The 12 Best Strategies to Keep Engineering Projects on Track

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Introduction

Engineering product development or improvement projects can be kept on track. The following strategies will allow a manager to improve significantly the probability that a project will complete successfully on time and budget. These have been accumulated as a result of working on engineering projects for 20 years as an independent developer, and seven years as a high tech manager.

In the case of any particular project, not all of the strategies need to be implemented, but the greater the degree of their implementation, the higher the likelihood of success. As is always the case, the skill, experience and judgment of the Engineering or Project Manager will allow them to determine which strategies are best emphasized for a particular project.

These strategies, taken as a whole, actually fit into a generic general management process that involves the following four basic management tools:

   a. **Planning** (specifying and organizing the task to be accomplished, including what resources are to be used)
   b. **Reporting** (how well the plan is working compared to original plan)
   c. **Corrective Action as Required** (Management by Exception, Risk Management, etc)
   d. **Process Feedback** (to improve future project planning and controlling)

Strategies

1. Learn to value the early days of the Project as if they were the same as the final days

Many managers consider the days near project completion as much more valuable and important than those at the beginning. Momentum gathers slowly during the early phases, and moves rapidly toward the end. In reality, a day lost at the beginning, or the missing of an early milestone, can have as significant an impact on completion date or budget as missing the final deadlines.

Similarly, a project kickoff meeting emphasizes that the project has begun and starts the focus on project outcomes and process. This is the time to discuss goals and objectives with the significant team members. It is surprising how many

projects are started without such a meeting, wasting valuable time and focus at the project beginning.

2. Generate a Detailed Specification and System Block Diagram

Nothing can be more crucial to the success of a project than to have a Detailed Functional Specification and System Block Diagram. These need to outline important system characteristics and be written down, and <u>signed off</u> by all critical team members. These specifications alone can often make or break a project. The trick is to have them detailed, but not too detailed. The experience of the manager counts a lot at this phase.

Most product specifications change throughout the project. Plan for this and have a method for tracking these changes, don't just assume that "everyone knows" what are the current product specifications. Have a method to track changes, and make key members again <u>sign off</u> on the changes and indicate their <u>impact</u> on schedule and budget.

Documented Functional and Software specs that are well controlled keep "creeping featurism" and a long sequence of "just minor changes" from seriously impacting the project negatively.

3. Determine high risk areas before beginning planning

Identify the unknown or undeveloped approaches, circuits and techniques involved in the successful completion of the project. These can then be broken out into a special project by themselves, or at least partially developed, before even beginning the formal project. This is another critical judgment call.

One important factor to be considered during planning is to be sure to have an alternate <u>Plan B</u> approach. This can be used to replace the initial Plan A if a high risk element fails to be work. The plans could include pursuing, at a higher cost, an alternative, "just in case" approach. As another alternate, a lesser technology could be substituted. Sometimes having the latest technology everywhere in a product is not as critical as having a working product in the hands of users. Effective project managers learn to make these judgment calls.

These are often delivered later than vendors' estimate. These can have severe consequences to the project completion or initial product delivery. Plan to order these items early. In the alternate, ask the question what can be done to substitute for the item if the vendor is late? Then think about an alternative potential plan.

4. Generate a detailed Project Plan

Be committed to creating a detailed, <u>written</u>, plan for the project. Even a small project, but especially a large one can not be controlled without a written plan. The persons working on the project must create this plan. Plans need to be detailed enough, but not so detailed as to obscure what is going on. They are not just produced at the beginning of the project, or because upper management wants them, but because they are crucial to getting things done within a reasonable time and budget.

This is the place where the most project management judgement is concentrated, both before the project begins, and as it progresses. It is best to consider a few alternatives, instead of just jumping in on one, as is often the case. A good place to start is a plan that has worked before. Begin with the basic project steps and milestones, then make a few example schedules.

Show these "top down" cases to the critical plan resource persons. They should then breakdown the tasks even further, and give estimates to be integrated upward into the plan. It is critical that you and the persons that work on your project have a practical approach to estimating.

One good approach is to use a best, nominal, worst case scenario in the bottom up estimating. These can then be used to create a statistical measure of time and cost risk in a project. From this, a two or three sigma, nominal, best and worst case plan can be made. Be sure to approach the cost of items bought from vendors in the same manner.

When the selected and updated "top down" plan is ready for adoption, feedback the results to the critical resource persons that created the detailed "bottom up" plan. This process gives them another chance to make changes and become more committed to the final program. Without this "buy in", the project can have significant built in problems from the very start.

5. Develop an approach to handle unk-unks

Unk-Unks are the unknown-unknowns that come up during the period of a project. They are important tasks or delays that occur that were not, or could not, have been planned for. These can be especially vexing to a project. This is not the time to "throw the plan out the window". It is a time to update it.

The best strategy is to carefully follow the project being on the lookout for these situations. Try to locate them as quickly after they occur as possible. Once they are detected, the plan must be immediately recreated, taking the new situation into

account. Be sure that project-tracking reports note the occurrence of this event for later reference.

6. Develop a practical method to track project progress and costs

There are many methods to track progress and costs on a project, but most of them are too detailed to actually get useful data for the project manager or others to use. This is especially true for modern project management software, developed for large construction or government projects. It is a full time job entering information and creating reports. Often the reports don't even help the manager in decision making.

One good method is to prepare a simplistic set of tables generated on spreadsheets. These show summaries of overall accumulated project major event totals and cost totals compared to original estimates. The important point is that they be easy to generate and compare estimates to "actuals", so that over runs and slips, if they occur, can be detected early in the project. With graphical plotting, they also can be used to create best estimates of the amount of slip and over run. In the hands of a mature management, they can be far better for decision making than a "gut feel".

7. Have periodic Project Review meetings

Every project of duration over a few days needs to have review meetings involving the manager and critical resource persons. This eliminates the communications problem attendant with the belief that "everybody already knows what is going on". Often they do not, because they are busy on their own work. Weekly or bi-weekly meetings are often enough. The challenge is to avoid meetings that cover too much territory, or that allow a few people to dominate what is communicated to the others. This creates the feeling of boredom and frustration that resource persons often complain about at such meetings.

These meetings are a good time to feedback project status reports that are generated for the upper management to the team. After the meeting, it is often important generate a timely report for team members on Action Items and to whom they are assigned.

One of the most critical things to watch out for at such meetings is that they can be a major factor in creating "creeping featurism" on the project. Major changes that are agreed upon must be updated in the Specification and reflected in Schedule before giving authorization to proceed. The manager must then act quickly to perform this update so that they do not hold up progress.

8. Give support to the project team

The concept of the supporting team of members is a difficult to define, but it grows out of the experience of the manger and a few basic concepts. Most effective project managers of complex projects have learned the ability to coach, rather than overly direct the team. This can be a style foreign to many engineers, but it can be critical in effectively achieving overall project goals.

One important coaching skill is learning to really <u>listen</u> to the team members and what they are saying. Be sure you understand their project related comments and needs completely. Refrain from judgement until all of the information is gathered. Then take action on what is heard.

Another important coaching skill is to give, as appropriate, positive feedback to the team. Often, engineering mangers tend to only give negative feedback. A manager that feeds back only project difficulties and concerns, and not the positive outcomes of challenges overcome can slow down a project significantly due to lower morale.

Still another critical skill for the manager as coach is to assist with fixing ineffective patterns that can frequently develop in the team. These shows up as conflicts, missed deadlines due to lack of communications, etc. The process involves the coaching of two or more individuals independently, and then as a group. The purpose is to assist them in resolving an ineffective pattern. This skill is complex, but can be modeled from others and learned at programs that teach it.

9. Follow up on agreements among team members and upper management

These are agreements that are made with a team or a team member to receive some form of support from upper management. This can involve everything from handling excessive work schedules, to the purchase of capital equipment critical to a project, to adding additional resources, etc. Some project managers try to sidestep these agreements, because they can often be difficult to resolve or accomplish. This can create a sense of a lack of upper management concern for the team members or the project. If this occurs, it can definitely impact team productivity. As appropriate, keep team members informed as to the progress on these agreements.

10. Take into account the almost inevitable project slips at Debug and Test

Of all of the time during the life of the project, the time at the end seems to drag out much more than was planned. This is where every error made by all team members accumulates. It is rare that a project plan can take into account the large number of

tasks that can occur at this time. In addition, team members often can not work at tasks in parallel, instead, many of them must be done in series, delaying the project each step along the way.

One approach is to keep asking the question, what can the team members do in parallel during this period? This can at least help the team to act to minimize the impact of new tasks during this phase.

It is also valuable to have a real, believable, understanding of the economic impact of delayed time-to-market at this phase. This could provide justification for adding additional resources to solve specific challenges at this critical time.

Another approach, if practical, is to plan market introductions with some lag time compared to schedule. It is rare that a company's management will do this. On the other hand, they will often delay product introduction caused by such delays.

11. Have an approach for the almost inevitable project cost overruns

It is very rare that a project does not overrun its cost budget. A good plan can minimize its impact. A lot of the problem has to do with unk-unks at the beginning of the project. Additionally, it is rare that the resource persons planned for use on the project remain on it from beginning to end.

Most upper managers do not want to consider a plan to overrun the budget, but if methods are created to track costs all along the project time frame, they can allow the magnitude of the potential overrun to be contained.

A good approach to force the tracking of project cost is to schedule formal project cost and status reviews. If timely and accurate cost tracking is available, it can lead to decisions to implement alternate courses of action at the earliest possible time. This can be invaluable in containing costs.

12. Develop a built in method of feedback for the next project

After a project manager has completed a project, it is a good time to use what has been gained during the actual project period to improve their management skills for the next one. This is accomplished by studying the difference between the estimated and actual times and costs during the separate phases of the project. Determine where project time phases and costs were under and over estimated.

It is also valuable to study the estimated and actual times and costs that are made by the various resource contributors to the project. These can be used to create a "normalizing" factor to be applied to the various estimates produced by them in the

future. Some persons habitually over or under estimate their project costs and times. This information, if fed back to them, will help to increase their effectiveness in the future.

With proper planning, the normal project reporting process can be structured correctly from the beginning to produce the required feedback reports during the timeline of the project. Then, the reporting function would automatically capture the data needed. This will increase the accuracy of this strategy and help it to be implemented.