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ENGINEERING DESIGN CAPABILITIES  
IN TUNISIA <sup>1/</sup>

presented by

the secretariat of  
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## RESUME

- 1 - Role of the Engineering Design capabilities.
- 2 - Present situation in Tunisia related to the Engineering Design capabilities.
- 3 - Actual needs for creative capabilities in Engineering Design and branches of industry more interested in it, in Tunisia.
- 4 - Suggestions on ways and means for increasing Engineering Design capabilities in Tunisia.
- 5 - Organization of Design Development Centers.

1 - Role of the Engineering Design capabilities.

1.1 - Today, in the developing countries, industry is born out of a more or less natural compulsion which is almost exclusively based upon the foreign contribution of necessary technological knowledge. This method, which appears to be the only one possible at present, consequently brings about a more or less declared dependent linkage of the new industry to the "suppliers" of this knowledge, particularly in the field of interest to us, that of Engineering Design.

1.2 - In effect, the new industry always finds itself much more preoccupied with the problems of production than with all other things, which leads it into becoming disinterested in the problems of Engineering Design for want of means of solving them. Naturally, in this manner, the new industry will never acquire an autonomous capacity sufficient for permitting its independence.

1.3 - Only the development of Engineering Design capabilities can eliminate these links through the creation of

new products and new manufacturing methods capable of entering directly into competition on the market. It is thus to be seen that all industrial development is directly connected with Engineering Design capabilities, which is, moreover, perfectly recognized. "What can we do?" and "How can we do it?" are among the most common questions that international experts are asked during their missions. They very often indicate that available capital remains unused for lack of autonomous local Engineering Design capabilities.

Engineering Design thus assumes the function of a catalyst between the needs of the market and the availability of capital by the formation of new ideas and the manner of realizing them and leads to the launching of new activities with a multiplication of effects in all of the industrial domain.

## 2 - Present situation in Tunisia related to the Engineering Design capabilities.

2.1 - The problem of Engineering Design is not yet well

recognized in Tunisia since most of the existing industries are more or less closely connected with the industries of the more developed countries which supply them, or have supplied them in past years, with fundamental drawings of parts to be produced. This depends directly on the fact that Tunisian industries, particularly those of transformation, came into existence relatively recently and, in the best cases, do not count ten years since their creation. For this reason, at present, all the Tunisian industries of transformation as yet either handle assembling only or work on products or drawings imported from abroad. Consequently, no industry has at yet needed to develop particular studies in the field of Engineering Design, and even in the case of spare parts and special toolings, they still remain dependent on foreign industries.

2.2 - Naturally, there are some small attempts to begin something new on a local basis, but these are very isolated cases mainly because of the nearly total lack of qualified personnel in this particular domain.

3 - Actual needs for creative capabilities in Engineering Design and branches of industry more interested in it, in Tunisia.

3.1 - Tunisia's population slightly exceeds 4.5 million. It is, therefore, a question of a rather small market which in the present situation cannot permit profound engineering studies.

3.2 - Perhaps the most apparent needs are still those connected with the manufacture of spare parts needed for agricultural and textile machines, automobiles, etc. This is a special case in Engineering Design since it is limited to the copying of parts already relatively known of which it is only a question of discovering the characteristics and reproducing them in a mechanical drawing.

3.3 - Some other branches which already have more complete needs include the manufacture of plastic articles for domestic use, for which Tunisia already counts several establishments. There also exist some industries for kitchen utensils, electrical household appliances, and agricultural and domestic tools which already need



to be able to develop an Engineering Design department. Potential needs exist also in the automobile and electrical household appliance industries, including radio and television, which at present are limited to assembling but can already be considered ready for a local production of certain component parts.

3.4 - Finally, a general need is strongly felt at this time for the conception and manufacture of special tooling, a necessary complement of the machine-tool for the mass production of parts in the above-mentioned industries.

4 - Suggestions on ways and means for increasing Engineering Design capabilities in Tunisia.

4.1 - The development of a capacity for Engineering Design in a country in which industrialization is in its first stages calls for considerable efforts. For Tunisia, the lack of basic personnel (engineers and technicians to specialize and perfect) is one of the most serious handicaps since the few people trained on this level in foreign schools are immediately attracted by

existing industries for perhaps more imperative needs in the field of organization and production. It follows that, at this time, practically no local specialists in this domain exist to carry out any kind of training activity, which, moreover, local industries are not yet ready to be able to develop within their interior.

4.2 - In this case, the developing countries absolutely need international co-operation to solve this problem, and it goes without saying that the most acceptable solution from the organizational and economic viewpoints lies in the creation of Centers of Development through the joint efforts of public powers and international aid. Here, the U.S.I.D.O. can best carry out its role by participating in the creation of Design Development Centers principally by sending specialists in Engineering Design to the different branches which are of interest to the country.

4.3 - For Tunisia, at present, the tooling center being created through the project TUN-27 can cover the coun-

try's needs during the next four to five years, but it is foreseeable that in the future the need will arise for a center more particularly specialized in the creation of prototypes of local origin.

5 - Organization of Design Development Centers.

5.1 - In the project study for the creation of a Design Development Center, it should be made clear that it is a question of a center for the engineering design of special toolings and spare parts or of industrial and household products of widest use.

5.2 - In the first case, the demand is almost always limited to the unit or to a small number of parts. The utilization of the manufactured part is very specific, and the testing is reduced to a minimum. Although very diversified, the materials to be used in the manufacture are already known in advance, the parts are relatively more complicated, and the cost price is of minor importance, whereas functioning security must be absolute, the failure of which would entail remaking the part. All these conditions together lead to advise that the

Center be capable of furnishing products directly destined for utilization. This requires an organization altogether similar to an industrial enterprise, and the organizational diagram of such a center could be as shown in Figure 1, which illustrates that the three main functions, promotion, production and inspection, are on the same hierarchical level. Design in the strict sense of the term becomes a sub-function and holds the same position as planning and manufacturing. The function referred to as promotion assumes great importance since it must undertake a more profound activity of advice to clients who are not always exactly familiar with the possibilities of solving their problems. On the contrary, the function inspection is mainly limited to the dimensional control of parts or of the manufacture sets and very rarely carries out functioning tests.

5.3 - In the second case, the studied part or set is generally destined for mass production. "A priori" the materials to be used are unknown and are chosen on the basis of successive tests. The facility of the manufacture of the part must particularly be studied in view of re-

ducing to a minimum its cost price. The physiognomy of this type of Center is very different from that of the preceding one, its objective being mainly to create prototypes destined for outside enterprises for their successive manufacture, prototypes which do not even always require being manufactured in the Center. The organizational diagram could be as represented in Figure 2. The principal functions are promotion, design and testing. In this case, the function referred to as promotion has a much more simple task than in the preceding case, whereas the function referred to as design takes on a primordial importance and must arrive at the creative stages. The manufacturing workshop can be reduced to a mere laboratory. At the same time, the function entitled inspection, in the industrial sense of the term, disappears and is replaced by the function testing, much more complete than the preceding one and requiring entirely different equipment and functioning.

Figure 1

Organizational diagram for a  
Design Development Center for toolings

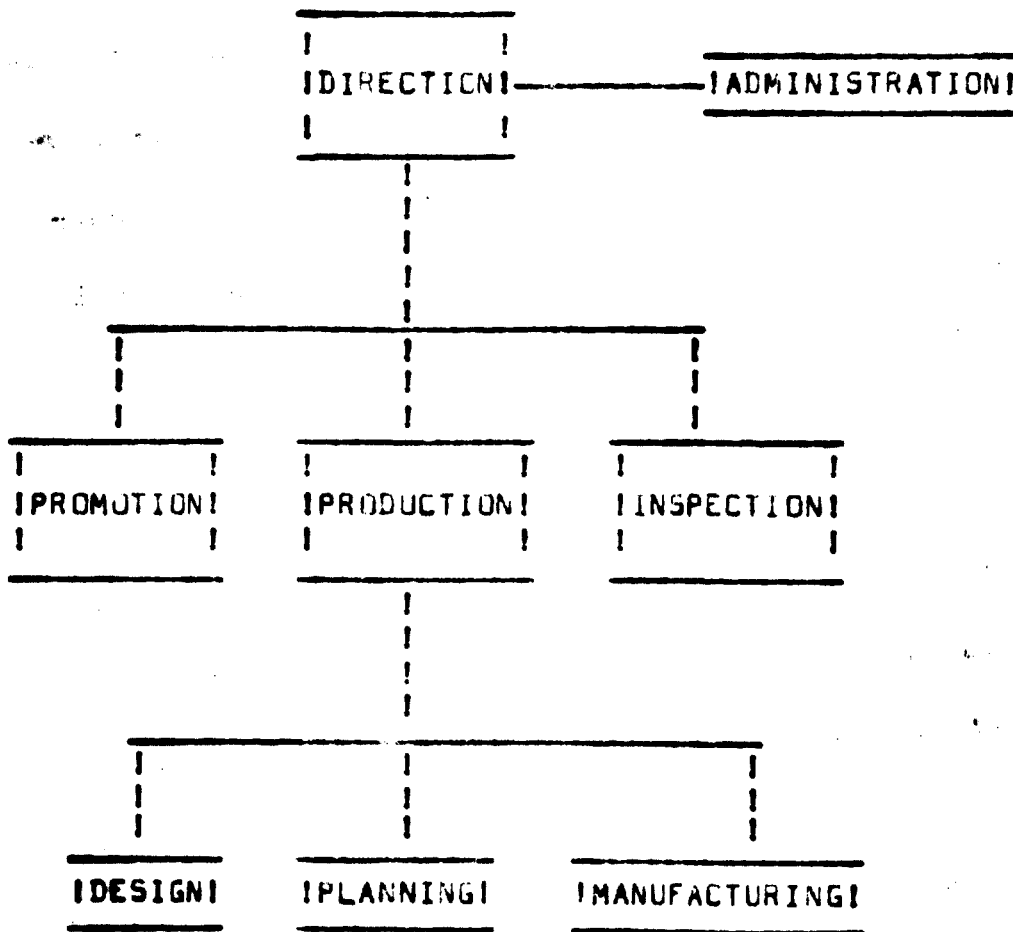
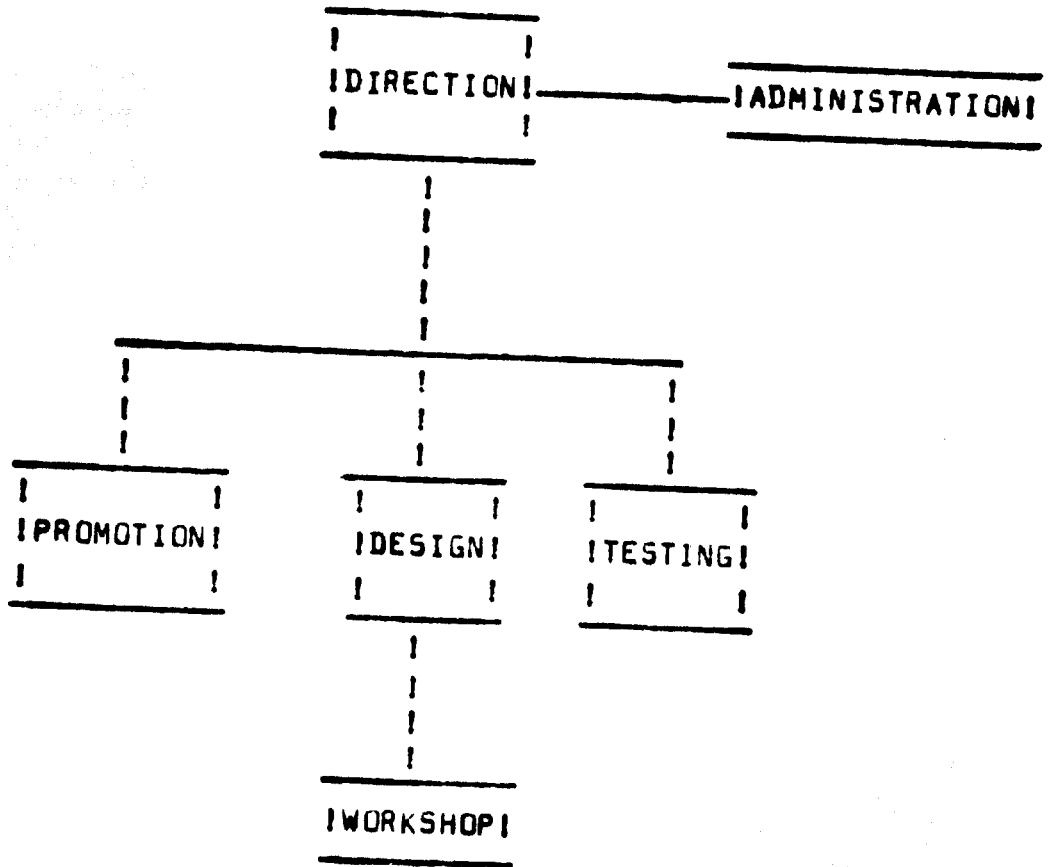


Figure 2

Organizational diagram for a  
Design Development Center for prototypes



5.4 - It is also to be remarked that these two types of Design Development Centers can be united, with difficulty, into one for the purpose, for example, of reducing investment costs since the functions of the departments composing them are substantially different in the two cases. In other words, the creation of a single Center instead of two separate ones requires practically the same investment, and the organizational diagram could only be a combination of the two, with very little possibility of eliminating some functions.

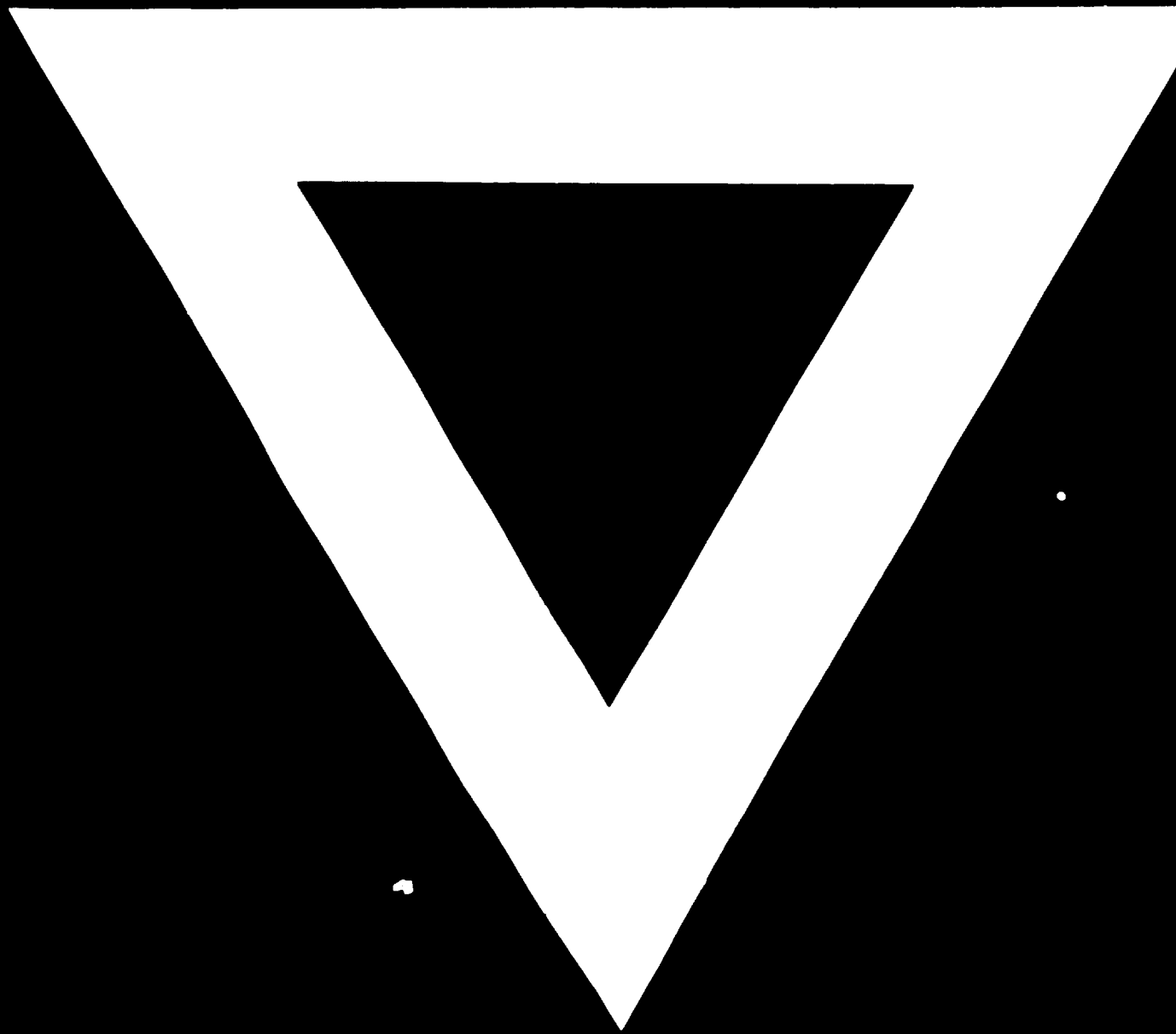
5.5 - Finally, as far as priorities are concerned, the situation can be different, depending upon the level of industrialization in the country. It is evident that the manufacture of tooling is one of the basic needs of budding industries. If the level of industrialization is very low, industries have not yet had the possibilities of equipping tool workshops capable of providing for all their needs. This is the case of Tunisia, in which country concentration on the



creation of Design Development for the manufacture of special toolings is thus advisable as it is done in the framework of the U.N.I.U.O. sponsored project TUN-27 of the Centre for Development of Prototype Tools in Sousse, Tunisia. The design of spare parts should be a second step and the design of prototypes, a third.

On the contrary, in countries whose level of industrialization is slightly higher, industries have already been compelled to solve their tooling problems by the creation of workshops specialized in this manufacture inside or outside the enterprise. For example, this is the situation in Chili, Venezuela, Jamaica, Turkey, etc., where it is preferable to create Design and Prototype Development Centres.





**74.09.13**