PLANNING AN ENGINEERING PROJECT

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Abstract: The planning activity for the management of an engineering project is crucial. Plans are the simulation of a project, comprising the written description of how the Triple Constraint (Time, Performance and Cost) will be satisfied. Therefore, project plans are really three plans: one for the performance dimension (the work breakdown structure), one for the schedule dimension (preferably a network diagram but occasionally a milestone listing or bar chart), and one for the cost dimension (a financial estimate). This paper covers plans in general, reiterates the need for plans, describes how these three kinds of plans are made, reviews several planning issues, and discusses a document or series of documents embodying the project's planning agreements.

Keywords: brazed, heat exchanger, life cycle

1. WHY AND HOW TO PLAN AN ENGINEERING PROJECT

In broadest generality, plans depend on three factors:
1. Knowing where we are now (or will be when whatever is being planned for will start)
2. Knowing where we want to get.
3. Defining which way we will get from where we are to where you want to be.
4.

These factors are illustrated in Figure 1. The old saying, "When you don't know where you want to go, any road will get you there," is true; we can have a plan only if we have a destination in mind [2].

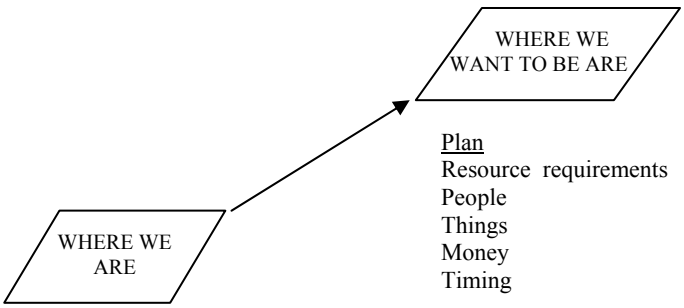

Figure 1. Planning [3]

Many company sponsored engineering projects are initiated because of the organization's long-range plan. Thus, plans are frequently hierarchical, with short-range plans established within the context of long-term plans. For instance, project task plans are components of the overall project plan. When the

long-range plan covers five or ten years, changes obviously occur, priorities must be altered, and projects are added or canceled in response to the dynamic environment [4].

2. THE NEED FOR PLANS

Plans aid coordination and communication, provide a basis for control, are often required to satisfy requirements, and help avoid problems.

2.1. Coordination and Communication

Most engineering projects involve more than one person. Typically, a technical expert is asked to perform in the area of his or her expertise. For instance, an expert on electronic circuit design works on the electronic circuit design task, not on the optical design task for an electro-optical system. The project plan is a way to inform everyone on the project what is expected of him and her and what others will be doing. Plans are a vehicle to delegate portions of the Triple Constraint down to the lowest (task or subtask) reporting level. If the people responsible for these tasks also participate in making the plans, they will have an added impetus to adhere to them [1].

The project plans matter. Even if the project can be performed in the office, other people in the organization (for instance, the boss) will want to know where the project is headed, what we are doing, and for how long we will be doing it. Thus, project plans constitute an important communication and coordination document and may motivate people to perform better.

2.2. Basis for Control

Plans are also the basis of the project controls (see Figure 2). It is a characteristic of projects that they do not go in accordance with plan. What do not know when we start is where and how our project will go off plan. Deviations from plan, detected by monitoring progress, constitute our early warning signal during project performance that there are problems to be resolved. That should cause replanning to occur.

When a new numerical control system is being tested, it could be installed in a test machine tool. The machine tool is instructed to do a precalibrated course with several fixed reference check points. During the course of the work test, observations of the numerical system signals are compared to the expected signals at each check point. When deviations are observed, adjustments must be made. The same is true of a project deviating from the plan to achieve its Triple Constraint [2].

Plans are a detailed description, formulated before the project is carried out, for accomplishing its various aspects. Deviations may indicate that the project will not reach its intended destination.

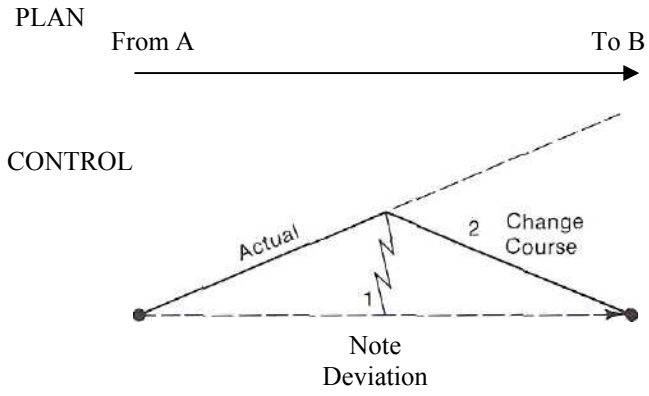

Fig.2. Plans are the basis for control [3]

Figure 3 illustrates how all the techniques of project planning documents are related. The work breakdown structure (WBS) leads to a network diagram. Each activity or task on the network is then time-phased and checked for resource allocation to be certain it is consistent. When this is done, it is possible (although not necessary) to construct a schedule bar chart indicating the time frame for each activity or task of the entire project. The costs for these tasks are then estimated and, when work is being performed on them, costs are reported back by specific task in each expense category.

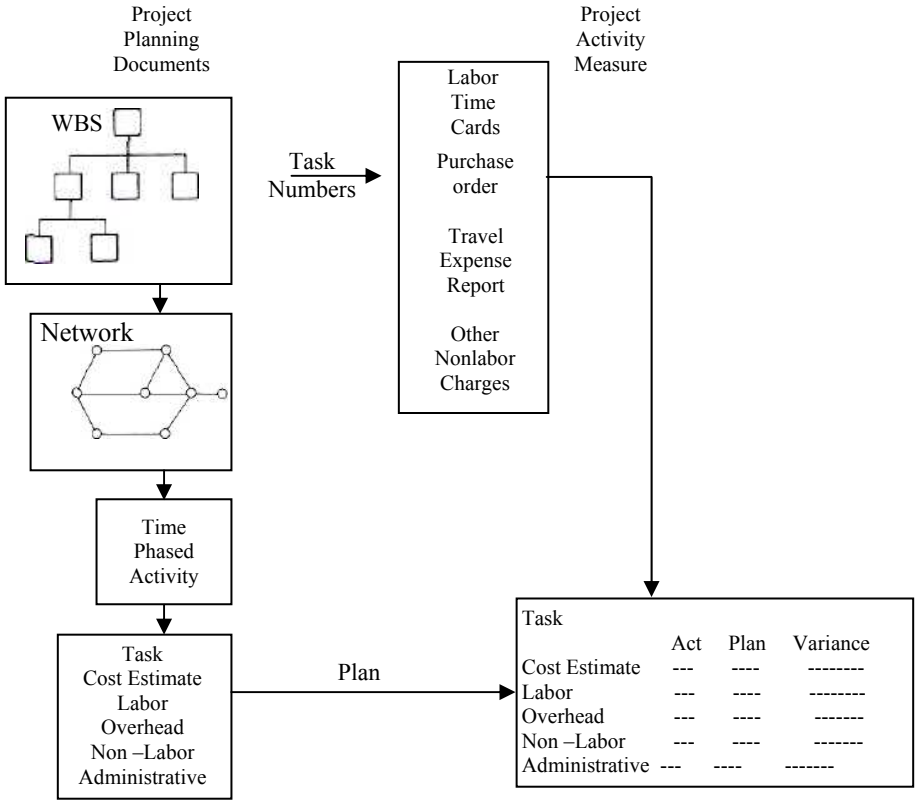

Fig. 3. Overview of how project planning documents are used in project monitoring phase [1]

Plans are sometimes created merely to satisfy requirements imposed by others, perhaps a customer or a boss. In such a situation, plans are often created under duress rather than because they are perceived to be valuable, even essential, in achieving project objectives.

Plans so created are frequently not followed. All too often they are generated and then discarded because they were prepared only to meet the requirement to prepare a plan. When there is such a requirement and the plans are prepared slavishly rather than thoughtfully, it is a waste of time for the preparer and the reader.

3. PLANNING ISSUES

The plans are a simulation of how things will occur in the future. There are necessarily uncertainties about the future, some of which may be somewhat predictable and thus partially controllable, but many of which are unpredictable.

It can reduce (but not eliminate) these predictable uncertainties by using checklists, thoroughly discussing the plans with experts, and involving your entire team. Nevertheless, uncertainties will remain because there are always unpredictable factors when you are doing something new. Allowance for these unknowns can be made by inserting contingency in your plans, but the unknowns cannot be eliminated. For instance, thorough plans cannot prevent bad weather or strikes from delaying a construction project or eliminate cost changes due to currency rate fluctuations. Plans can be no better than our present understanding. If we have done something similar before, we can plan it better than if it is entirely new to you and your team. For instance, previous experience with an organic polymer formulation is not terribly helpful for planning a materials study project [2].

Assumptions, such as which people will be able to work on the project, are involved in planning. The plan for the materials study project looks a lot different when a senior mechanical engineer will do the work than when a junior electrical or chemical engineer will. Because assumptions are involved in our planning, it is important to include contingencies. Good plans are quantitative rather than qualitative and as precise as possible.

In preparing plans, as in carrying out project work, we are frequently confronted with options. The plan may be considered the record of our choices between these options and will normally depend on how much risk we are willing to take or how much contingency allowance is included in your plans [5].

Project participants will frequently present a plan that seems absurd. It may in fact be absurd. But perhaps the person who prepared it is simply emphasizing activities that you are not stressing.

A common engineering project activity, ordering required materials, illustrates this problem. Sensible choices are to order these materials as early as possible (to be certain they are available when required) or as late as possible (to reduce the possibility of having to change selection or to help your organization's cash flow). It is important to discuss the perceptions of everyone involved in the undertaking.

Hazards: there are innumerable hazards in preparing engineering project plans. In an attempt to gain time in the early phases of a project or because we are addicted to our own ideas, we may tend to do much of the planning yourself. We should avoid doing so for the same reason you do not like to be told to carry out somebody else's plan: It is demotivating. In fact, it is important to involve the people who will actually be doing the work so they plan as much of their work as possible.

In addition, poor planning frequently occurs. Other than sheer laziness, the basis of almost all poor planning is a misunderstanding of the Triple Constraint point. Taking the time to create plans allows you to identify your perception of the Triple Constraint point and shows if and where it differs from somebody else's.

Once it have decided to plan the project and have issued the plans, people should take them seriously. They can do so only if they know the plans are current. Therefore, it is very important to know who has copies of them. When we revise plans, be absolutely certain to provide revisions to all people who have copies of previous plans. When we do this conscientiously, everyone involved in your project will know that you take planning seriously. They will know the plans they have reliably indicate the project intention [2].

5. CONCLUSION

The project management is one of the ubiquitous activities of the modern societies, even if only a few admit or refer to such a preoccupation. That is why, the viewed objectives aims at the awareness of the benefits brought by the project management in all activity fields, the creation of a vocabulary specific to the field, the skills to conceive the project, in spite of the aimed field, of administration and of their evaluation.

Today's competitive business environment is pushing companies towards a greater emphasis on innovation of product and processes. Project management offers a highly structured approach to effectively manage change and is capable of being adapted to fit a diverse range of applications. Managing projects is a highly complex job. If today's project leaders are to cope with complex projects, they need to think of themselves as change agents — aspiring individuals who implement change by gaining the commitment and action of key people both inside and outside their organization.

6. REFERENCES

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