# Managing a Company Using TSP Techniques

Dr. Carlos Montes de Oca and Dr. Miguel A. Serrano
*CIMAT Research Center*

*This article describes the experience of using techniques from the Team Software Process℠ (TSP℠) to manage a small software consulting company. The company's management team used TSP techniques to run the organization. The authors describe how the TSP has been adjusted and the lessons learned from this experience.*

The Team Software Process℠ (TSP℠) is designed to facilitate superior performance of software development teams. Although the TSP is designed for the software domain, it is so well defined that it can be used in other domains. For example, the management team of QuarkSoft, a start-up software company, decided to apply TSP techniques to run the company. In particular, they have been using TSP techniques as the baseline process for planning, controlling, and performing the activities of all the members of the management team.

QuarkSoft's management team members have been using the TSP approach for more than 10 months and are very pleased and excited with the results. They are convinced that the TSP has been fundamental for having effective company management. For example, the strategy and objectives for the company are well defined, risk management has been implemented, communication problems have been reduced, realistic plans have been built, and important problems are addressed in a timely manner. Their experience shows that the TSP is a powerful team process that can be customized to improve the performance of teams beyond the software domain.

This article explains the motivation for using the TSP as an executive management process, how the TSP has been adjusted to fit the QuarkSoft management team's needs, and the lessons learned from this experience. The authors assume the reader knows the main concepts and products of the TSP. Please refer to [1, 2] for a description of the TSP.

## Background

QuarkSoft is a small start-up company whose core business is outsourcing of software development. Since QuarkSoft's differentiator is quality software development, the company decided to base its operations on the Capability Maturity Model® for Software (SW-CMM®)[3] and chose the Personal Software Process℠ (PSP℠) [4] and the TSP as the means for implementing the Capability Maturity Model®.

QuarkSoft's staff is organized into a management team that runs the company, a group of software engineers that develop the software, and a small administrative staff that attends to administrative and operational issues.

The management team (MT) is composed of the chief executive officer (CEO), the chief operations officer (COO), the chief financial officer (CFO), the research and development officer, and the software engineering process group (SEPG) chief engineer. The MT is responsible for all business and operation decisions. Major decisions are made by the consensus of the MT members.

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Since the company is relatively small, each MT member has additional duties as compared to traditional companies. Besides overseeing all the operations of the company, the CEO is responsible for marketing, contacting new clients, and closing contracts. In addition to assuring that all projects are on-time, the COO participates in quoting projects, does TSP coaching to internal software development teams, trains new hires in PSP, and

ensures that all the engineers are following the TSP. The COO is a Software Engineering Institute-authorized PSP instructor and TSP launch coach. In addition to handling financial issues, the CFO oversees legal, human resources, and daily administrative issues. Finally, in addition to being in charge of processes, the SEPG chief engineer coordinates quality assurance and configuration management activities, helps train new hires, and makes sure that data are collected.

### The Need for TSP

When QuarkSoft was created, the MT used typical management practices. A business plan and a strategic plan were elaborated. The mission, vision, strategic projects, and indicators were defined. These practices worked fine for setting up the company. However, after a couple of months, the business plan no longer represented reality. On the day-to-day activities, the MT started to operate in fire-fighting mode. They would solve the main problem of the day with no planning at all. The MT realized that without day-to-day planning it was easy to be caught by the urgent problems of the day. This problem-driven management style did not leave time to work on fundamental problems. A new management strategy was necessary.

Start-up companies need to respond rapidly to changes in the business environment to be able to survive [5, 6]. Many outside factors such as market changes, competitors, financial valleys, cancelled contracts, and delayed payments demand prompt attention. Very often, the strategy, planning, and objectives have to change according to these external factors. The business environment demands certain skills from MTs such as good communication, good planning, constant feedback, adaptation to changes, and prompt and accurate information to make decisions.

The TSP's main concepts and techniques provide the foundation to assemble and guide a team with such skills. The decision to use the TSP as the base process for organizing and running the

MT was somewhat natural and aligned with the company culture for two reasons. First, the company has experience using TSP (i.e., TSP is used in all software development projects). Second, most of the MT members (except the CFO) are TSP and PSP trained. Thus, running and managing the company was seen as a project, and the MT as the team to perform it. Making this decision was not difficult; the real challenge was adjusting the TSP to the needs of the MT and to start using it.

### Implementation

The first task was to define the general process. The MT agreed on dividing the project into one-month cycles that corresponded to calendar months. Each cycle would start with a re-launch and would end with a post-mortem. The re-launch would take two to four days. During the cycle, the MT would have one-hour weekly status meetings.

The MT has used this TSP approach since July 2001 (cycle one), including six cycles in 2001 (i.e., July to December) and five cycles in 2002 (i.e., January to May).

Adapting the TSP for the MT needs has been a gradual process. During the first two re-launches, the MT focused on making detailed plans for each MT member. Few objectives were set, and no risk analysis was performed.

In cycle three (September 2001), the MT started writing the minutes from weekly meetings, did some data analysis, and started holding post-mortem meetings. In addition, a general meeting was added at the end of the re-launch agenda. All QuarkSoft employees attend this meeting in which the MT presents the current status of the company, the short and long-term plans, and the status of issues and problems of general interest.

By cycle six, the re-launch process had been tailored to meet most of the MT needs. Risk analysis was recognized as an important part of the re-launch, and several forms and standards to report and analyze data had been developed.

## Adjusting the TSP for Management

The MT uses the following definitions to facilitate communication, planning, and data collection: *Overhead* is the time spent in unplanned activities. *Available time* is the time a MT member is supposed to be in the company (e.g., 40 hours per week). *Available task time* is the time that each MT member has for planning purposes. As the TSP advocates, the available time is not the same as available task time. Part of

the available time is used for answering e-mail and telephone calls, coffee breaks, interruptions, etc.; this time is called *dead time*. *Task time* is the time spent on planned activities. *Direct total time* is the sum of overhead and task time.

### Launch and Re-Launches

A regular TSP project starts with a launch for the initial cycle and continues with re-launches for each subsequent cycle. As mentioned before, the MT decided to perform only re-launches. However, in January 2002, the MT began the practice of performing a launch for a yearlong period followed by re-launches for each calendar month. During the launch, the MT revisits the company mission, vision, and general strategy, and defines the objectives, strategy, and milestones for the year. Re-launches are for detailed planning for every month.

A typical re-launch lasts three days. It follows the general structure of a TSP launch, i.e. nine sequential meetings. However, the MT re-launch includes only

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the equivalent of the TSP meeting numbers two (objectives), three (strategy), four (general plan), six (detailed plan), and seven (risk analysis). In addition, other meetings have been added as illustrated in the following bullet points. A typical agenda for a re-launch consists of the following meetings:
- Review personal issues.
- Review financial information/reports and forecasts.
- List important issues that have not been addressed or that came up in the previous cycle.
- Define objectives and priorities (both for the company and for the MT).
- Define the strategy, perform a risk analysis, and determine milestones

and important dates for the cycle.
- Identify the activities for the cycle, activities for future cycles, and responsibility for each activity.
- Resolve dependencies.
- Define the date and time for weekly meetings and next re-launch.
- Detailed planning (individually).
- Prepare the presentation for the general meeting.
- Hold the general meeting.

During the review of personal issues, each member of the MT describes personal issues that might be or will be affecting his/her performance such as feeling burnout, a wedding, a vacation, or a new baby.

Risk analysis is fundamental because there are many risks that could lead to bankruptcy or company dissolution. The risk analysis process follows the TSP approach. Risks are sorted according to likelihood and impact. Top risks are considered and activities to mitigate them are defined. Each risk has a responsible person who tracks the status of the risk. Contrary to a regular TSP re-launch, the MT decided to perform risk analysis before detailed planning because the risk analysis might produce a change in the strategy of the cycle.

### Running the Plan

After the re-launch, every MT member has a list of the tasks that he or she will perform during the cycle. Each MT member records the time that he/she has spent in each of the planned tasks. When a planned task is finished, the MT member that performed the task gets earned value for it. If the MT member performs an unplanned task, he/she records it as overhead.

Several administrative tasks have been detected. Examples include consolidate MT data; make agendas for weekly, post-mortem, and re-launch meetings; back-up documentation; and keep the project notebook (i.e., a binder with hard copies of all the documents produced) up to date. These tasks have been distributed among members of the MT.

### Weekly Status Meetings and Post-Mortem

Weekly meetings follow an agenda. Typical roles for the weekly meetings include the discussion leader for each agenda item, the timekeeper, and the recorder. Minutes are written during the meeting and e-mailed to the MT after the meeting is finished.

The MT modified the TSP weekly status meeting agenda. The major topics of

the agenda are as follows: personal issues, report of each of the MT members (i.e., each MT member summarizes the status of his/her area), follow-up of objectives and risks, status of the individual and team plan (e.g., overhead, earned value), next-week plan, summary, and meeting wrap-up.

The post-mortem of this cycle is done just before the re-launch of the next cycle and takes a couple of hours. During post-mortem, the analysis is focused on estimation errors, overhead and direct total hours per week, and problems with collecting and interpreting data. Process improvement proposals and new processes needed are addressed, too.

### Byproducts

The MT has produced several products such as a process for preparing post-mortem data, forms to summarize data from the cycle (e.g., overhead, task time, uncompleted tasks), calculation of indicators (e.g., estimation errors, overhead vs. task time), standards for collecting data, agendas and minutes, and a checklist to submit data for consolidation.

It has been necessary to define some policies. These include rules for setting deadlines to submit weekly and post-mortem data, rules to determine the time an agenda has to be distributed before the meeting, and rules for canceling or delaying a meeting.

## Lessons Learned
### The Process

TSP team member roles (e.g., design manager, customer interface manager, etc.) do not apply to the MT context. The MT tried to define new team roles but it was not worthwhile. The MT realized that managing the company is their project. Consequently, the roles correspond to the job positions (i.e., the CEO, the COO, etc.). Thus, there was no need to redefine them. Nevertheless, there are several administrative activities necessary to manage the team. As mentioned before, these activities were assigned to MT members.

Work balance is not done as it is typically done in the TSP because the MT members have very specific activities. There are few tasks that can be performed by more than one team member. Nevertheless, the MT does some redistribution of tasks in situations when one MT member is overloaded and the activities that he/she has to do are of high priority.

Weekly meetings have been exceptionally helpful to improve MT communication. As the company grows, it is difficult for every MT member to be aware of the current status of each area of the company. During weekly meetings, each MT member presents a summary of major decisions, initiatives, problems, etc., in his/her area. This practice has increased the levels of awareness about the status of the company and the issues that each MT member is dealing with.

One aspect that has not been resolved completely involves timing and meeting time commitments. Examples of this issue include submitting data for consolidation on time, starting meetings on time, and scheduling three full days in a row for a re-launch. Due to the nature of the work that the MT members perform, it is difficult to force them to meet these types of time commitments.

Collecting time data has been challenging. The MT uses the prototype TSP tool that is provided by the Software Engineering Institute to collect data. This prototype is implemented in Microsoft Excel, which means that the tool is not very accessible. For example, when MT

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members go away from headquarters, which is very often, it is impossible to carry the tool to keep an accurate time log. This mobility problem has been addressed by writing down the time log on a piece of paper, or using a simple time log tool that runs on hand-held computers, or more drastically, estimating the times. The inconvenience in all these solutions is re-typing the time log into the TSP tool.

### Re-Launches

Re-launches are very effort demanding; 10-hour workdays and pizza dinners are common. At the end of the three days, the MT is really tired. It has been proposed that one day be added to the re-launch. However, getting three consecutive full days from an executive is difficult.

Getting four days is unrealistic. Other strategies have been tried with different levels of success such as having a social activity at the end of day two, stopping work at 6 p.m. or starting at 10 a.m. on one of the three days.

During the early cycles, a considerable amount of time in re-launch was invested in detailed planning. Now, the MT spends more time defining the strategy and attending to urgent issues. For example, there are situations when the plan for the cycle depends on getting a contract. Thus, performing a good strategy and risk analysis should be the priority.

One important difference between the MT and a software team is that there are fewer interdependencies in the activities of the MT members. Detailed planning can be done individually because just a few interdependencies have to be cleared out.

Many issues and action items are produced during weekly meetings and re-launches and are recorded in the minutes. However, there are so many issues and action items that this approach is no longer adequate. There is a need for improving the process of tracking and prioritizing issues and action items.

### General

Characterization of quality work has been an unresolved issue. Quality management is a fundamental component of the TSP (e.g., the fifth meeting of a TSP launch). Moreover, one of the QuarkSoft's driving ideas is to work with quality. The MT has searched for a way to include quality management in the TSP-adapted process. But, what does quality mean in the MT work context? Unfortunately, the MT has not found a satisfactory answer to this question.

MT members have had difficulties in stabilizing their task time estimates. Specifically, the CEO time estimates have varied greatly because among other factors, he performs many different activities throughout the cycles. This reduces the chance to collect historical data on the same activity. Moreover, some of the CEO's tasks do not seem to behave consistently. For example, closing a contract has a wide range of variability.

The CEO has approached this problem by shifting from fine granularity estimation to coarse granularity estimation in closing-a-contract estimating. Instead of estimating the entire time for closing each contract in full, he uses historical data from previous contracts to assign a number of hours to this activity per week.

The COO has adopted a similar

approach. He uses historical data to calculate the average time devoted to supervising a project, then uses this average to estimate the weekly amount of time he would plan for each of the projects he supervises.

The CFO is the only member of the MT who has no previous background on processes. Although she comes from a managerial background, she has been very receptive to the concepts of the TSP and on collecting data. She shows a commitment to improving her estimates. She comments that having detailed plans allows her to better organize her days.

When beginning the second cycle, the MT agreed that its members needed to be up to date in their area of expertise (e.g., the CFO needed to be current in tax reforms, and the COO needed to be current in new technologies). Thus, the MT started planning time every week for what was called continuous education and actualization. However, it did not work; the workload for daily activities was too much. As a result, the MT started using the time scheduled for continuous education for other more important activities. Continuous education still is a major concern, so the MT changed strategies. Nowadays, each MT member is required to give a seminar every cycle that is open to all employees. He/she presents a paper that he/she has read. This practice has been working fine so far.

### Workload

Detailed planning has been very useful in detecting important issues such as excessive workload, unimportant tasks, identification of critical weeks, company milestones, and major company turning points.

It has been particularly helpful to have data on workloads and direct total time of each MT member. This data has helped put the effort required to run the company in perspective. For example, there have been weeks when a team member has worked more than 50 direct total hours per week (this figure means that he/she has spent at least 60 to 70 hours a week doing company-related activities). It is easier to see when the company is overshadowing the MT member's life. Working more than 50 direct total hours means that the MT member has had no time for family, social activities, personal care, etc. This fact is important because stressed MT members are less effective. But knowing how much time the MT must commit to

the company is still a debatable issue.

### Overhead

For planning purposes, the MT used an available time of 40 hours per week; a utilization factor of 75 percent, that is, to use 30 hours per week for direct planned tasks (i.e., available task time); and a time of 10 hours for overhead and dead time. After a few cycles, it was clear that each role behaved differently; planning based on those figures was not resulting in accurate estimations.

For example, historical data showed that the CEO invested about 50 percent of his/her direct total time in overhead. For the CFO, COO, and SEPG, the figure was about 30 percent to 40 percent overhead. These numbers were critical, because many important planned activities were not performed. The earned value of the team was consistently below

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70 percent and, in some weeks, below 45 percent.

It was decided that the CEO would make his plans with a utilization factor of 50 percent, that is, allocating 20 hours per week for planned activities and the rest for overhead and dead time. For the rest of the team, a utilization factor of 65 percent was decided (i.e., 26 hours per week of available task time). The MT has been producing more realistic plans since these changes were implemented. The team's weekly earned value has improved, and the overhead decreased.

One interesting issue derived from using these utilization factors is free time. Assume that in a certain week a MT

member finished all his/her planned tasks and he/she has no overhead. In other words, he/she has some free time in that week. The MT decided that each member should maintain a pool of tasks. This pool contains tasks that are important but have been delayed for future cycles. Thus, the team member with free time can check his/her pool of tasks and begin doing the one with highest priority according to the cycle's objectives and strategy.

Another interesting issue that arose from overhead analysis is that there are different types of overhead. In particular, the CEO and COO started collecting transportation data and detected that they invested a lot of travel time visiting customers to conduct negotiations, project supervision, and meetings. They found that in some weeks they invested as much as six hours on transportation (30 percent of the direct task time for the CEO). From this the question arose, "Should the MT charge the customer for this time?" This question is relevant, especially when the client delays a meeting or cancels it at the last minute.

### Conclusions

MT members produce a wealth of information that can be used effectively to make decisions and to improve team performance. The plan can be adjusted quickly, according to business needs, priorities, and risks. For a start-up company, short-term objectives might change rapidly. The TSP approach to management has allowed the MT to make rapid adjustments to these changes. In addition, having a detailed cycle strategy makes it easier to plan for such things as vacations, conferences, and business trips, or detecting warnings of employee burnout and recommending the best time for vacations for overwhelmed team members.

There has been only one cycle without a re-launch. The re-launch of February 2002 had to be cancelled. The result was a management nightmare. MT members went back to fire-fighting mode, the total direct time increased, several unattended issues caused several important problems, and one MT member declared himself burned out. Moreover, re-launch for cycle three took four days. After this experience, the commitment to do re-launches as planned and to work based on plan has strengthened.

Having the entire team make decisions has been a major advantage. Every MT member knows and decides on the most convenient time to do important

things, such as making major investments and purchases, hiring engineers, and scheduling vacations and training. In addition, TSP has helped the MT to focus on important things and on aligning MT activities to the strategy and priorities of the cycle.

The MT considers that the time invested in doing all the administrative TSP activities is reasonable. The MT is investing about 14 percent of its time in re-launches and less than 5 percent in management activities (e.g., weekly meetings, preparing post-mortem data, etc.).

So far, this TSP experience has been successful. The MT is very pleased with the results. MT members are enthusiastic about the data they collect and their performance findings. They are continuously looking for ways to improve their team process and plan to keep using and improving the TSP approach to management.

This experience in managing a company using TSP techniques shows that the TSP is a very powerful process that can be tailored for other domains besides software development. This experience also suggests that the ideas behind the TSP can be used as the foundation for any teamwork.◆

## Acknowledgments

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## About the Authors

**Carlos Montes de Oca, Ph.D.,** is a research professor in the Department of Computer Science at the Center for Mathematical Research (CIMAT). He is a Software Engineering Institute-authorized Personal Software Process<sup>SM</sup> (PSP<sup>SM</sup>) instructor and Team Software Process<sup>SM</sup> (TSP<sup>SM</sup>) launch coach. He has more than 10 years experience in software development and management. Dr. Montes de Oca is involved in several TSP and PSP projects in both academia and industry. His current research interests include software process improvement and software quality. Montes de Oca has a doctorate degree in computer science from Louisiana State University.

Apdo. Postal 402
Guanajuato, Gto., 36000
Mexico
Phone: +52 (473) 732-7155
ext. 49577
E-mail: moca@cimat.mx

**Miguel A. Serrano, Ph.D.,** is a researcher in the Department of Computer Science at the Center for Mathematical Research (CIMAT). He is a Software Engineering Institute-authorized Personal Software Process<sup>SM</sup> instructor and Team Software Process<sup>SM</sup> launch coach. His current research interests include software process improvement, statistical process control, and software quality. Dr. Serrano has master's degrees in information systems and decision sciences and in system science, and a doctorate degree in computer science from Louisiana State University.

Apdo. Postal 402
Guanajuato, Gto., 36000
Mexico
Phone: +52 (473) 732-7155
ext. 49544
E-mail: masv@cimat.mx