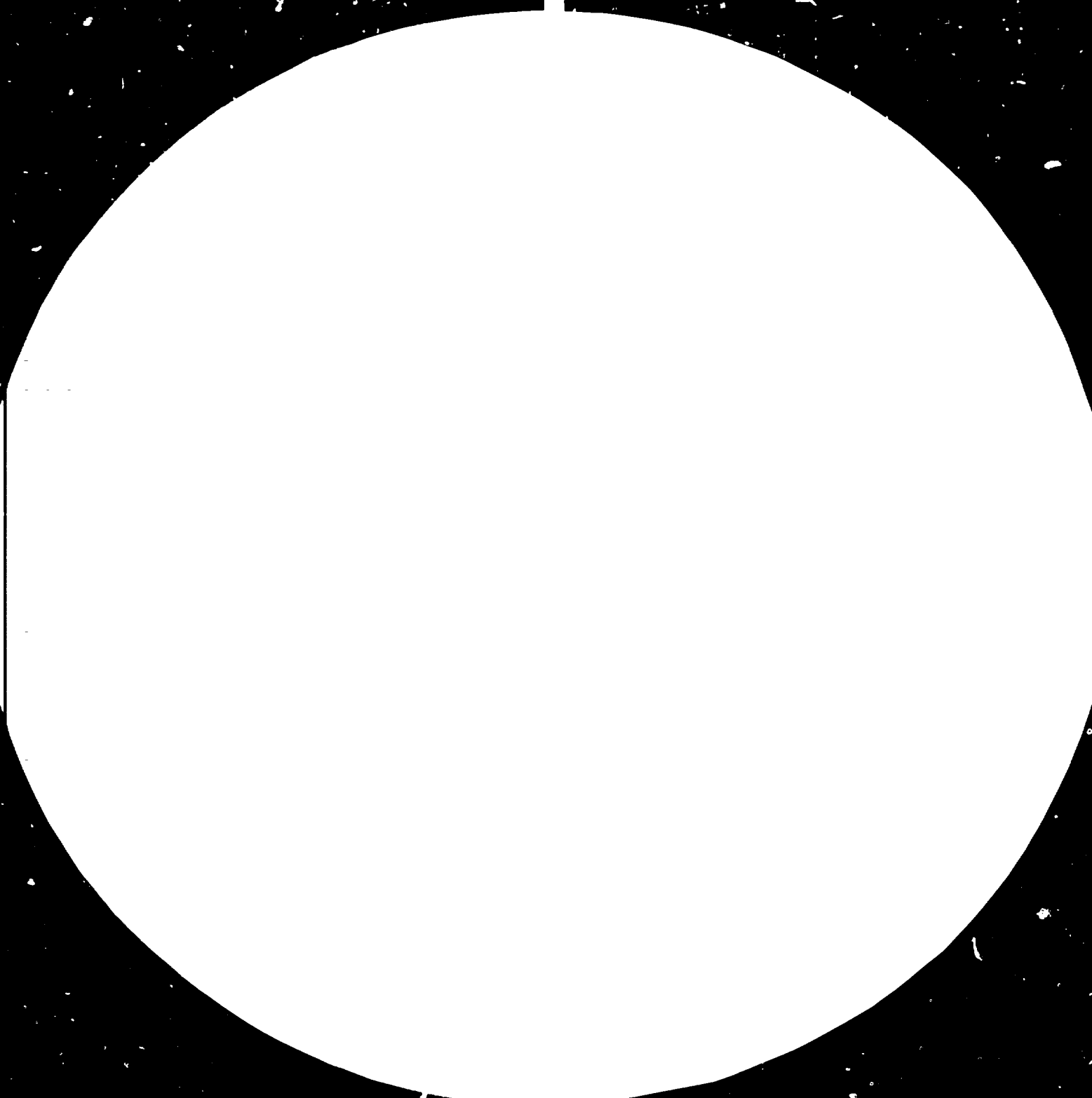
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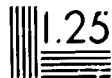
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TECHNOLOGY TRANSFER TO ASSIST WITH
THE INDUSTRIALIZATION OF DEVELOPING COUNTRIES ^{1/}

by

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Synopsis

This paper considers the problem of transferring product and process technology to industries in developing countries from the available pool of information and experience in developed countries.

It suggests that the conventional approach by means of licencing may well be non optimum and proposes new methods involving assistance from non government organisations which could achieve a more affective transfer of technology, as well as leaving the new industry entirely free from policy restraints and royalty fees.

Introduction

There are many components required for the industrialisation of a developing country, which include the availability of suitable raw materials and of labour with some appropriate skills, as well as some form of infrastructure to supply transportation, communications and energy. The degree to which these components need to be available will depend on the type and size of industry which is being established, and in fact the actual availability or otherwise of the various components may well determine the type of industry which can be established.

Depending upon the level at which the general components are available, it should be possible to select an appropriate product for which there is a market need, either nationally or in an appropriate selling area. When an appropriate product or range of products has been chosen there is then an essential requirement to obtain information about such products. This information will relate to both the technology of the product itself, in terms of its design and application, and also its possible methods of manufacture.

The method by which product technology is most commonly obtained is to take a licence from an industrial company or similar organisation in a developed country, who currently manufacture products of the type selected, so that the appropriate technology can be transferred to the new industry. This can be a successful arrangement, but there are alternative methods which may be much more to the advantage of developing countries. It is the object of this paper to describe some of these alternative methods, and to show how some non government organisations can play a major part in assisting in this area.

Some limitations of licencing

Licencing is a technique which is already well established in developed countries as a means of transferring industrial knowledge from one organisation to another. At first sight, therefore, it seems to be an obvious method of organising the transfer of technology from industries in developed countries to those in developing countries.

There are however some essential differences between the two situations since if both industrial organisations are in developed countries, they probably operate at about the same level of technology, and the transfer of knowledge usually relates to some specialist production method or, if it relates to products, it may be concerned with permission to incorporate some detailed feature in a design, or may involve permission to manufacture a particular range of products for sale in an area not fully covered by the main manufacturer. In this situation a direct transfer of the exact product or process used in the originating organisation is generally appropriate. This situation does not usually apply when the recipient is in a developing country because the market into which he wishes to sell will probably be different, the optimum economic choice of the type of materials and methods of manufacture, to suit local conditions, will probably also be different, and usually he will require quite a broad and detailed transfer of the technology in the general product area, rather than just specific data on the product alone.

Because of these various factors, problems often arise for the new industry in the developing country when they take a licence from an existing industry in a developed country. Typical problems are:-

1. They are usually asked to adopt products from the donor company's existing range, rather than being provided with a new range of products matched to their industrial capabilities and their market needs. The emphasis is generally on learning how to make the existing product and this has two basic limitations:-
 - a) The new company becomes oriented around a particular design of the product which can make it more difficult to change later to other possible alternative designs, which might be better suited to their needs.
 - b) The new company may have to accept buying in certain components or sub-assemblies from the donor, which they are unable to manufacture themselves.
2. The technology which is transferred is not usually complete in that they will probably be given full manufacturing drawings for the existing range of products, but will not be given the data to enable them to design similar products in other sizes.
3. The market in which they are entitled to sell the product is likely to be restricted by the donor to prevent them from competing with him in his existing markets. This is likely to restrict the opportunities available for earning foreign currency by selling the new product overseas.
4. The agreement usually involves continuing royalties and ties with the donor organisation which can restrict the future freedom of action of the new industry.

These limitations of licencing suggest that, although its use is currently widespread, there may be other more appropriate methods of organising technology transfer from developed countries to new industries in developing countries and the next section of this paper is concerned with some of these.

New methods for technology transfer

An important feature of the technology which needs to be transferred in order to establish industries in developing countries, is that it is usually well established and is never at the frontiers of knowledge. For example the technology required, probably relates to simple machine tools, water pumps, agricultural machines, gear boxes, small engines, textile machines, electric motors and starter switches and items of this kind, rather than to solar panels for satellites or the latest solid state computer circuit components.

If the technology really was at the frontiers of knowledge it would be necessary to go to one of the very few organisations that possessed it and negotiate a licence. However this is not the case and the kinds of products or machinery that are actually involved are basic practical devices, which in many cases have already been used extensively in developed countries for at least 100 years, and sometimes 200 years. There is therefore an extensive background of information and experience available in developed countries which relates to all the products and machines that are likely

to be involved. The information and experience is dispersed and it needs to be collected together and collated into a form which is suitable for use by a developing country as an information base for its new industry. Such an operation is perfectly feasible, and essentially it involves distilling off from the large pool of information and experience in developed countries, a suitable package of technology matched to the needs of the developing industry.

The process must start from the user end with a listing of the information that is required by the new industry. For example there may be a recognised need for the production of a range of simple water pumps with deliveries in the range 10 to 100 gallons/min. at a head of 100 ft. of water, which can be manufactured using local materials and labour, and information is needed on how to design them. The necessary information is freely available in the form of published text books, research papers, pump manufacturers' literature and data on users' experience and service problems, but it needs to be collected together and the information which is relevant to the particular problem extracted from it. This can then be linked together by means of a few simple further studies and presented in a new and usable form matched to the needs of an industry trying to start up in this field.

Basically the work involves the production of a simple but comprehensive guide to a particular area of technology by the combination of the relevant experience that has been built up in the developed countries during the last 100 years or so.

This activity has the great merit that it really does transfer technology since it supplies the developing country with information which gives the people concerned some real understanding of the subject involved. Using this information and understanding they can then produce their own designs of the product at any time, without the need to continually refer back to technologists in a donor organization in a developed country, such as is usually the case with information transferred by a licencing agreement.

This kind of work can be done very effectively by independent consultants, and technical laboratories who can not only prepare the necessary summaries of the technology, but can also help with the testing of prototypes and with solving any subsequent service problems. Since these organisations are independent and are not tied in any way to existing manufacturers, they can work solely within the interests of the developing country, which then owns the information and is entirely free to manufacture and sell however and wherever it likes.

The example which has just been quoted relates to a product of which similar examples to those required are likely to be currently manufactured in some developed country. There will also be cases however where, although the necessary knowledge is available in developed countries, no equivalent product is currently manufactured. An example of such a product might be the production of rope/belt drive units using natural fibres available in a developing country. Most developed countries now use reinforced rubber vee belts for this kind of power transmission and these are very efficient in the use of space for a drive unit, but are very capital intensive in manufacture, and rely on mass production to keep their unit cost reasonable. A direct transfer of such a product to a developing country would not necessarily be particularly appropriate. However sufficient information is available on the basic principles involved and on the performance of rope and fibre belt drives used in the

past to produce the necessary information for a more suitable developing country product, based on more appropriate materials and technology. Again this would be an ideal task for independent technological organisations and in such cases the alternative possibility of licencing may not be available anyway if the product is no longer manufactured in the developed world.

Various independent non government organisations have already developed the methods and techniques for providing this kind of service. This gives a new potential in industrial freedom for developing countries who can operate industries without ties or restraints by industrial combines or multinational companies in the developed world.

UNIDO could provide an important co-ordinating role in bringing together appropriate non government organisations and developing countries who have specific needs for the transfer of appropriate industrial technologies. UNIDO could also assist with initial funding for any necessary pilot studies and in providing payment guarantees as a backing to contracts arranged between non government organisations and developing countries.

These ideas appear to offer considerable scope for the development of new and improved methods for accelerating the industrialisation of developing countries in line with the Lima declaration.



