Systematic Engineering Drives EPC Project Success

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For a typical project involving Engineering, Procurement and Construction (EPC), the Total Installed Cost (TIC) is split between the above three phases as 10 to 20% , 35 to 45% and about 40 to 50% respectively. Therefore the common notion to manage the project effectively in order to control the budget and thereby to avoid any over run is to focus heavily on the Procurement and Construction phases of the project because P&C are two significantly higher cost components of any EPC project. However, the cost influence of E on an EPC project most often could be very significant. It is therefore important to understand and appreciate that poor and sloppy engineering could potentially spell disaster for any EPC project. Such importance needs to be taken into account at the very beginning of the development of project execution plan.

In order to perform engineering phase in a focused and systematic fashion many operating companies and EPC companies have their own way of performing this phase. However, IPA's Front End Loading (FEL) approach has become an well accepted industry practice. Following the FEL process this paper elucidates the necessary steps for a systematic approach to perform Engineering phase from conceptual to detailed engineering of any given EPC project. Following such a rigorous systematic methodology helps to avoid any adverse impacts on the remaining two significantly higher cost components of the project and thereby to achieve a successful project. The influence of various phases of any EPC project on the project cost is elucidated in Figure 1 below. This plot shows how important it is to do the front end effort right. Once that phase is completed the influencing factor of the subsequent phases of the project to create the opportunity to minimize cost over run as well as project schedule of the overall project gets eliminated.

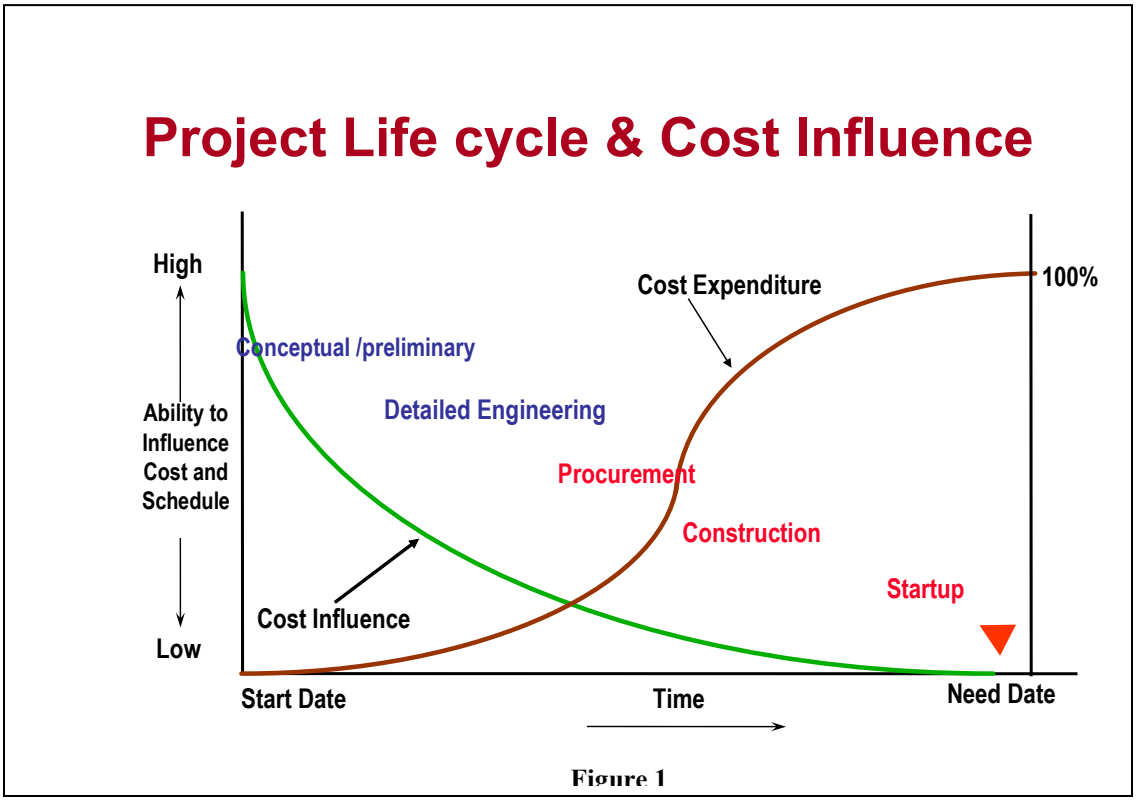

Figure 1

On a given project, FEL covers all the basic and preliminary engineering prior to commencing the detailed engineering. Depending on the complexity of the project, this exercise accounts for 15 - 25 percent of total engineering effort. A proper front end engineering effort sets the stage for an effective detailed engineering

FEL helps to achieve a detail definition of scope of any project. It establishes the business objectives of any given project. It translates business and technology opportunities into a capital project. It aligns all stakeholders to the defined scope and execution plans. It ensures total commitment to a no change philosophy once FEL is accepted by all stake holders.

There are three phases of FEL:

FEL 1
FEL 2
FEL 3

FEL 1 defines the project business case
FEL 2 Phase establishes project/process concepts and
FEL 3 Phase produces detailed engineering and project execution plan

Once executed properly, this sort of engineering effort phase creates the following three categories of deliverables:

1) Engineering documents such as PFDs, P&IDs, plot plans, energy and mass balances, single line electrical diagrams, and specifications of major equipment,
2) Project execution strategy
3) A cost estimate typically at the ±20% range, often as high as ±10%

Typical barriers to do systematic front end planning & engineering:

Depending on the culture of the project owner and the contractor several issues may surface to shorten the project planning and front end engineering efforts. Such detailed effort sometimes is viewed as a waste of time and money. Sometimes the ego and attitude of project manager and/or key management personnel comes into play: "we know how to do it, been there done that (btdt), no room for innovative ideas"

In order to preserve the benefits of proper front end engineering and planning a detailed transition step is to be incorporated in the project execution plan which should include a written transition plan to detailed engineering, procurement and construction phases. this should include division of responsibility (DOR) and detailed project schedule. Utilization of adequate gate checklist to ensure completion of FEL and transition to detail engineering is important. There should be a concerted effort to ensure continuity of key resources in the project team. This is critically more important to maintain the continuity of key process engineers beyond the front end engineering phase. To achieve success in executing an EPC project continuous and consistent interaction & input between engineering and construction representatives are a must.

Concluding remarks:

Proper front end engineering and planning as shown in Figure 2 followed by a properly executed detailed engineering phase integrated with a well thought of transition to procurement and construction phases will result in minimization of engineering rework and thereby a successful project execution.

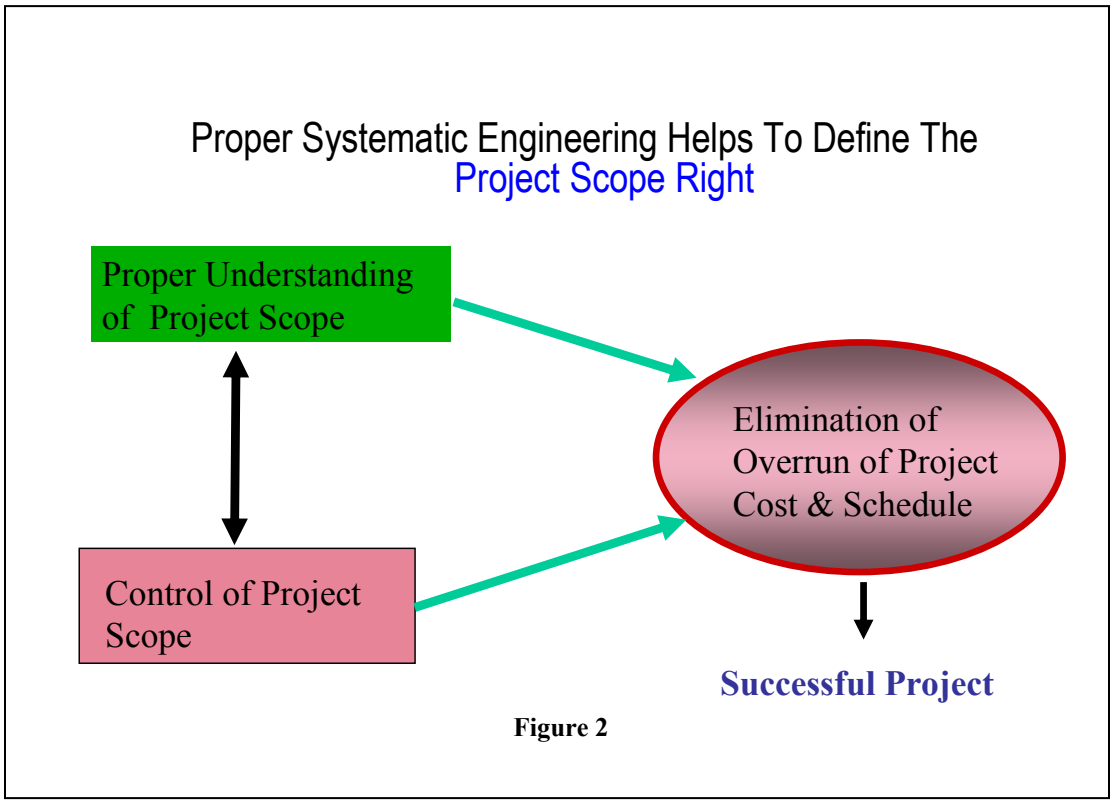
Proper Systematic Engineering Helps To Define The
Project Scope Right
Proper Understanding of Project Scope
Control of Project Scope
Elimination of Overrun of Project Cost & Schedule
Successful Project

Figure 2