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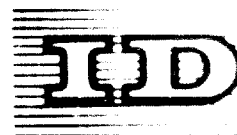
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IMPORTANCE AND PRACTICAL APPLICATIONS OF A TECHNICAL
CO-OPERATION IN THE PROCESS OF THE ESTABLISHMENT OR THE DEVELOPMENT
OF AN AUTOMOTIVE INDUSTRY IN FOREIGN COUNTRIES^{1/}

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^{1/} The views and opinions expressed in this paper are those of the author and do not necessarily reflect the views of the secretariat of UNIDO. The document has been reproduced without formal editing.

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Importance and practical applications of a Technical Cooperation in the process of the establishment or the development of an Automotive Industry in foreign countries.

A country which wants to establish or expand rapidly an automobile industry generally calls on car builders from other countries whose production has acquired a solid international reputation.

Our aim is to explain how CITECON considers the cooperation which must be established between the responsible Authorities of the country in question and the car manufacturer

Since we are dealing with the automobile, a complex product which mobilizes very diversified technical fields, our aim is an optimum participation in the plan and in its realization, of the scientific and technical potential, both human and material, of the host country.

The cooperation between the car manufacturer and the host country must therefore become effective as soon as the preliminary talks begin, up until mass production, commercialization and through the life of the vehicle.

The cooperation must be practised at all levels and more particularly on the technical and industrial fields.

Among the problems more generally industrial which make up the subject of this cooperation, we shall examine successively the following ones :

- I - Choice of the vehicle adapted to the country
- II - Stages of Production
- III - National Production and Integration programs
- IV - Investment programs
- V - Setting up of the factory
- VI - Cost and price of the car
- VII - Conclusion.

I - CHOICE OF THE TYPE OF CAR ADAPTED TO THE COUNTRY

Be it a question of establishing an automobile industry or of expanding this industry by completing the range of existing models, we shall take the case in which the country decides to produce a car for the greatest number, the car of the masses, generally designated by the term the "Popular Car",

What is a popular car ?

people energy - vid

It is an economical, practical, comfortable and sure car, one which the people can widely use.

Ideally it must satisfy the following conditions :

- Reduced cost so that the greatest number can buy it.
- Low gas and oil consumption.
- Sturdiness and simplicity in construction.
- Different utilisations on all kinds of terrains.
- Versatility, that is, its aptitude for different uses, in particular, the uses in rural regions : transportation of passengers, light loads, etc...
- Simple and low-cost upkeep.
- Long life.
- Maximum comfort.

The popular car must not be a reduced-scaled car ; its body must be able to accommodate, with ease, four passengers and their luggage.

- Possibility of transforming it, easily and without too much further investment costs, into functional derivatives such as light vans and jeep-like models which can be used by Industry, Agriculture and Commerce.

The essential characteristics of such a car are the following :

- Sturdy, simple, sober motor.
- Motor situated in front to allow for a greater luggage space in the back.
- Independent suspension which can adapt to bad roads.
- Front wheel drive, an important road-holding factor.
- Spacious car without being cumbersome, having 4 side doors as well as a door giving access to the luggage compartment.
- Removable seats allowing transportation of variable cumbersome loads.
- Efficient interior ventilation and heating.
- Comfort insured not only by the interior equipment but also by the driving safety.
- The vulnerable parts of the body can be removed to facilitate repairs and lower their cost.
- Upkeep must be kept at a minimum, thus insuring safety even when experienced personal in maintenance work is not available.
- The car must, as much as possible, keep to the lines and style of a generally defined "passenger car"

To conclude with the popular car's characteristics, we will quote, the opinion of M. WOJCIEN KUBICKI which was published in August 1968 in a daily paper of a neighbour country.

"Without going into technical complications, it is easy to realize that these are not requirements which are easy to meet. The conditions of having a low-priced car can be met by forgoing all kinds of accessories, by maximum simplification of shape—which is not submitted to body fashion but to cost calculation—and let us not be afraid to say it, this car can be ugly provided it is cheap and fulfills utilitarian conditions which are given it. Something must always be dropped and it would seem that in this case we can, firstly, forgo fashion and esthetics, in any case relative.

..... Sure mechanisms executed by using perfect technological methods, together with a solid but very simple and cheap body : that is exactly what is suitable."

We share M.KUBICKI's reasonable opinion about a popular car but we will not go further into the esthetic or anti-esthetic concept and we sought solutions to this problem

Having recalled these considerations for the popular car, let us see how the cooperation between the Mother country and the host country must be practised for the choice of the type of vehicle to be produced.

In function with the conditions a popular car must satisfy and in function with its essential characteristics, the manufacturer must give all information concerning the type of car he proposes :

- 1 - a commercial description of the standard model and model versions as well as their derivatives manufactured and sold in the Mother country.
- 2 - a technical description giving :
 - the characteristics of the car's organs :
Motor - Transmission (clutch, speed box, transmission shafts and joints)
Suspension and shock absorbers - Steering - Brakes - Pneumatics - Electrical equipment for functioning, visibility, signaling - Chassis - Body.
 - The characteristics of the car :
General constitution, Dimensions, performances (speeds, acceleration, consumptions Weight.
 - The advantages which a type of car which allows the combining and assembling of several types of bodies.

It is up to the manufacturer to furnish models for test in the host country, to follow up these tests , to examine their results with competent technicians and to establish in close cooperation with the latter the specifications book for the car to be built in the country.

For the manufacturer , it is not a matter of strictly imposing the same models of cars as those currently sold in the Mother country.

Without questioning the structural conception of the type of car chosen, the models to be produced in the host country which will have to be driven in this country may differ somewhat with those of the Mother country ; for example :

- Special anti-dust equipment, more specifically a special air filter
- Certain protective devices for frost in cold countries

- Supplementary heating for cold countries.
- reinforced ventilation for hot countries or air conditioning
- different pneumatics.
- various modifications which might be necessary in view of the regulations in Force in the country
- etc...

The technicians on the both sides, and mainly the Commercial Technicians, will have to decide on the establishment of a specifications book for the different models, specially if the conception of a type of car allows this

- private cars.
- commercial vehicles such as vans, jeep-like models, all kinds of vehicles useful in the agricultural, industrial, crafts and commercial fields which can fill the most varied needs.

The study of the market which allow us to define the production programs will be made by the commercial technicians on the both sides.

For a popular car which satisfies the conditions and meets up to the characteristics which we have enumerated - convenient price and low cost upkeep - there are few problems : the sales possibilities are generally a direct function of the density of the country's population, standard of living and individual income.

II - THE STAGES IN MANUFACTURING

The production of vehicles in a factory which is to be built or expanded must be realized according to a methodical plan, one which is worked out in detail and adopted by both sides.

The manufacturing of local products - those of the factory and those of suppliers of the Host Country - must start off progressively, following a succession of stages for the Bodywork and the Mechanics.

National integration consists of assembling vehicles with imported components, then of replacing these imported components with locally manufactured ones. The different stages will be reached while the percentage of local products and the production output figures increases according to determined progressions.

Spreading the stages out over a period of time allows for :

- a parallel spreading out of investments.
- productive investments, therefore, redemption as these investments materialize.
- facilitating the setting up of local production by allowing progressively to deal with the different problems which must be solved.
- to strive for a better cost as soon as the operation starts.

Let us now examine the two principal components of a car, the Bodywork and the Mechanics.

For the Bodywork we propose our partners a preliminary stage followed by 6 main stages :

- The preliminary stage has to do with a small number of cars assembled with all imported components, the external components having already received their top-coat. The essential aim is to familiarize the personnel with the car and with its assemblage. This stage gives a national integration of about 4 %.

- It is possible to eliminate the preliminary stage and to start with the 1st stage during which the external components of the Bodywork, which have only received an undercoat, are imported.

The Factory must ensure in a minimal amount the application of the layers of lacquers and the assembling of the vehicle which represents a percentage of national integration of about 8 %.

The Factory must be able to ensure a certain amount of wiring, upholstery and detail panel work.

The local suppliers will deliver the manufacturing material and the elements of the vehicle will have already been approved by the Manufacturer.

- In the 2nd stage, all of the coatings (surface treatment of the sheet metals, undercoats of paint, layers of lacquer) must be ensured by the Plant.

It is during this stage that the following steps will be begun :

- assembling of the Bodywork
- manufacturing of various components ("units") of the Bodywork
- manufacturing of the pressed parts by outside factories.

- During the next 3 stages, the assembling of the body panels, the doors, the chassis, the pressings and the sheet metal will begin, increasing proportionally.
- All manufacturing of the Bodywork must be ensured by the end of the 5th stage, since the aim of the 6th is to attain a maximal output.

For the Mechanics, we propose 8 stages for the assemblage of parts :

- 1 - Assemblage of the motor and gear box with that of the carburator and fuel pump, the 2 latter components in general can rapidly be made locally.
- 2 - Assemblage of the Suspension components
- 3 - Assemblage of the rear axle.
- 4 - Assemblage of the Front axle and the steering.
- 5 - Assemblage of the Gear Box.
- 6 - Assemblage of the Motor.
- 7 - Assemblage of the transmission joints.
- 8 - Assemblage of the inertial dampers (components which are particular to our popular vehicles).

The 8 stages in parts assembling condition the corresponding stages of the manufacturing of the components of these parts : from the beginning of the assemblage of a unit we can incorporate the components produced in the Host Country by the manufacturer or by local suppliers.

The stages in manufacturing the Bodywork are the basic stages : along with the mechanical stages, they make up the object of various combinations depending on the possibilities of the Host Country.

The order we have just outlined for the mechanical stages is not necessarily rigid. For instance :

In Spain, a gear manufacturer allowed us to begin manufacturing the gear boxes during the 2nd stage.

In Argentina, a factory run by competent men having valid equipment which we were able to complete, started manufacturing the inertial dampers within a short period of time.

What forms can and must take the cooperation in this field ?

On one hand the Authorities of the Host Country must allow the manufacturer's Technicians to gather sufficient knowledge of the industrial possibilities of the Host Country.

On the other hand, the interested Executives, Engineers and Technicians of the Host Country must follow information and training programs in the factories, branch offices and certain suppliers of the manufacturer.

During these training programs, the interested parties will be able to become familiarized with the car which is to be built, to the manufacturer's conceptions and engineering, especially when advanced engineering is involved.

These programs prepare the foundation and organization of a supply service run by personnel having a technical and industrial training, who can acquire more knowledge or enrich their knowledge under the manufacturer's auspices. This aspect of cooperation is all the more important as it conditions the better cost over the share of sales which make up the total cost of the vehicle, this share representing about 65 % of the unit cost.

The Technicians of the both sides will then have to decide on the repartition of manufactured products in the Host Country :

- manufacturing of the products which will be ensured by the plant to be built or developed including to a minimum degree a Bodywork shop with stamping if the predicted productions allow for this.
- the manufacturing of the mechanical products can be totally or partially ensured in the factory to be built or expanded ; certain mechanical manufactured products - the gear box for exemple - can be produced by the Host Country's existing factories which will have to be expanded consequently.
- the manufacturing of raw products (casting and forging) can eventually necessitate the building of a shop or the extension of an existing one.

The technical cooperation between the 2 sides for the best utilisation of the existing industrial means in the Host Country and for their best development while continually for the lowest cost, must be a constant and having care.

III - PROGRAMS OF PRODUCTION AND NATIONAL INTEGRATION.

Once the Host Country's Technicians have familiarized themselves with the standard model and versions of cars to be built, and once the manufactured parts and components which must be ensured by the shops to be built or developed and those to be ensured by the exterior supplier, defined, it is now a matter of defining in close cooperation with the Authorities of the Host Country the goal which must be reached, that is :

- the predicted maximal annual production
- the number of years defined to reach this production goal and the progressive national integration.

The maximal annual production depends essentially on the Market Study.

If this production corresponds with hourly output figures greater than 6, the production facilities will be divided into 2 "shifts" which represents about 4200 work hours a year. (working hours depending of course of the country regulations)

National integration at a given moment is characterized by a percentage.

In general we express the technical percentage for national integration by multiplying by 100 the ratio between the value of the parts locally produced and the list of the value of the vehicle parts of the completed car.

We can also express the percentage of national integration by multiplying by 100 the ratio between the weight of all the parts locally produced and the weight of all the parts of the completed vehicle. This kind of ratio is currently used in Brazil.

To set up the production and national integration programs, the technicians of the both sides must take into account certain considerations as well as the experience acquired by the manufacturer in setting up and starting plants outside his own country, particularly in keeping within the time limits.

For exemple, as for the time limits, we have set up 2 plants outside of France, in Spain and later on in Argentina, both of which have reached an hourly output of 6 vehicles and a national integration of 90 to 95 % within 5 years.

We shall study the principal elements which in our opinion must be taken into consideration during the cooperation sessions which end in the setting up of schedules, then of Programmes.

In starting up a car production operation, the quality, the output and the cost must be watched and maintained and this, in the indicated order :

- the output cannot be maintained if the quality is not ensured, for as we shall see when we speak of investments, the means of production are not foreseen in manufacturing large amounts of scrapping.....
- the cost predicted can be maintained only if the quality is ensured and the output maintained.

Industrialization in all countries of the world shows that great output figures impose quality and cost.

At output figures of less than 6 an hour, the quality is often uncertain because of the nature of the means utilized which can only be very limited ones and therefore cheap ones.

The costs obtained for the cars, depending the output figures and the degree of national integration can attain and even surpass 3 times the cost of the mass produced car.

At the rate of 6 vehicles an hour (12,500 vehicles a year using one work-shift, 25,000 vehicles a year with 2) and a national integration of 90 %, the quality is easier to obtain, the costs obtained may be valid in the country in question, but they may also attain up to 2 times the cost of mass-produced cars

At this output rate, the share of about 10 % which remains to be imported, represents manufactured items for which the necessary investments allow for a greater output ; thus, they are almost unredeemable for an hourly output of 6 (crank and cam shafts of the motor for our popular cars).

From 12 vehicles an hour on (50,000 vehicles a year) we can look forward to a national integration of 100 % but the costs obtained may be 1.4 times the cost of the mass produced car.

At 50 vehicles an hour (200,000 vehicles a year) there are no more problems as for national integration of 100 %. The costs obtained are valid and may even be competitive on the world market

At 75 vehicles an hour (300,000 vehicles a year), the factory has reached the European standard.

These facts result from our own experience, they can be different from a country to another.

These summary facts and figures show how important a market study is for a popular car of quality obtained at low cost (we shall speak later on about the problem of the vehicle's cost).

Among the other elements which must be studied in close cooperation and which must be taken into account for setting up of the programme, we can mention the following :

- 1 - The importance and length of the training periods under the manufacturer's auspices and the setting up of a Supply department - questions which we have already outlined.
- 2 - The possibility for the Factory to build or to expand , and for local suppliers to materialize the investments and especially those which necessitate foreign currency.
- 3 - The possible time limits for delivering the manufacturing material and especially the material which will have to be imported.
- 4 - The possible time limits for realizing the building (hardware) and technical installations
- 5 - The delays necessary for the Builder to obtain patents of his suppliers for all that has to do with electrical accessories and special mechanical components.
- 6 - The absence in the Host Country of components which will have to be imported for an indefinite period of time (For exemple, thin sheet iron for certain countries).

Quality must be the constant preoccupation of the Technicians. Cars produced in the Host Country will have to be of a quality as least as good as that obtained by the manufacturer in his own country, both must be on the same technical and performance level.

The Technicians of both sides will thus have to take into account the delays for reaching this quality which partly depends on the Host Country's degree of industrialization.

In general, all the components produced in the Host Country will have to be approved by the manufacturer in cooperation with the managers of the Factory before they are assembled on the cars. Therefore we must take into consideration the delays needed for these approvals which will come about, case by case in the manufacturer's test facilities or in the Host Country's factories but always according to the supplied norms.

The components having been approved, it remains to ensure the consistency of the quality and in following the modifications of the Manufacturer resulting in continual evolutions in engineering and in the vehicle itself, so as to produce only up to date vehicles.

When it is a matter of building or expanding an automobile industry in a country, and if the predicted output of which is to be of a high level, it is not a matter of predicting a rapid progression of the hourly output and a slow progression of national integration : the total amount of the necessary foreign currency for the payment of the imported share would be too great for the balance of payment of many countries.

We have seen that in countries where the automobile industry has not reached a high level of development, it has been possible to integrate percentage of 90-95 % within 5 years. The length of integration depends on considerations which we have outlined and more particularly on the industrial development of the country concerned.

In many countries, for an output greater than 12 cars an hour, we can attain a national integration of 100 % within 5 years. The progression of integration is not linear : integration of 100 % within 5 years lets us suppose that at the end of the 3rd year we have integrated about 80 % and that practically during the 5th year, the vehicle is 100 % integrated, the share which will have to be imported during this 5th year represents eventual and temporary failing of local production either in quality or in output.

The facts and figures for setting up a national integration program can be modified by some compensation procedure between the Host Country and the manufacturer's country : this is a form of cooperation between the 2 countries which can only favor giving the Host Country an important role in the framework of international exchanges.

For the manufacturer, it is a matter of buying in the Host Country raw material and car components manufactured in the Host Country.

It is also a matter of taking into account the various Purchases carried out in the Host Country, not utilized by the Manufacturer himself but which result of his intervention in his own country's organizations and industries which have accepted to acquire products in the Host Country.

We shall give you 2 exemples of this kind of cooperation :

In Spain, CITROEN HISPANIA, ships out daily to CITROEN FRANCE 20 tons of finished products and certain components to our subsidiary in Portugal and in Chile which become part of their own car production.

Jugoslavia, to compensate the car components bought from CITROEN FRANCE, delivers finished products utilized on cars manufactured in FRANCE.

This kind of cooperation is specially interesting for the Host Country during the entire time when the vehicle is not 100 % integrated. It partially compensates for the cash outflows which are necessary for purchasing the imported share ; it also can allow us, for a fixed amount, to plan for a more rapid increase in production.

We can also admit that the vehicle will not be 100 % manufactured in the country (This is the case of SPAIN). and that the share which remains imported will be wholly compensated for in purchases by the manufacturer's country in the Host Country.

Of course the purchases of the Manufacturer's country in the Host Country are submitted to approved standards in quality, delay of delivery and in cost, the level of which characterize the degree of industrialization of a country.

This large field of cooperation between both sides in Industrial and Commercial Engineering thus lets us gather sufficient knowledge of what must be taken into consideration for setting up the Programmes :

- General Programmes
 - . National Productions and Integration
 - . Studies and realization of the production facilities
- Programme for beginning each of the production stages.
- "Compensation" programme

IV - INVESTMENT PROGRAMME

First let us study the nature of information which we are able to give in this field, for the manufacturing, outside of France, of our popular cars at various hourly output figures.

We shall then see how we can exploit this information in close cooperation to set up the investment programmes necessary for setting up a plant adapted to the Host Country or for expanding an already existing one :

1°) A complete automobile plant will have :

- 1 Bodywork unit
- 1 Mechanical unit with heat treatment
- 1 Raw material unit (casting and forging)

a) The Bodywork unit is composed of the following workshops :

Workshop for manufacturing of metal sheet sections

- " " sheet metal
- " " chassis and Bodywork assemblage
- " " coatings

Surface treatment of the sheet metals

Paint (chassis, bodywork, wheel rims, various other components)

. Electrolytic coating (Polishing, Zinc coating, cadmium coating, chroming).

Workshop for wiring and upholstery

Assembly lines for vehicles.

Above output figures of 12 vehicles an hour, we add to the Bodywork unit :

a stamping workshop

Up until the hourly output figure of 12, it is difficult to redeem a pressing workshop : thus, until this output figure is reached, the pressed parts must come from already existing workshops.

b) Mechanical unit includes the workshops necessary for the manufacture of the different organs of the car with one heat treatment or several heat treatments according to the importance of the hourly output figures.
This Mechanical unit can be added to that of the Bodywork or it can be apart.

c) The raw material unit includes

- 1 forging workshop
- 1 casting workshop for ferrous metals
- 1 " " non-ferrous metals (aluminum alloys)

This unit can be added to the Bodywork and mechanical units.

It can make up 1 or 2 different plants.

In function with the hourly figures, for each manufacturing specialty and for subsidizing buildings, we give our partners from the Host Country an estimate of the covered areas, broken down into basement area, ground floor area (with or without rolling cranes) and into floor areas.

This estimate is accompanied by schema-type arrangements for individual buildings.

2°) The Components of the Plant

a) The Ground

The area of the ground can be from 6 to 10 times the covered area.

This ratio depends on the ground available, on the personal conceptions as to the layout of the buildings and the importance of the areas called "green areas", on the evolution foreseen for the Plant.

In function with our experience, we indicate the ideal conditions that a ground must satisfy : nature of the soil, equipments, viability, water installation, electric power and systems, road and railway systems.

We shall not give you the estimates of the expenditures for buying and equipping the ground : Each case is a particular one.

b) The Buildings

The structure of the buildings and particularly the workshop building (reinforced concrete, metal framework) depends on the possibilities and on the costs of realization in the Host Country.

For the workshop building, we prefer metal framework which gives more suppleness ; it is with this structure in mind that we have established our estimates.

c) Fluids

The estimates give :

- Hourly consumptions in compressed air, water, gas, electricity, steam
- installation expenditures necessary to ensure these items, the gas and electricity coming from the country's own networks.

d) General and subsidiary departments

The estimates for general and subsidiary departments include the expenditures of :

- Workshop departments (Maintenance, tooling, professional training shops, etc...
- Control Reception Department for outside supplies
- Laboratories for Chemistry and Metallurgy
- Handling, transportation, stores
- Subsidiaries (offices, cloak rooms, restaurants, infirmary, fire service, etc...

e) Manufacturing Means

The estimates of the manufacturing means give for each workshop the expenditures of :

- Tooling manufacturing
- Purchase of Material
- Various purchases (in general Toolings sold and bought on the market)
- Installation of the manufacturing means
- Tests and turning " "

To sum up, for each workshop, we give our partners of the Host Country, distinct estimates for the Buildings, necessary Fluids, General and Subsidiary Departments and Manufacturing means.

These estimates are completed by lists of materials used and of technological and technical documents concerning the various manufactures.

The investments are estimated on the basis of those of the Mother Country. They include all the expenditures which must be redeemed over a certain number of cars.

The estimate of the manufacturing equipments allows for :

- manufacturing cars
- normal refuse percentages which are those observed in the Manufacturer's plants which on a high production level are very small.
- Manufacturing spare parts necessary for the maintenance and repair work of the cars.

The hourly output figure allowed for by the manufacturing equipments is thus greater than the hourly car output figure.

As a complement, we give the amount of different expenditures which must be laid out, at the same time as the investment expenditures :

- the expenditures which we call "1st equipment" : these are the expenditures for consumable materials (cutting tools for exemple) the cost of which enters into the cost of the car under the heading "workshop expenditures".
- the expenditures for special equipment, at the expense of the commercial network for the maintenance and repair of the cars.

The Manufacturer's Technicians and those of the Host Country thus possess a framework which gives, point by point, for each manufactured item, the sum of the investments necessary for setting up a complete plant. We have already said that these investments had been estimated on the basis of those used in the Manufacturer's Country. In close cooperation we must decide on the reevaluation on the actual basis in the Host Country, particularly for the expenditures which will not have to do with imports.

During this stage, one of the most important of the technical cooperation before starting the factory going, the Technicians of the both sides will have to decide on the investment expenditures, keeping in mind that they must try to reduce them to a minimum : indeed, the investment expenditures must be redeemed over a number of cars and their importance influences the cost of the car. We must take this influence into account.

This preoccupation may lead us to modify the repartition of the manufactured items envisaged during the study of the manufacturing stages for all that has to do with the mechanics and raw material.

The mechanical manufactured products will thus be able to be ensured only partially in the plant to be built or expanded. It may be less costly to expand already existing plants for manufacturing Gear Boxes, Motors, for exemple.

The raw products, casting and forging, can be ordered from already existing plants which will thus have the possibility to expand. We can also foresee installing only one light metal forging, the forging of ferrous metals having already been ensured by an already existing one.

The Technicians of both sides, still working together, will decide upon the layout of the plant in function with the lay of the ground on which the factory must be built by adopting a layout for the buildings which will allow it to evolve with ease with the minimum amount of upset and expenditures : to progress in quality and in cost, an automobile plant must constantly evolve.

It is then that the expenditures regarding ground will be able to be estimated within the Host Country economy frame

The Technicians of the both sides will then have to establish :

- Programme of investment expenditures
- Amount of the sums to be redeemed yearly.

Once all the programs have been established in close cooperation, it is the will of each in following them that will allow the production to start off within the predicted time limits and the goals to be reached.

It is up to the Manufacturer to concretize technical assistance by supplying all technological and technical documents necessary within the time limits foreseen in the General Programme :

- Plans and blue prints from his Design Department
- Norms, specifications book, various other specifications
- Scales and operation sheets for each vehicle component
- Plans and documents concerning the production means and the installations in his own plants of the vehicle concerned
- Norms of control and approval, control scales
- Documents of the same kind as those which we have just outlined for his suppliers' manufactured products.

The studies to be made concern :

- Arrangement of the ground
- the Buildings
- the installations for the fluids
- General and subsidiary departments
- Means of Production

These studies can be made by the Manufacturer (Engineering) who can deliver a fully equipped plant to be Host Country or by the Host Country's Technicians with documents furnished by the Manufacturer and with the assistance from the latter's own Technicians.

The 2nd solution is that which allows the fullest expansion in technical cooperation between the 2 sides.

Having for goal to form as fully as possible the Technicians in the Host Country, we prefer this solution in which the studies are undertaken in the country, in "on the spot" collaboration with the Manufacturer's Technicians. This does not exclude moreover certain studies made by the Manufacturer which are followed by the Host Country's Technicians during the course of their training period which we have already spoken of.

Indeed, if the Manufacturer gives the Host Country the license to manufacture a car, and if he imposes norms in quality and in manufacturing engineering, we believe that the choice of means to perform the manufacturing is largely up to the Host Country.

For example, for mechanical manufacturing at a given output, it is up to the Host Country to decide whether or not he must use a succession of usual machines which will then be adjusted, or an entirely automatic transfer. This decision depends on the cost of labor in the region where the plant will be built, on the compared operation costs of the machines to be adjusted and that of a transfer, in both cases, on that which must be imported or bought in the country.

Thus it is the same for forging manufactures (choice between Hammers and Presses), for casting manufactures (choice of means of fusion), for Pressing (Types of presses and a greater or lesser automatization), and for coatings.

The solution we recommend is that which is suitable when it is a case of developing an already existing plant.

We will conclude with the choice of means by saying that it is not a matter of producing a popular car with spectacular investment and equipments, but rather of manufacturing one with those means which allow us to obtain the quality imposed and the lowest cost.

V - STARTING UP OF THE PLANT

During the building of the plant, of its equipment, or its installations and of its start, the cooperation between the manufacturer and the Host Country technical assistance will take on a permanent character.

Before starting up the plant, it is useful to foresee in the Manufacturer's plants, training periods for the superintendents (workshop heads, foremen, shift foremen) and even for certain specialized workers.

The engineering and manufacturing personal which will be sent by the Manufacturer will make the Host Country benefit from its experience and its know-how acquired in the building and equipment of the plant, in the manufacturing of vehicles and it will supply all complementary information as problems to resolved come up.

The technical assistance of the Manufacturer will continue during the life of the vehicle : the Manufacturer will make the plant set up in the Host Country benefit from the results obtained by its Study and Research Departments in order to have a continual improvement in methods of manufacturing, in control and in the tests of all products or raw materials used for manufacturing.

During the period of constructing, equipping and installing the plant, we have realized by experience that it was difficult to ask the local suppliers to adjust at the right standard the components of cars which are not immediately used and followed up with real orders even at weak output figures.

CITROEN'S experience, notably in Spain and then in Argentina, has shown that we could and should produce cars during the period which elapses between the working out of the plant layout, its construction, its equipment, its installations and its start.

This production can be realized with simple means, in workshops which will be used afterwards towards different goals. We call a "Pilot Workshop" such an installation which allows us to start up the preliminary stage, the 1st stage and part of the 2nd stage which are then considered as transitory stages during which the building and equipment of the definitive factory is realized.

One of the principal aims of the Pilot Workshop is to adjust a certain amount of local supplies. As soon as it is possible to get components delivered from the local suppliers, we utilize them by assembling them into the cars. The vehicles thus assembled in the Pilot Workshop are tested and immediately delivered to customers chosen from among the public to drive them in the Host Country. We thus can adjust the supplies which have been used, and improve their quality.

The Pilot Workshop allows us to interest more quickly the Manufacturer's Suppliers in setting up technical and commercial cooperation in parallel with the basic cooperation between the Manufacturer and the Host Country representatives. This stage gives a concrete framework to discussions, it facilitates the conclusion of license agreements and certainly, the compensary operations between the Host Country and the Manufacturer's Country.

On the other hand, the Pilot Workshop allows us to gain precious time during the following operations by letting :

- the technicians on the both sides talk progressively the same technical language : the terms used by the Manufacturer take on an entirely different meaning and are no longer subject to misinterpretation or discussion when we deal with mass-producti
- the process of approval, the problems of "control" and "quality" be adjusted
- a labour force for assembling of the car be formed.

The productions of the Pilot Workshop thus allow us to tackle mass-production in the final plant :

- with a percentage of national integration which may not be very high but which is not negligible
- with a certain amount of problems resolved
- by delivering vehicles which have already been adjusted and tested, and which will not be a bother for the customers.

Compared with the investments necessary for the realization of the final plant, the investments of the Pilot Workshop are small. In addition certain expenditures can be recovered : for exemple, the paint installation of the Pilot Workshop becomes, in general, the retouching installation of the final plant.

Moreover we can concede that the non-redeemable investments are partially compensated for by the foreign money savings obtained by starting mass-production with vehicles having a national integration greater than that represented by vehicles assembled with all imported components.

In Spain, the production of the Pilot Workshop was 1410 vehicles in 16 months, with a national integration of 12% in cost and 17% in weight.

These low percentages are explained by the difficulties we had at that time — it was in 1958 - 1959 — with the local supplies : we have been very strict for the quality and it must be said that the industries of the country have understood our position of no compromise, and have made the necessary effort and progress to achieve the required quality standards.

In Argentina, the production of the Pilot Workshop was 395 vehicles in 9 months ; we were able to attain a national integration of 20 %.

VI - COST AND PRICE OF THE CAR

In close cooperation, the Technicians of the both sides will have to estimate at what industrial cost we can manufacture the car in the Host Country. The result of this study is a primordial element of decision for the Authorities of a country who have conceded that a popular car had to be sold at a given price.

As propos the price of the cars, we have on occasion had to justify ourselves on comparisons of price to the kilogram of our cars and of price to the kilogram of other cars ; however, the cars themselves have not always been of comparable type or characteristics.

In general, the comparison of price to the kilogram of cars having appreciably different weights is a discredit to the lightest cars.

When it is an obligation for a country of importing complete cars, we well understand that for cars with similar characteristics and almost the same weights, we compare the prices to the kilogram, (the qualities particular to each car do not make up the object of an estimation).

But when it is a matter of manufacturing a car in a Host Country, the comparison of the sales price of the Manufacturers loses its meaning : the sales price of a Manufacturer with regard to a given country depends on the price policy of the Manufacturer and on what he must make each car pay for, particularly in special study and research expenditures.

It must be understood (and that is one of the goals of technical cooperation between the Manufacturer and the Host Country) that for a type of technically advanced car, the Host Country will not have to enter high expenditures for initial research, study, tests into his price : these are assumed by the Manufacturer.

Let us examine in function with our experience, the components of an average industrial cost.

- the purchases from local suppliers of finished components represent about 40 % of the cost.
- the purchases of material necessary for the manufactured products of the plant represent about 25 % of the cost.
- manufacturing (Labor for the Forging, Casting, Mechanics, Pressings and Assembly) represent about 35 % of the cost.

These are percentages of the Industrial cost in the Manufacturer country (FRANCE, for instance).

According to a list of components bought from suppliers by the Manufacturer, the estimate of the cost in the Host Country must result in consultations with competent organizations of the Host Country and with specialized suppliers by Technicians of the Purchasing Department of the Manufacturer aided by the Technicians of the organization assigned by the Host Country to study and carry out the project.

For raw material :

- Casts and aluminum alloys
- Various steels for the forging and turning of parts
- Various sheet metal for Bodywork and mechanical parts
- Various tubing
- Coating material and various manufacturing materials
- textile and plastic material for the seats and trim
- Wiring and various material for the electric bundles

the estimate is easier by negotiating with competent organizations the price of the raw material which is currently practised in the Host Country in function with the production output figures adopted.

For the manufactured products, it is a matter of estimating the labor cost.
The manufacturer gives the following information :

- time for each work pit
 - amount of personnel necessary for making the Plant go :
 - Manufacturing personnel (including the subsidiaries of the shops)
 - Personnel which comes under the heading of "General Shop Expenditures"
 - Personnel which comes under the heading of "General Administrative Expenditures"
 - General Shop Expenditures, which include expenditures common to several shops.
- In function with the direct hourly labor cost of the Host Country, determining the Plant's manufacturing cost does not present any problem.

By adopting the same basis of calculation for the different car types on the market we can establish valid comparisons.

To obtain the "factory price", we must add :

- the technical redemptions
- the general administrative expenditures
- the eventual financial expenditures
- the commercial expenditures
- the Manufacturer's retribution (Patent and technical assistance)
- the Plant's profit
- Various taxes

To obtain the selling price for the public, we must add the salesman's remuneration (dealer)

We have seen how car costs can evolve in function with the production.

We have seen that a popular car had to be a product of quality sold at a price acceptable to the greatest number and that high hourly production output figures imposed quality and cost.

Many countries have understood that in order to industrialize, it is necessary to expand the automobile industry, but to produce a 100 % locally made car at low output is not industrialization, it is using small production means to obtain a costly product. However, to manufacture certain car components a high output is the beginning of industrialization.

It has therefore seemed logical to us to try to interest 2 or several countries in the same geographical area in manufacturing a same kind of vehicle, certain components being produced at a combined output in the countries concerned. This is what we call "compensation between countries of the same geographical area".

To explain what we mean in more concrete terms, we will describe to you succinctly what have accomplished in Chile and in Argentina in agreement with the 2 governments which have concluded bilateral agreements.

In 1964, in Argentina we entered into the 4th year of the integration plan, a 92 % integration in cost having to be realized by the end of 1965 : investments had therefore been committed to ensure this percentage of integration.

Chile had reached a national integration of about 35 % and the Chilean government predicted 85 % in 10 years, but the possibilities on the Chilean market for a popular car (1 or 2 cars an hour) would not let investments be committed to ensure a high percentage of national integration.

The Chilean government then admitted that it would consider as "local" a share imported from Argentina if it, Chile, could export into Argentina a share representing a counter value of the share imported from Argentina.

At the present time, Argentina produces 5 times more cars than does Chile, and the ensemble of the 2 productions gives us an hourly output figure greater than 6 vehicles. The breakdown of vehicles into technical percentages is approximately the following :

<u>CHILE</u> (hourly output rate "C")		
Share imported from Europe		40
" " " Argentina		20
Share produced in Chile at the combined output figure of the 2 countries ...		
	(C + A)	4
	Chile (C)	36
		<hr/>
		100
<u>ARGENTINA</u> (hourly output rate "A")		
Share imported from Europe		5
" " " Chile		4
Share produced in Argentina at the combined output figure of the		
	2 countries (A + C)	20
	Argentina (A)	71
		<hr/>
		100

The cars produced are 50 % Latino-American in Chile and 95 % Latino-American in Argentina, which is considered national by the 2 countries since there is little foreign currency expenditure

Chile invested to produce only 40 % of the car.

The experience is going on, the goal being to reach a 90 % Latino-American made car and even a 100 % Latino-American made car if the 2 countries' production allows it.

We started off the compensation between our 2 plants in Argentina and in Chile with, at the beginning, a certain number of restrictions which step by step have eliminated themselves in particular those coming from the local suppliers. Among the suppliers, a selection has taken place and only the first-rate ones have benefited.

Exchanges are made for the vehicle components :

- at the prices in US of the European Manufacturer nomenclature
- without customs or taxes
- with strict compensation in US\$

The conditioning, packing, transportation expenditures which are a result of the exchanges must be made up for by a reduction in the cost (higher output figures, less rejections, a better quality therefore less refuse, etc...).

Therefore it is possible for 2 countries in the same geographical region to reach agreements to produce together 100 % of a vehicle which for each country would be constituted by :

- a non exportable local share
- an exportable local share produced at high output (sum of outputs of each country)
- a share imported from other country.

For example for 2 countries A and B the annual production possibilities of which are respectively 25,000 and 175,000, we would get :

	A	B	A + B
Annual productions	25,000	175,000	200,000
Hourly Output figures	6	42	48
Ratio of productions	1	7	8
Non exportable local share	20	20	20
Exportable local share	10	70	
Imported share	<u>70</u>	<u>10</u>	<u>80</u>
T O T A L	100	100	100

The non exportable local share includes :

- local supplies which can be purchased in the country and not be interesting to import from the other country (i.e; tires, batteries, etc...)
- partial or total assembling of the mechanical organs allowing for the incorporation of local supplies which would not be interesting to import from the other country.
- Assembling of the Bodywork, and the coatings
- Assembling of the vehicle

This share can vary from 10 % to 30 % . As an assumption, we have conceded 20 % in the table above.

The percentages of the local shares which are exportable to and imported from the other country are inversely proportional to be productions of each country.

It is necessary that the make up of these shares comport a share of supplies which can be ensured either by one or the other country in such a way as to allow for compensation adjustments in function with the possible evolution in production of each country.

A close study of the preceding table show that to produce vehicles in both countries without having cash outflows, it is necessary invest only :

up to 30 % of the vehicle in country A
 " " 90 % " " " " " " B

In general, Country A investments to produce 30 % of a vehicle make up less than 30 % of the investments necessary to produce 100 % at the output figure of Country B : It is, generally, the country having the highest output rate which takes the more costly investments upon itself.

Without having cash outflow, Country A produces vehicles including parts representing 80 % of the vehicle cost which are produced at an hourly output A + B = 8 A.

In both countries, the cost improves with manufacturing 80 % of the vehicle at a higher output and the heading "Redemptions" diminishes.

The operation is especially advantageous for the country having the weakest production but it is adequate for countries of better industrial resources to help those in the same geographical zone which are less equiped, so as to allow them to industrialize and to produce cars without cash outflows.

Of course, what we have just outlined can be applied to more than 2 countries.

VII - CONCLUSION

We have examined the principal problems that a technical and industrial cooperation poses between the Manufacturer and a Country which wants an automobile industry and a popular car.

As we have seen this cooperation can take on different forms according to industrial expansion of the country be it a question of creating an automobile industry or expanding it.

The world needs cheap transportation to help ^{and} solve numerous problems in particular that of the mobility of workers.

It is this need for transportation in a modern and evolving world which makes the automobile industry an industry of the future, a pilot industry which gives work to a great number of people in all branches of industrial activity.

It is natural for today's big Manufacturers to make other countries benefit from their experiences and know-how which they have acquired.

The harmonious expansion of an operation, the complexity of which we have tried to show you and which must end in production at the best cost of a vehicle of quality, is therefore wholly linked to the establishment of a close and continual cooperation between the Host Country and the Manufacturer.

We think we have defined the framework within which this cooperation must operate and we allow ourselves, to conclude, to underline beyond the immediate and concrete aim, its remarkable influence, on the international level, on the development of human relations and the comprehension between all People.





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