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REDUCE COSTS BY PLANNING THE OVERALL PROJECT *

by

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PROJECT CONCEPTION AND MANAGEMENT

Introduction

There have been many papers dealing with the management of projects from the point of view of experienced contracting companies carrying out their part in the design and supply of an industrial plant. This paper looks at larger aspects, as seen by the plant owner, from the very first basic idea for the project until the plant is in industrial operation and producing steady income and profit.

Our contention is that correct management of these aspects, that is, foreseeing all necessary steps and making sure that they are dealt with efficiently and in the correct sequence, will result in significant savings in the overall project cost that can easily outweigh any possible savings resulting from, for example, choice of technology. The savings due to correct management will appear not as reductions in budget costs but as the absence of the large over-runs that are a feature of so many modern projects. As such, the savings might be difficult to quantify but they are, nonetheless, real. The role of a managing contractor in achieving the savings, particularly for large projects, is explained in the paper.

Fundamental Project Steps

The detailed steps necessary to bring a project to completion will never be the same for any two cases but, basically, a project in a developing country using a foreign contractor plus as much local equipment and engineering as possible will need to follow the route outlined below.

I Basic Concept:-

A basic idea for a project must be conceived by an entrepreneur or possibly by a government. The idea may arise from the recognition of a market demand for a product, from the need to exploit an indigenous raw material or even from a systematic study to identify an opportunity to construct a profitable industrial plant. Another possible source of the basic idea could be the need to convert by-products or effluent from an existing plant to a marketable product.

In all cases, the completion of this step will be the conclusion that there seems to be a good enough case for developing the project to justify the cost of the next stage i.e. the feasibility study stage.

Examples:

a) A source of 'free' SO_2 from a zinc smelter might suggest the possibility of converting it to sulphuric acid then to phosphoric acid and finally to finished fertiliser.

b) The discovery of a new deposit of phosphate rock might suggest the possibility of a complete phosphatic fertiliser complex.

c) The discovery of a new natural gas source might suggest the possibility of a nitrogenous fertiliser complex.

d) A market projection could indicate the need for additional production capacity to reduce or eliminate import requirements.

e) A study of ways of introducing industry into a depressed area could indicate the possibility of setting up a fertiliser factory.

f) A review of modern technology could indicate the possibility of improving the profitability of current production.

2 Feasibility Study:-

After the initial concept it is necessary to carry out a feasibility study. There are many aspects to this, some of which are discussed in more detail later, but in general, the end product of this stage is an answer to the following questions:

a) Is the project technically feasible?

b) Are feedstocks available,

c) Can the product be marketed?

d) Can a plant be built at a capital cost and with running costs that will enable the product to be made and sold at a profit.

e) Is the project politically acceptable?

f) If the project environmentally acceptable?

g) Is the necessary finance available?

h) Is the necessary infrastructure available or able to be provided?

i) Are necessary government approvals available.

j) Is there a suitable site available for the plant.

k) Are there adequate human resources available for building and operating the plant at the chosen location.

If the answer to all these questions is yes, the decision to implement the project can be taken. Once this decision is taken, the owner is committed to a substantial and growing cost even if the project is later abandoned (as happens in many cases). Furthermore, many other organisations will be involved in considerable expense in the expectation of the project going ahead. It is therefore important that the feasibility study should be well done and the decision to proceed with the project should be very carefully considered before being taken.

3 Final Project Conception and Contract Award:

The next stage is to finalise the project concepts such as capacity, location, finance etc and to appoint a contractor to supply the imported elements. There should also be a project team set up by the owner to handle the local elements and to understand the technology. Aspects of this stage are discussed in more detail later in this paper.

At the completion of this stage it must be possible to plan the remaining stages of the project accurately and in detail. All major obstacles to the project should have been cleared. From this stage there is a commitment to spend most of the project cost. Two points must be borne in mind:

i) A subsequent decision to abandon the project would be financially disastrous. Practically 100% of all costs incurred until the abandonment would be irrevocably lost.

ii) Subsequent stages are very costly in any case, but costs increase dramatically with any delays which are incurred. It is therefore essential that the bases established in the previous stages are correct.

4 Project Execution - Imported Part:

This is the stage in the project that is normally carried out by the Appointed contractor. This is indicated in our Typical Overall Project Plan by a few key activities but in a real project this might involve up to 6 or 7,000 activities per process unit, with a total for a complete fertiliser complex up to 40,000 activities. The end result of this stage will be the arrival of completed equipment and designs at the job site.

5 Project Execution - Local Part:

In many developing countries. the execution of a large industrial project will be used as a basis for the development of allied local industries. This is done by ensuring that as much as possible of the design and supply of the plant is local. Typically, this could involve design and/or supply and carrying out of:

Site clearance
Civil works
Steel structures
Simple carbon steel vessels and tanks
Simple piping
More complex vessels and tanks
Stainless steel equipment
Simple mechanical equipment
Complex mechanical equipment
Instruments
Electrics
etc

The extent of this part of the project will depend to some extent upon the capability of the local industry to produce the components required for the project. However, in all cases, the local part must include the civil and mechanical erection at the job site. In any case, tight supervision by a competent managing contractor is necessary to ensure that mistakes and delays do not occur to the detriment of the main project.

The end result of this stage will be the completion of the plant ready for final testing and commissioning.

6 Operation:

This final stage includes testing and commissioning the plant, training operations and maintenance staff and initial operation in which the plant is worked up to full capacity. Market development, which has been taking place throughout the project, is completed. At the end of this stage, the plant is in normal operation, under the management of the permanent plant staff and the project may be considered as completed.

The total cost of the plant will be the sum of all costs incurred from the basic concept up to the stage at which the plant operates profitably. We think it will be clear that the cost of the contract with the main contracting company is only one of many components in the final overall sum, and that all the components must be given careful consideration.

The basic steps outlined above have been developed in the diagram "Typical Overall Project Plan" to show in more detail some of the sub-activities involved and their relationship with each other. It should be noted that each of these sub activities will include many other activities, all of which may require separate identification and planning. A further point is that special local circumstances may mean the addition of further critical steps or possibly the elimination of a few of the steps shown here. However, in general, this diagram represents the necessary steps for a typical major project, such as a fertiliser plant, that is being imported.

We should now like to discuss some aspects of this plan.

I Consultant:

We have assumed that a consultant is appointed to prepare the feasibility study and to prepare the Invitation to Bid and to evaluate the bids received. This "consultant" may be a part of the Owner's existing organisation but, if experienced experts are not available, then experienced outside consultants should always be employed. It is often recommended that the roles of consultant and managing contractor should be combined and a competent contractor appointed for this work. Remember that the "consultant's" work is the foundation on which the project is built and any faults or omissions in this work will affect the project throughout its life. For example, a frequent error is to omit the step "study infrastructure available" and then to run into trouble during the shipping or construction phase because of lack of infrastructure. We know of one example where a large ammonia converter was delivered to the docks of the importing country but could not be delivered to the job site because the roads and bridges were inadequate. That problem caused a delay of 6 months with a consequent increase in the overall project cost.

In other locations there have been serious delays at the quayside because ships could not be unloaded in a reasonable time. This has resulted in the double penalty of high demurrage costs as well as costly delays in the project.

It is about right under modern conditions to assume that each month's delay in a project increases its cost by about 2%. Thus an avoidable delay of one month in a $100 million project wastes about $2 million.

We have shown the consultant making preliminary enquiries to contractors after making several basic investigations himself. Obviously, contractors can be consulted at any stage, but it is useful to have other basic information available first to assist the contractors in giving useful replies. Possibly process licensors will also be directly approached at the same time.

We should point out that it is only fair and most productive to make clear to the contractor the status of the project, i.e. feasibility study stage. It is not useful to ask a contractor to produce a detailed bid at this early stage and thus cause him to waste a lot of money and effort. Deal with your contractors in an open and fair way and you will then be able to build up a trusting relationship that will be most profitable to you in the development of the project.

Within the Feasibility Study stage, we have indicated the need to establish an operating company or organisation. This might be a completely new company with private equity partners; it might be a new division of a government organisation or it might simply be an extension of an existing company. In all cases, its structure and scope of responsibility need to be defined before a final decision to proceed with the project can be taken.

Another point to consider in the Feasibility Study stage is the question of government approvals. All large industrial projects in developing countries have considerable impact on local economies, industry and environment. As such, there is certain to be government involvement. Even if the entrepreneur for the project is itself a government agency, almost certainly other government agencies will also be involved so the step described as "Obtain government approvals" will still be necessary before a final decision to proceed with the project can be effectively taken. The approval of the government could be required for, eg:

- Basic concept of the project within a national plan.
- The plant location bearing in mind environmental effect.
- Transferring of the required technology from abroad.
- Importing the equipment.
- Incurring costs in foreign currency.

etc

Many projects have proceeded to an advanced stage only to find that the necessary government approvals have not been identified and obtained, with the result that the project is delayed and in extreme cases abandoned. It is even known for projects sponsored by one government agency being thwarted by the actions of another agency of the same government.

During the pre-feasibility stage there will be a steady cost factor that might reach a total of, say, $100-200,000 for a medium size project. At the completion of this stage, a commitment to proceed with the project commits the owner to a subsequent higher level of expenditure. It also invites contractors to bid which can involve very high costs in the preparation of the offer. Therefore, it is suggested that this decision should only be made on the basis of very thorough groundwork.

The final project conception stage includes the highly important step of the preparation of the ITB. The owner is inviting international contractors to make bids that may cost $100,000 or more to prepare for even a medium sized project. The better the ITB then the better and more useful the bids will be.

The definition of a good ITB could well be the subject of a separate paper but we would like to touch on a few of the important aspects which are sometimes overlooked. The basic aims of the ITB are:-

a) To result in bids for what the owner wants to buy rather than what the contractor wants to sell.

b) To produce bids that incorporate the best of the contractors technology and know-how that is applicable to the project.

c) To inspire confidence in the pre-selected contractors that the project is serious enough to justify the very high cost of producing a bid.

d) To produce bids that can be fairly compared for selection with the minimum of alteration and reference back to the bidder.

With these aims in view, the ITB should contain, as a minimum:-

a) A clear specification of the plant production requirements i.e. the quality and quantity of the main products, by-products and effluents.

b) A complete specification of the feedstocks available.

c) A complete specification of utilities available.

d) A reasonable statement of the guarantees required.

e) A complete specification of the scope of supply required.

f) A specification of the documentation standards required.

g) A complete specification of the design standards to be used, or a statement that the bidder can use his own preferred standards.

h) Any special requirements for source of finance.

i) Any special requirements for source of equipment.

j) Full description of the job site available.

k) Basic clauses for a draft contract

etc etc etc

A competent consultant will take care of all these features plus others which might be specific to a project.

Having received the final bids, they must be carefully evaluated to select the one which gives the best combination of price, technology, delivery, finance and confidence factor. The confidence factor will depend upon an assessment of the contractor's experience with the specific process and with his ability to handle the project at the time. Having made the selection, the final contract can be negotiated with wording that is clear enough to minimise the gap between what the Buyer thinks he has bought and what the Seller thinks he has sold. Mis - understandings cause future delays and delays cause extra costs for all parties.

The project execution of the imported part always receives a lot of attention but is rarely a major source of delay or extra cost in the overall project. This will normally be handled by an experienced international company that is well qualified to control the thousands of activities involved, provided it is allowed to proceed exactly as foreseen in the contract. Of course any late changes of mind by the Buyer, usually resulting from inadequate preparation of the earlier stages, will result in confusion, delay and extra cost.

Incidentally, the extra cost of changes is often a cause of disagreement between buyer and contractor. The buyer finds it difficult to understand why a small change that might have been negotiated for a nominal charge during the contract negotiations can cost a great deal during the contract execution. The contractor on his part finds that even very small changes result in so many changes to documents and drawings with their resultant delays and risk of errors, that their actual cost can never be recovered from the buyer.

All competent contractors prefer to perform their work with no changes whatsoever in their scope of work or design basis.

In the case of major fertiliser complexes consisting of several process plants supplied by different contractors with the requirement for complex offsites facilities, it is usually necessary to appoint a managing contractor to coordinate the whole project. This step is highly recommended in cases where the project is complex and where the buyer does not have a team of experienced staff. For the managing contractor to be fully effective it is essential that he is appointed before the final contracts for the process units are signed, so that there can be a contractual relationship between the contractor and the managing contractor. The managing contractor will normally have the task of controlling all activities, local and imported, involved in the design, procurement, delivery, erection, testing and start up of the complete complex.

In cases where several process units on a complex are handled by one contractor, he will employ a process design coordinator to ensure that all plants are designed to a common process design basis and that plant layouts integrate relative to the overall site plan. He will also ensure that battery limit interfaces are fully consistent in engineering detail etc.

The project execution of the local part is often the cause of delays and increased costs. The principal reasons for this are:-

a) The information required to start the work can only be finalised after the basic design for the imported part is complete. At the same time, much of the local work is required to be complete before the imported equipment can be shipped and erected.

   I am sure we are all familiar with the sight of imported equipment, perhaps delivered against a penalty date, standing for months at a store or dockside or even at the job site waiting for the local work to be completed.

b) The local work is not controlled with the same expertise as the imported part. It seems clear that the control of the local part is at least as important as the imported part, but there is often a tendency to put this in the hands of inexperienced managers who are doing this sort of work for the first time. The appointment of a managing contractor is the best way of overcoming this problem.

The reluctance of developing countries to spend scarce foreign currency on expatriate supervision is understandable, but hard experience has shown that lack of experienced supervisors in this phase always leads to very expensive delays and high cost overruns. There are also often high costs and delays resulting from rectification work. It is worthwhile to spend a few per cent of the project cost on supervision to avoid doubling the final cost due to errors.

Plant start-up, initial operation and commercial operation will proceed smoothly provided that:

a) A good plant has been supplied and well erected.

b) A competent operating crew has been recruited and trained.

c) A competent maintenance team has been recruited, trained and supplied with adequate equipment and tools.

d) All raw materials, utilities and start-up chemicals and catalysts are available at the right time.

e) Necessary spare parts are available.

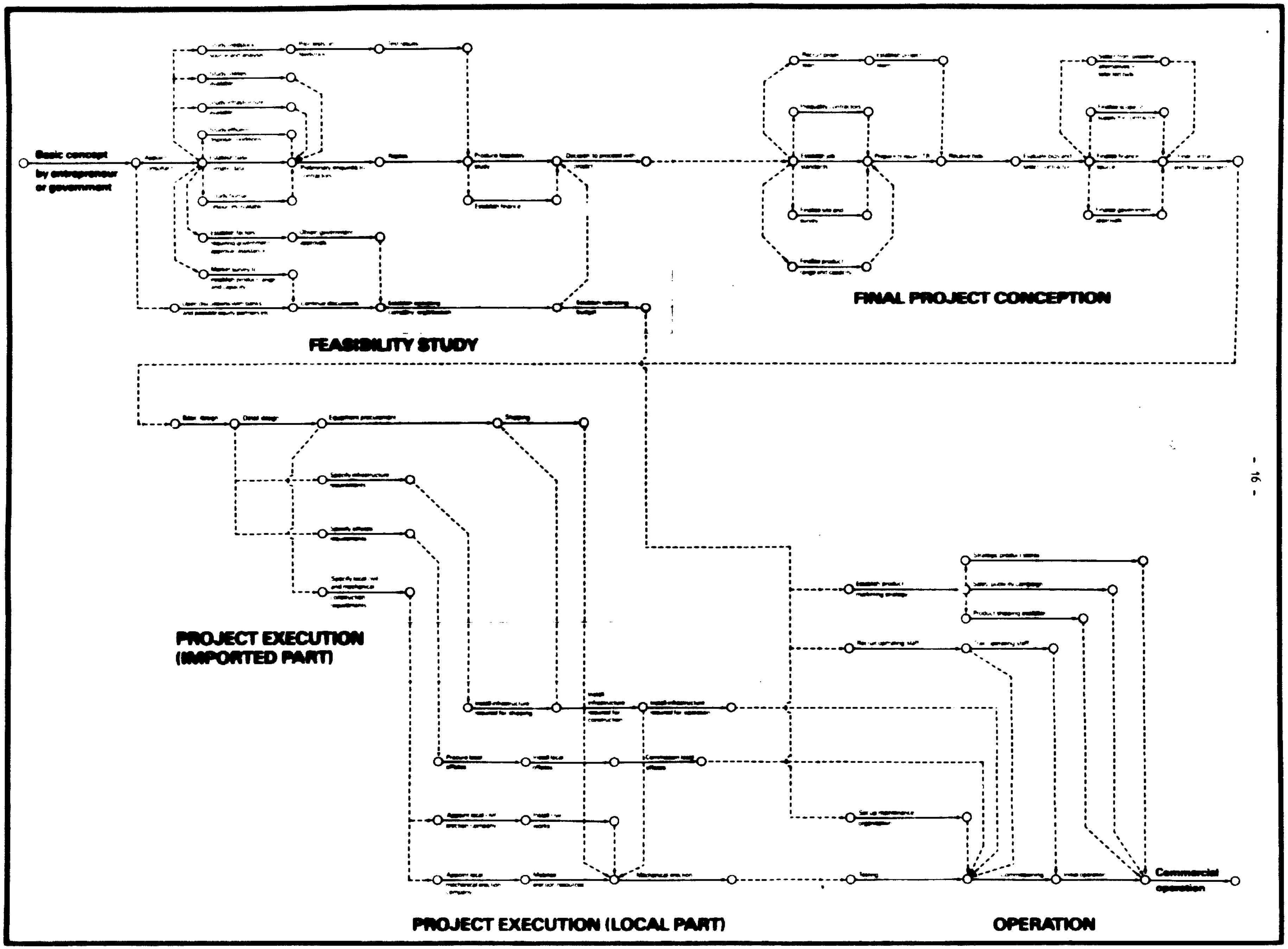
f) The marketing organisation for the product is fully established.

The absence of any one of these conditions can turn a successful project into a failure.

Conclusion

We all know of projects which are failures, technically, financially or operationally. We suggest that if you know the details of the development of any such plant and can compare its progress with the Typical Overall Project Plan, you will be able to identify one or more steps which caused the failure by not being carried out thoroughly and at the right stage.

If a project is developed logically with all stages covered in the correct order then there is a good chance that a $100 million plant will cost about $100 million and not $200 million and will not be late.


Basic concept
by entrepreneur
or government
FEASIBILITY STUDY
FINAL PROJECT CONCEPTION
PROJECT EXECUTION
(IMPORTED PART)
PROJECT EXECUTION (LOCAL PART)
OPERATION
Commercial
operation

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