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UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org

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Developing Countries

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DEVELOPMENT OF ENGINEERING [illegible]
IN THE DEVELOPING [illegible]

M. Fouad Hussein
Engineer Consultant
Cairo
United Arab Republic

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Introduction:

Design is an essential factor for a balanced and lasting industry The problem of developing design is not an easy problem and a good deal of planning is required to bring it to a success.

Before attempting to develop design, the importance of building up indigenous designer and design-teams must be well stressed and every effort must not be spared to propagate the correct atmosphere which will bring out the natural instincts and ensure its continuous progress.

Design development and designer's training and build-up must start, at least, with the start of industry and not to be left to a later date, the earlier this matter is taken up, the better it is for the industry of the developing nations.

Types of Design in Industry:

Development of design should be carried out as a central concern or concerns and not to be tried out widely at first due to its very complex nature and the difficulty of building up design staff properly. The spreading out could be effected later, according to priorities and can go on progressively with the increase in the number of designers and design staff.

The two basic types of design viz.:

a- Industrial Design

b- General Engineering Design,

should be given equal thoughts. Both must be simultaneously developed and institutes or places for teaching both, must be established either independently or otherwise as detailed.

Procedures to Promote Design and its Staff in Industrially Developing Nations:

Incentives to encourage designers must be well considered because they constitute the most essential step in that direction. Educational systems with regard to design must be studied and redrawn to suit the demands of industrialization in the country.

Design institutes are [illegible] tools for promotion of design by means of [illegible] design staff, carry out or conduct applied research [illegible] for the [illegible].

Design [illegible] incorporated in colleges and/or training centres [illegible] prepared, to make up for the [illegible] that prevails in developing [illegible] start with, are very much needed.

It is necessary [illegible]:

The establishment of design and drawing offices in factories, and ways of carrying out such proposals.

Prototype [illegible] centres, a general purpose units of an specialised [illegible].

Establishment of [illegible] design institutes due to the [illegible].

[illegible]

[illegible] should be established to give to designers [illegible] the following:-

a. [illegible]

b. [illegible]

c. [illegible] regarding recent developments and [illegible]

All information [illegible] should be concerned basically with [illegible] requirements. Information centres [illegible] of [illegible] with local design [illegible].

[illegible] of these centres must be [illegible] in such a manner that makes them easy [illegible], at consumer-side, should be regularly [illegible] they are kept in order.

The [illegible] and technological benefits of such centres have been identified.

Effect of Design on Industry:

It is clear that design has a marked effect on utilization of the country's natural resources whether it is raw material or human power.

It has a profound effect on quality of production and its else. Beside the economical advantages gained from the two items stated, design aids another economical aspect by opening the possibility of utilizing unused machining capabilities, commonly met with in developing countries which results from the accumulation of machine tools with every new factory and the want of security when setting them up.

It could produce the articles as required by the nationals and this gives it a more stable saying-power in its market.

It could remove the chronic ailment of shortage of special tools most needed for production.

It could provide some sort of solution for the production of spare parts needed for all services in the country whether they are public services, agricultural or industrial and would certainly minimize the pressure on the limited amount of hard currency available during these first stages of development.

It provides stability for the industry of a country and thus favourably affect its general economy.

It would open up the road in front of the private entrepreneur, the creative thinker and the small-scale industries as a whole, through the organ of putting up show-rooms for new designs and provide patenting and security.

It could sustain a good hand-craft and village industries.

A proposal was given to differentiate between design approaches, and two basic categories have been proposed. Strict comprehensive programmes should be set to ensure successful results.

Design of equipment of pilot plants essentially needed for studying the characteristic of indigenous raw materials is an important step towards improving the economy of the country.

Procedure of Approach:

A pre-investigation by UNIDO's experts as to the suitability of the existing state of education is proposed. The formation of a design body is essential. The analysis of the findings are to be discussed with government concerns before continuing further activities.

It is also proposed that no actual steps towards setting up a project to be taken by UNIDO before the complete formation of the body for the design required.

The design group should be formed as an independent body and considered as one of the highest level industrial concerns.

A high national council of design embodying important industrialists should preside over the project.

Independent self-contained preliminary programmes for work to be set beforehand , with prototype production centres to be able to put before the eyes of the industrialists actually designed working items before they can look forward for demand of their services.

Role of UNIDO:

Feasibility studies and pre-investigation and short-term help are all needed before actual institutes and design experts are sent over to the country.

Design promotion requires the initiative to come from UNIDO agencies and not to expect requests to come forth from the nations. The earlier that step is taken the more beneficial it is for the industry of the country.

Length of UNIDO's assistance is anticipated to be for ten years and not three to five as it is commonly adopted with other projects.

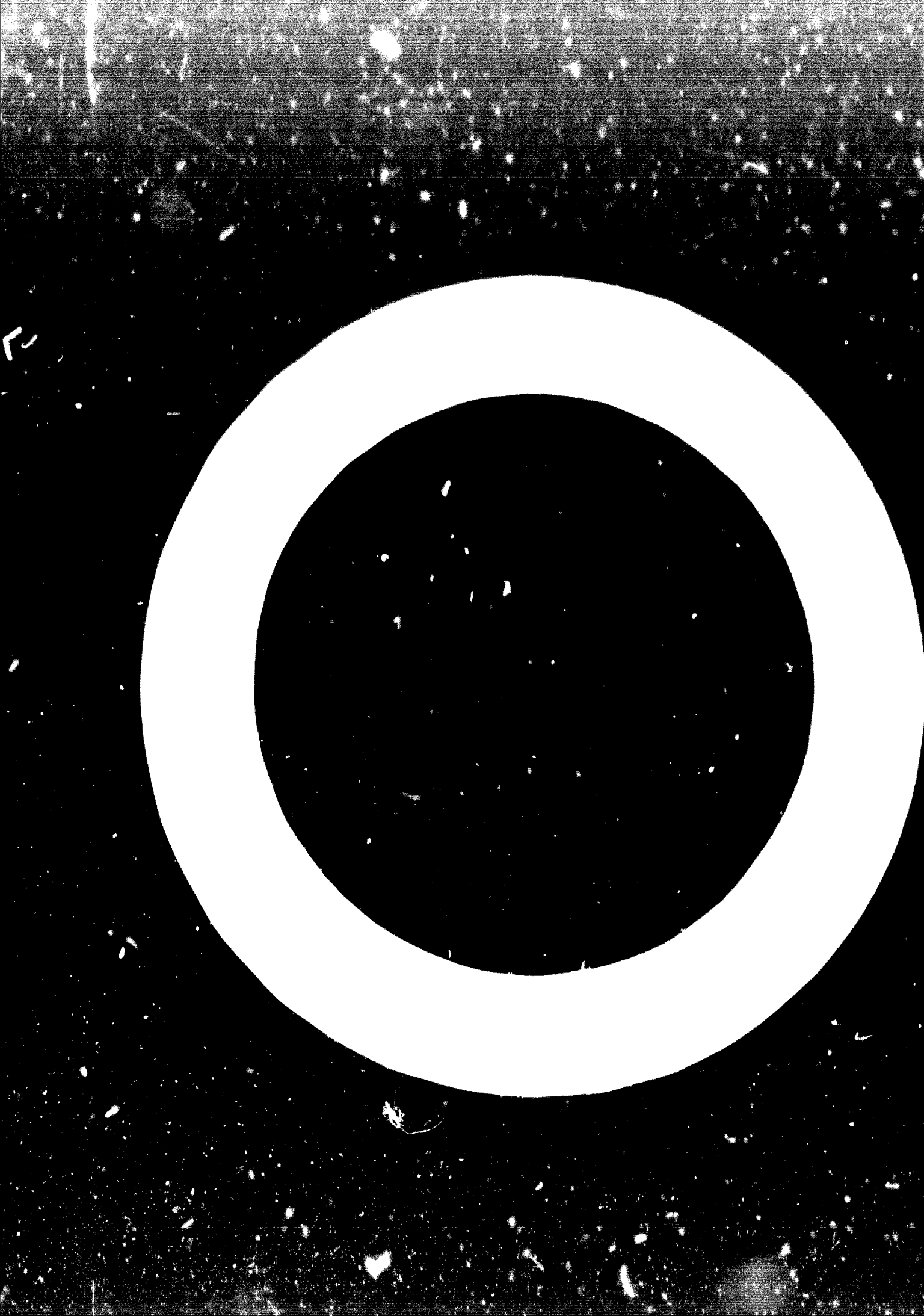
The length and complicated nature of the subject encourages a proposal to be put forth for UNIDO to have a specialized section or team whole-heartedly enveloped in that field to initiate, assist, advise and follow-up its progress, analyse results arrived at, and propose new methods of approach whenever an old method fails.

Other Aspects Necessary for Promoting Design Capabilities:

The lack of technical references in the language of the nationals of the developing nations is one of the obstacles to design development which should be removed. UNIDO could take an important role in overcoming this difficulty.

A high level national council for design, if formed, could act as a very big counter-balance against its obscurity and lack of evident results. Its formation is recommended as one of the early steps to be taken up with the governments concerned.

Reluctance of design offices and concerns in developed countries with regard to opening their doors for training young designers from developing countries, should be considered and a compromising formula worked out to cure such a state. UNIDO could, through the organs of the institutes and seminars, do a lot towards making up for this reluctance.



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SYNOPSIS

Design is an essential factor for a lasting and balanced industry. Its development is an important step that should be taken simultaneously with the initiation of industry in any developing country.

Special attention is drawn to the exceptionally long period needed to build up the abilities of designers. Thus it is never too early for any country which is embarking on industrialization to set up high level organisations to develop all categories of designs, meaning general engineering and product or industrial design.

Such organizations should be given every facility, financial and otherwise, to promote design education and build up basic knowledge of its technique. The practical means of producing the proto-types needed for the proofing of the new ideas should be well looked after and developed.

These organizations should also give all the staff involved in design fields the applied training and regular upgrading needed to keep their knowledge in harmony with the advance of modern technology.

Design has many facets and deals with a variety of specialities, thus its development is a complex problem.

To overcome this difficulty a systematic procedure of approach should be drawn and priority-lists indicating preferred channels should be marked out. Design of equipments commonly re-occurring in the predominant industries in the country would be a very good starting point.

But it must be remembered that advancement in design matters could not stand still and adequate provision to meet such circumstances should be taken care of from the start.

For the satisfactory execution of designs prepared in a country by the utilisation of its local capabilities the designers must be made aware of the facilities that are existing. For this reason information centres should be set-up to provide the required knowledge.

Full characteristics of indigenous raw materials should also be made accessible to them.

Regional information concerning the two points raised above would certainly be a great asset.

Good simple designs which harmonise with the liking and natural instincts of the nationals in the country are liable to attract a more stabilised market. They in turn stimulate small-scale industries, open a

wider field for cottage industries and provide a higher living standard for the private enterprises. They sustain a good [illegible] and [illegible] attraction for tourism and [illegible].

[illegible] for new designs and [illegible] ornamental patent protection for new [illegible] and [illegible] inventors and investors [illegible] would have a favorable effect on the economy and industry of the country.

Design institutes [illegible] service to the country by [illegible] and [illegible] construction work to [illegible] the indigenous raw materials [illegible] [illegible] adoption in the [illegible] designs.

The [illegible] in the developing countries [illegible] time, means, the [illegible], the [illegible], the strengthening of [illegible] and prosperity [illegible] of human [illegible] changes in the general [illegible] of a human being.

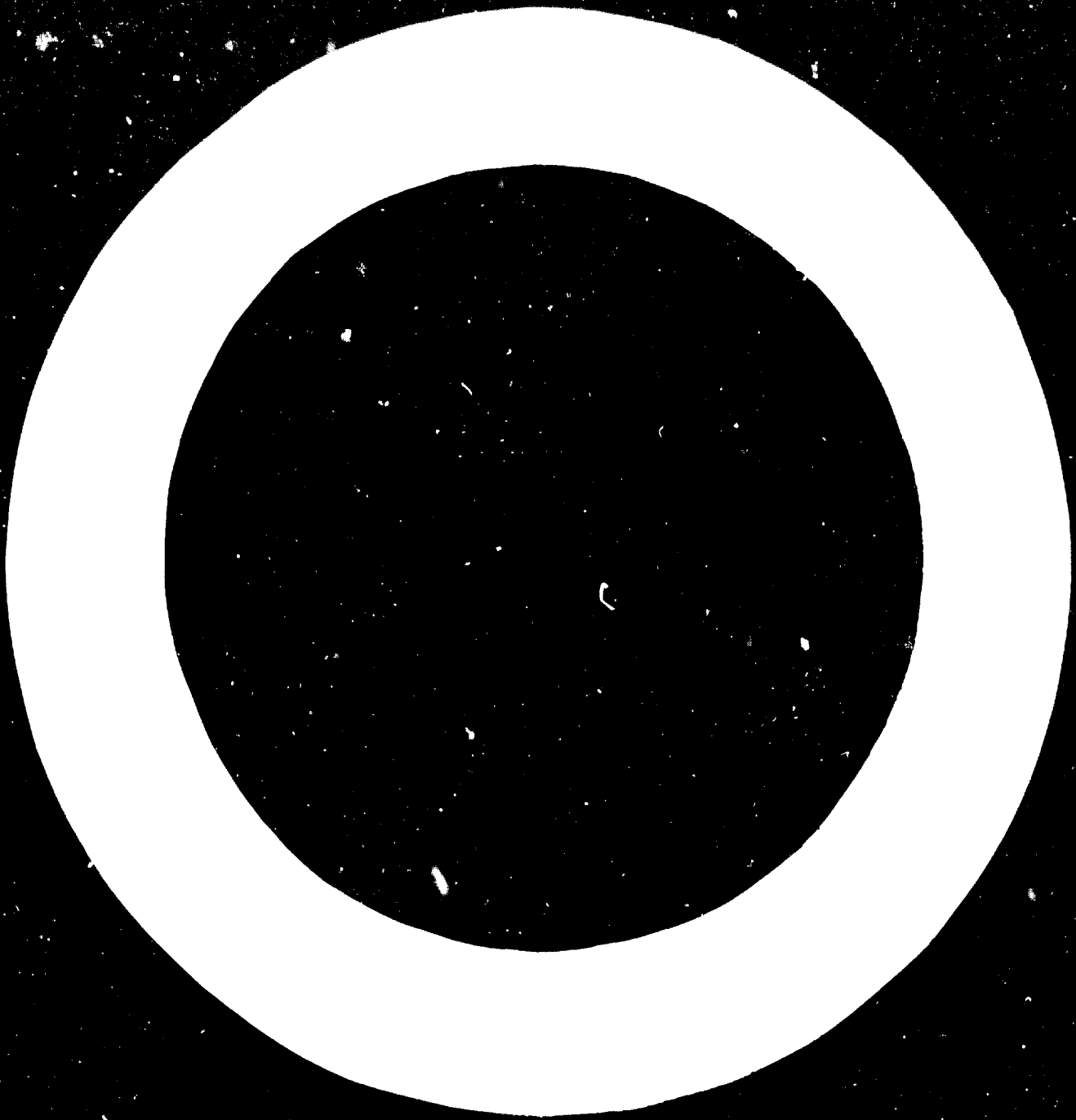
This formidable task has been successfully achieved in the industrially developed nations gradually and over the span of several years.

Such a responsibility demands pre-investigation. It calls for detailed studies and careful consideration. Failures and setbacks are to be expected. They must be faced with patience and continuous efforts until the correct means to overcome them are finally found.

The help and guidance of UNIDO in that respect could be very valuable. UNIDO, with the help of the governments of the developing nations, could establish the design institutes whose duty would be to overcome and prepare the correct atmosphere for design development. Regional institutes would give a greater push to the matter.

Basic references concerning design and its procedures in the national language of young designers would be very effective.

UNIDO could extend a magnificently helping hand in that direction by encouraging the specialised concerns to extend their activities to cover this aspect.



CHAPTER 1

Introduction

As it is a fundamentally accepted fact in any branch of Engineering or Science that before any idea can be utilised, it must be embodied in a suitable physical form, whose dimensions and proportions must first be designed. For this reason design is considered one of the important foundation stones for creating, promoting and maintaining industry. Its continuous progress becomes the aim, wish, and duty of anyone who is concerned with the growth of industry in any country.

During the preliminary stages of industrialization in developing countries, this fact is dormant and apparently non-existant. Thus, it is not acutely felt and is very unfortunately, neglected. The reason for such a phenomenon is that, at these early stages, the developing countries are wholly dependent on the developed countries to put up their factories for them. The personnel needed for running these factories are also trained by the supplier and finally the whole enterprise is handed over to them in good working order. Regrettably, it is only after the first few years of the factory's working life that the responsible people in the developing countries

begin to feel the need of introducing new ideas or rehabilitating old equipment to suit their people's natural instincts and environmental circumstances. But, unfortunately, they would not find the proper experienced designer amongst their people who could put such ideas into operation, and so once more they go back to the old supplier in the developed countries which will [illegible] high financial demands. Alternatively, they can entrust it to the hands of inexperienced nationals, who might have high academic qualification but lack the touch of practicability needed for a good design and the result will come out uneconomical and inefficient.

Unhappily, the problem does not end at this. It is usually found that by that time the supplier in the developed country has already improved and changed his product and is inclined to offer even more up-to-date equipment, thus adding one more cause of thought and concern to the responsible people in the developing countries and strain their [illegible] further. All this would be in addition to the multitude of strains that generally exist in new industries, where poor efficiency, low productivity, unsettled management conditions, untrained labour, acute shortage of

technicians, lack of suitable raw material and lack of industrial stability are all making themselves painfully felt.

Placing all these facts in the front line of our thoughts and with the full knowledge and realization of the difficulty in creating designers, as will be explained, it becomes an essential step for every developing nation which is seeking industrialization to begin the preparation and training of their designers from the first moment they indulge in industrialization. Promotion of designers should be one of the high-priority projects to be included in the first plan of industrialization of any developing nation. In that way, when the factories lose their newness, and the ailments and troubles begin, they will then discover those trained hands that can at least attempt to ease the troubles in their own way.

Touching back on the nature of design it is well to state that design, which is considered the highest form of engineering practice, is, in its fundamental feature, a science of a complex nature. It demands a knowledge of the basic principles and behaviour of the materials of construction under various conditions of temperatures and loading. It requires a fair knowledge of the theory of elasticity, stresses and strains, and also requires

a deep probing into the metalurgical aspects of the various materials, especially with the ever-increasing non-static development of these days.

In addition to the above-mentioned points, design cannot be effectively or correctly carried out if the designers have not had sufficient practical training in a workshop and are not fully conversant with its technology and practice.

This does not rule out the need for the designer to possess a fair amount of general knowledge about gadgetry and a good background of practical experience.

It is thus clear that, to develop design, the country must provide abundant means for the training of individuals, bearing in mind that design has varied and numerous fields.

This problem is not what one would call an easy one. Considering that the mere writing of a book on design is an arduous task, the teaching of its basic elements is an even greater one. It requires an instructor that possesses more special qualities than are needed for ordinary teaching. It calls for a very high degree of flexibility of thought, a good deal of common sense, ability to quickly grasp other people's

point of view. He must be capable of falling-in with the ideas of other people if they even indicate the smallest degree of probability for success.

I would like at this stage of my introduction to quote few words from a preface to one of the very old and well-known English books on design written by Professor Henry J. Spooner. This book was written at the time when design was depending on the rule-of-thumb and was, in fact, much less complicated than it is today. In it he states :

> "When I was honoured by an invitation to write this work I was at first chary of undertaking such a difficult task."

I would like also to dwell a little on my personal experience during my lengthy career of teaching this subject. I have come across cases where the student looked dismayed and felt completely lost when he was first asked to design a certain element. I have also noted how long such feelings lasted with the good majority. Things were not made easier when the students were told that there is never only one possible solution for a design problem.

From what has been stated, it becomes evident that in order to reach our goal, which is the developing of engineering design capabilities, the necessary means for a successful build-up of the teams required for design work must be sought. Such teams, or "design cells" as I have called them during the course of my involvement in the field of actual design work, were usually composed of a balanced harmonized group of people working together, made up of two assistant draughtsmen or detailers, one draughtsman, one draughtsman-designer or calculator and a design engineer as a head of the team. The designer was generally a university graduate with practical experience, or alternatively, an old hand at the drawing board with long practical experience. The forming of such a team, which should be made to specialise in the design of certain equipments, is one of the difficult tasks that requires all the energy and full attention of good, well-experienced guiding hands for a long period of time.

It is well to point out here another factor that makes the duty of the design training expert more difficult. A designer has never been a person of mere academic knowledge nor even of mere practical experience; he must have a mixture of both, or at least have equivalent

qualifications. He must also be a person with artistic taste, possessing a fair amount of creative thinking ability, a lover of all that is new, a person who takes personal pleasure in and gets natural exhilaration from improvising a new gadget. Such qualities make the job of selecting a new prospective designer a very important one.

Picking the suitable person is only halfway to reaching the goal because it is essential to create for him a healthy atmosphere and the correct environment in which he, with all his peculiarities both artistic and industrial, can thrive, live and prosper.

It is the main objective of this paper to dwell, rather lengthily, on matters which, in spite of being essential, might be considered by some of the best learned and responsible people in the developing countries as unnecessary and irrelevant, especially at the early stages of industrialization. Psychologically, this is understandable. We are only human, and when the problem is so complicated and difficult we are naturally inclined to throw it to the back of our minds. Such action gives us a temporary but unfortunately a false relief.

It is earnestly and sincerely wished that every responsible man in the developing countries would reflect

and reconsider. We must not expect well-founded and experienced advice from the developed countries, because the industrialists there do not feel the same situation. They were more fortunate in having had the opportunity of a gradual acceptance of design and its importance, in the course of their gradually progressing industry. The younger developing nations cannot afford the luxury of gradual industrialization. They have a national psychological problem to deal with and to satisfy. They are driven by the earnestness of their country-men to produce rapidly and cheaply, while design work is slow and expensive.

In the meantime, they themselves feel it is their duty to make up for lost time and thus they find themselves between "the devil on the deep blue sea". And unless they start early enough to develop their design and designers, they are liable, in their eagerness for reaching the top rapidly, to expect too much from them and to blame them if they do not get the correct response rapidly.

For this reason, and considering all points and facts touched upon in my general introduction, it is to be stressed that the procedures, ways and means which have been and are being practised in the developed

countries should not be taken and [illegible] just as they are in the developing countries. They must be altered, trimmed, [illegible] and [illegible] to the state that exists in each developing nation.

At this [illegible] that was once mentioned in an article by [illegible] Professor [illegible] Hoselitz of Indiana University [illegible] of the Academy of [illegible] under the title "Organizational Transfer and Class Structure" [illegible]

"Nations [illegible] developed countries often [illegible] realize that much of the developed country's class structure, behavior and attitudes are often [illegible] into its technology. Thus, [illegible] may be obtaining more than it [illegible] for in such technological borrowing."

Then the article went on to state further :

"In spite of considerable efforts to borrow such techniques [illegible] in other countries in the minimum possible time, it is usually true that such transfers result in less efficient production in the borrowing countries than in the giving countries. [illegible] the equipment that proved quite productive at home operate at low levels of efficiency abroad."

Summarising the contents of the introduction, the following could be stated:

1. Design is an essential factor for balanced and lasting industry.

2. The problem of developing design is not an easy one, and [illegible] is required to bring it to a successful solution.

3. Before attempting [illegible] design, the procedure of building [illegible] and design-teams must be [illegible], [illegible] effort must be spared to prepare to the [illegible] which will bring [illegible] institutes and ensure lasting progress.

4. Design development and designer's training and build-up must start, at least, with the initiation of an industry and not be left to a later date; the earlier this matter is taken up, the better it is for the industry of the developing nation.

CHAPTER II

Types of Design in Industry

When we mention the word design we must reflect and dwell a little on what we actually mean and what we are [illegible] well and orderly constituted field of design. The problem might be to design industrial equipment to be part of a factory or an industrial enterprise. On the other hand, it might be the design of a standard or special purpose machine tool. It might be neither case, but rather the problem of designing an engine or part of one, or a prime mover for a certain job, which in turn [illegible] differs widely from the two cases just mentioned. It might be the design of a household item or of a consumable article that will be used by the housewife.

Every one of the above, which are only a few examples of many others, is a problem of engineering design if we use the term in its generalised sense. But each of these problems requires a special technique which can differ widely from the other, so if we aim at developing design capabilities in developing countries, we must first define what line or lines of design we are

to follow. The design of a motor car, for example, falls into two main categories, viz., car body design and car engine design, and they are both completely different. They still differ from the design of a machine tool, and so on. All that I have mentioned here are in fact problems whose solutions have been earnestly requested and actually attempted by the people of the developing nations in an effort to go ahead with their industrialization plans. It must be the paramount duty therefore of the person seeking the development of design in any of these countries, to begin by making a survey of requirements and to set a programme of priorities to define and limit the scope and make the going easier and more feasible.

It will be, without doubt, an absolute waste of time and good effort to indulge in too many trends within that wide field. We are not suggesting that the country would follow only one trend, but it would be best to consider only a defined few at one time. Before deciding on these few, the possible future demands must be considered, through the analytical study of the survey, and the choice made from the most probable.

The point might then be argued, why not let various

concerns follow up the various lines of design at the same time? But with a slight reference back to my introduction, and with consideration given to the difficulties encountered in the process of choosing and building up designers, it is, in our opinion, more satisfactory to concentrate efforts of the first few designers, in one or two centralised concerns, in order to be sure of attaining success, and only then to spread out in as many fields as seem necessary. The directive for the choice of these new fields would be the result of failures or successes that may be met with during the first trial. This is a personal opinion arrived at from actual experience, which calls for debate and consideration.

In the meantime, for every line of design of these mentioned above, there are two main aspects with regard to the types of design needed for any of them. One of these aspects is purely industrial, while the other is physical and embodies all the various aspects which might be mechanical, electrical, electronical, pneumatic, etc... So if we consider these latter aspects, and for the sake of simplicity, phrase this type of design as "The General Engineering Design", we would have two basic types of design to deal with :-

a- Industrial design or as it is termed sometimes product design.

b- General engineering design.

Although these two types of design are inseparable, they can be clearly differentiated by the nature of the work involved in each of them. In fact the difference in nature between these two types resembles the difference in nature between the work of an architect and that of a civil engineer in the field of construction work. We could safely call the industrial designer 'the architect of the present mechanical age', who deals with the overall shape, suitability, attractiveness and utility of the item to be designed, while the engineer designer is the designer who could basically fix the dimensional articulation and sets up the main lines of procedure for its execution and mechanical performance.

Both classes of designers have to endeavour to produce the article - whether it be a machine, equipment or commodity - in the most economical and acceptable form for the consumer's desired satisfaction. Thus both are essential and complementary for any successful industry. Otherwise it will be lame and unable to stand on its own legs always depending on others.

The realisation of the benefits gained from the

above-referred-to differentiation between the two types of design and designers is a fairly recent trend. It has been widely adopted in the developed countries since the Second World War. In fact, it dates back to the year 1919 when it was first started at the "BAUHAUS" school in East Germany. Later, and especially after 1945, it was taken up by the United States of America, then by Japan, France and England. At the latter, a council for Industrial Design was formed. This council founded the Industrial design centre which had a pronounced repercussion on the British industry. The British council and all other industrial design centres in developed countries have regular issues of magazines that give the latest ideas in this respect.

Accordingly, this trend must be well taken in and considered by the developing countries if they are to sustain any glimmer of competition or sale on a world market, or even if they want to maintain a good acceptable existence in their own free market against similar imported goods; because no matter what measures governments might take in applying customs barriers, human nature and the love of something better is bound to take the upper hand in the end.

Obviously this is a present-day must in industrial

circles, and accordingly the developing countries should look after both types of design and designers, to sustain a healthy industrial existence.

The industrial designer should naturally be conversant in art, human body behavior, time and motion study, tastes, market inclinations and all that is needed for good styling. In order that the industrial designer be capable of performing the design proportionally and correctly, he must have a good background of general engineering design requirements and procedures. His job will be basically to produce a salable idea; as one very well-known industrial designer once told me "our basic duty is to sell the idea".

The other designer, who must be more conversant in stresses, strains and strength requirements, besides having a knowledge of technology of production and mechanical performance, must also have a fair background knowledge of industrial design in order to be capable of understanding and falling in with the ideas of his partner designer. So it is clear that both designers must work together to produce an article worth considering.

If the job is left to the engineering designer alone, it is more likely that it will come out ugly and awkward in spite of being satisfactory from the mechanical and

physical point of view.

Examples of the repercussions felt from the introduction of industrial design in the industrially advanced nations are numerous. [illegible] here consideration of the old and new products, from, for example, the United States of America, Japan and Germany etc., our statement can easily be proved. We have the old and the new locomotives, the old and new cars, household equipment, television, radios and so on. The fascinating modern articles compared with the old cumbersome ones are living proof of the advantages of the specialization suggested.

For this reason, to develop design in any industry successfully, both aspects of design must be given equal care; otherwise the developing nations will always lag behind with the tendency of a widening gap rather than of a narrowing one.

The benefits of having both types of indigenous designers are clearly manifested in the following :

a- With regard to tastes, habits, natural likings and suitability to local environment, the industrial designer from within the country could be the only answer. No outsider, regardless of his degree of

study, could express those points explicitly in a produced article, as the national industrial designer.

b- With regard to full utilization of the raw materials in the country, collaboration of both designers could attain the best means of effective results.

Nevertheless, the experience and knowledge of foreign experts must be sought, at least at the start, in the majority of cases; but it is the spirit, the skill and the instinct of the national designer that will finally satisfy and succeed in attaining the highest percentage of achievement. This in itself constitutes the most solid foundation for a healthy and well-established economic development.

It is more than likely that we would find academic centers and institutes for the teaching of general engineering design in the majority of the developing countries. But it is hardly probable at this stage, that we would find any thought or idea about centers for the development of industrial design.

UNIDO would do well to encourage, at least, at these early stages, regional institutes for industrial design -

either by establishing new ones, or by developing the existing few to make them suitable for regional demands.

Advice should also be given to the governments of the developing countries to supplement the existing courses of engineering design by suitable introductory courses on industrial design for the students of engineering.

Summarizing the points mentioned in Chapter II, the following becomes clear :

1. Development of design should be carried out in a central concern or concerns and not be tried out widely at first, due to its very complex nature and the difficulty of building up design staff properly. The spreading out could be effected later according to priorities, and can go on progressively with the increase in the number of designers and design staff.

2. The two basic types of design viz :

   a- Industrial Design.

   b- General Engineering Design.

   should be given equal thought. Both must be simultaneously developed, and institutes or centers for teaching both must be established, either independently or otherwise.

CHAPTER III

Procedures for Promoting Design and its Staff In Industrially Developing Nations.

In our attempts so far we have endeavored to bring to light the distinct and marked difference between the efforts needed to develop an ordinary known subject and those needed to develop a speciality which is difficult to attain besides being less widely known. Strangely enough, design is somehow taken for granted and never given the thought it deserves by the ordinary individual. For this reason, in this chapter every possible suggestion or procedure which in our opinion may reflect or encourage the progress of design and the building up of the staff required for it, shall be analysed. We have specifically mentioned here the expression "Design Staff" because when we talk about design we must consider all the personnel that will be involved in its production, from the assistant draughtsman to the designer, in other words, all the members of the team required for design purposes.

It is earnestly hoped that many suggestions other than those shown here will emerge from the study given in this paper.

The more such suggestions are made, the nearer we will be to reaching our goal. Incentives for the staff of design is one of the foremost suggestions we can think of. We feel it is essential to work out a system to enable responsible people to give their design staff certain rewards for their work; because unless some solid incentives - however small - are put forth in that respect and set before the young engineer to encourage him to continue on this difficult path, any hopes for the development of such a speciality are meagre indeed. This is particularly so in the atmosphere that generally exists in the developing countries where many other jobs are available to the young man, with the same pay, and entail much less effort in thinking and working.

During the primary stages of the industrialization of the developing nations, when the feelings are aflame with the enthusiasm of quick success, design, being naturally slow, stands a very slender chance of becoming popular. It is very important indeed that some other formulae be worked out to compensate for this fact. It is well realised that it is a very easy matter to talk about and enumerate incentives, but it is a completely

different matter to put such proposals into action, especially if you want them wholeheartedly accepted and knitted-in with the multitude of common rules, laws and regulations. It must be remembered that all these latter are tools being applied by the people responsible for the administration, who know little about design and are not likely to learn much about it. They have every excuse for resenting such exceptions for people who are to their thinking not producing showy presentations in the grand march common with the period of infancy in industrialization. What has been mentioned is not intended as criticism nor to place blame on anyone. It has been clarified only to present a correct and honest picture of natural human reaction, and events as they occur; this attitude, in fact, can only be the expected outcome in a nation's life. Such a change is usually welcomed with great hopes and enthusiasm, and every human being will only be looking forward to luminous results and big achievements, in spite of the fact that some might only be superficial.

Thus when we remember that design is a speciality that does not result in immediate glamour or show, we can then visualise the difficulties that will be encountered in procuring general conviction and agreement which would accord that class of people any exception to the general rule.

It is this obstacle that must be surmounted, and any solid suggestion which could help solve it would certainly lead to great achievements in that area.

It is hoped that we have not built up a black picture of the situation, but we are attempting to bring out its sombre reality, which we have been faced with, in actual experience.

Also we are putting forth the following suggestions for the two main bodies concerned with the subject in question, which are :-

a- The Governments of the developing nations.

b- UNIDO and all the agencies collaborating with it.

And we would like to state that unless united and amalgamated action is simultaneously taken by both, the result hoped for may be very difficult to attain. The Governments should, as a first step, stress the teaching of design with its appropriate levels in all its engineering colleges and high schools. It should also advise reconsideration of current syllabuses. New courses with all their inter-relation to other subjects should be redrawn with the aim of better preparing students and undergraduates to face the era of industrialization the country is going

through. To our thinking, such a course could be set correctly through mutual cooperation between educational authorities, industrialists and experts from UNIDO. This does not necessarily mean that a course set for one country would be suitable for another. Therefore, adjustment and alteration of the course must be effected to suit the country and its environment.

In every case, design with all its types, which has been clearly indicated in Chapter II, should be maintained and considered as an individual educational subject in spite of its close inter-connection and relation with the other courses given. It must be presented to the student as the outstanding link between the various subjects taught in the colleges or schools. The student must be clearly shown that the basic outcome of his studies is to be able to produce good, correctly designed objects, and that this is the crux of his education. Some people might query such a statement but, with deep reflection over the whole subject, we find that in all our educational procedures, we aim to advance our products. This means improving their shapes, their usefulness, their price and their utility factors, all of which rely on better and improved designs.

An attempt to incorporate design into the various taught subjects in the colleges has been made in some engineering colleges. The view put forth at the time was that, by adopting such a system - due to the close inter-connection between theory and its application, which ultimately comes out in the designed item - the lecturer would be able to go deeper into his subject matter. In the meantime it was thought that this system might make it easier for the student to tie ends together, a difficulty which confronts the majority of students during their time of undergraduate studies.

Unfortunately, that attempt has failed. It has, in fact, weakened the whole concept of the undergraduate with regard to the science of design.

With properly matched courses and normal directive from the community of professors and education staff, the correct perspective could easily be acquired by the student of average mentality.

Furthermore, so far as it is known to us, higher design studies are not common in the universities of the developing countries. The knowledge of design acquired by an undergraduate can, at this stage of his learning,

enable him to digest only a general phase of this science. A comprehension of the real and deep facts needs a much longer period than the relatively short duration of his studies. This is not a surprising fact, because it is just like the medical profession, the person has to deal with the unknown and has to depend on his imaginative thinking to diagnose the illness and propose the cures. For this reason the duration of study for medicine represents a longer period than that of all other specialities. This is a fact that should also be considered in the case of design studies. Moreover, a medical student must go through a period of practical training before being termed a Doctor; similarly a designer must go through the same type of period before we are able to depend on him in design matters and call him a designer. Those who want to make design as their career must have higher courses in design. The governments of the developing nations should have this fact presented to them clearly. In this case, the suggestion regarding incentives might then fall on a better listening ear.

What has been presented above is an opinion based on experience of cases where, in many, if not in the majority of instances, during a long connection with

design problems in and out of colleges, the writer has sensed the haziness in the minds of the young at the start of their career in this field, which was evidence of a state of undigested knowledge. Happily, there have been some brilliant cases emerging from the undergraduate body but this was only after few years of practical work. Such cases occurred among those who happened to have the chance to be in that particular field, and these few cases are far from being sufficient to support the industry with its voracious appetite for good designers.

For this reason, higher courses in that field are imperative in the developing countries where the opportunities for the quick gain of the practical side are limited. These higher courses must be given in the form of a mixture of theory and practical application.

So when UNIDO embarks on the subject of developing design in a country, it is clear that investigating into the field of design education in that country is to be recommended. In such a way UNIDO's efforts could then be established on solid ground and could be treated in the way best suited to its nature, in a way similar to that of our studies on "Soil Mechanics", before putting up the foundation of any worthwhile construction.

A further point is to be stressed here in connection with the procedure of teaching design in developing

countries, where the majority of students are more likely to be from the farming community where the industrial smoky atmosphere is on the whole missing. It has always been felt necessary in this school to provide a special-purpose 'Design Laboratory', in which the intricate points so vital to good construction of any machine element can be illustrated and exhibited to the student. The student would then be given the chance to touch and feel all these constructional details, where he now learns about them only through explanation which is very frequently forgotten. Moreover at such laboratory he could see for himself examples of bad construction of a machine element as it is placed side-by-side with a correctly constructed one.

Such laboratories are not needed in an industrially advanced country, and to the knowledge of the writer they are not in existence. The reason is that the opportunities for the multitude of youngsters to secure apprenticeships in industrial concerns are great in these countries and the need for such laboratories are not felt.

The writer is encouraged to stress such a point from the results of his personal experience during his design-teaching career. A marked advance in the creative capability and imagination of the students have resulted after few short

visits to a very modestly prepared laboratory for design purposes.

The establishment of such "Design Laboratories", and the process of equipping them with the suitable, specially-made parts, should be one of the primary concerns of UNIDO in countries intending to embark on the development of design.

In fact, the suggestion might be put forward that a special unit, or division, or whatever is considered appropriate should be completely specialised for the promotion of design, through all its progressive stages, within the framework of UNIDO administration.

Such a suggestion is made, because the details and requirements involved in the design development process is so vast, and complicated and only by devoting a whole time effort, the multitude of these points could be harnessed successfully.

So far we have recommended the creation of incentives for the design staff without giving any example or going into the details of forms in which it could be provided. Incentives could be in the form of giving the designing staff more opportunities for being sent out on missions to other industrially advanced countries. Such missions could either be for practical training or to gain more scientific knowledge or for both. It can take the shape

of special promotions, better payment, yearly or half-yearly bonus. It can even be in the form of shorter working hours, shorter daysweek, better transport and office facilities, special working breaks with some sort of provisions, etc...

A good list of possible incentives could be worked out by UNIDO's experts and proposed for the governments concerned to choose from.

In discussing higher status of knowledge we suggested the introduction of advanced studies for college graduates. Other means for up-grading the knowledge of design staff who have no college qualification must also be provided.

In our opinion, design institutes, whether they are countrywise or regional, could satisfy that dual purpose. They could either carry out the training and up-grading the knowledge of design staff of all industrial concerns beside following up their basic aim of promoting applied research connected with design matters.

Without serious efforts in the research field no profession, these days, could expect to thrive successfully.

If the training could not be carried out within the campus of the institute, it should be effected elsewhere

under her guidance, supervision and follow-up.

Moreover, the institutes can also embody within their boundaries a specially built-up workshops for proofing the new ideas.

Again, this might not appear usual to the experts coming from advanced countries where the proto-types are produced and tried out within the factories themselves. But we must always remember that, what a well established firm in an advanced community could do, a young and freshly set up firm in a newly advancing industry cannot easily carry out, particularly during the first ten to fifteen years of its life'.

Thus one of the most important fields where U.NIDO could render its assistance is by establishing such institutes, whose work and knowledge could be enriched by exchange of experiences, ideas and information with similar institutes in other developed countries and by cooperation with the regional ones.

Dwelling on the subject of proto-type production centres, we would like to high-light the important role it plays in building up designer's capability. It gives him the confidence in himself, he will also see where

he has committed practical errors. With no centre available at the disposal of designers a proto-type for any design can never be tried out successfully. No one can expect [illegible] design will be tendered for successfully [illegible] establishment, especially where young designers are concerned and the prospects for alterations anticipated. It can be stated that, [illegible] actual experiences in developing countries, there is no satisfactory way of executing [illegible] the absence of a centre. The lack of freedom to try out new ideas to carry out alterations and to [illegible] destruction without questionable financial explanation and embarrassment are all big obstacles in the way of progress of young designers in a freshly industrialising community.

It might look so simple for a large firm to try out its own new designs, but it is formidable for a designer in a young developing nation, especially where controlled economy exists, to try out his new designs. He will be fighting shy of the outcome of discrepancies and mistakes he might have made in his own endeavour.

There remains one debatable point with regard to the advantage or otherwise, that could be gained by concentrating the help of UNIDO on creating specialised proto-type production nuclei within [illegible] existing

factories in the developing nations.

In our opinion, this last mentioned system would not have the same national repercussion on the industry of the country as a whole. The proto-type production centres would certainly avoid repetitive efforts and trials and the experience gained during one job could be made use of in other work. Besides the distribution of UNIDO's effort in so many projects can create many administrative complications.

The national proto-type production centres could be established either independently as a self-sustained centre directly connected with the industry of the country, or as a part-of or affiliated-to, a design institute. The slight draw-back of the latter suggestion is that it would then be more inclined towards the academic side rather than to the purely practical side for which it has been basically created.

However, the choice of the status for the proto-type production centre, would better be left to the developing countries themselves after indicating to them the pros and cons of each system.

All the above discussions should not defer the necessity of advising and encouraging the various industrial establishments to set design offices within their premises and to urge them to build up small team of designers who

could be specialised in the design of equipment frequently wanted by them and which would naturally be of the particular nature that is demanded by their work. They could then leave the design of the more common, utilised and frequently met with items, to the national design proto-type centre, thus avoiding repetition, duplication and loss of valuable effort.

To begin the formation of factory teams the individual concerns could call on the design institutes to provide them by a minimum number of personnel to act as a nucleus for their office. Such a measure will always maintain the good looked-for link of co-operation between these individual offices and the mother institute.

The result of such coordination will spell economy, avoid duplication of efforts in design work and minimise faults and errors while carrying out developments. In many instruments designed on assembly which appears frequently in industrial enterprises such as conveyors, transporters, etc... could be exchanged, thus saving a great deal of trouble and expense.

Summary

In short the points raised in this chapter as suggestions could be summarized in the following :

1. Incentives to encourage designers must be well considered. They constitute the most essential step in design development.

2. Educational systems with regards to design must be studied and redrawn to suit the demands of industrialization in the country.

3. Design institutes are positive tools for promoting design by training design staff, carrying out or conducting applied research essential for the development of industry.

4. Design laboratories incorporated in colleges and/or training centres with specially prepared visual aids, can be an effective substitute to the industrial atmosphere which is generally lacking in developing countries.

5. The establishment of small design and drawing offices in factories, is essential and must be encouraged by UNIDO as well as by the governments of the developing nations.

6. Proto-type production centres are very essential for a developing community. They could be established as general purpose industrial units or as specialised units in factories.

7. Establishment of regional design institutes are very important due to the several advantages that could be gained from their existence.

CHAPTER IV

Information Centres for Design Purposes

It goes without saying that local designers shall be setting out their designs to suit, in the majority of cases, local capabilities of production. For this reason full information with regards to local available capabilities whether it is dealing with specialised men, machines or material in the country should be made readily available to them. If all information could not be compiled in a handy form, some sort of reference and cross-indexing should be improvised which must be made accessible to any member of any design team in the country.

The above information should be published in a loose-leaf arrangement to make the addition of any up-to-date information easy and possible. It must be remembered that supplements and alterations shall always be added. Therefore a proper coding and listing system must be well planned beforehand. Lists of consumers for such pamphlets must be kept in the national central design body so that regular mailing to these customers could be carried out. Occasional visits of inspectors from the M.C.D.B. might

be a good practice to make sure that all information sent out is kept in a handy form. Otherwise such publications would lose their basic value. Such action is in fact a sort of a round-about general training for all which is very much needed in developing nations. It has become evident to us from actual experience that such a step is important and necessary.

It would naturally be more beneficial if the facilities of the neighbouring country or countries are also made available. In this case an international unified scheme of filing of such information is strongly recommended. UNIDO could play a very important role in that respect.

In fact without the above information a designer could not set up a feasible economical design. Such information according to our experience are not readily available in developing countries and as a matter of fact they are not easy to get. This is contrary to what might be existing in the developed countries where catalogues, production pamphlets and sale-information offices are easily accessible and eager to serve.

From experience gained in a developing country it was clear that a specialised office must be set to collect all such information, have it well indexed and regular

pamphlets of all what exists and what has been newly added compiled and published regularly.

It is to be admitted that such a task was too complicated to be carried out without the help of expertize opinion in that line. The help of UNIDO has been asked for. This is a point which I would like to stress once more, being an important corner which is very much in need of UNIDO's expert guidance.

At the early stages of industrialization in developing countries, there is usually too much eagerness for information. Accordingly repeated attempts to gather it are usually made by various sources in the country. This can result in the over-burdening of the industrial concerns with requests and with forms to fill and finally frustration. The outcome of such an avalanche of requests is that incorrectly studied information are usually given out which are very misleading and harmful.

If valuable constructive information is to be collected, other methods than forms must be attempted. A study for the best procedure to follow, which may vary from one country to another, should be first made before attempting to set up the offices concerned.

Again regional information offices can play a very big role in that direction. It enlarges the span of

information parameter needed for the designers.

A newly developing nation could be very well guided towards a better path for development if they got acquainted with the information from a neighbouring and perhaps a slightly more developed nation.

The regional and countrywise institutes for the development of design could also play a big part towards collecting and disseminating valuable information with regards capability of machining of large and heavy objects. Capabilities of existing technicians, certain historical information about exceptionally complicated jobs are very valuable information to acquire. We do not mean here that information should only be concerned with machining capabilities but it could include methods of handling, welding, pressing, forging etc... In fact the institutes could embody within their campus, a section to help newly founded industries in issuing a knowledgeable catalogue and industrial information similar to those frequently circulated in the developed nations. The graduates of the industrial design colleges are best suited to carry out such tasks due to the high degree of artistic background needed for such work.

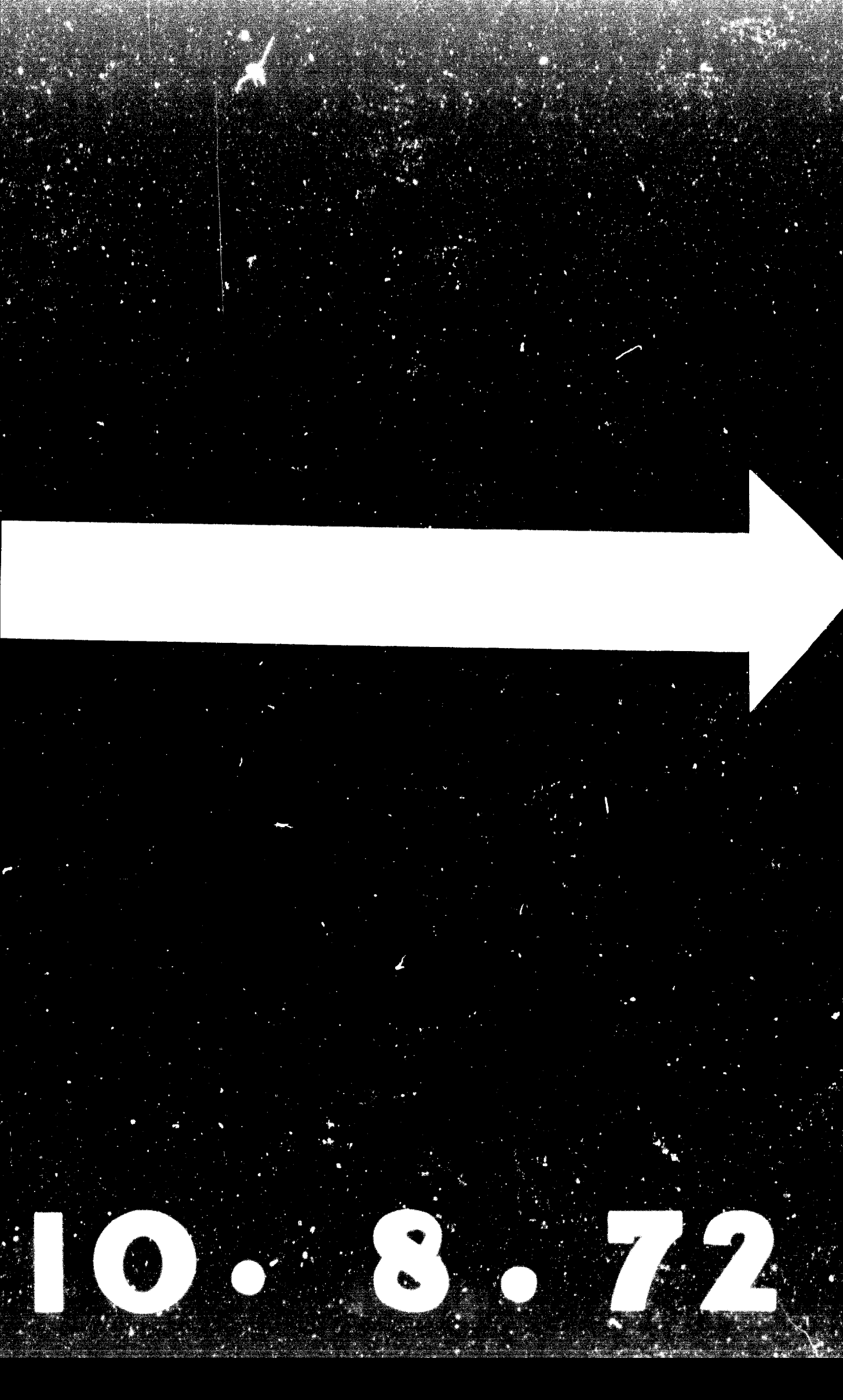
It is thus strongly recommended that engineering, industrial and productional information should be well

harnessed, cross-indexed, regularly published and made very easily available to designers.

It must also be remembered that the mere act of exchaning information, whether it is between the industrial concerns themselves or between them and the design teams, tends to create an atmosphere of friendliness and family-like feeling between all concerned. It also opens up possibilities of getting information about correct sources of know-hows. The economical benefit of such procedure need not only be in the sphere of design but also in the industrial sphere as a whole. We must never expect that the atmosphere of design could ever be divorced from the general industrial field.

With regards to the extent to which such information could extend, it is well to mention that the benefits will undoubtedly be far more reaching if it embodies recent trends of design matters in developed nations. But we must give a warning here about the type of information required for the purpose of design, as it must never be confused with other types of general information needed for the study of projects. The latter presents a completely different field.

The design information centres must guard against indulging in a multitude of types of information which is liable to make them miss their basic target.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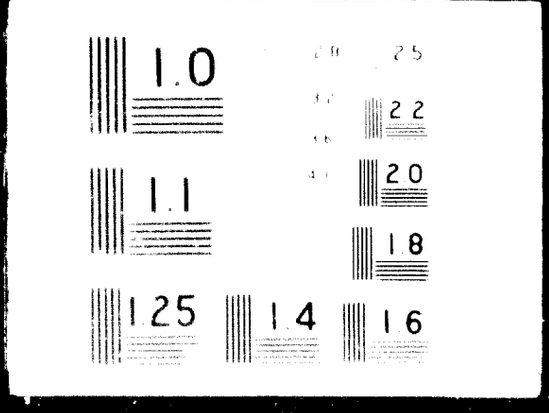

S U M M A R Y

Summarising the [illegible] in this Chapter, we have [illegible]

1. Design information [illegible] to give [illegible] industrial [illegible] the following

   a. [illegible]

   b. [illegible]

   c. [illegible] develop ment [illegible]

   All information [illegible] basically [illegible] requirements.

2. Information [illegible] constant [illegible] institutes and [illegible] if exist

3. [illegible] these centres [illegible] in such a manner that [illegible] by designers [illegible] be regularly looked into to see that [illegible] order.

4. The [illegible] benefits of such centres are [illegible]

Chapter V

Effects of Design on Industry

If we try to enumerate all the possible effects design and its development can have on the industry and welfare of the nation, we shall find ourselves indulged in a most exhaustive study. This is simply because the effects are so numerous and diversified.

For this reason we feel it is quite sufficient in this paper to dwell only on the basic effects and their repercussion on the economy of the country and to give some illustrative examples whenever possible. We shall attempt to classify the trends in development into two main categories according to the nature of their effects.

The first is the kind which could give speedy results and could be felt by the majority. Its effect could be noticed after a short period from their introduction.

The second may have obscure results at the beginning of its introduction, but will have a pronounced economical effect at later stages. Its successful introduction requires research, study and experimentation.

However, both types of developments are advantageous and both should be considered by the developing nation simultaneously.

It is the duty of the governments of developing nations to see that two specialised teams are created to deal with both classes.

Also it is proposed that either the design institutes or the national design organisation would be advised to set for themselves two basic programmes for work. One would be called "The Short Term Policy for Design Development", while the other could be called "The Long Term Design Development Policy".

The short term policy team would set forth a programme to deal with designs which give quick effects. The type that could be felt by the majority of the public. The long term policy team will have to set a long term plan that aims at self-reliance in the field of raw materials and accordingly would improvise and carry out alternative designs adopting indigenous or abundantly available materials in place of the special materials originally used. They have to try and test these new designs and continue that sort of research till a satisfactory alternative designs are arrived at. In the

time they should demand and encourage [illegible] the exploration of the mineral wealth [illegible] the country [illegible] direct [illegible] design. They should [illegible] the [illegible] between the various [illegible] the full [illegible] design by the [illegible] materials.

[illegible] trends it is [illegible] of designs in the [illegible] existing in all [illegible] results [illegible] and increasing the [illegible] produce depth of [illegible] to the [illegible] existing. In the [illegible], [illegible] and gadgets, [illegible] building could [illegible] use of the [illegible] industry of the country.

Such [illegible] immediately increase the [illegible] it [illegible] such [illegible] ents are [illegible] country of

the writer, where the man uses his hammer and chisel for inlaying copper or mother of pearl, a little electric or pneumatic hand held percussion tool could increase his production several folds. The forging of soft metal dishes and household-ware, or glass-ware would be quickly done by hand operated power presses. All such equipments, if designed for cheap production, would certainly create a boom to those districts which constitute a basic attraction for tourism. I mention here, for example, the place called Khan El Khalily in Cairo.

These special tools and gadgets must be made in abundance and cheaply so that they would be easily available for whoever wants them. They should even be given out on the instalment system to the small and private industrialists with the help of the government of the country or the industrial unions or industrial co-operatives as may exist.

The introduction of such tools and the creation of new design ideas would certainly turn those districts, mentioned before, into places of continuous attraction not only for tourists but also for the inhabitants of the country itself.

Development of new designs will tend to kill the air of stagnation that drive the inhabitants of the country away from these places.

On the other hand, if we consider cottage industries with its deviating fields, new geometry designs could easily lead to its flourish.

To name only few examples, hand-woven materials have and shall always possess their special charm and if this is substantiated by new designs and ideas it will naturally open up new horizon for those working in that field. What more a country with increasing population and little wealth could wish for. Leather goods could also be another vast field to explore.

All such industries, with the powerful push of goods and newly created designs, would have a profound effect on utilizing the natural resources of the country including its human power to the utmost possible degree.

In our discussions we are not proposing the introduction of highly mechanised methods, we are only explaining the significance of introducing indigenous designers. Because only this type of designers could introduce substantial development on local industries without prejudice to the integrity of the national trends and shapes which are the actual source of attraction for tourism and collectors of unique products.

On the other hand, new designs could influence the promotion of small scale industry to a great extent.

At present the private intrepreneur who, in most of the developing countries, depends completely on his ingenuity will be able to find local designers who can advise him advantageously. These designers could enrich his knowledge of improvisation and would help to shift him from his dismal, miserable dark limited existence to a brighter and more technically advised atmosphere.

If the design institutes or the proto-type production centres, whichever is existing in the country, would establish show rooms for exhibiting the new ideas and designs and make these ideas available for the industrialists at a fairly reasonable acceptable rates, both the private entrepreneur and the private thinker or inventer or designer in a developing country would then find the most suitable, long-waited-for place to go-to for advice and help

The help that could be given could either be technical or financial or both. It might even take the shape of merely putting him on the right track to find the interested concern that would welcome his idea and make use of it for production purposes.

Such show-rooms or permanent exhibitions could be turned into in their turn a design development centre that could look after the work of every good creative thinker in the line of [illegible] country. It could follow up all the necessary legal steps to provide security and protection for every individual or concern that comes forward to them with a new idea or a design.

Patenting, of the raw metal, styles or shapes especially in the industrial design field is still in its infancy in the world. A lot of harm has been done to good industrial designers and designs through the lack of such safeguards. An international concern in Geneva called

BUREAU INTERNATIONAL REUNIS POUR LA PROTECTION DE LA PROPRIETE INTELLECTUELLE GENEVE, SUISSE.

<u>OR</u>

i.e. UNITED INTERNATIONAL BUREAUX FOR THE PROTECTION OF INTELLECTUAL PROPERTY GENEVA, SWITZERLAND.

has been formed to act as the secretariat of two principal intergovernmental unions for the protection of industrial property :-

(a) Paris Convention of 1883; for the protection of literary and artistic works.

(b) Berne Convention of 1886.

Lately [illegible] diplomatic [illegible] at Stockholm adopted a Convention establishing the World Intellectual Property Organization which [illegible] will be a continuation of BIRPI.

Strictly speaking though BIRPI has more than 80 years general experience, the matter of intellectual property protection is fairly new.

Design developing offices could collaborate with BIRPI and the two could provide protection for the new ideas within and without the country a matter which would naturally encourage designers who are [illegible] to go ahead with their efforts thus enriching the industry.

At present a man with a new design idea is simply lost. He is compelled to rush forward to any capital at or industrialists with his idea lest it is stolen from him and he would not be able to demand compensation. On the other hand, if he goes also at to government concerns he would not get the attendance he is hoping for. This is due to the fact that there is no specialised concern to attend to him who is capable of rewarding him.

Thus a man with a good and perhaps a very useful idea could get absolutely frustrated over presenting it to government or industrial quarters.

The writer in his capacity as a Director General for the only Industrial Design Administration in his country has found it exceedingly difficult to reward effectively the people that came to him with new ideas. The cases where certain compensations were successfully given to the inventor represent only a very small percentage and the rewards finally sanctioned were far from being satisfactory. On the other hand, very little use has been made of the new ideas that were rewarded.

All these difficulties are due to the newness of the whole subject matter in the developing countries. Thus it is strongly recommended that a thorough investigation of this problem should take place and a list of alternative proposals recommended for the governments of the developing countries. Such action would be a further step towards the encouragement and development of designs.

So far our discussions were more directed to actions affecting the small and private concerns. But we must not forget the effects of better design capabilities of large industrial establishments.

If we take for example, the special tools, jigs and fixture which are very essential for the mass production system, it is clear that without the local capabilities for their design, it would be very costly and difficult to find the concern in the developed country who would be willing to render service in that direction. As the matter stands, specialised designers are even short in these latter countries. One of the difficulties that large industrial concerns, at least in the developing country at the outset, have to find the way to replace and/or repair the worn-out special tools, which have been supplied when the factory was new. This is a common complaint which is usually felt few years after the factory has been put into service. It goes without saying, that the [illegible], quantitatively or quantitatively, could [illegible] without adequate tools and production facilities. Unless some source of supply for these equipments is available within the country, its [illegible] production shall always be hampered. Thus without indigenous capabilities in the design of these special tools and their production, the industry of the country will not be stabilised, it will always be faced with the necessity to compromise on the account of the size of production and its quality.

the design of the various parts. So long as designs are not made locally the fulfilment of such an aim could not be attained. And even after local designs [illegible] effectively take place [illegible] and behaviours of these [illegible] obtained. Experiments, research [illegible] have to be carried out on all designs [illegible] and correlation tables have to be [illegible] son between [illegible] being readily employed [illegible] application. Until that stage is reached [illegible] designers would not find it easy to use indigenous materials.

Such a [illegible] team work which can only be achieved by [illegible] research and experimentation both of which could be encouraged by the design institutes in collaboration with the specialised organisations, universities and research institutes. Regional design institutes could also play a much larger and wider role in that direction because they would be concerned with a group of countries and a wider range of raw materials, which would naturally provide better facilities for the designers.

In carrying out the work stated above a fair amount of experience has to be built up in the field

of pilot plant testing. Also in the design and manufacture of pilot plant equipments. Such a specialised job which is basic with raw material preparation must be carried out with the full cooperation of specialised sections in mineralogy and metallurgy.

The help of specialised U.N.I.D.O. experts is undoubtedly required in that respect. Such an achievement if successfully carried out would be a very effective step towards overcoming the hard currency problems required for raw materials in these countries, and would minimize it immensely. It would thus create one of the best supports for the stability of the industry in the developing nations. A living example of such a case has been made clear to the writer where the industry of a certain country was trying to stabilize itself and could not do so before a bold decision was taken by her responsible people to limit the imports of the raw materials and direct it to one capable source only. With all the possible pros and cons in such a decision, the results were astounding and the industry flourished.

Careful studies of the national capabilities of production and natural inclinations of the nationals in a given country have very close relation with design matters. In many incidents an article designed outside

the country could find a better marketing possibilities if its design is altered and transformed to make it more fitting for the habits and customs of the people. You could so often hear it mentioned in the various circles "such an article has the right thing that you want". Admit the new fascinating shapes have their on-the-spot reaction, but an article that goes deep in its specification and coincide with the natural instincts has a better and longer staying power.

Thus to be able to have within the country sufficient capabilities to reshape existing designs to suit the environments of the place is a great asset. Especially if such alteration could utilize the existing possibilities of production within its borders.

It is a very common thing in developing countries to find excessive machining capabilities which are not utilised. Such alteration and remodification of designs as stated above would have the double benefit of utilizing the unused capabilities beside giving the article a more lasting market trend. We must also remember that spares needed to maintain and repair various articles can then be made more readily available. It is well known that the spare-parts problem in developing countries

faces many difficulties such as :

a- Shortage of hard currency.

b- The difficulty of getting the right spares [illegible] of manufacture; [illegible] countries [illegible] standard and [illegible] on to things [illegible].

c- The [illegible] very uneconomical to carry a big stock of spares [illegible] intervals while it [illegible] find the required financial [illegible] the time when the spare is required, [illegible] results in a lengthy [illegible].

Again [illegible] reference should be made to another [illegible], not only on the subject of spare parts but on maintenance and repairs and [illegible] the spares.

If the capability of design is developed in the country, this difficulty could be averted to a great extent.

Before leaving the subject it is well to briefly mention the following :

The simpler the design the better it is for those working in the developing countries to control its quality.

Inspection methods will be easier especially with the acute shortage of technicians which is a common trouble during the transition period of the change from Agriculture to Industry.

Simpler designs do not demand elaborate machining procedures for their production and thus they are more fit for the simple machine tools that are abundantly existing. Sophisticated equipments are expensive to acquire, difficult to use by the average technicians, difficult to maintain and keep in good running order for a length of time. Thus they are not suitable for the developing nations at least at the first stages of industrialization.

Accordingly complicated designs that are prepared by designers who have at the back of their minds the availability to all these modern facilities, could not so easily be adopted in developing countries as they are. Even if you make all these points clear to those designers they are apt to misapprehend the exact situation and only indigenous designers could provide the solution.

Summarizing the various points mentioned in this Chapter we can state :

1. It is clear that design has a marked effect on the utilization of the country's natural resources whether it is raw material or human power.

2. Design has a profound effect on quality of production and its size.

3. Design capabilities within the country opens up the possibility of utilizing unused machining capabilities, commonly met with in developing countries.

4. Design from within helps to produce the articles as required by the nationals and thus it gives industry a more stable staying power.

5. It could remove the chronic ailment of shortage of special tools most needed for production.

5. It could provide some sort of a solution for the production of spare parts needed for all services in the country whether they are public services, agricultural or industrial and would certainly minimize the pressure on the limited amount of hard currency available during these first stages of development.

7. It provides stability for the industry of a country and thus favourably affect its general economy.

8. It would open up the road in front of the private entrepreneur, the creative thinker and the small scale industries as a whole through the organ of putting up show-rooms for new designs and provide patenting and security.

9. It could sustain a good hand-craft and village industries.

10. Design approaches for two basic categories have been proposed. Strict comprehensive programmes should be set to ensure successful results.

11. Design of equipment of pilot plants essentially needed for studying the characteristic of indigenous raw materials is an important step towards improving the economy of the country.

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CHAPTER IV

Proposed Procedure of Approach For Setting-up a Design Development Service

Practical experience has proved that introduction of design in developing countries requires a different parameter to that practised in the advanced nations.

The basic reason behind this statement is that, in the case of developing countries, it is impossible to establish, in a short space of time, what have taken years of gradual growth and progressive transformation within the industrially advanced nations.

With this thought in mind we must anticipate a multitude of set-backs, and we should not consider it possible to literally follow up the procedure practised in the advanced countries.

New ways and means must be improvised and an expert advice coming direct from a developed country is not expected to bring successful results unless it undergoes modifications and re-adjustments.

The underlying trouble is not only in overcoming the non-terming attitude that is common in the developing

countries but it is the very great [illegible] from the industrialists in accepting designs or suggestions made by the newly formed teams of design. This is only natural as nobody would like [illegible] risk [illegible] of something he is not sure of [illegible] industry is known to be very conservative.

Even if [illegible] the country succeeds in creating design teams by training [illegible] in a design centre, these teams will soon find themselves [illegible] with the lack of orders or requests for their services. For this reason a well set programme must be drawn for any design centre beforehand. This programme must be based on the principle that the centre shall be able to carry out several independent attempts of design problems, at least at the first stages, without having to wait for demands or orders from the existing industries.

To carry out such a proposal successfully the prototype production centres should be established with enough financial and administrative provisions to make them capable of producing locally made designs without waiting for orders from industry. The products thus designed could then be tried out and put into successful working condition before inviting the industrialists to see for themselves what have actually been achieved and we can

[illegible] recall the saying "Seeing is believing". If one [illegible] on the [illegible] at the beginning [illegible] welcome [illegible] be forthcoming from the industry [illegible] is doomed for [illegible] disappointment.

One of [illegible] discussion is [illegible] made us introduce this chapter with the idea to put it before India's experts for [illegible], operation and thought.

Another equally [illegible] is to advise the Governments concerned, [illegible] establishing a design centre or a design organisation [illegible] amongst the highest industrial concerns of the nation. It should be established as completely independent with full autonomy. It should be presided over by a high level Council for Design embodying [illegible] industrialists.

All these proposals [illegible] to make sure that the design concerns are given every chance of high level contacts with the industrial groups. These relations must be made administrative-wise otherwise they are apt to be neglected. The idea of attaching them to any existing industrial establishment would narrow the atmosphere of their activity and usefulness. It would limit their freedom of movement and would hinder possibilities of introducing the very necessary incentives required.

Generally, it will tend to put the whole concern in the second place of importance with the expected neglect and failure. Such [illegible] clash with any possible attraction and [illegible] for success.

It is thus suggested that the correct procedure of approach to design matters calls for a thorough pre-investigation by UNIDO's experts to study all these details, etc., on the spot. The pre-investigation should be well analysed and put forward clearly before the governments concerned. The basic sources of teaching of the element of design in all its stages should not be neglected as has been detailed before.

It is strongly recommended that, whenever UNIDO is contemplating the acceptance of giving assistance to establish a design centre or an institute, the experts for both engineering and industrial design should not be sent to the country before the complete setting up of the place and ensuring that the provision of its adequate personnel has been finalized. The usual hopes and promises given towards forming these bodies at later dates when the project is approved for UNIDO's assistance can hardly be depended upon.

It is a frequent event at these early stages of

industrialization that requests of personnel for other purposes are given preference thus depriving the design concerns; with their slow less showy results, from the vital number needed for their existence and progress.

In our opinion a skeleton formation of a design establishment would be at least composed of the following-

Board of directors
Director General
Production Manager
Inspection & Testing Department
Production workshop
Finance Manager
Show-room & Information office
Administration & Personnel Department
Finance & Budgeting
Industrial Design Unit
Research Director
Information Centre
Library & Documentation
Design Director
Drawing Office & Reproduction Unit
Special & Production Aids Design Unit
Product Design Unit
Factory Equipment Design Unit
Industrial Design Unit

S U M M A R Y

Summarizing the main points mentioned in this Chapter we have the following :-

1. A pre-investigation by [illegible]'s experts of the existing education status and the possibility of forming a design body in it must be carried out in detail. Analysis of the findings must be also discussed with government concerns before setting any activities in this respect.

2. It is proposed that no actual step towards setting up the project [illegible] by UNIDO before the completion of the design body required.

3. Design establishment should be formed as an independent body and considered by the country as one of the highest level industrial concerns.

4. A high national council [illegible] embodying important industrialists should preside over the project.

5. Self-contained work programmes for the centres should be set up with the basic principal, at the start, of not being dependent on direct demands and requests from the existing industry.

6. Actual proto-types of some items, related to existing industries, must be produced and placed before the industrialists before the centre can look forward for trade and of its services.

CHAPTER VII

Role of UNIDO

From the preceding discussions the role of UNIDO has been made quite clear. Basically, we feel that UNIDO's main aim, would be to assist in establishing industrial and engineering design national institutes and to enrich their work by establishing regional institutes which augment, encourage and help all these individual country ones.

Before embarking on any of the above ventures a thorough pre-investigation or a sort of feasibility study must be carried out. In this study all aspects leading to design matters that might be existing in the country have to be well assessed. Such knowledge should include all procedures existing commencing from the teaching of design in colleges and high schools to the ultimate stage of design plants wherever they may be; whether they are attached to industrial establishments or as private offices or as governmental departments. Such a study should also include a reasonable forecast for the possible number of personnel expected to be involved in any of the stages of design work. Bearing in mind that teams of design embody :

a) Tracers.

b) Draughtsmen or Detailers.

c) Draughtsman-designers or Calculators.

d) Designers, whether industrial or engineering.

e) Chief Designers.

Without the existence of all these elements in a balanced number, design teams could not be formed or function successfully.

Again the pre-studies should include a wide scanning of the fields of industry where design can have its pronounced effect whether these are in the handicraft, cottage, small scale, large scale industries or mass produced articles. The study should include a slight psychological touch of the readiness of the responsible people in the country regards encouraging this science and how important it appears to them.

All these matters should be thoroughly analysed by UNIDO experts to decide when and where the starting point for development of design should be.

A further point which we would like to stress at this stage, is that, for the improvement and propagation of design UNIDO has got to take the initiative in her

hand and go forward to advise the nations in that respect. They must not wait for the developing countries to submit requests in that direction. The reason for that is clear and throughout our report we have repeated again and again that the subject of design is generally not understood by the majority, not appreciated and simply forgotten and is not given the attendance it deserves.

Unless UNIDO's agents take an effective role in that direction at the very early stages of industrialization of the developing nation, the unique benefit of design shall not be realised except too late.

This is the reason why during our discussion we took the liberty to propose the creation of a specialised section within UNIDO's organization for this subject matter because it requires continuous probing, analysing and following up, all of which is to be carried out for a lengthy duration estimated at not less than ten years in the country concerned. Again this differs from other projects where three to five years duration could be considered sufficient.

Disappointments, set-backs and frustration of experts might be encountered but perseverance, patience and staying power are all very much needed in this respect.

The request for the assistance of UNIDO must be literally prepared by UNIDO's expert.

Pre-studies, pre-preparation for design establishment and all their auxiliaries such as proto-type production centres, industrial design show-rooms and design information centres, etc.. should be considered as pre-requisites for the studies to be made. Their nuclei must be set and manned before UNIDO sends her design experts to the country in question. The setting up of these nuclei have also to be done by the help of short-term experts of UNIDO or the special service type in collaboration with the various agencies.

SUMMARY

Summarizing the main points mentioned here the following could be expressed :

1. Feasibility studies and pre-investigation and short term help are all needed before design experts are sent over to the country.

2. Design promotion requires the initiative to come from UNIDO's agencies and not to expect requests to come forth from the nations. The earlier that step is taken the more beneficial it is for the industry of the country.

3. Length of UNIDO's assistance is anticipated to be for ten years and not three to five as it is commonly adopted with other projects.

4. The length and complicated nature of the subject encourages a proposal to be put forth for UNIDO to have a specialised section whole-heartedly enveloped in that field to initiate, assist, advise and follow-up its progress, analyse results and propose new methods of approach whenever an old method fails.

CHAPTER VIII

Other Aspects Necessary For Promoting Design Capabilities.

In this section we are referring to a subject that so far has not been mentioned in our previous discussions.

One of the biggest hinderances encountered by the people of the developing countries is the lack of good references for design matters written in their language. Only a minority of the nationals who claim to understand other languages than their mother-tongue could really understand the depth of meaning behind some of the expressions used in foreign languages. Even if the language is understood by them their lack of practice makes them utilise a big portion of their thinking efforts in mastering the language, and thus missing a good deal of what is intended as design matter. Solved examples of design-problems and design data are all a rarity to designers in developing countries. Thus one of the most appreciable help for designers is the formation of a big collection of references in their language.

This matter is brought about because the general trend of the people responsible for translation establishments

is directed towards [illegible] and manuscripts about the more commonly understood subjects. Thus a specialised study like our subject must be adopted by the concern that feels its importance.

Such translation could not be expected to form a materially profitable business. The only group that could consider its cultural and indirect profitability are the industrialists and those who are interested in the development and stability of industry.

Therefore U.I.D.C. has the choice of either attending to this matter herself or act as the medium to influence industrialists to see its importance and help in bringing it about successfully. On the other hand, U.I.D.C. could arouse the interest of the well-known translation establishments to follow this matter up with the suitable financial coverage.

Referring back to the help that could be given to design, we like to revert to the suggestion passed before, concerning the formation of "A High National Council of Design", it is in our profound opinion that such a council, if formed from mixed specialities in the country, could have that successful repercussion on the development of design and would act as the good counter-balance for

its obscurity. Thus it is strongly recommended that one of the pre-conditions UNIDO could put forth is her advice to the governments concerned to form such a council and to consider it as the first foundation stone to be placed in this respect.

On the other hand the industrially developed nations are generally reluctant to take expectant young designers from developing nations to train within their design offices. The reason for that might be that these latter offices are considered to contain the future ideas, which should be kept secret as long as possible.

This matter needs a special attention by UNIDO. A suitable compromising formula to overcome such difficulty must be worked out to avert the very disappointing feeling which faces young designers who are usually eager to see how design problems are being overcome and solved. If prolonged visits to these establishments could not be allowed, perhaps short visits with well arranged defined programmes could help in solving it without interfering with the developed nation's rights in keeping their own ideas secretly kept as long as they wish. An alternative procedure could be performed by inviting specialists from the well-known design concerns to give regular

seminars in the development centres to demonstrate and discuss the procedures adopted by their concerns with regard to solutions of design problems which their offices had faced. If UNIDO could successfully convince those concerns on such subject, it would give design development a positive push forward.

SUMMARY

Summarising the various points mentioned in this Chapter we have the following :-

1. The lack of technical references written in the language of the nationals of the developing nations is one of the obstacles to design development which should be removed. UNIDO could take an important role in overcoming this difficulty.

2. A high level national council for design if formed could act as a counter-balance against its obscurity and lack of short results. Its formation is recommended as one of the early steps to be taken up with the governments concerned.

3. Reluctance of design offices and concerns, in developed countries, with regards opening their doors for training young designers from developing countries should be considered and a compromising formula to be worked out to overcome such difficulty. UNIDO through the organs of the Institutes and seminars could do a lot towards making up for that.

CHAPTER 14

Conclusion

After going through the individual summaries given at the end of each chapter it can be clearly stated that :

Design forms an important supporting foundation stone for a well balanced progressive industry. In turn a stabilised industry is the straight road leading to a higher standard of living and a brighter future for the community. Thus it has a profound effect on the temperaments of its individuals and on the peaceful co-existence of all.

Design whether industrial or engineering is a subject that we could correctly describe as "Handle With Care". It needs lengthy incubation periods and must be given enough stimulating medias by practising the personal incentive tactics.

We have shown how big a role UNIDO could play in that respect. As a matter of fact we are confident that without the serious push of UNIDO in the way of

- Provision of experts.
- Establishment of Design Institutes Regional and otherwise.

..

- Assistance and guidance in forming the :

(a) Design information centres.

(b) Prote-type production centres.

(c) Show-rooms for new ideas and new designs.

(d) Design terms for pilot plants necessary for the utilisation of indigenous raw materials.

(e) Centres for the production of special tools, jigs and fixtures.

(f) The setting up of the top-most body termed "The High National Council of Design".

The subject of the development of design would not find the hoped-for higher road to success.

We end our report stating that design establishments should be convened as early as it is possible. In the case of newly developing countries it should be embodied in their first plan of industrialisation. Its organization should be placed amongst the highest level of industrial organizations in the country. It should be allowed freedom of movement and given the full autonomy for their work.

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