

PROJECT MANAGEMENT TOOL ANALYSIS AND RECOMMENDATIONS WHITE PAPER

Project Management Tool Working Group

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PURPOSE

The purpose of this paper is to provide an overview of the Project Management Tools Initiative.

INTRODUCTION

For the past year, the Principal Center for Workgroup Hardware and Software (PCHWS) has been involved in an extensive study of project management tools in use and available in industry. Under the FY2000 Memorandum of Understanding (MOU) between NASA Headquarters and the NASA Glenn Research Center, the PCWHS is tasked with studying and evaluating project management tools.

The intent of the Project Management Tools Initiative is to study and evaluate project management solutions and produce relevant documents, which will serve as the source of information to the Agency to assist in the selection and use of project management tools.

EXECUTIVE SUMMARY

All NASA missions require tools to manage projects. Project Management tools are used at every project level to organize tasks and track project status, allocate responsibilities, and plan and track project costs and resources. The current business environment demands that all NASA missions use good project management techniques and best practices. The Project Management Tools Working Group (PMTWG) researched and evaluated several project management solutions available in the market. The aim of this working group was to provide recommendations on which project management tools are best suited for NASA. To that end, the PMTWG has recommended two Tier I/II (desktop) level packages, namely Microsoft Project 2000 and Primavera SureTrack. The PMTWG selected two desktop level solutions to give flexibility to programs and projects throughout the Agency. While Primavera SureTrack meets all of the project management user requirements, MS Project cannot be overlooked because of its broad presence in the NASA project management community.

Through the establishment of project management software guidelines, projects can spend less time analyzing tools and more time managing projects. Agency-wide adherence to the tool recommendations will improve data sharing capability, increase interoperability with other agency standard tools, and enable speedy accessibility through common Agency-wide procurement vehicles. Other potential improvements for mission projects include greater expertise in the use of COTS software tools and the opportunity to re-engineer business processes.

The following summarizes the final recommendations made by the PMTWG.

Summary of Recommendations

Tier I-/II- (Desktop) Project Management Tool Recommendation

- 1) The primary recommendation is to use the Tier I-/II-tool Primavera SureTrack.**
- 2) A secondary recommendation is to continue the use of Tier I/II tool Microsoft Project 98/2000.**

- 3) **The PMTWG recommends the Project Management Tool Initiative Recommendations White Paper be integrated into the APPL website.**

Tier III (Enterprise) Project Management Tool

- (1) **The PMTWG recommends a follow-on effort to look at Enterprise-level project management tools that would integrate with the desktop recommendations and other systems.**
- (2) **The PMTWG recommends further investigation into SAP's project management capabilities and its interfacing capabilities with the recommended project management tools.**

Next Phase Recommendations

- 1) **The PMTWG recommends a follow-on effort to more thoroughly evaluate Enterprise-level project management tools that would integrate with the desktop recommendations, the Integrated Financial Management (IFM) system, and eNASA.**
- 2) **The PMTWG recommends further investigation into SAP's project management capabilities and its interfacing capabilities with the recommended project management tools.**
- 3) **The PMTWG recommends a follow-on working group research and recommend Enterprise-level project management software tools that are consistent with end user requirements and the requirements set forth by both IFM and e-NASA.**
- 4) **The PMTWG recommends a follow-on working group under the direction of the Agency CIO to explore and present the challenges and benefits of formulating and implementing project management software guidelines or standards.**
- 5) **The PMTWG recommends a follow-on working group to consult with KSC and evaluate MS Project 2002 after its release.**
- 6) **The PMTWG recommends NASA participation in the PM XML Consortium as a customer representative.**

SCOPE

The focus of this document is to provide an overview of the Project Management Tools Initiative.

The Project Management Tools Initiative charter is to research and evaluate project management software tools. This includes surveying project managers and users to gather requirements, analyzing survey results, conducting vendor demonstrations and interviews, and completing an extensive literature review of current project management tools and their capabilities. Based on this information a MINIMUM set of tools will be recommended as a guideline. However, project managers throughout the Agency will be best served by using the tools that are ultimately recommended. That is, the recommendations provided by this study will not be mandatory. These recommendations should be used as a guideline in selecting and using project management software.

BENEFITS

With increased access to project data, informed decisions can be made. Project managers can plan the proper and timely use of all resources and thereby ensure schedule commitments. Cost information will enable project managers to plan, direct, and control the project within budget. Project status can be reported in a consistent and timely manner. Potential project risks can be identified and mitigated in a timely fashion. Projects will be met on time and on budget.

Another benefit is that by making project data consistent and available to a broader user base, opportunities to re-engineer our business processes will arise. Exploiting these opportunities is crucial to our ability to adapt to reduced budgets and personnel while at the same time ensuring success in meeting project objectives. Through the close adherence and implementation of the recommended tool set, more project users will be more informed throughout the project management process via electronic reporting, file import/export, database access, E-mail, etc. Information distribution through platform independent tools will allow a wider dissemination of project information. Through information sharing, barriers due to functional, vertically aligned elements of the project team will be broken down, enabling NASA project managers and project team members to better manage and control their projects. Re-evaluation and re-engineering of the processes associated with project management can then occur, allowing users to perform their project tasks in the most effective and efficient manner possible.

In addition, as the recommended tools are implemented throughout the Agency, tool expertise will increase. Successful techniques and processes can be shared across projects and across Centers.

Lastly, further studies should be sponsored to adopt and implement project management tool standards across the Agency. This will provide considerable cost savings due to the elimination of duplicated studies. Tool selection studies have occurred at the project level and at the Center level throughout the Agency. Cost savings will be realized not only in person-hours expended in these efforts, but also in the procurement, licensing and maintenance of many different solutions. Savings in procurements will be realized with increased quantity purchases and licenses of standard tools.

BACKGROUND AND RESEARCH METHODOLOGY

In January of 1996, Executive Notice 04-95 identified the Glenn Research Center (GRC a.k.a. LeRC) as the Principal Center for Workgroup Hardware and Software (PCWHS). The Information Technology (IT) Principal Centers define the IT architecture associated with their areas of responsibility, maintains configuration control, and identify and recommend standards.

The scope for each Principal (Lead) Center was, at that time, defined to be:

"The Lead Center for each technical area of responsibility will identify and define standards and architectures that are appropriate to support the NASA IT infrastructure and will submit

these standards to the NASA CIO and the ITMSC through the ITS&A Subboard for approval.
..."

One of the specific areas of responsibility for the PCWHS is the Special Purpose Services area, which includes Project Management.

Under the FY2000 Memorandum of Understanding (MOU) between NASA Headquarters and the NASA Glenn Research Center, the PCWHS was tasked with developing Project Management tools recommendations. The MOU contains the Level 1 Milestones for the Project Management Tools Initiative. In order to fulfill the MOU, a project plan was developed which defined the needed activities to accomplish Level 1 Milestones. The first activity associated with the Level 1 milestones was the development of an Agency-wide survey to gather the project management tool requirements of project managers throughout the Agency. For more details on Level 1 milestones refer to the Project Management Tools Project Plan found in Appendix A.

NASA CIOs identified program managers, project managers, project team members, and others willing to participate in the survey and/or willing to participate on the Project Management Tools Working Group (PMTWG). The PCWHS also partnered with the Academy Program Project Leadership (APPL) in distributing the survey to APPL's alumni. Participation was also requested from the Project Management Council (PMC) Working Group and the System Management Offices.

Project managers and team members at all NASA Centers were polled regarding the required capabilities of project management tools. The survey contained a list of requirements compiled from a previous study of project management tools performed in 1996 by the Kennedy Space Center (KSC). Third-party discussions were also conducted with Metagroup, which is a consulting organization specializing in IT commercial best practices and the current market place trends. This information was used to determine tool requirements and identify opportunities to improve project management capabilities throughout the Agency.

The PCWHS convened the PMSTWG in early January/00. The charter of the PMTWG was to review the project management tool requirement document, study the characteristics of available project management products, evaluate the available products, assist in the development of project management tool recommendations, and report its findings to the CIOs. The PMTWG, which is composed of project managers, COTRs, representatives from Center SMOs and CFOs, and government and contractor project schedulers, studied and evaluated project management tools against the requirements obtained through the Agency-wide survey.

The survey results were used to develop the Project Management Tools Requirements Document. The Requirements Document was used to evaluate Commercial-off-the-Shelf (COTS) project management software. The Project Management Tools Working Group, Principal Center Integration Team (PCIT), Chief Information Officer (CIO) representatives and System Management Office (SMO) representatives, reviewed the draft Requirements Document.

The Requirements Document is the key driver of the evaluation process. The evaluation process consisted of four steps: definition of requirements, definition of project management data

elements, product shortlist elaboration, and evaluation and selection. Each project management tool under consideration was evaluated against these requirements. Evaluators were asked to rate how well each tool met the requirements. Another step of the evaluation process was the identification of project management data elements. These data elements were defined in such a way as to ensure consistency of project management information that could be shared inter- and intra- Center. They represent project management data that is most important to project managers throughout the Agency. This is essential in the enhancement of communication between projects and Centers, since the PM tool(s) should easily be able to manipulate these data elements.

An initial investigation of software products was conducted through market analysis, review of independent research reports, and vendor interviews, demos and product descriptions. The result of this investigation is a shortlist of potential project management tools. See Table 2 for the list of project management tools evaluated.

The next step was to develop a functional evaluation matrix based on the survey requirements results. This functional matrix was used to evaluate the potential project management tools. Tools were evaluated on how well a tool met the requirements. Each requirement was evaluated against the tool capabilities and given a rating of Exceed, Meets, or Does Not Meet. Evaluation of a particular tool was recorded using the functional evaluation matrix. In order to adequately evaluate the potential project management software packages, products were sorted into categories of similar breadth of functionality, i.e. Tier I/II, and Tier III.

The evaluation results and supporting documentation such as the Requirements Document and Data Elements were used to develop the final recommendation of project management tools. The final recommendation is presented as a guideline to be used throughout the Agency in selection of project management software tools.

PROJECT MANAGEMENT TOOLS INITIATIVE DOCUMENTS

❖ Project Management Tools Project Plan

The Project Plan organizes the Initiative by phase. Each phase identifies specific activities and tasks that needed to be performed. It also includes the deliverables and schedules associated with each phase. The following steps summarize the methodology/approach used:

Completed (1Q00 - 1Q01)

- Conduct Agency-wide survey (CIOs, SMO, APPL, Program/Project managers)
- Establish Agency-wide Working Group
- Develop Requirements Document
- Develop Evaluation Methodology Document
- Contact vendors and conduct demos/presentations
- Evaluate software against requirements using evaluation methodology

Ongoing (2Q01 - 4Q01)

- Review and analyze evaluation results
- Develop Project Management Tool Recommendations
- Publish and present recommendations and reports

The Project Plan is included in Appendix A.

❖ **Project Management Survey Summary Report**

The Project Management (PM) Survey Summary Report documents the methodology used in designing and analyzing the PM survey questionnaire. The summary report includes a description of the data collection methodology, percentage of survey participation, and an interpretation of the data. In addition, the summary report provides a high-level summary of the results of the survey. The survey results showed that NASA project managers desire the following general capabilities in project management tools.

- Multi-user capability
- Multi-project capability and support
- Easy-to-use, intuitive and quick to learn
- Scheduling, cost, resource, reporting, and risk management functionality
- Earned value analysis
- Flexibility - ability to integrate user-defined parameters
- Interoperable with Desktop tools

An abbreviated Project Management Survey Summary Report can be found in Appendix B.

❖ **Project Management Tools Requirements Document**

The purpose of the Project Management Tool Requirements Document is to identify and document the requirements for project management software tools. These requirements were used to evaluate Commercial-Off-The-Shelf (COTS) and other project management tools. They were also used to develop the Agency-wide project management tool recommendations and guidelines. The document contains the critical PM tool requirements as determined by the results of the Agency-wide project management tool survey.

The Project Management Tools Requirements Document can be found in Appendix C

❖ **Project Management Tool Evaluation Process Document**

The purpose of the Project Management Tool Evaluation Process Document is to document the methodology and evaluation process for selecting Project Management tools.

An initial investigation of software products was conducted through market analysis, review of independent research reports, review of technical publications, and vendor product

descriptions. The result of this investigation was the shortlist of potential project management tools included in Table 2.

The key driver of the evaluation and selection are the requirements obtained through the Agency-wide requirements survey. The project management tool(s) were evaluated against the user requirements. Product demonstrations were arranged to evaluate each software package. An evaluation copy of the software was also requested.

The vendors/manufacturers or resellers of each tool were evaluated in areas such as product support, especially in the area of functionality enhancements, cost, installation, implementation, training, and on-going technical support.

Another component of the evaluation process was the project management data elements. A matrix showing project functions vs. project phase was completed and used to define specific data elements associated with each project management activity. The data elements were used to evaluate and assess the product's ability to integrate user-defined parameters, data sharing capabilities, and import and export capabilities.

The data element table is an attempt at defining a representative set of data elements that constitute project data, i.e. data required for the planning, executing, and controlling of a project.

As NASA proceeds to acquire, integrate and deploy the Integrated Financial Management (IFM) system, it is expected that IFM will provide some of the data required by project managers to be able to track the progress and performance of their projects. The data element table serves as a starting point for IFM regarding the data requirements of NASA's project managers.

Follow-on work is needed to ensure that the data elements and their definitions are representative of the project management data used throughout the Agency.

The Project Management Tool Evaluation Process Document can be found in Appendix D. The Functional evaluation matrix can be found in Appendix F and the Data element table can be found in Appendix E.

PROJECT MANAGEMENT TOOLS WORKING GROUP

The charter of the Project Management Tools Working Group (PMTWG) is to review the Project Management Tool Requirement Document, assist and facilitate in the review and evaluation of Commercial-Off-The-Shelf (COTS) Project Management Software Tools, and develop and review documents supporting the recommendation of Agency-wide project management tools recommendations. The PMTWG comprises project managers, project team members, COTRs, representatives from Center SMO and CFO, and government and contractor project schedulers from across the Agency. The current membership of the PMTWG is as follows:

NASA Center	Representative
GRC	Diana Centeno-Gomez
GRC	Anita Alexander
GRC	Dave Anderson
MSFC	Kenneth Poole
LaRC	Debbie Cook
GSFC	Oswin Findlay

The key documents of the working group activities are presented in the appendices of this White Paper. The Working Group meetings support the development of these key documents.

PROJECT MANAGEMENT TOOL SOFTWARE UNDER CONSIDERATION

The Project Management Tool survey results provided the current installed base of project management tools at NASA as shown in the following table. As illustrated in Table 1, NASA’s project management tool installed base covers a wide spectrum of functionality.

Center Name	Project Management Software Packages Currently In Use*
GRC	Microsoft Project 2000, 98 and 4.1 CA SuperProject, FastTrak v6.01, Welcom OpenPlan
LaRC	Primavera P3, Microsoft Project 98, Welcom OpenPlan Artemis 7000, MESA/VISTA
MSFC	Microsoft Project 2000 and 98, Primavera P3 v3.0, SureTrack, Milestones, FastTrak
GSFC	Microsoft 98 and 2000, Primavera P3, SureTrack Milestones etc, FastTrak, MacDraw Pro
JPL	Welcom OpenPlan
Stennis	Microsoft Project 98, DekkerTracker, Doors
JSC	Microsoft Project 2000 and 98, Artemis Views
KSC	Microsoft Project 2000
ARC	Microsoft Project 98 and iTeamwork

Table 1. Current NASA Project Management Software Installed Base (* in order of predominance at each Center)

Table 2 contains a list of project management software packages that were evaluated by the Project Management Tools Working Group. Tools were classified in tiers based on their breadth of functionality.

Tier I- and Tier II- products provide basic project management capability to plan and keep track of tasks, goals, resources and other project details. They are designed to be easy to use and deploy. More recent Tier I-/II- products feature web-based tools that offer limited collaboration capability.

Tier III-products are used in large, well-detailed projects. Technical individuals who are well trained in using project software are the primary users of these tools. They provide the ability to manage multiple projects of substantial size in a multi-user environment. More recent Tier III-products offer extensive project management capabilities such as earned value, resource management features, what-if (risk) scenarios, and customized reporting.

Future trends in project management software include expanded web-related functionality and resource management, knowledge management, and emerging professional service automation. The evolution of project management tool(s) can be categorized in three areas and described as follows:

Users: Individuals -> Teams -> Enterprise

Focus: Productivity -> Coordination -> Knowledge Management

Connectivity: Desktop -> E-mail -> Web

	Project/Program Mgt.	Workgroup Coordination
Tier I	AEC Software/Fastrack t Primavera/SureTrack Microsoft Project 98	Inovie/Team Center Web Project /Web Project Netmosphere/Action Plan
Tier II	Microsoft Project 98 Microsoft Project 2000/Project Central Computer Associates/SuperProject Planview/PlanView Primavera/Project Planner (P3v3) Micro Planning International/Micro Planner Manager WebTransit OmniTracker	
Tier III	Artemis Management Systems/Artemis Views 4 Primavera/ Project Planner for Enterprise (P3E) Welcom/OpenPlan Dekker Trakker Framework Technologies/Active Project V 2000/E Scitor/PS Suite Planisware OPX2 – enterprise Elabor Enterprise Project	Project Management Process Tool (a.k.a.Visual PM) - MSFC

Table 2. List of Project Management Tools under Evaluation

A user of Tier III-products at NASA is characterized by his/her need to manage multiple projects simultaneously each of substantial size. Emphasis is on prioritization of projects, allocation of resources, schedule and tracking of people working on multiple projects. These users also generally want to create detailed project budgets, have access to actual cost data, sophisticated risk assessments, -as well as detailed performance tracking and earned value.

Tier III-tools are suitable in the NASA environment for managing a portfolio of projects, i.e. managing at the Enterprise or Program level. Users that require Tier II-products need to manage projects with approximately up to 2,000 tasks. These users may have several projects going at the same time but the emphasis is not on multiple projects.

Tier II-tools are suitable for managing at the Center or Project level. Users of Tier I-products want to automate the planning process, need to manage a few hundred tasks, have to prepare occasional reports and produce some simple Gantt and PERT charts. Tier II-level products can also be used to meet Tier I-needs.

Each potential project management tool was independently evaluated on how well it met the requirements. After the independent evaluation, gaps were identified and tools were compared to other tools within the tier under which they are classified, not across tiers. Other key selection criteria are breadth of functionality, current installed base, architecture and technology, and vendor’s expertise in the industry.

After the evaluation of project management tools, the final phase involved summarizing the findings, and making a final recommendation of project management tools. The goal is to select one tool for each tier. There are vendors that provide solutions for each tier making it easier to transfer project data from one tier to the next in the event that project requirements change. These types of solutions strive for integration from one tier to the next.

RISKS

There are risks associated with the implementation of a guideline to select and use a project management tool set across the Agency. The success of the guideline implementation will depend on the NASA CIOs and other stakeholders (i.e., APPL, SMO, Program Enterprises, and PMC Working Group) acceptance of the guideline. There is also the risk that the recommended tool(s) will not be used due to inadequate communications to project managers of the recommended guideline. Added to this is, the risk associated with the agility of each Center to move toward a PM tool standard as well as how well the selected tool is able to respond to the project management process.

Legacy issues will also affect each Center's ability to implement the tool recommendation. Investment in project management systems that currently support ongoing projects, at the field Centers, must be offset by near-term achievable gains in order to support a timely move to a new standard.

PROJECT MANAGEMENT TOOL FUNCTIONS/REQUIREMENTS

Project Management Software

Most project management software packages let users perform the following basic functions:

- Define a project calendar that reflects the business schedule including holidays, workdays and work-hours.
- Enter and edit basic task, cost, resource, and task-duration data for planned projects.
- Specify task dependencies and project milestones to represent the relationship between tasks and the major subdivisions of a project.
- Display and print project schedules in Gantt and network diagram form.
- Identify tasks on the critical path.
- Enter and edit actual time, cost and resource data.
- Create view, and print basic reports such as task, cost, and resource listings.
- Perform resource leveling.
- Develop/Define Work Breakdown Structures (WBS)

Most packages use project-schedule information to calculate costs by resource, task, or date. A growing number of packages have groupware and Internet support.

There are currently several project management tools on the market that fulfill our requirements, so availability of a suitable tool is not a concern. What is in question is how well these tools specifically support the traditional project management functions. Project management is often defined as the planning, scheduling, and controlling of project activities to

achieve project objectives. Specific project management functions defined by NPG: 7120.5a, NASA Programs and Project Management Processes and Requirements are planning and re-planning, resources management, risk management, and performance management.

INTERIM PROJECT MANAGEMENT TOOL RECOMMENDATION

As of Q4 FY00, the PMTWG recommended that NASA use Tier II-tools such as Microsoft Project 98/2000. Trends¹ in the market place show that Microsoft Project has become the de facto standard for the desktop/Tier II. There are approximately 5 million MS Project users worldwide. While this is the case, trends² also show that all vendors are converging on high-end, enterprise-level project management functionality. Although most Tier III-vendors support Microsoft Project 98 as a planning client for their own project management tool, they provide additional and functionality to manage multiple projects of substantial size in a multi-user environment not provided by Microsoft Project 98. (Note that this recommendation does not cover MAC users. To be able to utilize/access project management tools developed for PC platforms, MAC users need Virtual PC, Citrix, Winframe, or a similar tool)

FINAL PROJECT MANAGEMENT TOOL RECOMMENDATIONS

SELECTION CRITERIA

The PMTWG used an objective rating process to determine its project management tool recommendations. To that end, the PMTWG used a set of functional matrices to evaluate each package, and the following scale was used to arrive at a score for each general category.

Scale Legend

- 1 - More than 25% of the requirements are rated "does not meet"
- 2 - 25% or less of the requirements are rated "does not meet"
- 3 - All of the requirements are rated as "meet"
- 4 - 25 % or less of the requirements are rated "exceed"
- 5 - More than 25% of the requirements are rated "exceed"

The PMTWG scored only those categories that were considered essential to a fully functional and viable Tier I-/II- (desktop) level project management software package. Using the scale legend above, each package was given an overall score for functionality in the categories of workgroup capability, ease of use, project scheduling, project task/field features, cost management and reporting features. The score was based on how many functional requirements were fulfilled. Each package had a total score, out of a possible of 30 points, and the three packages with the highest scores were considered for recommendation. At the Tier I-/II- (desktop) level, the three packages with the highest scores were Primavera P3, Primavera SureTrack and Microsoft Project 2000. At the Tier III- level the three packages with the highest scores were Welcom OpenPlan, Primavera P3E and Planisware OPX2.

¹ 1999 Gartner Advisory/Dataquest Market Trends and Forecast: PC Software, 11 Oct 99

² 1999 SPEX, Project Management Software Product Evaluation Kit

Summary of Recommendations

Tier I-/II- (Desktop) Project Management Tool Recommendation (not in order)

- 1) **The primary recommendation is to use the Tier I-/II-tool Primavera SureTrack.**
- 2) **A secondary recommendation is to continue the use of Tier I/II tool Microsoft Project 98/2000.**
- 3) **The PMTWG recommends the Project Management Tool Initiative Recommendations White Paper be integrated into the APPL website.**

Next Phase Recommendations (not in order)

- 1) **The PMTWG recommends a follow-on effort to more thoroughly evaluate Enterprise-level project management tools that would integrate with the desktop recommendations, the Integrated Financial Management (IFM) system, and eNASA.**
- 2) **The PMTWG recommends further investigation into SAP's project management capabilities and its interfacing capabilities with the recommended project management tools.**
- 3) **The PMTWG recommends a follow-on working group research and recommend Enterprise-level project management software tools that are consistent with end user requirements and the requirements set forth by both IFM and e-NASA.**
- 4) **The PMTWG recommends a follow-on working group under the direction of the Agency CIO to explore and present the challenges and benefits of formulating and implementing project management software guidelines or standards.**
- 5) **The PMTWG recommends a follow-on working group to consult with KSC and evaluate MS Project 2002 after its release.**
- 6) **The PMTWG recommends NASA participation in the PM XML Consortium as a customer representative.**

Tier I/II (Desktop) Project Management Tool Recommendations

The Project Management Tools Initiative provides a technology recommendation aimed at improving project managers' ability to manage projects, identify and mitigate risks, share information and reengineer processes when necessary. The recommendation offers a **MINIMUM** set of project management tools that meet the needs and requirements of project managers Agency-wide and provide a unifying solution across tiers.

If adopted, this recommendation will help the Agency minimize the cost and inefficiency of having numerous Centers expend resources to identify technical project management solutions that may or may not satisfy overall Agency requirements. Providing a streamlined solution process will save project managers time and money. Other benefits include less funding for training required and greater opportunities for sharing and integrating data, processes, experiences and lessons learned across the Agency.

The primary recommendation is to use the Tier I/II tool Primavera SureTrack.

Although Primavera P3 scored higher than SureTrack, the PMTWG believes that SureTrack is the more cost-effective solution between the two. SureTrack is suitable for small- to medium-size projects. It can be used as a stand-alone product or as a front-end to Primavera's P3 and P3E. In addition, most projects do not require the advanced levels of functionality that P3 offers. Also product upgrades are usually introduced in SureTrack before included in P3 and P3E. This gives the user the benefit of new features early on.

Overall SureTrack (version 3.0) is a viable and scalable project management solution. It provides a framework for successful cost and schedule integration for small to medium-sized projects. Although, SureTrack is generally utilized as a single-user application, it can also be placed on a network fileserver to provide multi-users read access to the software at the same time.

SureTrack's workgroup capabilities have been enhanced to provide greater collaborative usability and publishing capability. Project schedules can be accessed and viewed across an Intranet or the Internet using the Web Publishing Wizard. SureTrack allows users to import and export blocks of data from other windows applications, as well as, MPX file conversions from other project scheduling software applications, such as Microsoft Project. Project data can be communicated quickly and directly to team members through E-mail distribution using Primavera's Post Office feature. SureTrack's e-mail features are compliant with Vendor Independent Messaging (VIM) as well as Microsoft Mail and Messaging Application Programming Interface (MAPI).

SureTrack is very straightforward and easy-to-use. It provides preset wizards and help guides to lead new users in establishing and populating their project data files.

SureTrack project scheduling capabilities are excellent. SureTrack allows a user to perform accurate slack calculations for all types of task relationships, which provides the capability to identify multiple project critical paths. The user can determine and assign his own Work Breakdown Structure (WBS) which is controlled totally by the project team. Both schedule and resource data can be filtered and rolled-up utilizing the activity coding and WBS for clear, effective management reporting. SureTrack provides simplified Earned value cost management capabilities. Earned value is based only on resource-percent-complete status. A good variety of preset management reports and histograms are provided for in SureTrack, which the user can customize or use to create his own. The graphics capabilities and quality are extremely well done and in some cases better than those provided for in the high-end products.

A secondary recommendation is to continue the use of the Tier I-/II- tool Microsoft Project 98/2000.

The PMTWG acknowledges the investment the Agency has made in Microsoft project management tools. Microsoft Project 98 and 2000 are probably the most widely used project management tools throughout the Agency. Microsoft project management tools are viable and are the most compatible with the Microsoft Office Suite. The PMTWG recommends that users of MS Project fully transition to MS Project 2000/Project Central. Upgrading to MS Project 2000 provides managers more flexibility in project planning, scheduling and increased opportunities for collaboration among distributed working groups. MS Project 2000 has incorporated Project

Central, which is a companion product that allows asynchronous communication between team members.

Project 2000 also offers more flexibility in project views and analysis features. Users can customize basic group, sort, and filter routines to create the views and reports they need. The PERT chart feature has been enhanced so that users can customize network diagrams using new filtering layout options and formatting features. Users can take advantage of the new graphic features and create spotlight reports based upon user-defined criteria. Project 2000 offers users more resource management capability than Project 98. Users can view, share, and allocate resources across a portfolio of projects. The new leveling operation takes into account task calendars, resource availability and project priority. Users can better understand the impact of leveling a shared resource on all other projects.

The PMTWG selected two desktop level solutions to give flexibility to programs and projects throughout the Agency. While Primavera SureTrack meets all of the project management user requirements, MS Project cannot be overlooked because of its broad presence in the NASA project management community.

Even though MS Project 2000 meets just as many of the requirements as SureTrack does, several concerns exist. First, there is the legacy issue in using Project 2000 since Project 2000 uses a new file interchange format, MPP. Project 2000 can read from and save to the Project 98 MPP format, however, Project 2000 does not allow users to save MPX files. Users can migrate MPX files to Project 2000 by saving in the MPX file format, opening files in Project 2000, and then saving the files to Project MPP file format.

Second, the same is true for Project 2000 database file format. The database schema in Project 2000 has been changed substantially. Therefore, Project 2000 can open a project file that has been saved to a Project 98 database format, but again, it cannot save a project file in the Project 98 database format. Users must use the Project 98 MPP format.

Other specific concerns with Project 2000 should also be addressed. For example, Project does not enforce the proper schedule updating disciplines to always reflect incomplete task duration in the future beyond the status as-of date. Another concern is that Project 2000 calculates incorrect slack for certain types of overlapping task relationships, which affects the task and project end dates. Another concern is that Project 2000 has inflexible resource loading capability that does not accommodate man-hour loading. And finally, task identification numbers constantly change as new tasks are added to the schedule, which can make tracking cumbersome.

The Spaceport, Engineering and Technology Directorate at KSC is currently working with the Beta version of MS Project 2002 on the KSC Projects and Resources Online (KPRO) project. They report the tool as meeting the PMTWG Tier I/II level (desktop) requirements. The follow-on working group should consult with KSC and evaluate MS Project 2002 after its release.

PC/MAC Applicability

The above project management tool recommendations apply to both PC and MAC users. However, MAC users need Virtual PC, Citrix, Winframe, or a similar PC-emulation tool to utilize project management tools developed for PC platforms. A cursory survey and assessment was conducted looking at running various project management tools on a PC-emulation tool. The preliminary results suggest that MAC users can successfully run PC/Windows-based PM software on their MACs by using a PC emulator. They can also create, modify, and exchange files with PC/Windows users of the same PM software.

APPL/Project Management Portal

As NASA's expert in program/project management processes, it is essential to have the Academy of Program Project Leadership's (APPL) involvement in any effort that strives to support and assist project managers throughout the Agency. The success of establishing project management tool recommendations and guidelines depends on many factors. One of them is that program and project managers, and team members use the tools recommended. NASA's Project Management Development Process (PMDP) already contains the disciplines necessary for mission success. Integrating the project management tool guidelines into the NASA/APPL project management website and curriculum will ensure effective adaptation of the tools within the project management process adopted by NASA. Integration of processes, strategies, tools, and training are key to project management and mission success.

It is recommended that the Project Management Tool Initiative recommendations be integrated into the APPL website.

NEXT PHASE RECOMMENDATIONS

Even though completion of this initiative will ensure a recommended project management tool guideline to be used Agency-wide, more research is required to build an integrated project management environment and to establish a NASA-wide project management standard. Process management integration is the key to successful project implementation. Better coordination of business processes and requirements with projects is needed.

NASA needs to fully utilize the benefits gained by establishing strong management and organizational strategies and processes; since tools alone do not equal good project management. Tool guidelines and standard must be combined with effective organizational project management practices and training for mission success. Failing to adapt effective project management practices is a cultural rather than a technical one.

IFM/Data Elements

In the long term, NASA will be better served by a unifying technology solution, which aims at consolidating data across Tier I, II and III.

The PMTWG recommends a follow-on effort to more thoroughly evaluate Enterprise-level project management tools that would integrate with the desktop recommendations, the Integrated Financial Management (IFM) system, and eNASA.

This follow-on effort would include a re-evaluation and validation of the current data elements and Enterprise-level user requirements, identification of all data and system interfaces, and an evaluation of Enterprise-level project management software. Even though an exhaustive review of Enterprise-level project management tools was not conducted by the PMTWG, the working group's preliminary assessment identified Primavera/P3E as an Enterprise level software package that should integrate with SAP (used for IFM) and the Primavera/SureTrack desktop recommendation.

Another recommendation is to further investigate SAP's project management capabilities and its interfacing capabilities with the recommended project management tools.

The IFMP has selected SAP as the primary ERP vendor for NASA. SAP products have built-in project management capabilities that might be suitable for NASA's programs and projects. SAP has several software partners, in the category of Project Systems, who have certified interfaces to SAP software - Primavera being one of them.

It is therefore recommended to research and recommend Enterprise-level project management software tools that are consistent with end user requirements and the requirements set forth by both IFM and e-NASA.

E-NASA/Project Management Council Working Group (PMCWG)

The Agency needs clarity on the issue of PM tools standards as a way to support program and project teams. This will require a follow-on project management tool activity sponsored in partnership by e-NASA and the PMCWG.

The PMTWG recommends a follow-on working group work under the direction of the Agency CIO to explore and present the challenges and benefits of formulating and implementing project management software guidelines or standards. The work of this working group should facilitate, support, and convey the final decision of the Agency CIO.

MS Project 2002

The Spaceport Engineering and Technology Directorate at the KSC is currently working with the beta version of MS Project 2002 on the KSC Projects and Resources Online (KPRO) project. They report the tool as meeting the PMTWG Tier I-/Tier II-level (desktop) requirements.

The PMTWG recommends a follow-on working group consult with KSC and evaluate MS Project 2002 after its release.

Open Standards

Certainly, there is a risk associated with establishing a single vendor's solution. It is preferable to choose solutions that support open standards in order to mitigate this risk. Unfortunately, there are currently no open standards for project management tools. There is however a Project Management XML Consortium led by Pacific Edge Software Inc. Pacific Edge Software originally developed a Project Management XML schema. Several companies, i.e., eProject.com, Great Plains, Onyx Software, PlanView, Primavera Systems, and Welcom have joined in the effort to develop the schema. The goal is for these companies to work together to forge an open industry standard by making modifications, extensions, and enhancements to Pacific Edge Software's XML schema for project management on a regular basis. It is important to note that the vendor for the PMTWG's primary recommendation, Primavera, is a current member of this Consortium. However, Microsoft is likely to also join in the very near future. The PMTWG considered the participation in the Consortium important because tools that integrate open standards will give the Agency flexibility in upgrading or re-selecting future tools should the Agency's project management requirements change. The desktop and enterprise recommendations took into consideration the vendors' participation in the Consortium.

The PMTWG recommends that NASA participate as a customer representative in the PM XML Consortium.

**APPENDIX A - PROJECT MANAGEMENT TOOL INITIATIVE PROJECT
PLAN**

NASA Glenn Research Center

**Principal Center Workgroup Hardware and Software
(PCWHS)**

Project Plan

For

Project Management Tools Initiative

FY00 - FY01

09/03/99

Change Record

Rev.	Effective Date	Description
1	8/2/00	Identified specific work to be performed under FY00 and FY01.

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1.0 Description

The objective of this project is to standardize project management software tools throughout the Agency. Users currently use a variety of independently-chosen project management software tools. Moreover, the existing capabilities of these software packages do not adequately support the technical demands of the typical collaborative environment.

Clearly Project Management Tool Standards will improve data sharing capability and collaboration, facilitate the transition to less expensive desktop solutions, and increase interoperability with other Agency-standard tools.

2.0 Background

Within the Agency today, each project chooses a project management tool. The selection of project management tools is left up to the individual project users. In many cases, costly and redundant evaluations of project management software tools have been conducted individually as well as by various field centers. As a result, many different project management solutions, processing on a variety of platforms, can be found in use across the Agency.

In the past, project management software packages were hosted on expensive mainframe computers. Proprietary databases restricted access to project data to only a few users. Furthermore, the software was so hard to learn and use that its benefits were accessible only to those who were specially trained. Developments in project management software packages designed for desktop computers have allowed for more inexpensive solutions to satisfy the requirements typically met by traditional host-based project management packages.

Today, less expensive desktop packages are much easier to use and are becoming not only practical but also necessary for managing NASA projects of any size. Numerous third-party add-on tools and web-based project management tools have also become available over the last couple of years. Although these tools add more power and flexibility to standard desktop project management software tools, they compound the efforts and increase the work associated with evaluating tools for selection.

Clearly, the proliferation and maturity of the available project management software tools makes Agency standards an imperative. To that end, the Kennedy Space Center, as the Expert Center for Project Management, initiated an important research effort to determine high-level project management tool requirements in 1996. The Principal Center Workgroup Hardware and Software (PCWHS) is continuing with this effort by updating these requirements and using them to evaluate COTS project management software. The results of PCWHS research will be reported in the fourth quarter of 2000.

3.0 Methodology/Approach

This project builds on the results obtained from the Kennedy survey. The following series of activities are considered major milestones toward the completion of this project.

FY 00 Activities

3.1 Planning Phase

- Solicit CIO's for a list of prospective survey participants.
- Conduct an Agency-wide survey of the Academy of Program and Project Leadership (APPL), senior- and junior-level project managers and project coordinators, and CIOs to identify tool requirements.
- Develop and distribute a project management tools requirements document.
- Establish an Agency-level working group for the software evaluation phase and scenario piloting activities.
- Develop a matrix of evaluation criteria vs. commercial product capabilities.
- Establish on-going communications with an external-consulting representative. The PCWHS retains the services Metagroup, Inc. to provide third-party consultation on best commercial IT practices and current marketplace trends and user requirements. A representative from Metagroup will provide expert consultation on project management software products and their capabilities throughout the course of this project.

3.1.1 Pre-Survey Discussions

Initial discussion of project plans, customer requirements, and anticipated/forecasted survey results.

3.1.2 Post-Survey Discussions

Discuss actual survey results, review any changes to the direction of the project, review project management software selection matrix, and discuss probable selection of project management software for evaluation.

3.2 Evaluation Phase

- Contact vendors for evaluation copies of project management software.
- Conduct on-site vendor demonstrations/presentations.
- Evaluate software against evaluation criteria.

3.3 Selection Phase

- Recommend project management software package(s) for Agency-wide use.
- Develop an Agency project management tool standard document.
- Agency CIO's and Project Management Committee (PMC) Working Group's approval of the project management tool standard.
- Publish, present and distribute recommendations, standards, guidelines, and reports.

FY01 Activities

- 3.4 Integration/Implementation Phase
 - Develop a comprehensive training plan in consultation with APPL.
 - Develop a comprehensive Agency-level implementation plan for integrating recommended project management software within the existing architecture.
- 3.5 Project Close-Out Phase
 - Archive information.
 - Conduct final working group meetings.
 - Present and archive lessons learned to the CIO community.

4.0 Requirements - Methodology

An updated list of user requirements will be obtained through an Agency-wide survey of NASA's program and project managers, APPL, and CIOs. Each survey participant will receive a copy of the survey questionnaire via electronic mail along with a cover letter that explains the nature of the survey and the instructions for completing the five-page questionnaire.

The questionnaire consists of two parts: part one presents a list of high-level requirements obtained through the Kennedy Space Center research, while part two requests demographic information as well as a description of the network operating system and any project management software currently being used. Participants are asked to rank each requirement in part one as either: 1= Must Have, 2= Want to Have, and 3= No Longer A Need.

Participants will be given four weeks to complete and return the questionnaire to the Glenn PCWHS points of contact via electronic or ground mail.

The results of this study will be provided in a requirement document after the survey results have been compiled and analyzed.

- 4.1 Constraints

The PCWHS budget is limited and thus will affect the number of project management software packages that can be purchased and evaluated.
- 4.2 Assumptions
 - There is a significant quantity of project management work within the Agency that requires coordination between multiple centers.
 - Selected technology must be deployed on multiple desktop platforms such as UNIX, Mac, and PC.
 - Solutions must be compatible with Agency- and Center-level networking standards.

- Solutions must comply with accepted industry standards for database connectivity (ODBC) and embedding/linking (DDE/OLE)
- Adequate user workstations are already in place at the field Centers.
- No single tool will be able to satisfy all of the user requirements for a PM tool. The selected software must be able to support or be compatible with third party add-on tools.
- COTS desktop or network-based PM tools are less expensive and easier to use than host-based higher-end software products.
- The computer proficiency of the user-community will be varied. The selected software must be easy-to-learn and use.

5.0 Budget

FY00 Budget

CS FTE	1.5 FTE (PCWHS Staff)
SSC Support	0
\$5000.00 for software and testing licenses	

FY01 Budget

CS FTE	1.25 FTE (PCWHS Staff)
SSC Support	0
Consultant Support	\$10K
Hardware/Software	\$10K

6.0 Schedule

FY00 - Level 1 Milestones and Schedule:

- | | |
|--|-------------------------|
| • Project Management Tools Requirements Document | Q2 FY 2000 |
| • Interim Project Management Tool Recommendation | Q2 FY 2000 |
| • Limited Tool Evaluation, Testing, Selection and Draft Std. | Q4 FY 2000
(Q1FY001) |

FY01 - Level 1 Milestones and Schedule (If standard is adopted):

- | | |
|---|------------|
| • Comprehensive training plan for recommended tools | Q2 FY 2001 |
| • Implementation plan for integrating the recommended tool (s) into the current Agency architecture | Q4 FY 2001 |

FY01 - Level 1 Milestones and Schedule (If standard is not adopted):

- | | |
|---|------------|
| • Provide PM Tool Recommendations | Q4 FY 2001 |
| • Provide Transition Plan to integrate the PM Tool Initiative into e-NASA | Q4 FY 2001 |

7.0 Deliverables

FY00 - Deliverables:

- Project Management Requirements Document
- Project Management Tools Initiative White Paper
- Project Management Tool Evaluation Methodology Document

FY01 - Deliverables (If standard is adopted):

- Project Management Tool Standards Document
- Comprehensive Training Plan
- Agency-level Integration/Implementation Plan

FY01 - Deliverables (If standard is not adopted):

- Project Management Tool Initiative White Paper (Revised)
- Project Management Tool Evaluation Summaries Document
- Project Management Tool Initiative Transition Plan

APPENDIX B – ABBREVIATED SURVEY SUMMARY REPORT

Project Management Software Tool Requirements

Survey Summary

January 19, 2000

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I. Introduction

The purpose of this study is to establish baseline user requirements for project management software. This study also includes an importance assessment of each requirement that was given by various project management software users.

The requirements depicted in this study therefore represent characteristics and dimensions of project management software tools that are considered important to the user community.

The results of this study will be used to evaluate Commercial-Off-The-Shelf (COTS) project management software. The study results will also become the basis for the project management tool requirements document, which will be subject to the review of the Principal Center Integration Team (PCIT) and Chief Information Officer (CIO) representatives throughout the Agency.

II. Methodology

Survey Design

The survey was originally designed and conducted in 1996 by the Kennedy Space Center (KSC) in their role as Expert Center for Project Management. In 1999, Glenn Research Center (GRC) updated the original survey instrumentation and conducted a follow-up survey throughout the Agency. This report summarizes the results of that survey.

Instrumentation

The original requirements were taken from previous studies of project management tools performed at other NASA Centers, discussions with various project management team members and the NHB 7120.5A, Management of Major Systems Programs and Project Handbook.³

The update included additional requirements that were offered by an external-consulting representative⁴.

The instrument was modified to include more demographic questions as well as questions to assess how well the users' current project management tool fulfills each requirement. The adjectives for each evaluation scale were also modified. See Appendix A, Project Management Software Tool Requirement Survey Questionnaire.

The survey questionnaire was divided into three parts.

³ Business Case for Project Management Software Tool Standardization, 5/10/99, WHS Lead Center p.7.

⁴ The Principal Center for Workgroup Hardware and Software (PCWHS) (GRC) retains the services of Metagroup Inc. to provide third-party consultation on best commercial IT practices, current marketplace trends and IT user requirements. A representative from Metagroup will be consulted throughout the course of this project.

Part I requested user demographic information such as contact information, current project management tool being used, type of network operating system and total number of projects currently being managed.

Part II was composed of a list of technical, performance and reporting requirements along with a three-point ordinal scale⁵. Users were asked to score the importance of each requirement statement using the scale provided. The following scale was used:

Semantic	Numeric Point Value
No Longer a Need	3
Want to Have	2
Must Have	1

Figure 1 Three-Point Ordinal Scale of Importance Ratings

Users were also asked to use another three-point ordinal scale to rate how well their current tool fulfills each requirement. The following scale was used:

Semantic	Numeric Point Value
Does Not Fulfill	3
Somewhat Fulfills	2
Fulfills	1

Figure 2 Three-Point Ordinal Scale of Performance Ratings

Part III provided space for users to write-in any additional requirements that they felt should be included.

Data Collection

Target Population

The target population was any senior- and junior-level program/project manager or team leader/member with an interest in project management software tools. The CIO community was solicited for a list of prospective survey participants as well as the Academy of Program and Project Leadership (APPL).

Deployment Procedures

The deployment procedure consisted of the following:

- Pre-testing the questionnaire to evaluate its usability and assess administration time.

⁵ Ordinal scales measure and convey order or dominance. The numeric order of the assigned scores (1,2,3) represents the order of importance, indicating that whatever requirement receives a score of "1" is considered more important than requirements that are scored 2 or 3.

- Conducting the survey (via e-mail) for three consecutive weeks. Survey participants received a cover letter discussing the survey objectives, the questionnaire topic areas and a strong request for their participation.
- Sending a follow-up reminder letter (via e-mail) during week two of the survey in an effort to maximize response rates.
- Sending a final e-mail to thank survey respondents for their participation. See Appendix A, Project Management Software Tool Requirement Survey Questionnaire, and Appendix B, E-mail Correspondence.

III. Results and Analysis

The results of the survey are provided in this section. Center representation is presented first followed by narrative statements that summarize the requirements that are important to users.

Center Representation

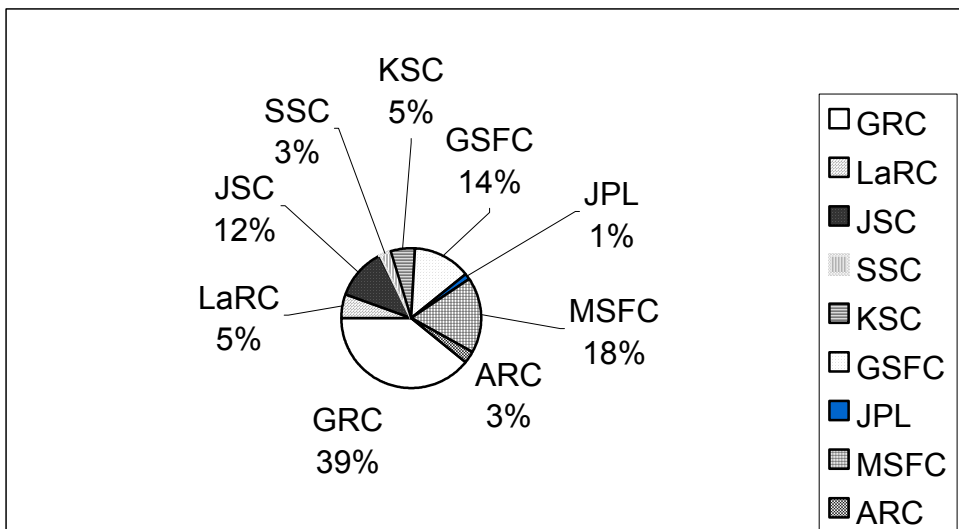


Figure 3 Center Representation

Requirement Narratives

It is important to note the procedure used to determine the criticality (importance) of each requirement. Each requirement was first assigned the total number of users who provided a numeric score for both performance and importance ratings. Next, the requirements were ranked in descending order according to the totals for each score. Then an average, range and standard deviation were calculated for each requirement sub-category. For example, average, range, and standard deviation was calculated for the sub-category 'Open Database

Connectivity/Architecture' while the same calculations were done for 'Workgroup Capabilities', 'Network', 'Ease of Use/Learning', etc.

Requirements that fell within and above the spread of the mean are judged to be 'Must Have' or primary requirements and are critical to users. Only requirements that fell below the lower limit of the spread are ranked 'Want to Have or Secondary Requirements. Secondary Requirements are considered non-critical but important requirements.

There are no requirements considered 'No Longer a Need' or tertiary requirements. Therefore, this category of requirements was omitted from this study. See Appendix C, Average Values and Standard Deviation Calculations.

Even though numerical values were calculated to determine the criticality of each requirement, the same conclusion could easily have been achieved by simply observing the natural breaks within the data of each category. Either way, the data clearly reflects the requirements of the average to sophisticated project management tool user.

The critical technical and performance requirements include open database connectivity and architecture capabilities such as controlled multi-user access to current and updated project data, platform independence and compliance with DDE/OLE and ODBC standards.

Workgroup capabilities include requirements such as the ability to import/export task, resource, schedule, cost, variance and tracking information to other applications and the ability to send project reports via electronic mail.

Users prefer site licensing or other multi-user type licenses to individually assigned licenses. Users also want the project management software tools to be able to operate on a variety of networks.

Ease of use is of utmost importance to users. The project management software tool set must not only be intuitive and easy to use, but it must also be quick to learn. The tools must also have a graphical user interface (GUI) as well as an on-line context sensitive help utility and tutorials. The tool set must 'look' and 'feel' like other standard desktop tools currently in use.

The project management tools must perform basic scheduling using Gantt, PERT, CPM views to show basic task information, dependencies between tasks and total project duration based upon individual task durations. Users must also be able to vary time scales for task durations, designate resource constraints with the complete flexibility to assign positive or negative delays and generate work break down structure (WBS).

The tool set must be able to roll-up multiple projects into a master schedule. It must also allow users to specify tasks or milestones to be rolled-up. Task durations must be easily and automatically calculated based upon their dependency with other tasks. Users must be able to add user-defined fields for each project, task, and resource.

Baselining and tracking project/task progress is important to users. The tools must allow users to create a baseline plan and also allow for re-baselining as necessary. Time versus cost

baselines must be able to be established and the tools must be able to calculate the percentages of tasks performed.

Users want tools to be flexible in the number of resource and calendar features provided. Resources must be able to be shared across multiple projects. The tools must allow the user to create and assign calendars to resources and apply resource-utilization factors, perform resource scheduling, and display resources that are over-and under-allocated. The user must be allowed to define time periods, set work and non-work periods for calendars, and allow multiple projects to share the same calendar.

Risk management features are important but not necessarily critical to users. However, the tool set must still have enough estimating capability to assign uncertainty to cost, schedule and resource parameters, and estimates.

The tools must be able to perform basic cost management operations such as assign multiple cost accounting codes to projects, provide cost-to-completion estimates, and forecast resource expenses through calendar or fiscal year end.

Reporting requirements are also important to users. Not only must users be able to view various types of schedule charts i.e., (Gantt, Pert, and milestone charts); they must also be able to print these schedules using both actual and projected information. The tool set must have enough flexibility to produce output formats containing user-defined time increments, start and end dates, bar styles, legends, and report titles. Users must also be able to add free text to graphs.

The software tool set must be able to produce other report formats such as schedule tracking and projection reports as well as resource over- and under- utilization reports.

Reporting for management requires the tools to generate project summary information across all projects within an organization. Summary information must include estimates, actuals and schedule and cost variances, namely BCWS, BCWP, ACWP, CPI and SPI, all of which can be used to generate earned value reports.

In addition, users have specified that the standard project management tools be compatible with Microsoft Project, IFMP, and APRS. The tool set specifications must clearly indicate the maximum number of projects to be integrated, the maximum number of projects opened or updated simultaneously, and the maximum number of users accessing the same project simultaneously. Also to be specified are the number of user-defined fields required for a project, task, and resource, as well as the required number of resources, constraints, and calendars per project.

See Appendix D, Project Management Tool Requirement Survey Results - Basic Sort, for the above narrative requirement statements in numeric format.

IV. Study Assumptions

The following technical and resource assumptions are of main consideration for successfully implementing the project management tool standard:

- There is a significant amount of project management work within the Agency that requires coordination between multiple Centers.
- An adequate number of user workstations are already in place at the field Centers.
- No single tool will be able to satisfy all of the user requirements. The selected software must be compatible with third-party add-on tools.
- COTS desktop or network-based project management tools are less expensive and easier to use than host-based, higher-end software products.
- The computer proficiency of the user-community will be varied. Users must be adequately trained to ensure a general appreciation for the tool set.
- The budget is limited and will possibly affect the number of project management packages that can be purchased and evaluated.

V. Recommendations

It is recommended that this document be used in formalizing the Project Management Tool Standard Requirement Document. It is further recommended that the formal Requirement Document be approved and baselined prior to the evaluation of project management software. The Requirement Document must be used as a template when developing evaluation criteria and pilot test checklists.

Even though completion of this project will ensure a project management standard for use throughout the Agency, more research is required to build an integrated project management environment.

APPENDIX C – PROJECT MANAGEMENT TOOLS REQUIREMENTS
DOCUMENT



Project Management Tools Requirements Document

Principal Center Workgroup Hardware and Software

NASA Glenn Research Center
Cleveland, OH 44135 US

Change Record

Rev.	Effective Date	Description
Draft	1/26/00	Initial Draft
Draft-2	3/10/00	Revisions to Initial Draft
Draft-3	5/30/00	Informal comments incorporated
Draft-4	7/19/00	Working Group face-to-face meeting review
Rev. 1	8/29/00	Minor changes from Working Group

1. INTRODUCTION

All NASA missions require tools to manage mission projects. Project Management (PM) tools are used at every level of a project to organize tasks and track project status, allocate responsibilities, and plan and track project costs and resources. The current environment demands that all NASA missions use good project management techniques. Through the establishment of project management software and tool standards, projects can spend less time analyzing tools and more time managing projects. Tool standards will improve data sharing capability and collaboration and increase interoperability with other agency standard tools.

NASA is in the process of establishing standards and practices document with regard to the acquisition and use of project management tools (planning, scheduling, etc.) across the agency. The NASA CIO tasked the Principal Center for Workgroup Hardware and Software with developing these standards. The PCWHS convened a Project Management Tools Working Group (PMTWG) to assist with this task. The PMTWG has as its charter the requirement to study the characteristics of available project management products, evaluate the available products and to report its findings to the CIOs. The PMTWG, which comprises project managers, Cost TRs, and government and contractor schedulers, will study and evaluate project management tools against a list of attributes/requirements deemed necessary to fulfill the project management process across the Agency.

2. PURPOSE

The purpose of the PM Tools Requirements document is to identify and document the requirements for project management software tools. These requirements will be used for assessment and evaluation of Commercial-Off-The-Shelf (COTS) and other PM tools, and for the development of Agency-wide PM Tool standards and guidelines.

3. APPLICABLE AND REFERENCE DOCUMENTS

Document Number	Document Title
	Managing Information Technology
	Roles, Responsibilities, and Processes of the Principal Centers, Principal Center Integration Team, Expert Centers, and Associated Working Groups - October 15, 1998
	Management of NASA Information Technology Architecture and Standards - March 3, 1999
	Project Management Software Tool Requirements Survey Summary- January 19, 2000.

4. REQUIREMENTS

This section contains the critical PM tool requirements as determined by the results of the Agency-wide PM tool survey. These requirements define as applicable the performance and reporting characteristics. This section is intended to indicate the minimum requirements that PM tool(s) must meet to be acceptable. Section 4.1 covers the Technical and Performance requirements and Section 4.2 covers the project and management reporting requirements.

4.1. Technical and Performance Requirements

The following requirements define what the project management tool(s) must do and how well they must do it.

4.1.1. Open Database Connectivity and Architecture

- 4.1.1.1. Project management tool(s) architecture must be compatible with Agency and industry standards.
- 4.1.1.2. PM tool(s) shall allow user/project level access and update control.
- 4.1.1.3. PM tool(s) shall allow multiple users to share same project file(s).
- 4.1.1.4. PM tool(s) shall perform global updates across multiple projects.
- 4.1.1.5. PM tool(s) shall be platform independent, i.e. deployable on multiple desktop platforms or provide Web-enabled/Internet-enabled access.
- 4.1.1.6. PM tool(s) shall provide multiple views across multiple projects.
- 4.1.1.7. PM tool(s) shall allow users to share centralized repository.
- 4.1.1.8. PM tool(s) shall use Open DataBase Connectivity (ODBC) standards to read/write to other databases.
- 4.1.1.9. PM tool(s) shall use Dynamic Data Exchange (DDE)/Object Linking & Embedding (OLE) to link to other applications.
- 4.1.1.10. PM tool(s) shall allow import large blocks of data.
- 4.1.1.11. PM tool(s) shall be able to interface with institutional legacy systems.

4.1.2 Workgroup Capabilities

- 4.1.2.1. Workgroup capabilities include requirements such as the ability to transfer project textual and non-textual data and information among different applications, projects, and users.
- 4.1.2.2. PM tool(s) shall send project reports via E-mail utilizing Simple Mail Transfer Protocol (SMTP) and Multi-part Multi-media (MIME) Protocol.
- 4.1.2.3. PM tool(s) shall have import and export capabilities.
- 4.1.2.4. PM tool(s) shall capture report output to files so that they may be incorporated into other documents.
- 4.1.2.5. PM tool(s) shall provide the capability of saving data, information, and files such as MPX files.

4.1.3. Network

- 4.1.3.1. PM tool(s) shall allow for multi-user licensing not tied to an individual by name.
- 4.1.3.2. PM tool(s) shall be compatible with a variety of networks, i.e., TCP/IP and output devices.

4.1.4. Ease of Use

- 4.1.4.1. The project management software tool set must not only be intuitive and easy to use, but it must also be quick to learn. The tool set must 'look' and 'feel' like other standard desktop tools currently in use.
- 4.1.4.2. PM tool(s) shall provide the capability of easily making changes to data.
- 4.1.4.3. PM tool(s) shall be easy to use and not require extensive training for the every-day user.
- 4.1.4.4. PM tool(s) shall be easy to show progress in a task or project.
- 4.1.4.5. PM tool(s) shall provide a Graphic User Interface (GUI).
- 4.1.4.6. PM tool(s) shall be consistent with other desktop tools.
- 4.1.4.7. PM tool(s) shall be intuitive and quick to learn.

- 4.1.4.8. PM tool(s) shall provide on-line, context-sensitive help on screens and fields and an on-line tutorial.
- 4.1.5. Project Scheduling Methodology
 - 4.1.5.1. The project management tools must perform basic scheduling functionality.
 - 4.1.5.2. PM tool(s) shall perform basic scheduling/PERT functionality.
 - 4.1.5.3. PM tool(s) shall allow variable scaling (month, week, day, hour) for task duration.
 - 4.1.5.4. PM tool(s) shall perform Full Critical Path Method (CPM) functionality including the capability of showing multiple critical paths (positive and negative) in output reports.
 - 4.1.5.5. PM tool(s) shall allow users to designate logical relationships, i.e., start-to-start, start-to-finish, finish-to-start, and finish-to-finish.
 - 4.1.5.6. PM tool(s) shall allow users to customize tables and views.
 - 4.1.5.7. PM tool(s) shall allow users specific defaults and the ability to create project templates.
 - 4.1.5.8. PM tool(s) shall generate an Organizational Breakdown Structure (OBS) and a Work Breakdown Structure (WBS) or allow a user to impose a WBS.
 - 4.1.5.9. PM tool(s) shall allow users to assign positive or negative lag/lead times on logical relationships.
 - 4.1.5.10. PM tool(s) shall perform resource leveling and smoothing.
 - 4.1.5.11. PM tool(s) shall have the capability of de-linking percent complete from remaining duration.
 - 4.1.5.12. PM tool(s) shall allow users to define and assign constraints to tasks and milestones.
- 4.1.6. Project Task/Field Features
 - 4.1.6.1. The PM tool set must be able to roll-up multiple projects and/or subprojects into a master schedule.

- 4.1.6.2. PM tool(s) shall allow users to specify tasks or milestones to be rolled-up.
 - 4.1.6.3. PM tool(s) shall allow users to define fields for each project/task/resource.
 - 4.1.6.4. PM tool(s) shall roll-up multiple projects into a master schedule.
 - 4.1.6.5. PM tool(s) shall define a task with the duration being automatically calculated based upon its dependency with another task, i.e., hammock task.
 - 4.1.6.6. PM tool(s) shall incorporate a large comment/notes field for the project for the entry of soft information
 - 4.1.6.7. PM tool(s) shall define task start and end dates as fixed, resource-driven, or effort-driven.
 - 4.1.6.8. PM tool(s) shall allow users to create a read-only version of the project (i.e., fields, tables, resources, and calendars).
 - 4.1.6.9. PM tool(s) shall allow the capability to restrict user access to specified fields.
- 4.1.7. Baselining and Tracking Progress of the Project
- 4.1.7.1. Baselining and tracking project/task progress is important to users. The tools must allow users to ensure that project objectives are met by monitoring and measuring progress.
 - 4.1.7.2. PM tool(s) shall create baseline plans to be used for comparisons.
 - 4.1.7.3. PM tool(s) shall report ahead/behind original or revised schedule estimate.
 - 4.1.7.4. PM tool(s) shall allow user to re-baseline multiple times.
 - 4.1.7.5. PM tool(s) shall calculate percentage of task performed when the start date, end date, and work is entered or the start date, duration, and work is entered.
 - 4.1.7.6. PM tool(s) shall allow users to elect to keep, change or delete the original estimate (baseline).
 - 4.1.7.7. PM tool(s) shall provide view of actual work by user-specified period.

4.1.7.8. PM tool(s) shall perform trend analysis.

4.1.8. Resource Features

Users want tools to be flexible in the number of resource and calendar features provided:

4.1.8.1. PM tool(s) shall assign costs to resources.

4.1.8.2. PM tool(s) shall perform resource scheduling.

4.1.8.3. PM tool(s) shall provide flexibility in creating and defining multiple resource types, i.e. dollars, government, and contractor.

4.1.8.4. PM tool(s) shall display resources that are over- and under-allocated.

4.1.8.5. PM tool(s) shall allow multiple resource-assignments per task.

4.1.8.6. PM tool(s) shall display all tasks using a resource.

4.1.8.7. PM tool(s) shall allow resource sharing among multiple projects.

4.1.8.8. PM tool(s) shall allow users to create and assign calendars to resources.

4.1.9. Calendar Features

4.1.9.1. PM tool(s) shall allow users to set work and non-work periods for calendars, (i.e., holidays, rest periods, etc.).

4.1.9.2. PM tool(s) shall allow multiple user-defined calendars within a project.

4.1.9.3. PM tool(s) shall allow users to define increments of hours, days, weeks or months.

4.1.9.4. PM tool(s) shall allow users to set starting day of week and/or starting month of the fiscal year.

4.1.9.5. PM tool(s) shall allow calendar sharing among multiple projects.

4.1.9.6. PM tool(s) shall allow users to set the calendar to user-defined time periods.

- 4.1.9.7. PM tool(s) shall allow distinctive task calendars and resource usage calendars.

4.1.10. Cost Management features

The tools must be able to perform basic cost management operations.

- 4.1.10.1. PM tool(s) shall calculate a cost to complete the project.
- 4.1.10.2. PM tool(s) shall associate multiple cost accounting codes to a project.
- 4.1.10.3. PM tool(s) shall provide earned-value analysis.

4.1.11. Risk Management Features

- 4.1.11.1. PM tool(s) shall assign uncertainty to schedule parameters.
- 4.1.11.2. PM tool(s) shall calculate schedule parameter uncertainty.
- 4.1.11.3. PM tool(s) shall perform risk analysis functions.
- 4.1.11.4. PM tool(s) shall provide cost estimating capabilities for both risk impact and mitigation.
- 4.1.11.5. PM tool(s) shall assign uncertainty to cost parameters and cost estimates.
- 4.1.11.6. PM tool(s) shall provide capability for user defined performance metrics.
- 4.1.11.7. PM tool(s) shall be able to perform risk simulations, i.e., Monte Carlo, or at least utilize risk simulation data.

4.2. Reporting Requirements

The following requirements define the type of data and/or information the project management tool(s) must report and required reporting format.

4.1.2. Project Reports

Users must be able to view various types of schedule charts and they must also be able to print these schedules using both actual and projected data. The tool set must have enough flexibility to produce output formats containing user-defined criteria.

- 4.1.2.1. PM tool(s) shall allow users to view and print Gantt, PERT charts, and histograms.

- 4.1.2.2. PM tool(s) shall display actual vs. projected information.
- 4.1.2.3. PM tool(s) shall adjust Gantt chart window view (user-selected start and end dates).
- 4.1.2.4. PM tool(s) shall allow user to customize bar styles and milestone styles for Gantt charts.
- 4.1.2.5. PM tool(s) shall create schedules in user-defined increments (i.e., hours, days, and weeks).
- 4.1.2.6. PM tool(s) shall indicate current time.
- 4.1.2.7. PM tool(s) shall generate PERT charts; consider time-phased vs. non-time phased elements, and plotter requirements.
- 4.1.2.8. PM tool(s) shall allow user to add free text to graphs.
- 4.1.2.9. PM tool(s) shall allow user to determine task label placement, i.e., left/right of bar, on bar, above, or below.
- 4.1.2.10. PM tool(s) shall create schedule tracking and projection graphs/reports.
- 4.1.2.11. PM tool(s) shall create resource over- and under- utilization graphs/reports.
- 4.1.2.12. PM tool(s) shall display negative slack time.
- 4.1.2.13. PM tool(s) shall display actual time for organization, project, resource, or contract company by user-specified period, i.e., year-to-date, fiscal year, current month.
- 4.1.2.14. PM tool(s) shall report resource requests by project and by filled or unfilled status.

4.2.2. Management Reporting

Reporting for management requires the tools to generate project summary information across all projects within an organization. Summary information must include data and information that can be used to generate earned value reports.

- 4.2.2.1. PM tool(s) shall provide standard reports.
- 4.2.2.2. PM tool(s) shall select data for reporting based on user-defined criteria.

- 4.2.2.3. PM tool(s) shall generate cost projection graphs/reports
- 4.2.2.4. PM tool(s) shall allow users to customize or create reports via a report writer.
- 4.2.2.5. PM tool(s) shall provide project-level summary reports.
- 4.2.2.6. PM tool(s) shall allow users to add free text to reports.
- 4.2.2.7. PM tool(s) shall provide the capability for reporting estimated vs. actual work for resources by user-specified period.
- 4.2.2.8. PM tool(s) shall allow schedule tracking/reporting from a common resource pool.
- 4.2.2.9. PM tool(s) shall have the capability to categorize and report projects by their project status, i.e. active, complete, dropped, or pending project start date.
- 4.2.2.10. PM tool(s) shall identify sub-projects within one project file for reporting purposes.

5. NOTES

None.

6. APPENDIX

None.

APPENDIX D - PROJECT MANAGEMENT TOOL EVALUATION
METHODOLOGY

Project Management Tool Evaluation Methodology

Principal Center Workgroup Hardware and Software

Change Record

Rev.	Effective Date	Description
Draft -1	7/21/00	Initial Draft
Rev. 1	8/21/01	Changes reflect final recommendation

1.0 INTRODUCTION

All NASA missions require tools to manage projects. Project Management tools are used at every project level to organize tasks and track project status, allocate responsibilities, and plan and track project costs and resources. The current business environment demands that all NASA missions use good project management techniques.

A myriad of tools is available to help individuals manage projects and resources. They are used in many environments, from desktop to client/server, from single-user to enterprise-wide. Project management packages provide a number of functions, depending on the application: task planning and scheduling, resource management, and large-scale project management and business management. NASA as well as many enterprises today is horizontally structured around projects, teams, and matrices, and project managers currently require packages that accommodate these changing structures. Project management software is increasingly providing better user-orientation, communication functions (including reports and printouts), and groupware-like attributes. Interfaces with electronic calendars and messaging systems, integration with 4GLs, EIS functions, and Web-enabled functions are just a few of the more recent advances in project management software packages.

The focus of the Project Management Tools Initiative is on researching and evaluating project management software tools. This includes surveying project managers and users to gather requirements, analyzing survey results, conducting vendor demonstrations and interviews, and completing an extensive literature review of current project management tools and their capabilities. Based on this information a suite of tools will be recommended for the Agency.

2.0 METHODOLOGY AND EVALUATION PROCESS

The evaluation and selection process is defined in four steps: definition of requirements, definition of project management data elements, shortlist elaboration, and evaluation and selection.

2.1 DEFINITION OF REQUIREMENTS

Project managers and team members from various NASA Centers were surveyed regarding the required capabilities of project management tools. The survey contained a list of requirements that were updated and compiled from a previous study of project management tools performed in 1996 by the Kennedy Space Center (KSC). Third-party discussions were also conducted with Metagroup, which is a consulting organization specializing in establishing , IT commercial best practices and current market place trends. This information was used to determine tool requirements and identify opportunities to improve project management capabilities throughout the Agency.

The Project Management Tools Requirements Document identifies and documents the requirements for project management software tools. These requirements were used to evaluate Commercial-Of-The-Shelf (COTS) software, and to develop Agency-wide project

management tools recommendations and guidelines. The document contains the critical project management tool requirements as determined by the results of the Agency-wide survey.

2.2 DEFINITION OF PROJECT MANAGEMENT DATA ELEMENTS

The next step in the definition of the needs of the project managers was to analyze the typical functions associated with managing projects as described in the 7120.5a.

An analysis was made of life cycle phases associated with a typical project - namely, formulation, approval, implementation, and evaluation and the typical project management functions associated with each. Using a matrix format, each project management activity that was associated with each specific function and phase was defined. The matrix showing project functions vs. project phase was completed and used to define the specific data elements associated with each project management activity. The data elements will be used to evaluate and assess the product's ability to integrate user-defined parameters, data sharing capabilities, and import and export capabilities.

2.3 SHORTLIST ELABORATION

An initial investigation of software products was conducted through market analysis, review of independent research reports and technical publications, vendor interviews, demonstrations and product descriptions. From this investigation a shortlist of project management tools was generated. The shortlist of potential project management tools were further down-selected based on such factors as breadth of functionality, current installed base at NASA, product architecture and technology, and vendor's expertise in the industry.

2.4 EVALUATION AND SELECTION

The key driver of the evaluation and selection are the requirements obtained through the survey. A functional evaluation matrix was generated using the Requirements Document. The project management tool(s) were evaluated to make sure they could meet the requirements. Product demonstrations were arranged to evaluate each software package an evaluation copy of the software was requested.

3.0 EVALUATION AND SELECTION

There are currently several project management tools on the market, so availability of a suitable tool is not a concern. What is in question is how well these tools specifically support the traditional project management functions and meet NASA requirements as set forth in the Requirements Document.

The Project Management Tool Standard Initiative provides a technology solution aimed at improving project managers' ability to manage projects, identify and mitigate risks, share information and re-engineer processes when necessary. The technology solution is the MINIMUM set of project management tools that meet the needs and requirements of project manager(s) Agency-wide.

The desired capabilities in project management tools, based on the Agency-wide survey results, can be categorized as follows:

Architecture/Data Management – multi-user capability, multi-project capability and support, interoperability with desktop tools, import and export capabilities, ability to integrate user-defined parameters.

Reporting - Standard and customized reports and consolidation features.

Project Management Functions (Schedule, Cost, Resources, Performance, Risk Management) -

WBS and OBS structures, Gantt and PERT diagrams, multi-resource and multi-calendar definition.

Risk management and earned-value analysis.

Cost tracking, cost differentiation, financial resources, commitments, and obligations.

Collaboration/Web access - HTML conversion capability, accessibility of functions, publishing possibilities and methods, e-mail notification.

Ease-of-Use - intuitive and easy-to-learn with look and feel similar to other desktop tools.

User Access and Security - user- and project-level access and control

General vendor information such as package cost including maintenance, training, and technical support was also considered.

3.1 EVALUATION RATINGS

Tools were evaluated based on requirement fulfillment. Each requirement will be evaluated against the tool capabilities and given a rating of Exceed, Meets, or Does Not Meet. Evaluation of a particular tool was recorded using the functional evaluation matrix. In order to adequately evaluate the potential project management software packages, products were sorted into categories of similar breadth of functionality, i.e. Tier I, II or III. Each potential project management tool was independently evaluated against the requirements.

3.2 FINAL ANALYSIS AND SELECTION

The final analysis and selection phase consisted of summarizing the evaluation findings, and making recommendation of project management tools to be used Agency-wide. An objective rating procedure to select the recommended project management tools was used. The functional matrices for each package were reviewed and the following scale was used to arrive at a final score for each general category.

Scale Legend

- 1 - More than 25% of requirements are “does not meet”
- 2 - 25% or less of requirements are “does not meet”
- 3 - All requirements are “meet”
- 4 - 25 % or less of requirements are “exceed”
- 5 - More than 25% of requirements are “exceed”

Only those categories that were considered essential to a fully functional and viable Tier I/II (desktop) level project management software package were scored. Using the scale legend above, each package was given an overall score for functionality in the categories of workgroup capability, ease of use, project scheduling, project task/field features, cost management and reporting features. Again the score was based on how many functional requirements were fulfilled. Each package was given a total score, out of a possible of 30 points, and the three packages with the highest scores were considered for recommendation.

	Workgroup capabilities	Ease of Use	Project Scheduling	Project Task/Field Features	Cost Management	Reporting Features	Total Score
FastTrack							
SureTrack							
Project 98							
Project 2000							
SuperProject							
Planview							
P3							
Micro Planer Xpert							
OmniTracker							
Artemis Project Views							
OpenPlan							
Dekker Trakker-EMV							
ActiveProject							
Project Scheduler							
OPX2							
Enterprise Project							

APPENDIX E - PROJECT MANAGEMENT DATA ELEMENTS

Project Management Data Template - Checklist

Project Management Function: Common Identifiers

Data Element	Data Format	Project Only - Shared Data	Intra-Center/HQ Shared Data	Inter-Center Shared Data	Contractor Shared Data	Vendor Provided
Program Name/Year						
Fiscal Year - Current year, date, month						
Program Category / Type						
UPN/PCA @3,5,7 digits						
UPN Manager						
Project Number (CoF only - HQ generated)						
Project Title						
Project Engineer/ Manager						
Center/Installation/Location						
Activity Description						
WBS (Work Breakdown Structure)						
Task Number/Name						
Task Type (i.e. Deliverables, Milestones)						
Misc. Note Fields						
Misc. Numeric Fields						
Misc. Text Fields						

Project Management Data Template - Checklist

Project Management Function: **Schedule - Planning**

Data Format	Project Only - Shared Data	Intra-Center Shared Data	Inter-Center Shared Data	Contractor Shared Data	Vendor Provided
Data Element					
Baseline Dates (Start/End)					
Current Dates (Start/End)					
Actual Dates (Start/End)					
Constraint Dates					
Predecessor Task Number					
Successor Task Number					
Total Float (Slack)					
Original Task Duration					
Remaining Task Duration					
Percent Complete					
Resource Description					
Resource Assignment					
Resource Rate ¹					
Resource Unit (resource unit/time or cost/unit)					
Project Calendars					
Original Task Budget					
Current Task Budget					

¹Resource Rate: per time period

Project Management Data Template - Checklist

Project Management Function: Budget Formulation and Execution

Data Format	Project Only - Shared Data	Intra-Center Shared Data	Inter-Center Shared Data	Contractor Shared Data	Vendor Provided
PFA (Program Formulation Agreement)					
PCA (Program Commitment Agreement)					
Cost Account Description (category, direct, indirect)					
Program Authority (SF 506)					
Program/Project Plan					
OMB Submit Date					
Congressional Submit Year					
Congressional Quarterly					
300B Format - OMB Form for Capital Investment					
POP Formats/Submits (Number) (Date)					
Reimbursable's					
Current Cost Plan (date) ¹					
Current Year Commitments & Obligations (Plan)					
NOA - Current Year (New Obligation Authority)					
NOA - Prior Year (New Obligation Authority)					

Project Management Data Template - Checklist

Project Management Function: Budget Formulation and Execution

Data Format	Project Only - Shared Data	Intra-Center Shared Data	Inter-Center Shared Data	Contractor Shared Data	Vendor Provided
Data Element					
Prior Year Commitments & Obligations (Plan)					

¹Cost plan shows how you distribute costs over the project

Project Management Data Template - Checklist

Project Management Function: Cost - Actual (Tracking)

Data Format	Project Only - Shared Data	Intra-Center Shared Data	Inter-Center Shared Data	Contractor Shared Data	Vendor Provided
Total project cost (including contingency)					
Total cost by WBS element					
Total cost by element of cost/task #					
Total cost of a resource (materials, labor, etc.)					
Cost phasing over a task's duration by a specified time period					
Costed to date (i.e. has been paid)					
Current Period Cost - Actual					
Current Period Cost – Plan					
Cum-to-Date Cost (Actual)					
Cum-to-Date Cost (Plan)					
Projection (Period x)					
Balance of FYXX - Cost for FY Period					
Balance to Complete					

Project Management Data Template - Checklist

Project Management Function: Cost - Actual (Tracking)

Data Format	Project Only - Shared Data	Intra-Center Shared Data	Inter-Center Shared Data	Contractor Shared Data	Vendor Provided
Data Element					
Funding Limitations- Cost					
Funding Limitations- Fee					
Billings- Amt. Billed to date					
Billings- Total Payments received to date					
Total Cost for Job Order Number (Numeric Field)					
Allocation					
Available Balance (Calculation)					
Commits, Obligations, Cost, Disbursements					
Current Year Commitments & Obligations (Actual)					
Prior Year Commitments & Obligations (Actual)					
Actual Cost (Year to Date)					
Unobligated Funds					

Project Management Data Template - Checklist

Project Management Function: **Workforce - Planning**

Data Element	Data Format	Project Only - Shared Data	Intra-Center Shared Data	Inter-Center Shared Data	Contractor Shared Data	Vendor Provided
Job Category (Permanent or Temporary)						
Skill Type (plan)						
Baseline Workforce Loading Plan (time-phased)						
Current Workforce Plan						
Pay Rate						
Overtime Rate						
Employee name						
Employee number						
Directorate code						
Organization code						
Skill Type						
Subskill						
Center unique cost account number						
Text Field (Statement of work)/WBS Element/Task #						
Resource Calendar ¹						

¹Resource Calendars show how the person will be utilized throughout the project

Project Management Data Template - Checklist

Project Management Function: Workforce - Planning

Data Format	Project Only - Shared Data	Intra-Center Shared Data	Inter-Center Shared Data	Contractor Shared Data	Vendor Provided
Support Service Contractor Company					
Support Service Contractor's contract #					
NASA Classification Code (AST,ENG)					
Job Order Number (text field)					

Project Management Data Template - Checklist

Project Management Function: **Workforce - Tracking**

Data Format	Project Only - Shared Data	Intra-Center Shared Data	Inter-Center Shared Data	Contractor Shared Data	Vendor Provided
Actual (To-Date)					
Actual (Current Period)					
Year to date actual					
Year to date variance					
Current period variance					
Skill tracking					

Project Management Data Template - Checklist

Project Management Function: **Facilities - Planning**

Data Element / Data Format	Project Only - Shared Data	Intra-Center Shared Data	Inter-Center Shared Data	Contractor Shared Data	Vendor Provided
Location					
Facility Description					
Facility Dimensions					
Utilities - Text Fields					
Usage Rate Planned - \$ to use					
Available Equipment & Tooling					
Planned Usage (Units)					
Planned Start					
Planned End					
Facility Manager					
Facility Availability					

Project Management Data Template - Checklist

Project Management Function: **Facilities - Tracking**

Data Format	Project Only - Shared Data	Intra-Center Shared Data	Inter-Center Shared Data	Contractor Shared Data	Vendor Provided
Actual Usage (Units)					
Actual Start					
Actual End					
Actual Usage Rate					

Project Management Data Template - Checklist

Project Management Function: Support Equipment - Planning (Special Test Equipment, Ground Support Equipment, etc.)

Data Element	Project Only - Shared Data	Intra-Center Shared Data	Inter-Center Shared Data	Contractor Shared Data	Vendor Provided
Description					
Cost					
Planned Start and End Dates					
Actual Start and End Dates					
Provider					
Equipment Location					
Property Tag Number					
Usage Location (text field)					

Project Management Data Template - Checklist

Project Management Function: **Procurement - Planning**

Data Format	Project Only - Shared Data	Intra-Center Shared Data	Inter-Center Shared Data	Contractor Shared Data	Vendor Provided
Description					
Estimated Cost					
Date Fields (Needed, Promised, Delivered)					
Vendor Name					
Vendor Location					
Contract Type (i.e. fixed fee, cost plus, etc.)					
Contract #/Name					
Part Identification #					
Award Date (planned and actual)					
Long Lead Items					
Current Contract Cost					
Original Contract Cost					
Solicitation Date (IFB/RFP)					
IFB Number					

Project Management Data Template - Checklist

Project Management Function: Configuration - Version Control

Data Format / Data Element	Project Only - Shared Data	Intra-Center Shared Data	Inter-Center Shared Data	Contractor Shared Data	Vendor Provided
Document Name					
Document Control #					
Change Control #					
Submittal Date					
Approval/Release Date					
Revision #					
Responsible Mgr./Engr					
Level of Approval/Approval Status					

Project Management Data Template - Checklist

Project Management Function: Risk Management - Planning

Data Format	Project Only - Shared Data	Intra-Center Shared Data	Inter-Center Shared Data	Contractor Shared Data	Vendor Provided
Potential Risk Event					
Risk ID Number					
Date Identified					
Identifier (i.e. who identified the risk)					
Basis of the risk					
Risk Source (Cost, Schedule, Technical, Staffing, Political, affected WBS elements, etc.)					
Risk Triggers/Symptoms					
Probability, Impact (high, medium, low), Timeframe (when you expect the risk)					
Affected Project Phases					
Risk impact cost estimates					
Mitigation strategy with cost estimates and contingency plans					
Approach (research, accept, watch, mitigate)					
Risk Status					
Closure date					

Project Management Data Template - Checklist

Project Management Function: Performance Reporting

Data Format	Project Only - Shared Data	Intra-Center Shared Data	Inter-Center Shared Data	Contractor Shared Data	Vendor Provided
Data Element					
Earned Value Reporting					
Cost Account					
Earned value (BCWP)					
Planned value (BCWS)					
Cost to complete					
Actual Cost of Work Performed (ACWP)					
Milestone Exit Criteria (text field)					
Major Control/Review Gates (field text)					
Percent Complete					
Budget Quantity of Work Scheduled (BQWS)					
Variance Schedule and Cost (Planned -vs- Actual)					
Estimate at Completion (EAP)					
Technical Performance Status (stop light chart - green, red, yellow)					
Percent of Contingency Remaining					

Project Management Data Template - Checklist

Project Management Function : Documentation - Report Formats and Supporting Project Documentation

Data Format	Project Only - Shared Data	Intra-Center Shared Data	Inter-Center Shared Data	Contractor Shared Data	Vendor Provided
SOW /CDRLS reports					
Plan reports					
Actual reports					
Response reports					
UPN reports					
Ad hoc reports					
Lessons Learned					
Library Unique I.D. Number					
Originating Organization					
Control Code					
Document Title					
Key Words/Phrases					
Document Number					
Document Date					
Notes					
URL Address					

Project Management Data Template - Checklist

Project Management Function: Requirement Definition

Data Format	Project Only - Shared Data	Intra-Center Shared Data	Inter-Center Shared Data	Contractor Shared Data	Vendor Provided
Data Element					
Requirements					
-Level 1 (Hqs)					
-Level 2 (Center)					
-Level 3 (Prog/Proj)					
Mission Goals and Objectives					
Mission Constraints					
Mission Type and Prescribed Partnering Arrangements					
Resources					
-\$ and Partners					
-Staffing					
-Facilities					
-Organization/Interfaces					

Project Management Data Template - Checklist

Project Management Function: Requirement Definition

Data Format	Project Only - Shared Data	Intra-Center Shared Data	Inter-Center Shared Data	Contractor Shared Data	Vendor Provided
Processes and Methods					
-Project Control					
-Reporting					
-Configuration Mgt.					
-Risk Management					
-Acquisition Strategy					
-Safety Staffing					
Personnel Requirements					
Systems Requirements					
Commercialization					
Independent Evaluation					
IV&V Plans					
Specifications					
All the PAPC Processes/ Methods per 7120.5a (latest Version)					

Appendix F – Functional Evaluation Matrix

Company/Vendor Name:

Product Name:

Version:

Requirement Statement	Evaluation/Rating (0,+,-) 0 (meets), + (exceeds), - (does not meet)	Comments
1.0 Open Database Connectivity & Architecture		
allow user/project level access and update control.		
allow multiple users to share same project file(s).		
performs global updates across multiple projects		
platform independent, i.e. deployable on multiple desktop platforms or provide Web-enabled/Internet-enabled access.		
provide multiple views across multiple projects		
allow user(s) to share centralized repository		
use Open DataBase Connectivity (ODBC) standards to read/write to other databases.		
use Dynamic Data Exchange (DDE)/Object Linking & Embedding (OLE) to link to other applications.		
allow import large blocks of data.		
able to interface with institutional legacy systems.		
2.0 Workgroup Capabilities		
send project reports via E-mail utilizing Simple Mail Transfer Protocol (SMTP) and Multi-part Multi-media (MIME) Protocol.		
have import and export capabilities		
capture report output to files so that they may be incorporated into other documents.		
provide the capability of saving data, information and files such as MPX files.		
3.0 Network		
allow for multi-user licensing not tied to an individual by name		
compatible with a variety of networks, i.e. TCP/IP and output devices.		
4.0 Ease of Use		
capability of easily making changes to data		
easy to use and not require extensive training for the every-day user.		
easy to show progress in a task or project		
provide a Graphic User Interface (GUI)		
consistent with other desktop tools		
intuitive and quick to learn		
provide on-line, context-sensitive help on screens and fields and an on-line tutorial.		
5.0 Project Scheduling Methodology		
perform basic scheduling/PERT functionality		
allow variable scaling (month, week, day, hour) for task duration		
perform Full Critical Path Method (CPM) functionality including capability of showing multiple critical paths (positive and negative) in output reports		
allow user to designate logical relationships, i.e. start-to-start, start-to-finish, finish-to-start, and finish-to-finish.		
allow user(s) to customize tables and views		

NASA/Project Management Tool Analysis and Recommendations White Paper

allow user(s) specific defaults and create project templates		
generates an Organizational Breakdown Structure (OBS) and a Work Breakdown Structure (WBS) or allow user to impose a WBS		
allow user(s) to assign positive or negative lag/lead times on logical relationships		
perform resource leveling and smoothing		
have the capability of "de-linking" percent complete from remaining duration.		
allow user(s) to define and assign constraints to tasks and milestones.		
6.0 Project Task/Field Features		
allow user(s) to specify tasks or milestones to be rolled-up		
allow user(s) to define fields for each project/task/resource		
roll-ups multiple projects into a master schedule		
define a task with the duration being automatically calculated based upon its dependency with another task, i.e., hammock task		
incorporate a large comment/notes field for the project for entry of soft information		
define task start and end dates as fixed, resource-driven, or effort-driven		
allow user(s) to create a read-only version of project (fields, tables, resources, calendars)		
allow the capability to restrict user access to specified fields		
7.0 Baseline and Tracking Progress of the Project		
create baseline plan to be used for comparisons		
report ahead/behind original or revised schedule estimate		
allow user to re-baseline multiple times		
calculate percentage of task performed when the start date, end date, and work is entered or start date, duration, and work is entered		
allow user to elect to keep, change or delete the original estimate (baseline)		
provide view of actual work by user-specified period		
perform trend analysis		
8.0 Resource Features		
assign costs to resources		
perform resource scheduling		
provide flexibility in defining multiple resource types, i.e. dollars, government, and contractor		
display resources that are over-(under)-allocated		
allow multiple resource assignments per task		
display all tasks using a resource		
allow resource sharing among multiple projects		
allow user to create and assign calendars to resources		
9.0 Calendar Features		
allow user to set work and non-work periods for calendars (holidays, rest periods, etc.)		
allow multiple user-defined calendars within a project use system in increments of hours, days, weeks or months.		
allow user to set starting day of week and/or starting month of the fiscal year.		
allow calendar sharing among multiple projects		
allow user to set calendar to user-defined time periods		
allow distinctive task calendars and resource usage calendars		

10.0 Cost Management features		
calculate a cost to complete the project		
associate multiple cost accounting codes to a project		
provide earned value analysis		
11.0 Risk Management Features		
assign uncertainty to schedule parameters		
calculate schedule parameter uncertainty		
perform risk analysis functions		
provide cost estimating capabilities for both risk impact and mitigation		
assign uncertainty to cost parameters and cost estimates		
provide capability for user defined performance metrics		
able to perform risk simulations, e.g. Monte Carlo, or at least utilize risk simulation data.		
12.0 Project Reports		
view and print Gantt charts, PERT Charts and histograms		
display actual vs. projected information		
adjust Gantt chart window view (user-selected start and end dates)		
allow user to customize bar styles and milestone styles for Gantt charts		
create schedules in user-defined increments (e.g. hours, days, weeks)		
indicate current time		
generate PERT charts; consider time-phased vs. non-time phased and plotter requirements		
allow user to add free text to graphs		
allow user to determine task label placement (left/right of bar, on bar, above, below)		
create schedule tracking and projection graphs/reports		
create resource over-(under-) utilization graphs/reports		
display negative slack time		
display actual time for organization, project, resource, or contract company by user-specified period, i.e. year-to-date, fiscal year, current month, etc		
report resource requests by project and by filled or unfilled status		
13.0 Management Reporting		
provide standard reports		
select data for reporting based on user defined criteria		
generate cost projection graphs/reports		
allow user to customize or create reports via a report writer		
provide project level summary reports		
allow user to add free text to reports		
provide the capability for reporting estimated vs. actual work for resources by user-specified period		
allow schedule tracking/reporting from common resource pool		
have the capability to categorize and report projects by their project status, i.e. active, complete, dropped, pending project start date, etc		
identify sub-projects within one project file for reporting purposes		