Effective Project Management Using SAS
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ABSTRACT
Managing a project can be a challenging, demanding, and complicated process. Task, resource, and time requirements, allocations, and expenditures need to be defined, documented, and analyzed in order to review performance against targets for an accurate path forward, as well as to measure the overall success of your project. With limited resources and budget controls, you may find that the expense of additional software, including software to manage projects, is not an option in your organization. If you are already using SAS for your project deliverables, you will find that it is also possible to use SAS to document, manage, and control the activities required to accomplish your project. This paper will discuss a method, along with examples, for using SAS to plan, control, and track your project. By using SAS to manage projects, especially your SAS-related projects, you will find that management of the scope, schedule, cost, resource, and communication aspects of the project is facilitated.

INTRODUCTION
There are many ways to keep track of project-related tasks and activities that range from rudimentary handwritten lists to complex project management software. A simple, yet structured, method to collect data for your project, especially the quantitative aspects, that is direct and not time-intensive, is via SAS. Using a SAS dataset, you can easily build a database of project variables that may need to be monitored, measured, and analyzed. And then by using basic SAS programming techniques you can develop and generate progress reports. Should further analysis be warranted on the project, the data is available for inclusion in more elaborate SAS programs.

If the project being managed involves SAS programming, the data accumulated can be a permanent record of project details, as the dataset containing the project statistics can be archived along with the other SAS datasets. The alternative to this basic approach, yet still quite manageable, is the use of multiple datasets to store project variables. Using either method will require the initial step of designing the database where you must determine which variables to track.

THE PROJECT MANAGEMENT PROCESS
The process of managing a project generally includes monitoring several stages—including planning, executing, and closing—with a controlling approach that becomes the framework, thread, or underlying theme throughout the project, serving to balance and support each stage, enabling progress. Planning the progress of a project involves estimating the amount of time to be spent on each task and then comparing the estimates to the actual time spent by each assigned resource. One way to collect, analyze, and report project statistics is via SAS.

PROJECT DELIVERABLES
Each project will have at least one, and most likely, more than one, tangible or intangible, measurable, verifiable outcome, result, or item that must be produced in order to deem a project or phase of a project accomplished.

PROJECT DOCUMENTS
Among the documents that are prepared and circulated during the life of a project are the following:

- Project charter
- Project plan
- Progress report
- Close out report
- Risk register
- Issue/problem log
- Communication plan
- Change request register

Each of the documents may identify or specify any number of deliverables that need to be produced or any number of details that need to be registered in order to insure that project documentation is complete. This is especially true in regulated industries where a validation of process and results are mandatory. One of the most useful and straightforward documents to prepare is the progress report. Using SAS, this report can be generated easily.

QUANTITATIVE PROJECT DETAILS
Project deliverables and documents contain either specific data or quantifiable expected or actual results that need to be captured, collected, and monitored. Vigilance over project details will allow effective project management and provide the basis for analysis of these data for a thorough project final review. Listed in the table below are many of the details that can be recorded. These are the elements that will be placed into your SAS dataset so that you may control various aspects of your project. Many of these are fields that you would use for reference only, while others would be ideal for use in calculations or analyses of the several aspects of the project. You will see some of these captured and displayed in the examples that follow.

<table>
<thead>
<tr>
<th>PROJECT DELIVERABLES</th>
<th>DOCUMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost baseline</td>
<td>Budget update request</td>
</tr>
<tr>
<td>Skill requirement</td>
<td>Resource allocation matrix</td>
</tr>
<tr>
<td>Actual start date</td>
<td>Scope management plan</td>
</tr>
<tr>
<td>Resource name</td>
<td>Work breakdown structure</td>
</tr>
<tr>
<td>Estimated hours</td>
<td>Requirements specification</td>
</tr>
<tr>
<td>Actual hours</td>
<td>Quality assurance plan</td>
</tr>
<tr>
<td>Deliverables</td>
<td>Change request register</td>
</tr>
<tr>
<td>Expected risk level</td>
<td>Project plan</td>
</tr>
<tr>
<td>Project duration</td>
<td>Project charter</td>
</tr>
<tr>
<td>Activity name/id</td>
<td>Budgeted expenses</td>
</tr>
<tr>
<td>Activity group</td>
<td>Actual expenses</td>
</tr>
<tr>
<td>Activity sequencing</td>
<td>Indirect costs</td>
</tr>
</tbody>
</table>

Planned start date       | Planned finish date |
Actual start date         | Actual finish date |
Scheduled hours           | Scheduled work days |
Scheduled hours           | Budgeted expenses |
Actual expenses           | Actual expenses |
Indirect costs            | Indirect costs |
Task priority             | Task priority |
Project effort hours      | Project effort hours |
Reference group           | Reference group |
Administration & Support  | Administration & Support |
ASSUMPTIONS

The process and examples that follow were accomplished using the following software:


CONSTRUCTING THE DATABASE

The first step to creating the database is to identify the project variables to be tracked. This decision process should not be inordinately time intensive, however, selection of variables to be tracked and the arrangement of those variables in the dataset may influence the visibility of the data for reporting.

Once you have determined the aspects of the project to be monitored, you are ready to create the database. There are several ways that you can create your database—direct data entry, writing a program, importing from another file or program, and so forth. One way would be to launch a SAS session, and then once in SAS, from the Tools menu, select Table Editor.

A new Viewtable will open with undefined columns.

From the Data menu, select Column Attributes.

Once in the Column Attributes window you can specify the Type, Name, Label, Length, and Formats of each of the fields in your database, and then enter the data for each of these project variables.

A SAS PROJECT MANAGEMENT EXAMPLE

Project Description and Background:

This example project involves a series of reports that need to be coded and tested. The level of detail to be tracked will dictate the number and specificity of the activities and tasks the project includes. The preparation of each report will be an activity, with each report to be generated utilizing one resource for each of the two tasks, coding and testing. The tracking will occur at the activity level with data collection at the task level in example 1 that follows. This means there will be one resource for coding the report and one resource for testing the report. In example 2, a different database structure will be used—tracking will occur at the task level, utilizing multiple records for each activity, depending upon the number of tasks (and occurrences of those tasks should multiple resources be required to complete the task).

Project Database Elements:

Elements that are being tracked for this project include:

- Project name
- Activity name
- Estimated and actual hours to complete an activity
- Start and finish dates of an activity
- Resource assigned to a task
- Estimated and actual hours to complete a task
- Start and finish dates of a task

Design example 1:

Here is the first view of the dataset containing the elements to be tracked. The database is structured so that each activity record contains all the information about that activity—the hours, the dates, the tasks and the hours, dates, and resources associated with those tasks. This arrangement may be better suited to activities with a minimal number of associated tasks.
Report example 1:

Once the dataset has been populated with the activity and task data, using the **Solutions >Analysis >Analyst** sequence from the primary menu, an online print of the dataset may be obtained by selecting **Reports >List Data** and then specifying the variables to be included. The Options for this report include summing of numeric fields, as displayed on this report.

![Report example 1](image)

Design example 2:

You may decide upon another structure for your database, which could look something like this:

![Design example 2](image)

This database is structured so that each Task associated with an Activity is recorded as a separate entry, and includes variables for estimated hours, actual hours, resource assigned, start date, finish date, and notes.

Report example 2:

Once the dataset has been populated with the activity and task data, using the **Solutions >Analysis >Analyst** sequence from the primary menu, online prints of the dataset may be obtained by selecting **Reports >List Data** and then specifying the variables and reporting levels. The second reports lists hours for each activity by task.

Variable and Option combinations available via **Reports >List Data** provide the opportunity to prepare a variety of listing that can serve as Progress Reports for your project or be incorporated into other project documents.

![Report example 2](image)

Using the **Solutions >Analysis >Analyst** sequence from the primary menu, online tables of the dataset may be obtained by selecting **Reports >Tables** and then choosing from among five different report styles.

Based upon your specifications, a variety of tables, such as these three examples that follow, may be generated to use as standalone Progress Reports or for inclusion in other project documents, such as the Work Breakdown structure, the Communication Plan, or the Issue Log. The statistics that are generated can support requests for time extensions or additional resourcing and serve as evidence of quantifiable project results, or lack thereof.

This report is a table of resources assigned to the tasks within the project, irrespective of the associated activity.

![Report example 2](image)

This report is a table of total and average hours for each task, along with the minimum and maximum values.

![Report example 2](image)

This is a table of actual hours for each task within each of the three activities in the project, Reports 1 through 3.

Depending upon your specifications, a variety of statistics can be incorporated into the table. **Reports >Tables** allows for modifications to the report titles and settings, such as page number and date display, as well.
Using Solutions >Analysis >Analyst >Graphs your data can be displayed pictorially. The three tables that follow were created using Graphs >Bar Chart and using Graphs >Pie Chart. Data may be easier to interpret when displayed in a graph. The graphs generated may then be incorporated into Progress Reports.

This bar chart displays actual hours spent on the coding and testing tasks across the project.

This bar chart display the actual hours spent by each resource on the coding and testing tasks across the project in descending order.

This pie chart displays the percentage of actual hours spent by each resource across the project for all tasks.

Once created, graphs can be easily regenerated whenever there are modifications to the project data.

LIMITATIONS OF METHOD

Obviously, this method is not meant to be a sophisticated project management system so there are shortcomings to using such a simplified approach.

- This simple SAS technique described provides narrow project visibility and may lead to vague decisions.
- Without further data configuration, such as the use of multiple datasets, using a basic SAS approach accounts for only some of the quantitative project variables that could be captured and tracked.
- Without the use of intricate programming, the dataset alone does not provide the involved statistics that a more complex method or system may provide.

REASONS TO USE SAS TO MANAGE A PROJECT

So then, why should you use basic SAS to manage your projects when other methods and project management software applications are available and prepared specifically for that purpose. If you use SAS:

- The dataset(s) can be accessible by all or selected team members working on project.
- Using a SAS dataset is an uncomplicated straightforward method of managing a project where a basic project management method is suitable or even preferred.
- The collected data can be incorporated easily into SAS programs to produce reports of project statistics or downloaded to other applications.
- You can avoid the need to obtain additional software for short-term resources.
- Should further analysis be warranted on the project, the data is available for inclusion in more elaborate SAS programs.
- Data accumulated can be a permanent record of project statistics as the dataset containing the project statistics can be archived along with the other SAS datasets.

THE SAS PROJMAN ALTERNATIVE

SAS offers a more comprehensive alternative to the simple method described in this paper via its Projman application. Projman is a graphical user interface for performing project management within the SAS system. Through the PM procedure, you can easily create and manage multiple projects. Projman is accessed by invoking the Projman command in the SAS Display Manager or by selecting Solutions >Analysis >Project Management from the primary SAS menu.

SUMMARY/CONCLUSION

The use of SAS to manage a project is a natural extension of a SAS programming project. Even if the project does not involve SAS programming, base SAS can still be used effectively to collect, track, and analyze project variables, thus providing a variety of useful reports. For a more robust approach to project management, The SAS System for Windows provides the Projman application, accessible from the main menu. Either SAS solution affords the project manager an effective project management approach available to the entire team.

ACKNOWLEDGMENTS

SAS is a Registered Trademark of the SAS Institute, Inc. of Cary, North Carolina.

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