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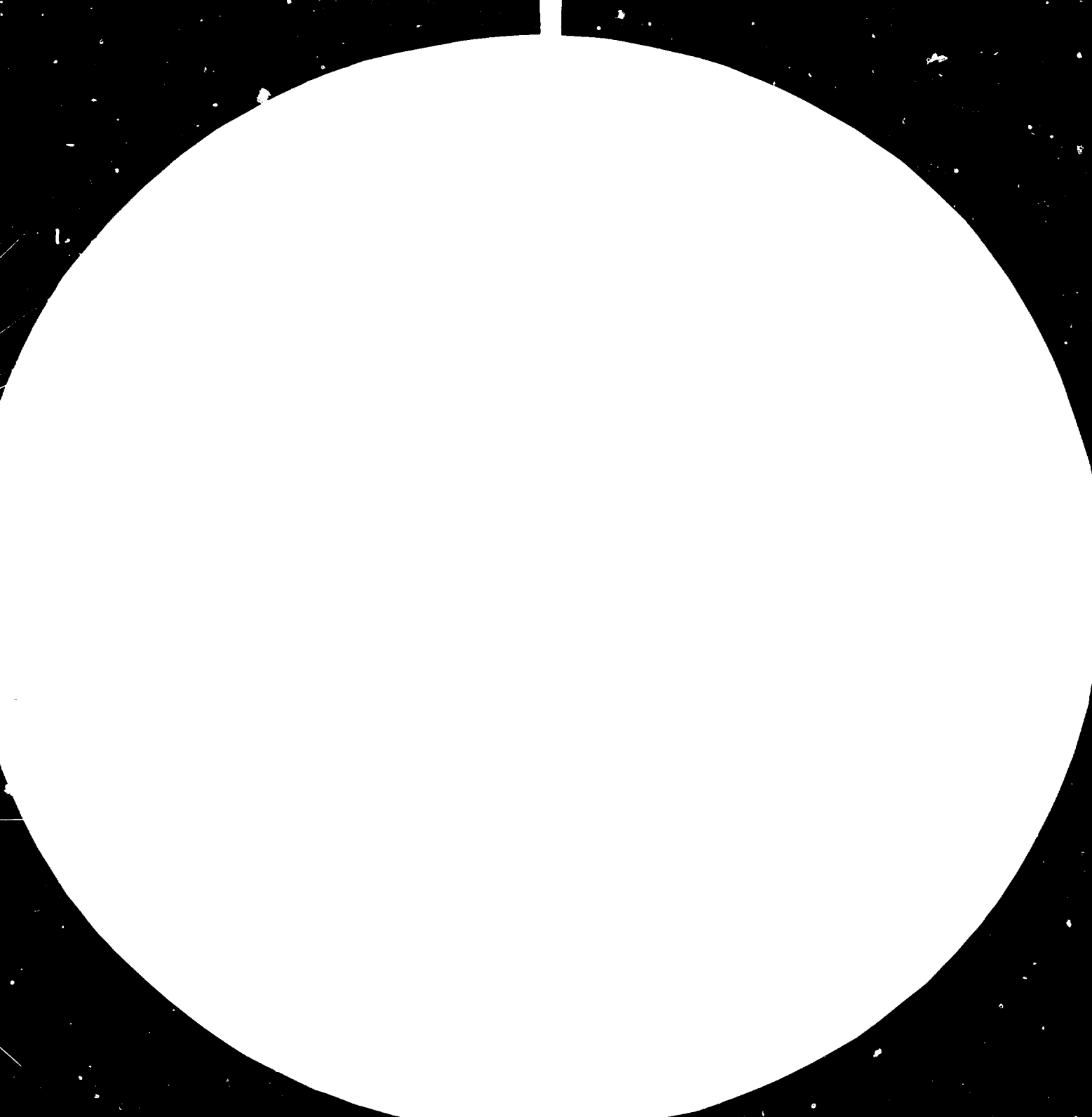
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ISSUE II

TECHNOLOGY IN THE SERVICE OF DEVELOPMENT *

Prepared by the Secretariat of UNIDO

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1. Capital goods - an elitist industry?

The role of capital goods in reducing the imbalance between the developing and developed countries is well known. Their development has a marked effect in restoring equilibrium in the International Division of Labour and in moving towards a new international economic order.

All developing countries have the innate ability to enter into the field of capital goods manufacture. Success in this venture, however, is dependent on the manner in which plans are drawn up and implemented, and a proper understanding of the conditions of manufacture of different groups of capital goods.

The developing countries, therefore, have to consider what they can produce on a long term basis, bearing in mind their own production capacity, future capability and the degree of complexity in the universe of machines.

2. Barriers to entry into in the capital goods sector

There are two types of barriers: socio-economic and technological.

The components of these barriers could be:

- the cost advantage of established firms - which increases in a situation of high price inflation,
- product differentiation and a share of the market held by well-known brands,
- economies of scale; for example, some of the capital goods common to all branches are the result of large scale mass production,
- capital needs including human capital formation,
- control of technology transfers which become increasingly rigorous with the rise in scales of complexity of the capital goods and
- non-availability of capital goods for producing other capital goods

These components are further related to the cycles of different products, demand characteristics, existing structure (monopoly, oligopoly, etc.), behaviour (strategy for prices, sales control, etc.) and results (profit).

In addition to these, these barriers show certain other characteristics: for example, oligopolistic power exercised by the international corporations for certain types of capital goods like heavy electrical, more advanced machineries for agriculture and food industries, sophisticated equipment for petroleum and petrochemical industries, etc.

In the case of the developed countries, agreements on specialization, subcontracting, marketing and technical co-operation are tending to create a new industrial structure which is bringing about a new international division of labour within the community. These changes are perhaps arising out of the obstacles and distortions to the traditional types of competition. An important question to be considered is whether these are affecting the developing countries by causing their development programmes to stagnate. Or is there a dominant opposite trend characterized by the redeployment of certain capital goods industries to the developing countries through "shared production" or "integrated production" with subsidiaries or independent firms?

3. Technological complexity analysis

A major obstacle faced by the developing countries is that of technological constraints. Hence, in order to understand the capital goods technological system, the UNIDO Secretariat has pioneered a new method - the analysis of technological complexity. A summary of this and its main results is annexed to the Background Paper to this issue.

This analysis reveals the enormous variations in the complexity of machinery and the increasing number of factors involved in this complexity, the existence of different levels and the conditions required to attain them. It demonstrates that the most difficult stage to enter into this sector is at the beginning, when a base at the lowest level of technological complexity is to be created.

At present 60 countries - that is most of the developing countries - are at this stage.

Creation of this base requires a set of conditions; existence of a societal consensus and a mobilization of national efforts, an adequate balance with the production of consumer goods and effective co-ordination with the educational system.

There is no inconsistency between a country's being dependent on its own resources and skills and at the same time obtaining stimulus through external aid. Such an aid can be instrumental in shortening the time span of development.

Assistance given in this form by the developed countries to the developing countries may not create a situation of serious competition between the two parties. The capital goods produced by the developing country will be mostly for internal consumption. Furthermore, such development could open up new markets for the developed countries' capital goods industry.

Thus aid would help to promote more solidarity and less competition between the developed and developing countries.

4. Long-term Trends in technological development

The studies carried out by the Secretariat of UNIDO to identify the main long-term trends in the capital goods sector have revealed the following:

- (1) new developments in the iron and steel sector will have a marked influence on the capital goods industry;
- (2) development will be concentrated increasingly on a systems approach covering mechanical, electrical and electronic components;
- (3) there will be greater integration in design and manufacturing activities using computers;
- (4) there will be more economic use of materials and energy, an improvement in working conditions and automation of production processes.

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These technological development prospects give rise to two important issues.

First is the effect on the future employment situation in the developed countries. In the light of the current economic recession one has to consider if these trends are likely to lead to a structural reduction in employment in the developed market economy countries? If so how is the situation to be reconciled with the assistance that the developing countries expect from the developed countries for their industrialization.

There is evidence to show that the delivery of factories and equipment by the industrial countries in exchange for some of the products manufactured with that equipment generally results in a largely positive balance in terms of direct and especially indirect employment in the developed countries. Any loss of direct employment is related more to unskilled categories, while the creation of employment is for skilled posts. The establishment of capital goods industries in the developing countries could therefore benefit the developed market economy countries, and help them deal with their employment problems, particularly in the skilled category.

A country requires still a large volume of capital goods that there is enough scope for the developing countries to undertake local manufacture as well as import capital goods from the developed countries on a large scale.

The second question pertains to the technological course that should be adopted by the developing countries by selecting appropriate technological models. This selection is dependent upon several factors like the technological system, likely future development, capacity for technological innovation and the degree of freedom in composite trade. While selecting the model, the developing countries need to keep in view not only the problems of unemployment which may necessitate adoption of intermediate or appropriate technologies that are less expensive, but also the innovations that are taking place in the field of technology in the developed countries. During the next 20 years or so, machine design in the developed countries is expected to be strongly influenced by the attempts being made to achieve savings in energy, raw materials and power.

Considering the employment problems in the developing countries, two alternatives seem available to them:

- select imports of technical goods and locally manufactured products so as to have a stable technological model which would make it feasible to employ a large labour force with low levels of skills; or
- develop local research and development so as to be able to adapt or innovate appropriate technologies which are geared to factors of production and established objectives.

An underlying feature of these alternatives would be the developing country's intention to establish a capital goods industry more for meeting its internal demand and not so much to reduce the technological gap between itself and the developed country.

One of the important models for the developing countries could be the one which uses the concept of technological pluralism. This envisages the adoption of a mixture of more advanced technologies that are likely to have linkage effects with simpler technologies in sectoral and inter-sectoral combinations.

5. Planning for capital goods development

Long-term development of the capital goods sector requires careful planning which would enable the developing countries to find solutions to the following problems:

- (a) the selection of paths of entry into the industry, which is dependent on the availability of infrastructure;
- (b) establishment and growth in complexity of the industrial fabric;
- (c) coupling of technology complexity levels involving a reduction in the gap between the complexity of the imported technology and local technological capacities;
- (d) mastery of international interdependence. This means adopting a clear policy regarding imports and local development of equipment and components and establishing a linkage for all these aspects through trade and international co-operation.

6. Conclusions

Based on the above analysis the following issues are suggested for consideration by the Consultation:-

- (1) what are the main long-term trends of technological development in capital goods and what is their impact on the development of this industry in the developing countries?
- (2) what roles are the developed countries willing to play in helping the developing countries raise their technological levels and overcome the obstacles to their entry into the capital goods sector?
- (3) in the light of the above and considering the varying levels of development in the developing countries, what are the paths available for different groups of these countries for entry into the capital goods sector?



