How do Managers Control Technology-Intensive Work?

John W. Fellers[1]

Abstract

Technology is all around us. In this day and age consumers are constantly anticipating and expecting companies to develop and produce technology that is bigger, better, and faster than the technology released the day before. Companies that choose to operate in this environment understand that their work is of a temporary nature. An idea is born, developed, produced, and as it hits the shelf the same company that produced this technology is already back at the drawing board starting on the next big thing. Effectively controlling technology intensive work is imperative and best achieved through the tenants of project management. Projects are best controlled first by good planning, then through measuring performance, and finally by taking corrective action when necessary. This purpose of this paper is to provide an overview of the tools and techniques of project management that can also be used to effectively control technology intensive work.

Keywords: Technology; Management; Project; Planning; IT

1. Introduction

Technology is everywhere. In the world we live in today, there is not a single part of our lives that goesun-influenced in some capacity by technology. Companies that survive off of the production of new technology must concentrate on speed and quality.

[1]MS, CFPS, CFI, RAS, Applied Technology and Efficiencies Initiative, Director, Environmental Health & Safety, Texas A&M University Health Science Center, Clinical Building 1, Suite 4130, 8441 State Hwy 47, Bryan, TX 77807, Phone – 979-324-7403, Email – fellers@tamhsc.edu

All strive to be the first to market with the latest and greatest technology that will bring consumers in. There is no time for rest in this business however. Where one technological breakthrough occurs, there lies a better one just around the corner. As a result, the technology intensive company must constantly be planning the next technological breakthrough that will keep them on top.

This presents a complex challenge for managers. How do managers control technology intensive work? As described above, the technology intensive company must move quickly to produce technology and even quicker to begin planning the next big thing. This type of temporary work can be considered project based. A project is defined as, "a sequence of unique, complex, and connected activities having one goal or purpose and that must be completed by a specific time, within budget, and according to specification" (Wysocki&McGary, 2003, p.3). This definition re-enforces the notion that technology intensive work is essentially one project after another. With this in mind, it stands to reason that the most effective way for managers to control technology intensive work is through the use of tools and techniques involved in the discipline of project management.

When technology intensive companies use project management principles to control their work, their likelihood of success is much greater (Pinheiro, 2010).Control is critical to accomplishing the company's overall goals and objectives, and the use of project control techniques provides the vehicle mangers need to monitor, measure, and deliver the expected output. Therefore, the management of technology intensive work requires the framework provided by project management that includes a project management plan, project organization, project management tools and techniques, along with the monitoring of performance and project control (Pinheiro, 2010).

The principles of project control are based on prevention, detection and action. Preventing constant changes is critical to keeping the project moving ahead, and this is accomplished through planning, effective communication, monitoring for potential issues and resolving issues quickly, and being clear on the objective of the project. Detecting possible changes early is also imperative and can be accomplished through such tools as performance review meetings. When established thresholds for change are reached it is imperative to take corrective action to keep the project on track (Horine, 2005).

Figure 1 provides a visual representation of these project control principles. Lewis, 2007 describes project control as a daily attempt to keep projects moving in the right direction and involves measuring work performed; comparing the status of that work with what should have been accomplished; then taking appropriate action to get the project back on track, if needed. This is echoed by Meredith & Mantel, 2006. They note that reporting on project performance and comparing it to the desired level of performance, then accounting for the differences are all elements of project control. They further explain that project control is essentially the process of reducing the degree of variance between what it planned, and reality. Morris & Pinto, 2007 comment that project control is about good planning, setting up appropriate measures to monitor performance, and taking corrective action to keep the project on track.

Figure 1: Project Control Process
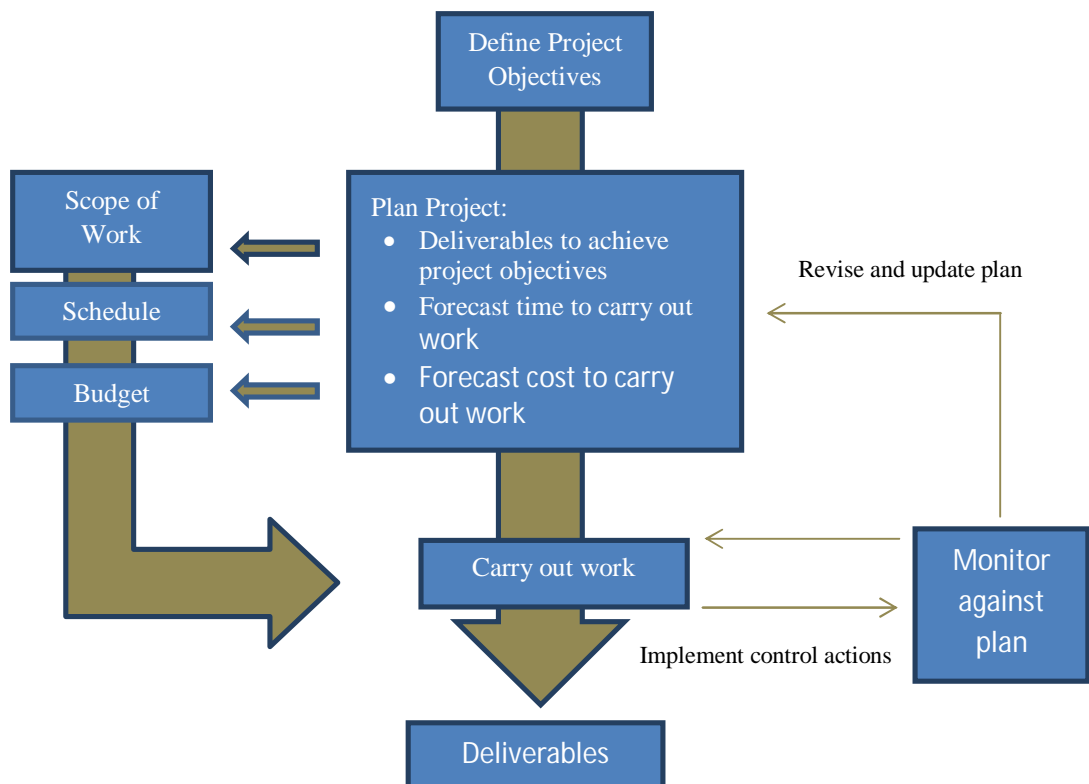
Source: (Morris & Pinto, 2007)

Taking this into account, it is clear that project control is a process that will take place at each phase of a project's life cycle. A project must be treated as a total system and in order to achieve the desired results the project must be controlled in its totality from the planning phase through delivery of the final product (Devaux, 1999). This is accomplished through project planning, measuring performance, and taking corrective action to promote continuous improvement of the plan, personnel, and the project scope (Pinheiro, 2010). This paper will explore how mangers can control technology intensive work through planning, measuring performance, and taking corrective action.

2. Planning

Planning is an extremely important step in the process of project control as well as the life of the project in general. Many things occur at this stage. Among them, during the planning phase the target deliverables are verified, commitments are established between project managers and stakeholders, and the need for resources is assessed (Dobie, 2007).But perhaps the most important product of the planning stage is the development of the project plan. The primary function of the project plan is to provide the project manager with a map of how the project is to be accomplished from delivery through finalization. This map will enable the project manager to see what still needs to be done, when it is to be done, what resources will be used, who will be accomplishing the work, and to what specifications(Mantel, Meredith, Shafer, & Sutton, 2005). In basic terms, the project plan shows the project manager how to do the project. It lists the tasks that will be completed, puts them in order, shows how long each will take, who will perform them, and to what cost (Newton, 2006).

Having this clear picture is tied directly to the ability to control a project effectively. If the project objective is not clear with regard to what is expected in the deliverable, it will be difficult to know what should be controlled (Snyder, 2004). The project plan or scope enables the manager to determine at what points during the project's life cycle control should be exercised, what should be controlled, how it should be controlled, how much variance from the plan is acceptable before corrective action is needed, and what type of action should be implemented (Meredith & Mantel, 2006). Planned projects will also be shorter and cheaper than projects that are attempted without proper planning (Devaux, 1999).

One method of project planning that is popular and effective is the work breakdown structure. A strong proponent of the work breakdown structure Devaux, 1999 states, "If I could wish one thing for every project, it would be a comprehensive and detailed WBS" (p.73). He further explains that the WBS is effective in assisting managers with defining and controlling projects, and that including all planned work on the WBS is critical to this process. The WBS is a method through which the project manager can lay out the project andvisualize it from beginning to end. As one of project management's most useful tools, theWBS enables the project manager to plan projects of any size, by focusing on the elementsthat make up the project one task at a time (Newell, &Grashina, 2004). Breaking a project allthe way down to individual tasks can seem like quite a daunting task in itself, especially ifthe project is large. However, the WBS assists the project manager in defining a clear pictureof what it's going to take to complete a project, and through this, also an estimate of howmuch time each tasks will take. This aspect of the WBS actually helps to simplify the projectfor the project manager (Portny, 2001).

The structure of the WBS is typically done in a family tree or organizational chart format. The project to be completed is listed in the top box. This is called the first level. The second level lists major work packages to be accomplished. These work packages are then broken down into activities that will accomplish the package representing the third level. These activities are then further broken down into tasks at the fourth level. This process can continue until the project is broken down to its lowest level (Lock, 2003).Devaux, 1999 lists several guidelines in the development of a WBS. First, activity names should consist of a verb and an object. For example, solder circuit board. Second, each activity should be product oriented. Third, the sum of an activity's tasks must equal the completed activity. Fourth, no activity should only have one task that completes it. Fifth, each task must be assignable to someone. Finally, the more risk a particular activity contains the more detail it should be broken down into. Each activity listed in the WBS will be given an identifying number or code. The first number in sequence identifies the work package. The second number indicates the activity and the third number identifies the task (Portny, 2001). Once the activities are all inserted in the WBS the manager can begin the process of estimating the time and cost of completing individual tasks which will provide the manager with the performance measure by which to compare actual work and implement controls.

3. Measuring

In order to properly control a project, certain key measures must be established for the purpose of comparing actual performance to the project plan. This could include measuring performance related to scope, time, cost, risk, quality, and even the satisfaction of the project team (Morris & Pinto, 2007). One project management tool that is often implemented is the establishment of threshold values on things that need to be controlled. If a certain cost or time frame, for example, is exceeded then corrective action is taken (Devaux, 1999). Another tool that is typically used is the identification of key performance indicators. KPIs are determined during the planning stage and are used to measure progress toward project completion and can also provide information needed to make decisions regarding trade-offs between possible control actions (Morris & Pinto, 2007).

Benchmarking is a project management technique that can be used to measure performance as well. Before benchmarking can take place it is important for managers to understand their own processes in detail first. Then the manager will be able to analyze the processes of other similar projects and compare the performance of the projects. This will enable the manager to identify areas where corrective action is needed to meet new performance objectives (Morris & Pinto, 2007). Benchmarking becomes a tool that managers can use to learn best practices. It also can help companies identify their strengths and weaknesses as compared to the competition (Pinheiro, 2010).

Also popular for measuring performance is the earned value analysis. Horine, 2005 states, "earned value is the best project control technique for early detection of performance variances" (p.130). Earned value enables managers to measure and keep track of schedule and cost simultaneously. Referring back to the work breakdown structure, each work package has a planned value. This value represents the budgeted cost of the work to complete the package. The earned value analysis compares the planned value to the estimated cost of the work and also to the actual cost of completing the work. From this, the metrics that are provided give information to the manager from which to determine if the project tasks are taking longer than planned or are requiring more work than planned to accomplish (Horine, 2005). More simply stated the EVA combines project cost and schedule in order to allow for comparison of the completion status of the project and the project budget (Pinheiro, 2010).

A final measurement technique to discuss is the phase-gate process. In this process the project is controlled at various points throughout its life cycle to ensure it is progressing as planned. This technique would seem appropriate for technology intensive projects, due to its common use with new product or service development projects where it is critical to continually evaluate the match between the ever changing market and the product or service being developed. In the phase-gate process, a series of gates are planned. The project is unable to proceed until each gate has been successfully passed. This allows for the manager to measure performance along the way and make corrective actions when needed (Meredith & Mantel, 2006).

4. Corrective Action

The third aspect of project control is taking corrective action in an attempt to put the project back on track when a variance from the project plan occurs. At this point in the control process, the manager has planned the project and knows what the final output should look like and how the steps along the way should be performed, how long it should take, and to what cost. The manager has also determined the measures that will be taken to compare actual performance to the desired performance as set out in the plan. Now, if variances from the plan take place that warrant corrective action, the manager must have the tools and ability to take the necessary action.

This should take place as soon as the manager perceives a problem occurring or about to occur. Control is exercised much better when corrective action is taken early (Meredith & Mantel, 2006). These corrective actionsalso known as action items are often identified through audits, risk assessments, review meetings, and change requests (Pinheiro, 2010). Morris and Pinto, 2007 provide several examples of possible corrective actions. These include: fast tracking a project that is falling behind in schedule. This is also known as crashing; adding additional resources as deemed necessary to get the project back on course. The resources could be more people, time, or money; the manager may also choose to reduce the scope of the project if it appears that the original scope is not obtainable; some managers may choose to compromise quality in favor of completing the project on time and in budget.

This could lead to increased risk however; managers can implement disciplinary actions, or provide incentives as well. Another means of corrective action takes place in the form of manager involvement and presence.

For example, if a manager is monitoring a project on a weekly basis and perceives a problem, the manager may choose to begin monitoring the project daily. If the problem persists then the manager may choose to check in on the process multiple times each day until the issue is solved (Lewis, 2007). Lastly, another method of implementing corrective action is through the performance appraisal process. The performance appraisal can offer insight into the commitment, self-direction and control of individual efforts, as well as identify areas of performance that are deviating from what is expected and need correcting (Pinheiro, 2010).

5. Conclusion

The market demands new technology. Companies that are in the business of producing technology understand this all too well. As technology intensive organizations race to be the first to market with the latest technology, they must already have the next idea waiting to be developed. It is due to this temporary nature of technology projects, that managers must utilize the tools and techniques of project management to control technology intensive work.

Controlling technology intensive work in this context begins with detailed planning of the project. This allows the manager to completely understand the project and what output is expected. It is through planning that the manager will develop the baseline expectations for measuring progress and performance. As the project progresses, the manager will implement performance measures such as benchmarking, key performance indicators, or earned value analysis. If the manager discovers that actual performance is not meeting desired performance, or has exceeded pre-determined thresholds corrective action must be implemented. Early detection and correction will allow for more effective control of the project. It is through this process of planning, measuring, and taking corrective action that technology intensive work can be effectively controlled.

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