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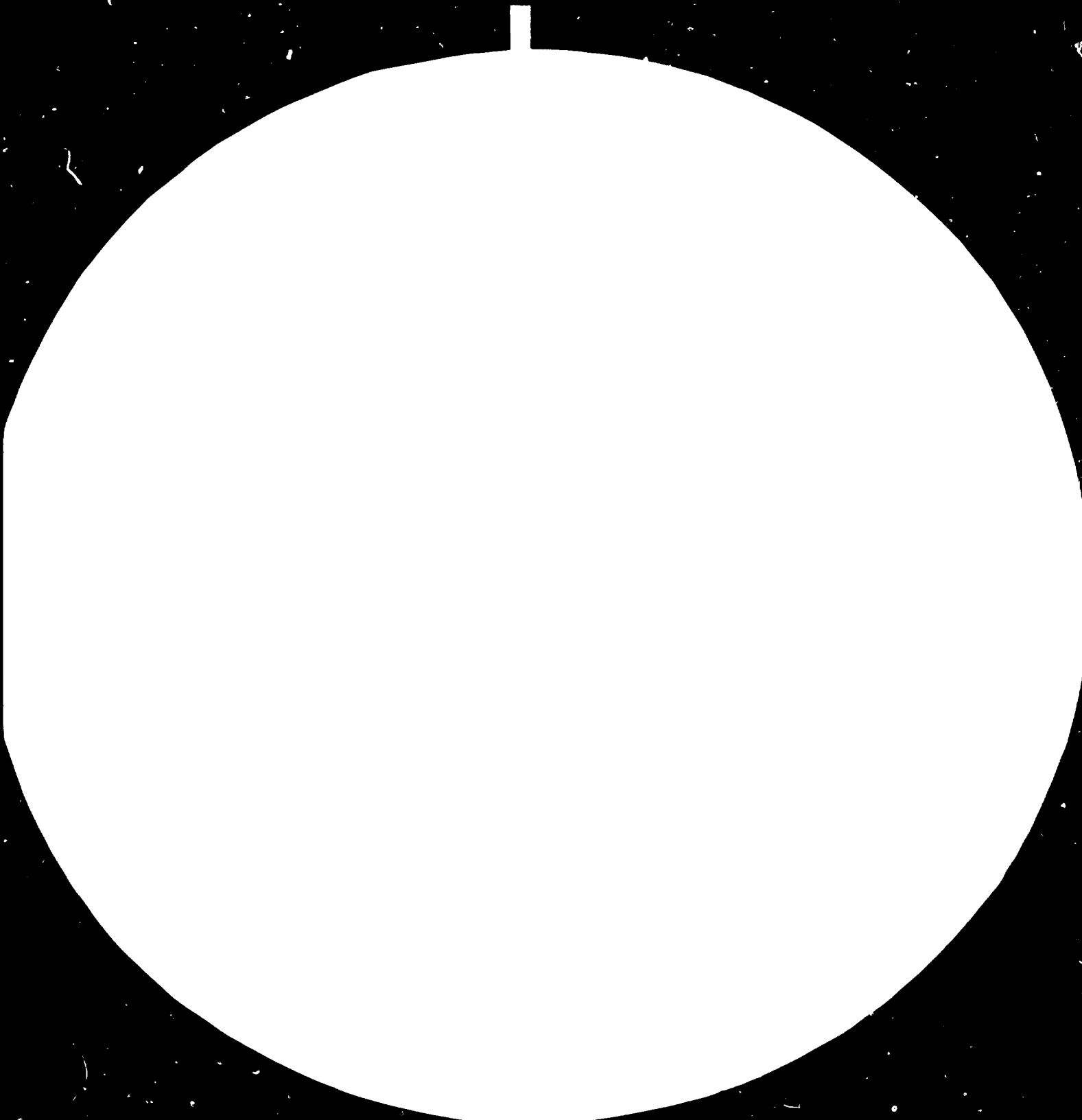
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Resolution Test Chart

Resolution Test Chart



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DELIVERY
of
Industrial Development

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S Y N O P S I S

This paper is suggesting that priorities now prevailing in Technical Assistance for industrial development may-be should be centered more around in-depth practical training in application of freely available technology than around soft infrastructure issues.

Also that much more emphasis may-be should be placed on technical assistance to the Metal Working and Engineering Industries, developing them to support and multiply other industries including rural industrial development in the creation of work places that will provide the highest output per invested Dollar.

General CONCLUSIONS on DELIVERY of Industrial Development

Much emphasis is put on soft industrial infrastructure in promoting industrial development. The already overloaded government bureaucracy in developing countries most often has to carry this kind of development effort, which primarily will only have an indirect and long-term effect.

Faster and more delivery of industrial development may take place with less bureaucracy involvement if incentives and technical assistance were directed towards the creation of new work-places and towards increased value added per invested Dollar rather than towards larger capital investments and manufacturing value added in general. This would also lead to more concentration on development of small and medium-sized industries.

The incentives should promote industrial development undertaken as a business, e.g. by assistance in the establishment of industrial infrastructure companies - making these viable operations by providing free technical assistance for longer-term in-plant training of the craftsmen and technicians providing the tools and services needed by other industries.

Existing medium-sized industries in developing countries most often started with short-term operator training only, depending for their technology and tools and equipment on overseas principals, because this was the only commercially viable way out. These industries could be encouraged with subsidies to undertake on the job in-depth training to expand their own production with less technology transfer and provide a service to other industries.

Similarly, to encourage re-deployment of industries with more multiplier effect, "Aid-organisations" and governments may be suggested to provide subsidy for in-depth training/grooming of "technicians."

Not the least in providing the tools and transport equipment for agriculture, a commercial but training-assisted approach may be highly desirable to get production started, using already developed implements and existing technologies, which R + D institutions have difficulty in reducing to practice.

The area of rural transport and cultivation deserves significant attention towards animal draft equipment to stop the very expensive head loading and growingly expensive tractor transport with increased oil prices, which in themselves are a heavy burden on the economies of developing countries.

The prime deduction of the paper should be for technical assistance organisations in industrial development, principally UNIDO, to study their priorities - related to above proposals and not the least to the suggestion that promotion of industrial development is facilitated by making the engineering and metalworking industries capable of assisting in the development and maintenance of other industries in developing countries.

As far as development of engineering industries is concerned, it is necessary for aid-organisations and the developing countries to realize that short-term assistance projects or training, e.g. for 1-2 years for workers, only creates operators - and not craftsmen, and that engineer and technician recruits are not able to perform on their own in a technical capacity before they have been groomed under guidance of senior engineers for 5-10 years.

Thus the Engineering Industry does not only require the first attention but also much more in-depth practical training and thus the larger volume of technical assistance to promote industrial development in general.

To focus on the Capital Goods Industry - being part of the metal working and engineering industry - suggesting that this industry should take first priority and could be developed through design and supply of "Technological Routes" - with engineers and technicians being incidental to the operation - is misleading for the majority of developing countries and one may compare it to start building a pyramid from the top - without having completed the base (simple industry based on operator training only) nor having started to build the middle section i.e. the complex infrastructure surrounding Manufacturing and Design Engineering and sophisticated craftsmen development to maintain precision machinery and provide tools and designs adapted to developing countries.

Likewise, it is misleading to believe that R + D institutions are mandatory for industrial development when most industrial implementation will be based on application of existing technology freely available to those who have been in-depth-trained to apply it.

DELIVERY of Industrial Development

Present Technical Assistance Emphasis in Industrial Development

A general overview of technical assistance work for industrial development would tend to indicate that much of it is of an "overhead" nature such as related to the following:

Sectoral and other generalized studies;
National planning, strategy and policy issues;
R + D institutions, standardization, etc;
Overall promotion institutions.

Undoubtedly, these activities will have a great impact on industrial development, however, one could be tempted to ask what priorities and criteria for priorities have been considered, e.g. are these activities the most efficient ones for promotion of industrial development in the short term and/or in the long term.

It seems as if these "soft"-infrastructure issues are often treated with more or less the same urgency and weight as the actual implementation of industrial projects.

As the provision of soft infrastructure is primarily in the hands of the governments, the implementation of these activities will put even more strain on the already overloaded government bureaucracy in the developing countries. There is generally a severe shortage of experienced educated cadres - in most of the governments of DCs - who are qualified to deal with these issues.

SUGGESTED PRIORITIES IN DEVELOPMENT ASSISTANCE

The Overall Goals

Although it may very well be a difficult exercise to weigh the importance and priority of each of the major activities in development assistance,

one should think that the satisfaction of the basic needs of the developing countries would require a more specific setting of priorities than the "increase of the manufacturing-value-added by 25 % by the year 2000".

Value can be added by workers or by expensive imported equipment or by local resources - and the basic needs may well be satisfied much earlier than a certain degree of industrialization can be achieved.

To identify the IMPACT of industrial development it would be more demonstrating and of more guidance to describe the increase in Manufacturing-Value-Added by:

(Number of work places-created) x (Added value per work-place)

combined with an identification of

EFFICIENCY IN CAPITAL UTILIZATION.

With capital availability being a serious bottleneck one may suggest key indicators such as:

Average Cost per Established Work-Place and

Yearly Manufacturing-Value-Added per Invested Dollar.

If one agrees that it is a high priority

to create as many work-places as possible giving the highest value added per invested Dollar,

then perhaps practical work in creating the appropriate work-places should have much higher priority in technical assistance work.

With this objective the emphasis would also automatically be on small and medium-sized industries.

The Priorities Required by Agriculture

Although it is realized that the technological impact on agricultural development and employment over the next decade or two is to come less from introduction of tractors than from animal-draft equipment, UNIDO seems to give the tractor development even higher priority than animal draft, while also overlooking impact in general of oil and petrol prices on transport and farming. The developing countries are not only directly suffering economically from this impact but the movement away from head-loading and hoe-farming is being further retarded - unless much more emphasis is put on animal draft transport and mechanical farming.

A survey made by the World Bank in Kenya in 1977 states that head-loading is by far the most common means of transport used on farms and estimates the cost of transport by head-loading at more than US\$ 2 per ton/km, compared to US\$ 0.2 for transport by bicycle or donkey, US\$ 0.5 for ox carts and US\$ 1 per ton/km for tractors. Similarly, for ploughing the ox-plough is by far the cheapest at about US\$ 14 per hectare compared to US\$ 40 for tractor ploughing - and the later heavily increased oil prices would further have aggravated this picture.

As the increased oil prices are now even having the effect of re-introducing the horse and the paved bicycle-path in northern Europe, they ought to have more powerful effect in developing countries suffering relatively much more from the increased prices. Rural Industrial Development efforts in particular in the area of metalwork would be the starting point for alleviation of this situation, which simultaneously could assist other rural industries in getting off the ground.

The Place of the Engineering and Metalworking Industry -

for Industrial Development

The Engineering and Metalworking Industry, it is suggested, should have the highest priority among industrial sectors as it also should be looked upon in itself as the most essential piece of industrial infrastructure, as already mentioned for rural industrial development.

We may compare this sector to the rest of industries divided into two groups, viz. :

1) Electrical, wood, plastic, building materials and electronic industries, which may also provide some industrial infrastructure services, however, not to the same basic extent supplying the capital equipment for other industries as the metalworking industry - and these industry sectors are themselves fundamentally dependent upon the metalworking industry for their own production equipment.

The Engineering and Metalworking Industry is in a secondary way also dependent upon these industries for its own functioning, e.g. for power supply and control of its machines.

2) The other group, namely the chemical, food, textile, leather and associated industries are primarily oriented towards serving the general public and agriculture and provide normally only auxiliary inputs to the above industries (e.g. paint and oil).

Thus the Metalworking and Engineering Industry, as may be appreciated from this rough division of industries, is the basic creator of the physical facilities for other industries and for everybody's needs for transport (cars, railways, ships, aeroplanes, and materials handling equipment), and for durable goods in general.

Although the chemical and food processing industries, etc. may provide the bulk of industrial output and be of prime importance in the economy of developing countries, they do not to the same extent provide a multiplier or industrial development effect, because often there may only be the need for a very few - if more than one of a kind - in each country, e.g. fertilizers, meat canning, refineries, etc., and in most cases the economy and quality requirements are best served by larger units, e.g. textile mills, breweries, tanneries, cement plants, and in any case the need for in-depth training is small and primarily related to maintenance of mechanical and electrical equipment.

The machines and equipment designed by mechanical/electrical engineers with the help of chemical engineers, food technologists, etc. are most often providing the output with little need for longer operator training. Thus the multiplier effect will be small.

Also when it comes to employment, the cost of creation of work-places is often high for the chemical and food processing industries.

Summarizing the Priorities:

The conclusion one may wish to draw from the above, could be, that to promote industrial development - understood as the maximum creation of work-places of a kind that will provide the highest value added per invested Dollar, i.e. with appropriate technology, it is suggested to concentrate much more effort on the establishment of small and medium industries, in particular for rural development and to do this by developing first the Metalworking and Engineering Industry and second that part of other industries that may support the development of this sector (e.g. electrical, wood, plastics, electronics, etc.).

From a shorter term economic point of view individual countries may have other priorities - although the obvious import-substitution possibilities have been exploited in most developing countries.

NON-TRADITIONAL WAYS OF IMPLEMENTING THE PRIORITIES

What is needed to create work-places?

The provision of money and technology, as is given high priority by development agencies, is essential but what facilities are otherwise needed to create appropriate work-places:

1. The techno-economic analysis (over and above the general feasibility study) to justify the practical establishment of the work-places based on:

2. The identification or creation of the market for sales of the products;
3. The product and manufacturing engineering activity to define the product and establish tool and equipment design and plans of facilities and of production;
4. The physical establishment of the facilities, the machines, the special tools, and production environment;
5. The on-the-job training and technical management.

How are these faculties for work-place creation best provided

In the industrialized countries relatively little of the first described soft infrastructure and generalized studies, etc. were available to make the industry grow, however, the industry did early provide an essential part of its own physical infrastructure, namely in the form of the specialized companies providing tools and parts. Also engineering companies themselves provided on the job training for engineers and technicians, having specialized marketing and engineering departments within the company, creating the techno-economic basis. Even medium-sized companies would in fact have within their walls all of the above-mentioned five faculties. One may say they were vertically integrated starting even with research and development through product and manufacturing engineering to actual production establishment and production including sales and service organizations.

What is now going on in developing countries looks often like creation of various horizontal levels of faculties which are not tightly inter-connected such as R + D institutions and national planning organizations, detached from manufacturing activities, and companies with no engineering departments and most often not even a sales department, because the old importers keep the distribution on their hands.

Vertically Integrated Industries

Not including India, South Korea and other EDCs with volume markets available for them, it has become difficult to establish viable industries in LDCs with multiplier effect, because the import-substitution possibilities for traditional western productions are becoming rare.

One may then suggest that vertically integrated companies subsidized by governments or foreign aid, where necessary, may be able not only to show the way in creating engineering departments and integrated operation in general, but more important, that they in themselves may provide that part of the physical infrastructure, which in developed countries today is provided by tool making companies, engineering companies and by stockists of tools, parts, etc. and provide these services adapted to the needs of low volume and less capital-intensive productions.

This is what is as now being suggested with "Metal Production Development Units" (MPDU) which will provide infrastructure while at the same time being an industry in itself supplying parts and tools.

Industrial Development as a Business

UNIDO has in various projects shown that a commercial approach in establishing an infrastructure like an MPDU is most efficient both in regard to training and to operation.

UNIDO should create a number of basic standard or modular production and development units similar to MPDUs rather than pursue the establishment of individually 'custom-made' government institutions in each country. From basic generalized units the work of 'tailoring' these to specific countries' needs is comparatively easy and far less costly and time-consuming.

By having commercial participation in such ventures from the industry in the respective country, one gets not only the commitment for the industry to utilize the services of "infrastructure companies" but also a far more positive attitude towards something, that is operated in the same way as the

industry itself, rather than an academically-oriented institution which perhaps does not appreciate the practical problems of the industry.

A techno-economic based business approach would automatically tend to create the work-place with highest output per invested dollar.

THE DELIVERY OF DEVELOPMENT TO INCREASE MANUFACTURING-VALUE-ADDED

The delivery of industrial development through the creation of work-places, using a business approach, may then be suggested to be undertaken as follows:

By Infrastructure Companies

Most essential to enable infrastructure companies to deliver development is in in-depth training

- of craftsmen who are able to create work-places;
- of 'technicians' in a broad sense who are able to (re-)design the products and design the "tools".

So much technology is already freely available if only brains and hands were trained to apply it.

Of course, these infrastructure companies should also get from existing R & D institutions whatever they can provide of adapted technology and try to get productions of developed appropriate equipment implemented.

By Existing Industry

But also private existing industries should be brought much more into the picture by infrastructure companies helping them to expand and increase the manufacturing value added per invested Dollars.

The expansion of existing companies gives most often with the least risk the highest value added per invested Dollar, e.g. removal of a few cheap bottlenecks in production may greatly increase production often without increasing overhead.

To promote this expansion, a fund to reduce the risk of expansion and to encourage the use of local engineering firms, e.g. infrastructure companies should be a very important aspect of a national strategy.

By Rural Industrialization Organisations

To improve the rural mechanization and industrialization and still reduce the oil bill a massive practical programme will be needed:

- to provide and train animals;
- to set up bicycle, cart and implements manufacture

facilitated by

- i) Standardization of the best existing carts/implements;
- ii) Central mass production of wheels, bearings and other essential parts and sales of these at subsidized prices to rural industries;
- iii) Provision of designs and training along with key parts supply for making carts etc. in the rural areas - and control of prices.

One way of achieving this may be with a business organisation, an infrastructure company with a central manufacturing, training and engineering facility setting up and controlling a number of satellite rural production units headed by rural technicians trained by the central organisation.

Such organisations would have to be technically assisted initially to provide the in-depth training, and grooming of 'technicians' who eventually also would establish and run rural production units.

By In-depth Training-assisted Redeployment

Also to encourage redeployment of industries from developed to developing countries one should provide new incentives which would tend to encourage transfer of technology that would have a multiplier effect.

Up to now the majority of purely commercial technology transfer activities have had very little multiplier effect, because it is commercially not a viable proposition to include a heavy training component for training, e.g. engineers, nor to include sophisticated tool-making facilities with most often minimum economy of scale transactions. The result is that few companies in, e.g. ACP countries have senior engineers/technicians working in a technical capacity; thus these firms do not either offer even a simple training ground for young local engineers/technicians.

To improve this situation one may first of all suggest that "aid organisations" and Governments promote redeployment with

Aid organisations maybe providing (part) payment of longer service of technical experts as part of a technology transfer package

and

local governments providing training subsidy of longer duration to the counterparts that must be trained to be multipliers rather than paying training subsidies for simple operator training as is sometimes done.

One should, so to speak, exploit the presence of an overseas operation by 'piggy back riding' on its experience to the benefit of both parties. Sophisticated ancillary operations such as for toolmaking, (chemical) testing etc. may also be suggested subsidized if open for service to other industries.

