STSC

Report on Project Management and Software Cost Estimation Technologies

April 1995

ABSTRACT

The Project Management Technology Domain is a classification of methodologies, tools, theory and practice as it pertains to the field of project management. The purpose of this report is to increase awareness and understanding of project management technology. Use of this report should be the first step in transferring effective project management principles, methods, and products into practical use. The target audience of this report consists of those managers and technical personnel who are responsible for the development and maintenance of software in their organizations.

This report defines the basic concepts of the Project Management Technology Domain and identifies their value in improving software quality and productivity. It explains how the capabilities of current project management products can improve management of software projects. It provides information about specific products in the marketplace. The information is aimed at those who must make decisions about acquiring project management technology and who must prepare their organizations to use it effectively. Finally, this report proposes an identification of future directions of the domain to help in planning long range strategies and development of an organizational road map toward improved software development.

The *Software Estimation Technology Report, March 1993* has been updated and is included in this report as Appendix A.

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PREFACE

PURPOSE AND OBJECTIVES

The Project Management Technology Domain is a classification of methodologies, tools, theory, and practice as it pertains to the field of project management. The purpose of this report is to increase awareness and understanding of project management technology. Use of this report should be the first step in transferring effective project management principles, methods, and products into practical use. The target audience of this report are managers and technical personnel who are responsible for the development and maintenance of software.

This report defines the basic concepts of the Project Management Technology Domain and identifies its value in improving software quality and productivity. It explains how the capabilities of current project management products can improve management of software projects. It provides information about specific products in the marketplace. The information is aimed at those who must make decisions about acquiring project management technology and who must prepare their organizations to use it effectively. This report also proposes an identification of future directions of the domain to help plan long-range strategies and development of an organizational road map toward improved software development.

RELATIONSHIP TO STSC MISSION

The STSC's mission is to assist Air Force Software Organizations to identify, evaluate, and adopt technologies that will improve: (1) the quality of their software products, (2) their efficiency in producing them, and (3) their ability to accurately predict the cost and schedule of their delivery.

UPDATES TO PREVIOUS RELEASE

The *Project Management Technology Report, April 1995* is updated from the *Project Management Technology Report, December 1994*. The *Software Estimation Technology Report, March 1993* has been updated and is included in this report as Appendix A. The update continues the premise that the scope of project management technology includes project management principles, methods, and products. The word "product" is emphasized over "tool" throughout the document, with "product" connoting greater breadth than "tool"; a product may be a tool, a group of tools, a method, or a technology. The sections of the report that have been updated are described below.

Section 2, STATE OF THE PROJECT MANAGEMENT TECHNOLOGY DOMAIN, has been updated to include current trends and capabilities. The appendices have been updated and redesignated. Appendix A contains the updated information formerly found in the *Software Estimation Technology Report, March 1993*. Appendix B contains product listings of both project management and software estimation software tools. Appendix C contains detailed product sheets for both project management and software estimation tools. Some product sheets have been omitted from this update due to a lack of response by the printing deadline from certain vendors. Appendix D lists a variety of recommended readings, standards, and references. Appendix E provides a glossary of acronyms and definitions used throughout the report. Appendix F provides background on the STSC. The Product Critiques section of the appendices has been eliminated in an effort to improve accuracy and efficiency in software evaluation efforts.

ACKNOWLEDGMENTS

The STSC Project Management Team thank everyone who contributed to the development of the *Project Management Technology Report, April 1995*. We also thank those who reviewed and edited the report, submitted comments, designed the page layout, and assisted in its printing.

1 PROJECT MANAGEMENT TECHNOLOGY DOMAIN TUTORIAL

1.1 PURPOSE AND OVERVIEW

Project management is a concern to the Air Force in general and its software development and maintenance organizations specifically. Before additional improvements can be made in Air Force Software Development Activities (SDAs), projects must have a stabilized management structure. Also, in this time of growing resource constraints and increasing demand for software, organizations must manage their resources and defend their resource requirements. This requires a well-defined approach to project management. The purpose of this section is to present an overview of basic project management theory. Topics addressed include:

- Background and a brief history of project management including the evolution of basic methodologies and the identification of those individuals responsible for their development.
- Current project management technology concepts and functionality including a description of how these concepts and functionality are implemented in current project management software tools.
- A description of the project management domain including interfaces with other domains, direction on acquiring project management services such as consulting and training, standards affecting the domain, and challenges and benefits facing the domain.

Once a grasp of basic project management concepts and theory has been obtained, the reader will better understand the functions and capabilities offered by current project management technology. Project managers can then determine those functions that best fit the requirements of their organizations.

This determination will then assist managers in evaluating and selecting the proper technology for their organizations. A description of functional features offered by current project management technology is presented to support project managers in technology evaluation and selection. This description is divided into the following topics:

- User Assistance Features
- Project Scheduling Functionality
- Resource Management Functionality
- Project Tracking Functionality
- Project Reporting Capabilities

1.2 PROJECT MANAGEMENT HISTORY

Current project management technology owes much of its existence to the development of network-based project management methodology [Moder 83]. Three principle events have set the stage for this methodology: (1) the initiation of large development programs during the 1950s, (2) the emergence of general systems theory, and (3) the development of the digital computer. Some advances in the optimizing of scheduling activities took place with the development of the bar chart by ship builder Henry L. Gantt during World War I. In 1931, Polish scientist Karol Adamiecki developed and published a methodology characterized by what he called a Harmonygraph. The Harmonygraph is a vertically-represented bar chart that displays time on a vertical axis with specific activity bars

displayed horizontally. Movable tabs clearly define the duration and start and end dates for each activity. However, it was an explosion of interest in the problem of scheduling large projects in the 1950s that paved the way for the development of current project management methodologies. Concurrent independent efforts in the United States and Great Britain based their methodologies on a network representation of the project plan. The results of two of these efforts are described below.

In 1958, the U.S. Navy was tasked to develop the Polaris missile system. Complex constraints were applied to the project in attempts to eliminate time and cost overruns, which were characteristic of such weapon system programs. Engineers from the Navy and its associated contractors formed a team to address the task. The resulting methodology was eventually termed the Program Evaluation and Review Technique (PERT). PERT represents the project as a logical network of activities and their associated predecessor and successor activities. The original team selected time as the controlling factor. Accordingly, the existing idea of a fixed duration for each activity was examined and modified to accommodate a system of three duration estimates. Estimates for optimistic, most likely, and pessimistic duration were established. Based on these estimates, the concept of uncertainty was introduced into the project plan and the probability of an activity finishing on or ahead of schedule could be computed. This enabled project managers to better understand the consequences of slipped schedules and the effects of expediting the schedule in a variety of ways and provides for better planning at the outset of the project.

The development of the Critical Path Method (CPM) was the result of a joint effort by a team of scientists at the duPont Company and Remington Rand Univac during 1956-1959. The team was tasked to examine the trade-off between total project duration and total project cost associated with regular plant overhauls. CPM determines the project duration which minimizes the sum of direct and indirect costs. Project constraints are taken into account, and the sequence or sequences of activities that require the longest duration define the critical path(s) of the project. Activities associated with CPM projects have relatively little variation in duration estimates as compared to those associated with PERT projects. The primary difference between CPM and PERT is that CPM provides for the development of a schedule that minimizes project cost while PERT provides for the development of a schedule that optimizes project duration.

The combination of the two methods has resulted in a methodology that is similar to the Harmonygraph. Additional information includes tabular listing of start and end dates, slack or float time for specific activities, and a variety of sorting and data layout schemes to meet the needs of various people. A number of different ways to implement these methodologies has since evolved. These include the works of CPM pioneer John Fondahl, the “Method of Potentials” developed in France, and the emergence of precedence diagramming in the 1960s. During the 1970s and 1980s project management continued to mature and build upon existing methods of CPM and PERT. The growing existence and use of personal computers spawned project management software that no longer was limited to mainframe platforms and could be used by the average user. The complex algorithms associated with PERT and CPM play a relatively minor role in today’s applications. However, these methodologies have been instrumental to the state of current project management technology. The 1990s appear to be a decade of information technology and information super-highways. Project management technology has accordingly kept pace in offering features that facilitate the sharing and use of information.

1.3 Concepts and Theory

This section presents an overview of basic project management concepts associated with the development and implementation of the project plan. Four principal areas of project management are presented and explained below. Activities performed in these areas can affect each other. For example, implementing a project plan can and often does influence management and project organization. The same can be true for developing project plans. Reporting project information certainly affects the other areas. It suffices to say that project management is a dynamic, interrelated set of business processes. Project management success depends on mastering the changing balance between such processes. The overview of these project management areas is by no means meant to be all inclusive and only provides a possible guide for project management efforts. The four principal project management areas are:

- **Project and Management Organization.** This area includes defining the roles and expectations that are necessary to assemble project teams and the management structure of a project, and how the use of project management technology relates to these topics.
- **Developing the project plan.** This area includes defining the project requirements, developing the project schedule, and assigning the project resources.
- **Implementing the project plan**. This area includes establishing project baselines, collecting and measuring progress data, and conducting "what-if" analyses and contingency planning.
- **Reporting project information.** This area includes reporting project information on a preliminary, intermediate, and post project basis.

1.3.1 Project and Management Organization

More problems arise in projects because of management practices (organization structure, project organization, etc.) than from failures in conducting project management functions. This section identifies four key areas that deal with the proper establishment of project organizational structure in relation to the business organization sponsoring the project. The four areas are:

- Business unit organizational structure
- Project team organizational structure
- Communication
- Team building

1.3.1.1 Business Unit Organizational Structure

Successful organization of corporate management consists of several key components that interrelate with each other. This section discusses four of these components. The components are:

- **Organizational Vision –** The organizational vision defines the direction of an organization. It provides a description of what the organization is, where it is headed, and what its anticipated accomplishment will be, in line with the organizational mission.
- **Organizational Mission –** The organizational mission describes what an organization does. It defines why the organization exists.
- **Value Set –** The value set of an organization aligns itself with the organizational vision, in support of the organizational mission. It defines the qualities or values that characterize the organization. Qualities of state-of-the-art mind-sets, professionalism, high technology and methodologies, and the value placed on personnel compose the value set of an organization.
- **Goals and Objectives –** Specific goals and objectives are defined to successfully attain the mission and are developed in line with the value set espoused by the organization. These goals and objectives include both quantitative and qualitative aspects aimed at improving the organization as a whole.

1.3.1.2 Project Team Organizational Structure

Planning, execution, and control of projects must be done in harmony with the four topics discussed previously: Organizational mission, vision, value set, and goals and objectives. The successful accomplishment of this dictates the project team organizational structure. Based on the definition and nature of the project, the business unit selects the project team structure that will best achieve the goals and objectives of the organization and bring success to the project. Several types of project structures exist. Three common structures are:

- **Departmentalized –** A departmentalized structure exists when primary responsibility and authority for a project is assigned to the department most involved. This type of structure is useful when the project effort is limited in scope to the primary functional boundaries of a single department.

Strengths:

- The management structure of the project generally maps directly to the management structure of the department. Little or no administrative positions or responsibilities need to be created.
- Accountability, reporting, and other communication channels are already in place.
- No correlation between departments is required.

Weaknesses:

- Focus may be placed on departmental concerns at the expense of the project.
- The project team generally cannot leverage the strengths of other departments because of limits imposed by the hierarchical structure.
- Any accountability outside of the responsible department is difficult to enforce.

- **Projectized –** A projectized structure exists when primary responsibility and authority for a project is assigned to the project manager. This type of structure is useful for project efforts that span multiple departments.

  Strengths:

  - An appropriate skill mix of participants is more easily achieved.
  - A project can span multiple departments.
  - Project goals and objectives are set above organizational biases.

  Weaknesses:

  - Maintaining commitment from all organizations involved is often difficult.
  - Focus is easily placed on meeting the needs of the project at the expense of the department.
  - A new management structure for each project must be created based on the nature of the project.

- **Matrix –** A matrix structure attempts to incorporate the advantages of both the departmentalized and the projectized structures and is often used for high-priority, strategic project efforts. This structure exists when responsibility and authority for a project is divided across each of the departments involved. Such a structure spans departmental lines as high-level participants assume "team-oriented" roles, and the project manager assumes a role of administering discipline and order. A matrix structure is useful for projects that span multiple departments in scope and require the enlistment of high-level organizational champions. It differs from a projectized structure in that the departmental line of authority remains intact, merged with and sometimes conflicting with the project management structure.

  Strengths:

  - The management structure of the project maps directly to the management structure of the organization—at a senior management level.
  - Strategic issues and objectives are more clearly identified due to high-level management participation from multiple departments.
  - Individuals benefit through visible achievement from being part of a project team while maintaining a continuity in career opportunities within a functional organization.
  - Distributed nature of the structure enables the efficient use of specialists, working part-time on several project efforts.
  - The formulation of a senior management steering committee allows senior managers to direct project efforts.

Weaknesses:

- The conflicting priorities of the organization and the project generally must be escalated to higher management for resolution and tend to be disruptive.
- The matrix structure protocol is complex and requires the clear definition of authority and responsibility, which is often prone to the delays of bureaucracy.
- The goals and objectives of both the organization and the project must be continually balanced.
- Senior managers often do not understand technical issues.
- The time required to adequately educate senior managers is often not available.

1.3.1.3 COMMUNICATION

Communication is an essential part of successful project management. It is a cultural issue that is necessary to attain understanding and meet expectations. Two types of communication are often employed:

- **Oral Communication –** Conversations between management and workers provide a direct method to address concerns, praise, and receive feedback. Seminars, workshops, and meetings provide useful forms to introduce change into an organization, address general concerns, and improve the skills and morale of the work force.
- **Written Communication –** This type of communication often constitutes the more significant communication in a project. Its nature tends to make it more formal and has the disadvantage that it can be interpreted differently by different people. Written communication can range in formality from simple handwritten notes to general policies and standards. Local area network (LAN) technology and groupware application such as E-mail are common media for written communication.

1.3.1.4 TEAM BUILDING

Studies have shown that a closely knit group of people working in a team atmosphere is collectively more productive and has a higher morale than equivalent people with equivalent skills and experience working alone. Productivity and team atmosphere are the focus of team building. A variety of factors are necessary for effective team building. Some of these factors are:

- Commitment of organizational management and a willingness to be aware of concerns identified by team management without unjustly punishing individuals.
- An open and receptive environment.
- Clearly defined team and individual roles.
- Familiarity with and mutual respect for fellow team members.
- Constant feedback from organizational management to the team, within the team, and from the team to organizational management.
- Visible rewards for good performance and pressure to improve poor performance.

1.3.2 DEVELOPING THE PROJECT PLAN

Many activities associated with developing the project plan are completed in conjunction with and are complimentary to the activities discussed in the project and management organization section. Plan development activities can be used to improve future efforts by incorporating lessons learned from previous projects. For the purposes of this document, developing the project plan consists of the following activities:

- Defining the project requirements
- Creating the project schedule
- Assigning the project resources

1.3.2.1 Defining the Project Requirements

The first step in developing the project plan is the definition of requirements. This generally consists of answering who, what, when, why, and how. The answers form the objectives and constraints of the project.

- **Project Objectives** – The objectives of the project define what the end product is, what the end product's intermediate steps are, and when and for whom the project will be accomplished. The objectives will also aid in defining how and by whom the project will be carried out. This information is compiled and distributed to the appropriate members of the project team and is the basis of the project plan.
- **Project Constraints** – Constraints are restrictions that affect the completion of project objectives. Constraints may arise from several factors. Some of these constraints are imposed by when the project must begin or end (see 1.3.2.2, Assigning Must Dates and Task Duration). Other constraints are imposed by the application of specific resources and their associated availabilities (see 1.3.2.3, Making Resource Assignments). Constraints can also be policies and procedures that require justifications or explanations of implementation actions. Project constraints are recorded in the project plan and considered in its development.

1.3.2.2 Creating the Project Schedule

The second step in developing the project plan is creating the project schedule. This step is essential since the schedule provides a detailed description of what is to be done and when it will be accomplished. This process can be broken into three specific activities:

- **Defining the Project Work Breakdown Structure** – A variety of methods exist for defining a work breakdown structure (WBS). One traditional method consists of using the objectives and constraints to identify specific activities to complete the project. These activities are successively broken down into more detailed tasks until each activity represents a small unit of effort generally requiring a single resource. In this manner, the project is defined in terms of small, manageable tasks to which an organization's resources are easily allocated. It is important to note that the WBS defines the project at hand with respect to the information and format dictated by its user. Therefore, the WBS required by a customer may differ greatly from the WBS for the same project used by the customer's contracting organization. Refer to [MIL-STD-881] and [Flemming 92] for informative readings on the WBS.

  The divisions defined by the WBS may be expressed in a variety of ways. Activities may be grouped according to topic, responsible organization, functionality, geographic location, etc. Likewise, there is a variety of ways to display the WBS. One method displays the project activities in an outline or point-paper format using indentation to define the project hierarchy. Another popular method displays the WBS graphically in a traditional tree structure format. A wide range of information can be displayed with a WBS including task start and end dates, resources assigned, task duration, and task description. Regardless of the method or the content, the WBS defines a project in an organized manner, facilitating the identification, assignment, and justification of resources.
- **Assigning Must Dates and Task Duration** – In addition to the dependencies described above, constraints commonly termed "must dates" also contribute to the development of the schedule. Must dates, like the dependencies, are defined in various ways. For the purposes of this document, must dates include any constraints that force the start or end of a task to occur at a specified time. For example, a task with a must finish constraint may be required to finish on, before, or after a specified date, depending on the definition of the must constraint.

  Once the sequence of tasks is established and the start and end date constraints are defined, the tasks are given duration. Task duration can be defined in multiple ways, including level of effort and elapsed time (see section 1.4.2.5 for more information on scheduling types). The project objectives and past experience on related efforts can be referenced to estimate the duration of each task. Some commercially available software estimation tools can also be used for this purpose (for additional information refer to Appendix A). The duration of each

task and its respective dependency relationships provide a good first approximation to the duration of the overall project. In reality, the length of the project is the major time constraint, and individual task duration is a reflection of this constraint.

- **Performing Precedence Analysis** – One piece of information not readily available with a WBS is the precedence relationship between tasks or the logical order in which tasks occur. Performing precedence analysis on a project consists of determining the logical order or sequence in which its tasks occur. A task that precedes another task is termed the predecessor of the task it precedes. A task that follows another task is termed the successor of the task it follows. Standard task dependencies, or the start and finish relationships between tasks, are a result of this precedence analysis. These dependencies are commonly termed links and are defined in a variety of ways. For the purposes of this document, standard task dependencies include:
  - Finish-to-start (F-S) – A F-S dependency requires that a task cannot begin until its immediate predecessor has been completed.
  - Start-to-start(S-S) – An S-S dependency requires that a task cannot begin until its immediate predecessor has begun.
  - Finish-to-finish(F-F) – A F-F dependency requires that a task cannot finish until its immediate predecessor has been completed.
  - Lag and lead (negative lag) – Lag defines a finite time the start of a task is delayed after the completion of its immediate predecessor. Lead (or negative lag) defines a finite time that the start of a task precedes (overlaps) the completion of its immediate predecessor.

An important result of precedence analysis is the calculation of float or slack time and the identification of the critical path(s). Since tasks in a project often have different duration, applying standard dependencies may introduce float to the project. Float is defined as a window in time during which a task may start without delaying the start of another task or the project completion date. Float can be further broken down into free float as will be discussed later (see 1.4.2.1).

Once precedence analysis is performed, all of the relationships between the tasks are defined. By examining each task's duration and the amount of float, if any, available to it, a sequence of tasks with the minimum amount of float can be identified. This sequence constitutes the critical path of the project. The critical path identifies those tasks which, if delayed, will delay the finish date of the project. These tasks, as a result, generally receive a corresponding level of priority and management attention. It is possible to have multiple sequences of tasks with the same amount of minimum float. In this scenario, all of these sequences constitute critical paths (see figure 1.4.2.1).

1.3.2.3 Assigning the Project Resources

The third step in defining the project plan is the assignment of resources. This process can be divided into three specific activities:

- **Identifying and Defining Resources –** The resources assigned to implement the project plan are an additional constraint (see 1.3.2.1, Project Constraints). Resources are defined to be the means required to accomplish each specific task. This definition encompasses not only the employees providing the labor, but the associated hardware, software, and services as well. A specific task might require not only an estimated 400 personnel hours to complete, but might include four workstations, local area network software, and an estimated 200 hours of computer time in a restricted graphics lab. Once the WBS is identified, an estimate is made of which resources will be required to complete each task (refer to Appendix A for more information). The precedence and task duration data provide an idea of when, and for what amount of time, the resources will be required.

- **Making Resource Assignments** – There are two activities associated with making resource assignments. The first activity involves defining which specific resources will be assigned to a task. All resources considered generally have varying applicability, availability, skills, experience, compensation rates, etc. This and other information constitutes a profile for each resource. Such profiles are generally reviewed to ensure that proper resources are assigned to a task. The second activity involves the actual assignment of the identified resources to each task. This includes addressing each resource's availability and allocating its time accordingly. This is especially important when assigning a resource to multiple concurrent tasks. Decisions are generally made at this time that define how actual effort by resources will be tracked once the plan is implemented. Progress tracking methods and an associated time accounting system are identified and prepared for implementation of the project plan.

- **Resolving Resource Conflicts** – It is possible that when resources are assigned, some over-allocation of resources may exist. These over-allocations must be resolved prior to implementing the plan and usually before approval will be given. Over-allocation occurs more frequently after implementation begins and adjustments are made to the plan. Several methods to resolve over-allocations can be used. Some of these methods include delaying the task(s) in conflict until all resources are available, increasing the duration of the task(s) in conflict, assigning additional resources to the task(s), replacing the over-allocated resource with one that is available, and lessening the commitments of the resource in conflict. Delaying or increasing the duration of tasks will eliminate or lessen the over-allocation but often has the result of delaying a task on the critical path. Replacing a resource, lessening its commitment, or assigning additional resources will also result in reduced or eliminated conflict but may not be practical or possible. In addition, resolving one conflict often results several more being created. This process is referred to as resource leveling and often takes many iterations and a wide variety of the methods described.

1.3.3 Implementing the Project Plan

When the project plan is complete, it is ready for implementation. Implementing the project plan involves the following activities:

- Gaining approval of the plan
- Establishing the initial and subsequent baselines
- Measuring and recording progress
- Making adjustments to the project plan

1.3.3.1 Gaining Approval of the Project Plan

Gaining approval for the project plan is essential to its success. Obtaining approval is often an iterative process. All parties responsible for the project should review the plan and assist in its refinement. This fosters a sense of ownership by all involved and strengthens the plan's chances of success. A thorough discussion of gaining approval is beyond the scope of this document. For further information, refer to the literature on this subject. A suggested source is [Silverman 88].

1.3.3.2 Establishing Project Baselines

Once the plan is approved, an initial baseline is established. This consists of making a copy of the plan to compare planned vs. actual effort. The initial baseline is used to compare planned progress with the initial implementation efforts. As deviations to the plan occur, the baseline may be renegotiated and subsequently updated during the course of the project. The baseline is the official version of the plan that is currently being implemented in the project. It is used prior to and during implementation to assess current and future actions in the project (see 1.3.3.4) and for archiving purposes to assist with future, similar efforts.

1.3.3.3 Measuring and Recording Progress

As the plan is implemented, progress on the project is measured and recorded. The progress tracking methods and the time accounting system identified during the development of the plan (see 1.3.2.3, Making Resource Assignments) provide the project manager with qualitative and quantitative views of the implementation's status. The time accounting system keeps track of the amount of time a resource works on an assigned task or the percentage of the task that has been completed. As the actual time or percentage completed is recorded, progress tracking methods such as Earned-Value Analysis provide measurements of progress, which can be displayed with respect to the current baseline. Schedule delays, and other potential problems, can be quickly identified and explained. Correlation with similar behavior in past efforts can also be determined.

1.3.3.4 Making Adjustments to the Project Plan

As the implementation progresses, deviations from the baseline may occur. Accordingly, the project manager must determine and direct corrective action to resolve the deviation. In addition, the project manager must be able to identify any modifications to effect possible benefits or prevent possible problems during future implementation. The corrective action or modification identified results in an adjustment to the plan. This adjustment might involve adding or deleting resources to minimize a deviation with respect to the current baseline, a modification of the current baseline, or some other action. One method to determine the proper course of action uses a copy of the baseline to determine the possible advantages or disadvantages of the proposed action. This process, termed "what-if" analysis, allows the project manager to look into the hypothetical future and determine the best ways to complete the project. For example, in addressing a delay in the completion of a specific task, the project manager analyzes "what" would be the result to the project "if" a particular resource was reassigned from one task to the delayed task. The proposed reassignment might resolve the delayed task but cause a delay elsewhere. Perhaps, the proper action would be the modification or addition of other tasks. In this manner, the best possible action can be determined by the project manager. What-if analysis is also a useful method to optimize the project plan prior to establishing the baseline.

1.3.4 Reporting Project Information

Reporting is an essential part of project management. Communication must flow all ways in developing the project plan to ensure a stable strategy and secure commitment from all parties involved. During implementation, the manner in which possible crises or opportunities will be addressed, and the success of the overall project will depend on analyzing progress and redirecting efforts accordingly. This is made possible through proper reporting. Three elements of reporting are discussed below:

- Preliminary reporting
- Status reporting
- Data archiving

1.3.4.1 Preliminary Reporting

Preliminary reporting occurs during project plan development and is generally used to gain plan approval. Information reported during this phase of the project often includes a WBS or similar description of the project tasks, a network diagram or PERT chart to define the dependency relationships between tasks, and a project schedule or Gantt chart. Additional information might also be required including resource loading reports and what-if analyses. Often, errors in requirements and resource analysis are discovered once the plan has been formally organized for initial presentation. This formality allows the customer or management to visualize the entire project and gain perceptions not previously attainable.

1.3.4.2 Status Reporting

Once the project begins implementation, periodic updates of the project schedule showing actual progress are usually requested. This provides the avenue for metrics to be discussed, viewed, and often changed. These updates inform the project manager of the current status of the project and may include a description of what tasks are ahead of schedule, in danger of falling behind schedule, and those that are behind schedule. It may also provide a view of project cost information and can be used to anticipate future benefits or problems facing the project. This status information generally includes resource data expressed in cost or hours or both. Earned value (EV) information may also be included to provide several status data to measure the progress of the project. These data might include the budgeted cost of work scheduled (BCWS), the budgeted cost of work performed (BCWP), and the actual cost of work performed (ACWP) as well as cost and schedule variances.

The BCWS is also called the budgeted costs to date and defines the amount of cost for tasks scheduled to be completed plus the amount of resource level-of-effort scheduled to be accomplished in a given period. It is simply the planned total cost to complete the project including administrative level-of-effort cost estimates. The BCWP is also called the earned value and defines the amount of cost for work completed at a given time. This includes costs for scheduled tasks completed and resource level of effort accomplished. The BCWP simply defines what the organization has achieved for the cost it has incurred. There are a variety of methods for computing BCWP. Some methods use an estimate of task or project completion percentage. Other methods employ a series of milestones that, once achieved, represent a specific amount of earned value. The method used for BCWP calculation is up to the performing organization. It should reflect the nature of the effort so that accurate cost and schedule measurements can be made. The ACWP defines the actual costs applied to a project, including planned costs (BCWS) and all external and unforeseen costs. Schedule variance is the difference between the earned value on the task or project and the planned effort. It is calculated by subtracting BCWS from BCWP (SV = BCWP - BCWS). If the resulting difference is positive, it means that less effort was expended than planned to achieve the current completion status (an “ahead of schedule” condition). If the difference is negative, it means that more effort was expended than was planned (a “behind schedule” condition). Cost variance is the difference between the earned value on the task or project and the actual cost incurred to that point. It is calculated by subtracting ACWP from BCWP (CV = BCWP - ACWP). If the difference is positive, it means that more value was achieved for the effort expended to date that the planned cost at that date (an “ahead of budget” or “under budget” condition). If the difference is negative, it means that less value was achieved for the effort expended than was planned (a “behind budget” or “over budget” condition).

1.3.4.3 Data Archiving

At completion of a project, the data compiled during implementation can be a valuable estimation tool for future, similar efforts. For this reason, as well as a variety of organizational purposes, complete documentation of a project plan and its implementation is often archived by an organization at the end of the effort. This information often includes the initial and adjusted baselines with accompanying documentation that explains the reasons for the adjustments. A description may also be included to detail lessons learned during the course of the project. A brief history and periodic status of the project throughout implementation are also valuable. Archiving should be accomplished in such a manner to facilitate future access to desired information.

1.3.5 Summary

This section presented an overview of basic project management concepts, a sample approach to developing the project plan, and tracking and reporting its implementation. This approach describes the phases of defining a project’s requirements, developing a schedule through the use of a WBS and precedence analysis, assigning resources, implementing the project plan and tracking its progress with the use of a baseline, and reporting project metrics and information. The intended use of this approach is to provide an introductory guide for project managers to structure and organize their management processes and facilitate the automation of project management within their organiza-

tions. Currently available project management software technology is described in the next section. The reader is encouraged to review this technology and identify its possible use in automating the organization's project management process.

1.4 Project Management Tool Capabilities

Project management theory and the technology associated with it provide for a wide variety of tools to assist the project manager. These tools can be used to implement, automate, and enhance project management methodologies such as those discussed in Section 1.3. Features and functionality available from these tools are briefly discussed below and are divided into the following categories:

- **User assistance features –** User assistance features provide functionality to facilitate the learning and operation of project management tools. This can include the user interface implemented, sources of instruction and explanation of terminology or procedures, automation of processes or project management functions, and user-defined tailoring of the interface and the tool itself.
- **Project scheduling functionality –** Project scheduling functionality enables the project manager to model and display the schedule aspects of a project to a satisfactory level of accuracy. This functionality includes a variety of methods to analyze a project mathematically and logically, and defining constraints that affect the implementation of the project plan. It also includes various methods of scheduling tasks and methods to define a project WBS.
- **Resource management functionality –** Resource management functionality enables the project manager to model the resources assigned to a project accurately. This functionality includes the realistic definition of resource profiles, wise assignment of resources, and determination and resolution of resource conflicts.
- **Project tracking features –** Project tracking features enable the project manager to collect useful progress and comparison data, which can be used to identify possible problems or advantages in the implementation of a project. These features include defining useful baselines, accurately comparing actual vs. planned progress data, various approaches to collecting progress updates, and conducting "what-if" analysis.
- **Project reporting features –** Project reporting features include functionality that facilitates reporting project information in multiple formats. Specific functionality includes the generation of schedules, project network diagrams, resource loading information, cost and earned-value data, and tailoring these data points to satisfy user and organizational requirements.

1.4.1 User Assistance Capabilities

1.4.1.1 Graphical User Interface

Project management is inherently graphical in nature. The processes of entering and scheduling tasks, making resource assignments, tracking the progress of tasks with respect to baselines, and reporting project information are enhanced by the use of graphics. Most graphical user interface (GUI) technology implemented in project management software allows graphical development of the project plan. This often enables the project manager to perform a wide variety of project plan development activities using a mouse or similar pointing device. These activities often include creating and defining tasks, establishing task dependencies, and defining and assigning resources. The number of currently available project management tools implementing a GUI is growing. A considerable number of these products operate under Microsoft Windows. A number of other products implement a propriety GUI. Regardless of the source of the interface, those tools implementing a GUI are generally easier to learn and to use effectively.

1.4.1.2 Tutorials

Project management software ranges in complexity and power. As an historical "rule of thumb", ease of learning decreases as the complexity and power of a tool increase. Tutorials provide an organized and understandable method of learning to use a tool. Tool developers generally design a tutorial to take a user on an interactive tour of the tool capabilities starting with the basic features and continuing through the complex features. Tutorials often take a short amount of time and cover many topics. Tutorials are also often designed to group the tool's features into specific sections or lessons. These sections can then be accessed by a user in any order or frequency that is desired.

1.4.1.3 On-Line-Help

In addition to the tutorial, on-line help is a capability that can be used to facilitate both ease of learning and ease of use. Using on-line help, assistance is provided to the user by a variety of methods. These methods often include a description of the currently highlighted file or command, context sensitive help, and lists of possible options. Another popular and powerful form of on-line help is in the form of hypertext. This capability allows the user to browse or search through a number of related help topics. Request for help on one topic presents the user with several additional related topics that may be accessed directly. Each of these additional topics, if accessed, may present the user with additional linked topics. On-line help is often accessible to the user by a key combination from the keyboard or may be mouse-driven.

1.4.1.4 Project Setup

Project management tools provide various ways to structure a project. The user generally chooses from a list of ways to input tasks, dates, and resources into a project. Currently available technology offers several formats of structuring a project, including task outline, network diagram, WBS, and Gantt chart. These formats provide a method to set up the project and provide a clear understanding of the tasks and their sequence of events. An additional feature becoming more readily available incorporates the use of a macro or external program to guide the user through the project setup phase. This feature allows a user to start using a tool quickly without understanding all of its operations.

1.4.1.5 Customization

Customization is another assistance feature that enables the user to enhance and automate a project management methodology. Customization allows the user to define the best method by which project information is acquired, manipulated, and generated. For example, this capability allows the project manager to specify the format, content and quantity of information that is acquired, to define the specific computations that are performed with the information, and to specify and standardize the format, content, and frequency of reports for each project. The capability to define macros that selectively execute specific functionality is an example of this customization. The capability to tailor a system to suit a user's work environment improves the ability to manage projects and use a tool to its greatest extent.

1.4.2 Project Scheduling Functionality

1.4.2.1 Critical Path Analysis

The critical path defines the shortest sequence of tasks through a project schedule. This path is determined by first identifying duration and dependencies for each task in the project. A precedence diagram is a useful tool for display and computation of the critical path. Next, a forward pass is made through the network, starting with the first task to be completed. During this pass, each task, based on its duration and the tasks preceding it, is scheduled at the earliest start and finish date possible. These dates correspond to the task's early start and finish.

When this is completed, a backward pass is made through the network, starting with the last task to be completed. Each task, working toward the first task, is assigned its earliest start and finish dates. These dates correspond to the task's late start and finish. Early finish and late start dates are then subtracted for each task. The resulting differences identify the amount of available "float" or slack time for each task. Those tasks with zero float are termed critical and define the tasks that, if delayed, will cause the project end date to be delayed. Float is generally further defined as free float and total float. Free float defines the amount of time a task can be delayed without delaying another task, regardless of its critical status. Total float defines the amount of time a task can be delayed without delaying a critical task and the end date of the project.

Some currently available tools allow the user to specify a minimum amount of float to define a critical task. This capability allows the user to incorporate a "safety buffer" into the project schedule in case of critical delays. The critical path analysis capability generally provides some method to distinguish critical tasks from non-critical tasks. This is often accomplished by representing tasks with specific colors or graphical symbols to denote critical status. Traditional color coding defines critical tasks (and the critical path) in red and non-critical tasks in blue. Additional colors are used to denote actual progress, float, delay, etc. Critical path analysis features are generally available in both Gantt chart and PERT chart formats (see Figure 1.4.2.1).

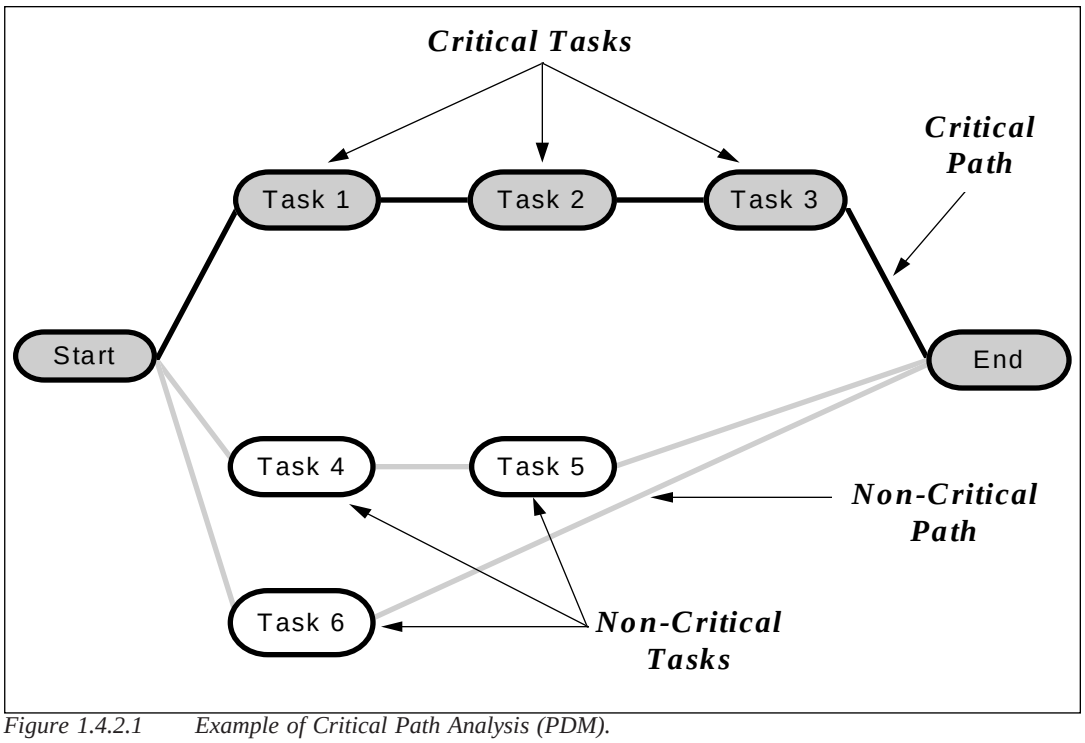

Figure 1.4.2.1 Example of Critical Path Analysis (PDM).

1.4.2.2 Precedence Analysis

Precedence analysis provides another capability to analyze or develop project plans. Two methods are generally available: (1) Arrow Diagramming Method (ADM), and (2) Precedence Diagramming Method (PDM).

The Arrow Diagramming Method (ADM), or activity on arc, provided the basis for the first network representations of a project plan. ADM represents each interface between tasks as nodes that indicate task start and stop events. Arrows or "links" are used to indicate tasks. This method can be somewhat confusing to construct and to read. Two reasons for this confusion are:

- The ADM requires the use of dummy activities, which can be the source of errors and can make the diagram hard to draw and read.
- There are several correct ways to depict the ADM diagram depending on how the dummy activities are used. These alternative diagrams can further confuse reading the diagram.

As a result, the ADM is less frequently used. An example of the ADM is shown in Figure 1.4.2.2.

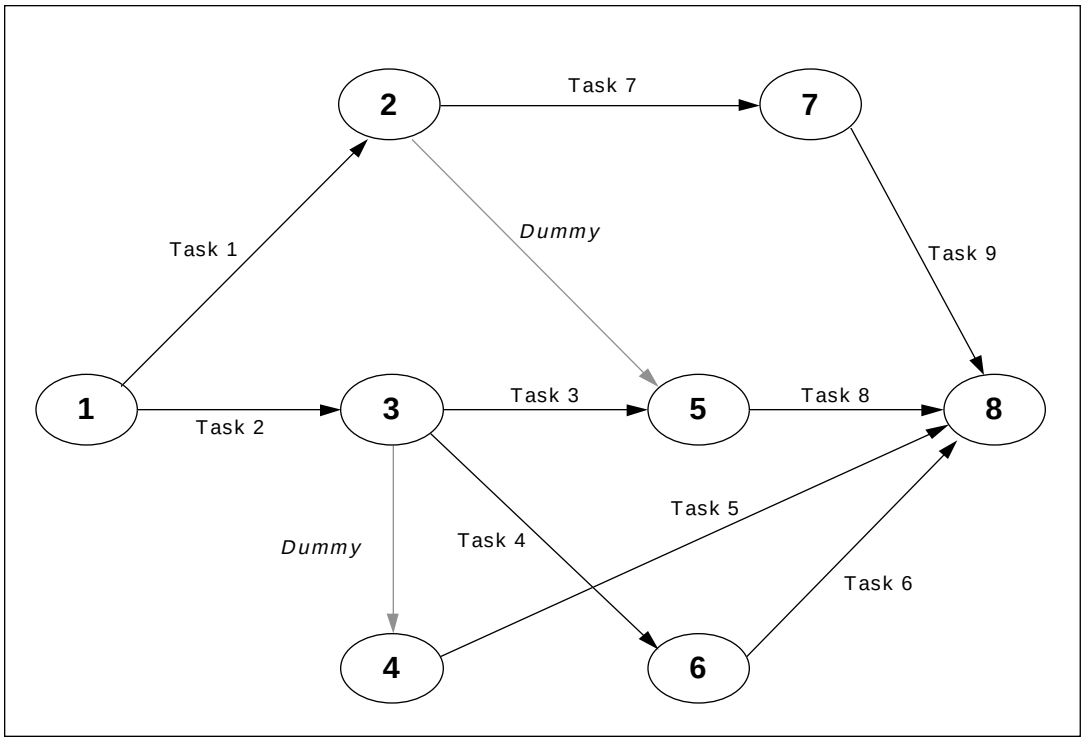

Figure 1.4.2.2 Arrow Diagramming Method (ADM).

The second method, the Precedence Diagramming Method (PDM), or activity on node, is more pervasive. This method represents each activity by a node or box. Arrows or "links" are used to connect the nodes and indicate the precedence relationships between the activities. Figure 1.4.2.1, shown in the previous section, is an example of this diagramming method.

Each project management tool implements precedence analysis in a different manner. Generally, standard dependency relationships may be defined to establish the links between tasks. These standard dependencies include Finish-Start, Start-Start, and Finish-Finish link types (see Section 1.3.2.2).

1.4.2.3 Constraint Definition

Project constraints define the start, end, and duration of tasks with respect to specific scheduling requirements. Many current project management tools model these constraints by allowing the user to specify "must dates." Some of the common constraints modeled are shown in Figure 1.4.2.3.

1.4.2.4 Forward/Reverse Scheduling

Much of planning projects deals with defining task duration such that the effort required to complete the project will satisfy overall project duration constraints. One method to accomplish this is through the use of forward or reverse scheduling. Specifying a project start date and calculating the estimated completion date is known as Forward scheduling.

Specifying a project completion date and calculating the estimated start date is known as Reverse scheduling. In both scheduling techniques, time is calculated from the project start or end date using task duration, dependency relationships, and resource availability to determine the respective completion or start date.

Constraint Type	Description
ASAP	Schedules a task *as soon as possible* with respect to its predecessor.
ALAP	Schedules a task *as late as possible* with respect to its predecessor.
Lead	Schedules a task at a point *following the start* of its predecessor, creating an *overlap* of effort between the two tasks.
Lag	Schedules a task at a point *following the finish* of its predecessor, creating a *gap* in effort between the two tasks.
Must Start On	Schedules a task to *start on* a specific date.
Start On or After	Schedules a task to *start on or after* a specific date.
Start On or Before	Schedules a task to *start on or before* a specific date.
Must Finish On	Schedules a task to *finish on* a specific date.
Finish On or After	Schedules a task to *finish on or after* a specific date.
Finish On or Before	Schedules a task to *finish on or before* a specific date.
Work Between	Schedules a task to *begin and finish between* two specified dates.

Figure 1.4.2.3 Common Scheduling Constraints Encountered.

1.4.2.5 Method-Driven Scheduling

One goal in using project management software is to model the project plan as close to reality as possible. Current technology attempts to accomplish this capability by allowing the user to model different ways tasks are scheduled. For the purposes of this report, this capability is referred to as method-driven scheduling. Some task type definitions include task-driven, effort-driven, elapsed time, and hammock-driven.

Task-driven scheduling models a task based on the estimated duration assigned to it regardless of the time its resources take to complete it. For example, with task-driven scheduling, if the 200-hour task described above is completed by its resources in 180 hours, it will still be modeled as having a 200-hour duration.

Effort-driven scheduling models a task based on the level of effort applied to it. For example, a 200-hour task will be completed in 100 hours with two full-time resources assigned to it. Elapsed time models a task based on a 24-hour availability of its resources. An example of this task type is the requirement of a large computer system to process satellite data for 18 uninterrupted hours.

Hammock-driven scheduling models a task based on the completion date of its immediate predecessor(s) and the start date of its immediate successor(s). With this task type, a task's duration will contract or expand based on the duration defined by these start and end dates. Method-driven scheduling simply provides a project manager with more flexibility in planning projects.

1.4.2.6 Task Priority Analysis

Task priority defines the relative importance that the user assigns to a task. When resources are assigned to multiple tasks or projects, the priority values are used by the tool to determine which task to complete first. Priority analysis is used further in implementing various resource management capabilities (see Section 1.4.3).

1.4.2.7 Work Breakdown Structure Definition

The WBS acts as a vehicle for successively breaking the project into smaller elements to provide visibility of major and minor tasks. The resulting structure aids the project manager with the identification, assignment, and justification of resources. A variety of methods to develop a WBS are available.

Some currently available tools allow entry of the WBS in outline or point-paper format to identify the hierarchy of the project. These tools then use this data to build the WBS graphically in a tree structure format. Other tools allow the construction of the WBS either graphically or in outline format. Associated with this capability is a specific WBS coding scheme that defines each task's hierarchical position. Project management tools implementing a WBS capability generally assign this coding scheme automatically and often allow user customization.

1.4.2.8 Program Evaluation and Review Technique (PERT)

The Program Evaluation and Review Technique (PERT) allows a project manager to introduce a degree of uncertainty into task duration. This is done by representing task duration with a probability distribution that defines pessimistic, most likely, and optimistic duration values. Some current project management tools allow the user to enter weighting factors that define this distribution or allow its definition in some other manner. A tool then uses this information to compute the duration estimates described above.

1.4.3 Resource Management Functionality

1.4.3.1 Resource Profile Definition

Another method of modeling management techniques is to define resource information. This information is termed a resource profile. Information contained in the profile includes type, availability, experience, and cost. Current project management technology allows the user to define detailed resource profiles.

Resource types are generally defined as labor, material, and other. Labor resources consist of non-consumable items such as personnel. Material resources consist of consumable items such as budgeted allocations. Other category resources consist of non-consumable resources such as rental of equipment, facilities, computer time, and resources charged at variable rather than flat rates.

The availability of a resource defines its accessibility to complete a task. Partial workdays, resource non-workdays, etc., both define the availability of a resource. The experience level assigned to a resource also affects its availability. A tool implementing this capability allows the user to specify availability levels for specific periods. A user-specified experience factor is used to scale the availability accordingly.

Resource costs are also specified in the profile. Many currently available tools allow the user to define both the rates and the associated periods during which they are effective. Fixed and variable rates can also be defined as well as onetime costs.

1.4.3.2 Assignment Definition

In addition to resource profiles, resource assignments can be used to model management techniques. Multiple, partial allocation levels, and split or intermittent assignments are examples of how resource allocations can be modeled. A partial allocation level defines a resource's commitment to a task that is less than its total availability. Multiple allocations of this type enable a resource to be assigned to concurrent tasks without exceeding the resource's availability. Similarly, split or intermittent assignments allow a resource's efforts applied to one task to be suspended and assigned to a concurrent task. After the current task's completion, the resource's efforts resume on the original task.

1.4.3.3 Resource Loading Analysis

As resources are assigned, over-allocations may exist. Most project management tools provide some capability to identify and display resource loading levels and associated conflicts. Resource loading analysis is performed by comparing existing assignments with the availability specified in the resource profile. The capability to identify resource loading levels allows the user to determine appropriate corrective action in the event of a conflict.

1.4.3.4 Conflict Analysis

In conjunction with a resource loading analysis capability, most currently available tools provide the user with the capability to resolve any conflicts identified. There are various methods provided for the user to resolve conflicts. The most common method is resource leveling. This capability delays the tasks in conflict until the needed resource is available. This action often results in the end date of the project being delayed. The degree and order of tasks delayed is generally based on the priority values assigned to the tasks in conflict.

Some current tools allow the user to interactively adjust start and end dates to level conflicts. Other tools allow the definition of a resource availability ceiling. In this case, leveling is restricted to delays that will meet the specified ceiling. Still, other tools allow split or intermittent assignments based on priority that will allow work on a low priority task to take place until a high priority task begins. At the completion of the high priority task, work will resume on the low priority task. Other variations of resource leveling include a smoothing function that delays only those tasks that have available float and a selective leveling function that delays only those tasks specified by the user.

1.4.4 Project Tracking Capabilities

Currently available project management tools provide a variety of features to assist the project manager in tracking projects. These features include establishment of baselines, on-screen comparison of planned vs. actual data, and methods to update and analyze progress.

1.4.4.1 Project Baseline Definition

A project baseline is a detailed record of task information, dates, resources, and costs. The baseline provides a fixed version of the plan against which actual progress can be compared during implementation. As actual progress is measured, modifications to the baseline can be made, if needed. All copies of the baseline can be retained for analysis on future efforts. Most currently available tools allow the user to establish baselines. In addition, some tools implement this capability at the task level, which allows the addition and baselining of detailed tasks after the project baseline has been set.

1.4.4.2 Planned vs. Actual Comparison

Actual progress applied to the project during implementation can be compared with corresponding baseline information. Many currently available tools allow this comparison data to be displayed in a common format. One example is the use of Gantt charts. In such an application, the baseline and actual progress are represented as separate Gantt bars. As actual progress reveals a schedule slip or early completion, the bar representing the baseline remains stationary, and the actual progress bar expands or contracts with respect to the baseline. The effects of delays along the critical path are also seen in this manner. In addition to the use of Gantt charts, baseline comparison data can be displayed using a cost graph (see Section 1.4.5.5), spreadsheet (see Section 1.4.5.6), or other ways.

1.4.4.3 Automatic/Manual Updating

A variety of methods to update actual progress are provided by currently available tools. Many tools automatically record updates with the assumption that progress is in accordance with what is planned. Many tools also allow manual entry of resource time and completion percentages. Some currently

available tools incorporate means to establish dynamic data links that allow the joining of an external software application to the project management tool for update purposes. An example is the use of an external time keeping application or spreadsheet that, when linked to the project management tool, automatically updates progress data. Another capability currently available is the import/export capability implemented within a tool. This capability allows the user to import progress data from external tools such as time accounting products using floppy disk or via a local area network.

1.4.4.4 "What-If" Analysis

"What-if" analysis consists of making specific modifications to a copy of the current baseline and observing the resulting effects. This hypothetical exercise allows the project manager to optimize the project plan or determine corrective action by testing and verifying possible strategies. With the increasing implementation of the GUI in project management tools, what-if analysis has become simpler and more readily available to the user.

Some currently available tools incorporate a multiple file display capability that allows the user to simultaneously display several versions of the project plan on screen. This provides quick access to several scenarios without having to discard one plan from memory to load another version. Most tools implementing a baseline definition capability allow what-if analysis to some degree.

1.4.5 Project Reporting Capabilities

Many useful features for meeting project reporting requirements are provided by currently available project management tools. These features may be used in all phases of project management and include customized reports, standard graphical reports such as Gantt charts and PERT charts, and tabular or spreadsheet data that is available upon database querying and filtering.

1.4.5.1 Customizing Project Information

Throughout the project planning and implementation process, a variety of reporting formats may be expected of the project manager. The capability to customize project information to suit an organization's specific needs clarifies this expectation and enhances and automates the reporting process. One method of customizing project information is by use of a "report writer" capability. This capability is generally implemented with a separate application which accepts and manipulates data generated by the project management tool. The user is able to specify the formats, fonts, data, and output device generating the report. Most tools have output customization capabilities to some degree.

1.4.5.2 Gantt Chart

The Gantt chart is a primary output of most project management software applications and an accepted theoretical project management tool. The chart lists project tasks down one side of the chart with corresponding horizontal bars next to each task. The length of each bar defines the relative duration of the task it represents. The chart is time scaled and the position of each bar on the chart defines the respective task's start and end date (see Figure 1.4.5.2).

As mentioned previously, the critical path is commonly displayed on a Gantt chart. Variations of the Gantt chart include user defined color coding, filtered display of data, and what has been termed a "Spaghetti Chart". The spaghetti chart adds dependency information to the standard Gantt chart. The display is similar to the Gantt, but includes links between task bars that define standard start-start, finish-start, and finish-finish relationships. Additional information including float, delay, and actual progress is also displayable on a Gantt chart.

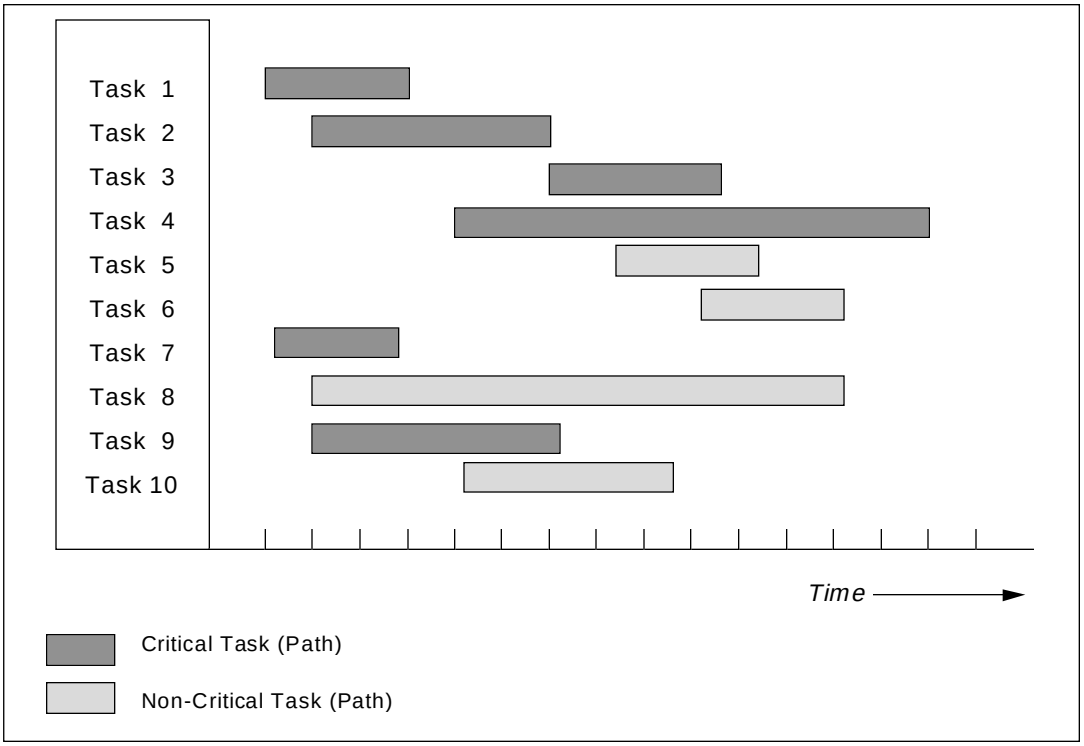

Figure 1.4.5.2 Example of a Gantt Chart (Schedule).

1.4.5.3 Network Diagram

The network diagram (PERT Chart) is another primary output of project management software. This chart shows the precedence relationships between tasks in a logic format (see Figure 1.4.5.3). Like the spaghetti chart previously described, standard dependencies can also be shown. Additional information includes task or resource data, completion percentages, and note text. Many currently available tools also allow the user to customize the diagram.

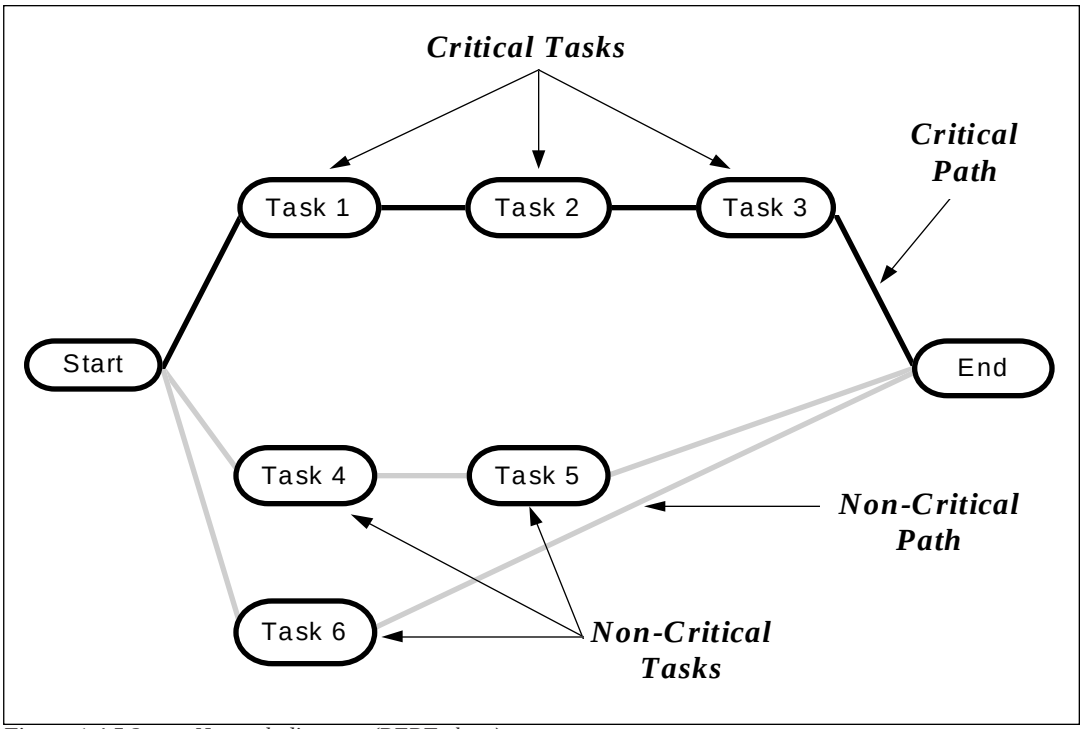

Figure 1.4.5.3 Network diagram (PERT chart).

1.4.5.4 Resource Histogram Chart

Resource information is displayed by many currently available project management tools with the use of a resource histogram (see Figure 1.4.5.4). This chart plots resource commitment vertically with respect to time horizontally. For each period of time, the total commitment for the resource specified is displayed. Additional information displayed includes resource availability, conflict, and user-defined time categories. Many currently available tools display this resource information with respect to the project schedule. Some tools allow the user to filter or sort the resource information displayed.

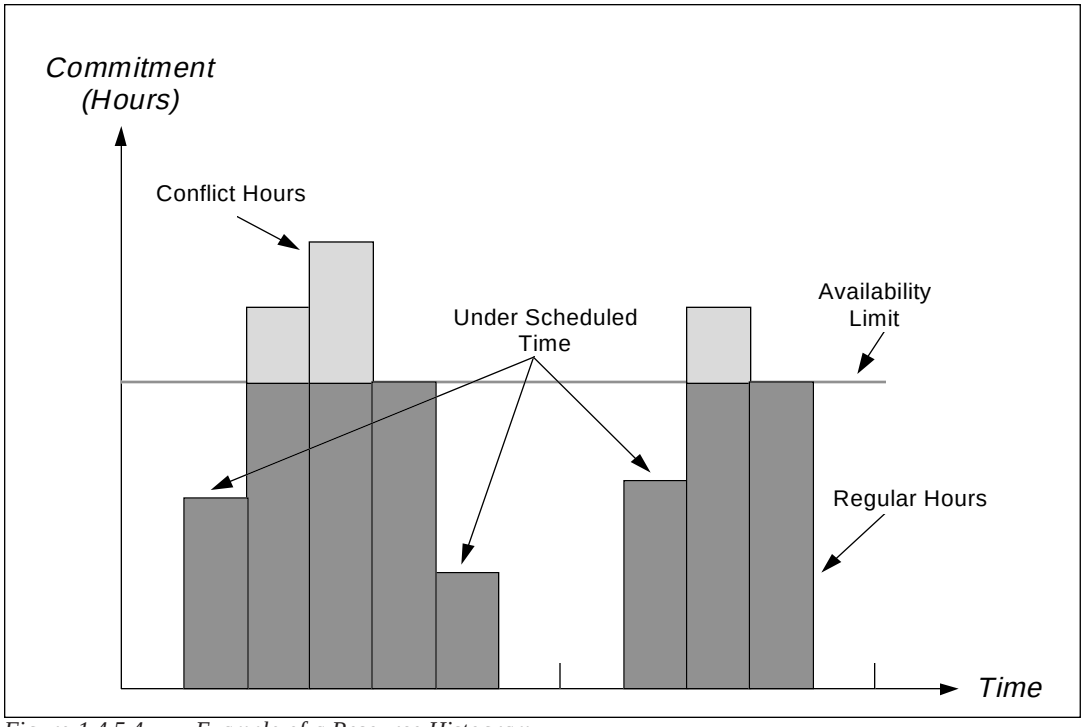

Figure 1.4.5.4 Example of a Resource Histogram.

1.4.5.5 Cost Graph

Many currently available tools provide the user with a means to display cost and resource information by means of a cost graph. This graph generally plots cost or resource commitment vertically with respect to time horizontally (see Figure 1.4.5.5). In the figure, a hypothetical situation is displayed where the budgeted cost of work to scheduled (BCWS) for the project plan is somewhat lower than the budgeted cost of work performed (BCWP) for the implementation. Yet higher is the actual cost, including unplanned expenses (ACWP) incurred during the implementation. As shown in the figure, the difference between BCWP and BCWS (schedule variance) indicates an “ahead of schedule” condition (BCWP>BCSW). Similarly, the difference between BCWP and ACWP (cost variance) indicates an “over budget” condition (ACWP>BCWP). This example illustrates the importance of project management understanding. In this case, the project being ahead of schedule may be masking a serious budget problem. Cumulative information can be displayed as well as filtered totals using the cost graph. The cost graph is being increasingly used to display earned-value data including BCWS, BCWP, ACWP, and cost and schedule variance information.

1.4.5.6 Spreadsheet Report

Most currently available tools provide the capability to display the information contained in graphical charts in spreadsheet format. Additional information that is calculated, as well as user-defined, can also be displayed. Specific database operations on this data including filtering and sorting are generally provided. Export to external spreadsheet applications is also supported by most project management tools.

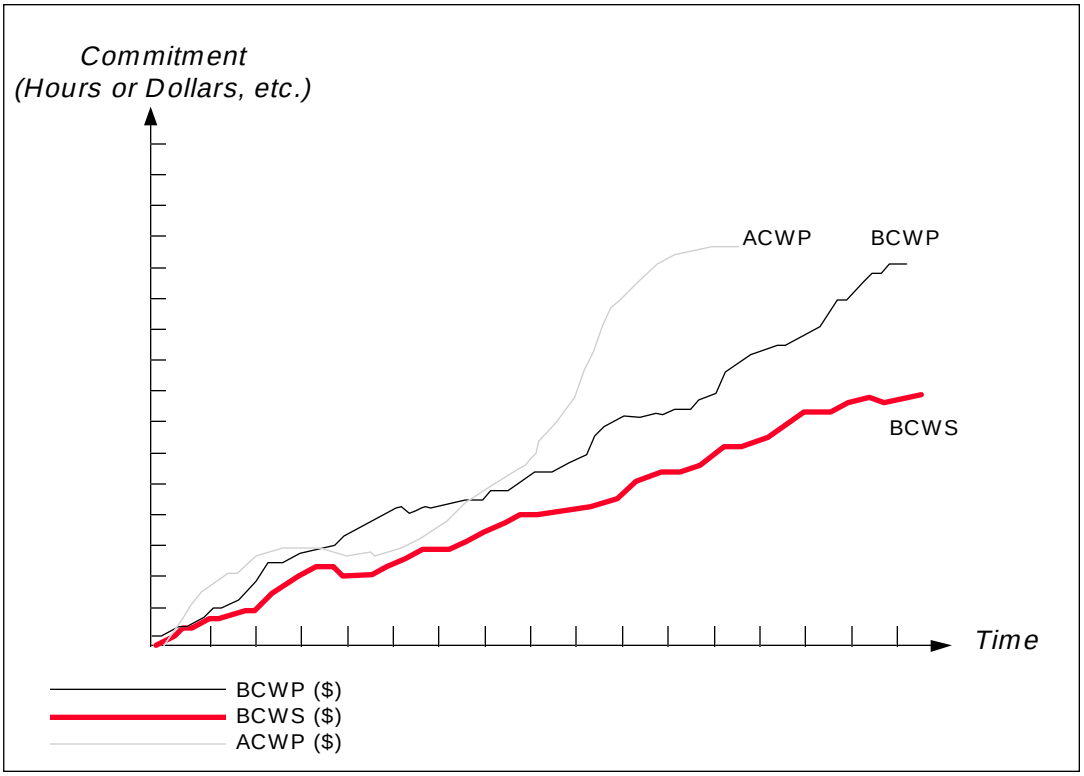

Figure 1.4.5.5 Example of a Cost Graph.

1.5 Relationship to Software Estimation Technology

One of the most challenging tasks in project management is to reliably estimate the size of the software product and resources needed to produce the product. The software estimation process provides the project manager with the estimates to develop the project schedule, to apply resources, and to determine the probable cost of the project. Appendix A discusses the software estimation process, and the methodologies and tools that are available to assist with the process. Appendices B and C contain information on specific tools for software estimation.

1.6 Project Management Training and Consulting Services

A variety of training and consulting options exists for organizations inserting project management technology. Much of this training is offered in a predefined or generic format. Certain sources of training and consulting allow the customer to tailor the services received to organizational needs. For the purpose of this report, training and consulting services are divided into project management theory and project management software categories. A detailed list of possible sources of training is available from the STSC.

1.6.1 Training and Consulting in Project Management Theory

There are many organizations in private industry and within the U.S. government that offer instruction in project management theory. Some of these organizations offer set packages with little or no flexibility to change the format, while other sources provide services tailored to a requesting organization. One source of training is found in academia. Many colleges and universities with business-oriented programs teach courses in basic project management theory. In addition, many of the professors on staff at these organizations either participate in existing continuing education programs or have the flexibility to lend their services in the capacity of a consultant. This option

provides an attractive source of training since professors can often tailor their lectures to the specific needs of the requesting organization. Under most circumstances, a 20- to 30-hour training course for a moderate size class of 20 to 25 students functions well.

Another source of training is available from consulting companies in private industry. These companies generally tailor instruction to organizational needs. In addition, these companies often offer organizational design assistance and provide a consultant on-site for a contractual period.

The STSC conducts workshops on project management theory. These workshops are tailored to an organization through the use of pre-workshop interviews and understanding of current business processes. The workshops cover schedule, budget, and technical aspects of project management. Additional topics covered include software size and cost estimation, time management, risk analysis, and earned value.

1.6.2 Training and Consulting with Project Management Software

In addition to the on-line tutorials provided by the software vendor, many project management software vendors provide specific training for the product they manufacture. This training is generally comprehensive for the tool and may last several days. There is also generally a limit of less than 15 students per class and a fixed price requested. Some vendors are willing to tailor the training to fit organizational needs but this requires development of a special training format and may require additional cost. Some vendors also provide contractual consulting services incorporated with their product. Prices vary for this service but appear to be equivalent to charges by specialized consulting companies.

Another training option is instruction provided by government agencies. Many government organizations have a training office. A chance may exist that some form of training material for a selected project management tool is available. Still other government organizations may have previously acquired a particular product and may be disposed to preparing a basic training course for presentation to other organizations. For example, the STSC project management team has provided training to multiple organizations for the product it selected.

1.7 Standards Affecting the Project Management Technology Domain

No particular government standards are currently imposed on project management software. However, many government contracts require that the contractor's cost accounting system be in compliance with the cost/schedule control system criteria (DOD-I-7000.2). Other applicable military standards are MIL-STD-499A (*Engineering Management*) and MIL-STD-881A (*WBS for Defense Material Items*). Some standards may apply to the hardware hosting an application. In addition, some software development regulations such as DOD-STD-2167A have had specific requirements that apply to project management. The recently released MIL-STD-498 continues this influence, requiring software planning, tracking, oversight, configuration management, and other project management requirements.

1.8 Challenges and Benefits

Project management technology presents a variety of challenges and benefits to software engineering and technology.

1.8.1 Challenges

The use of project management software complements and automates a strong, established management structure. Without an adequate basis in project management theory and procedures, a tool for automation may cause more harm than good or may not be used at all. A principal challenge, therefore,

is the development of such a project management basis. With a firm basis in place, the challenge of developing a project management system can be addressed. The detailed requirements of the future system should be documented and agreed upon by the end users of the system. A related challenge in selecting tools for the system is preventing the functionality of currently available products from clouding or complicating the end goals of the system. Project managers should focus only on that functionality actually needed immediately or in the future. Some currently available products exist that may have less comprehensive functionality but may accomplish the project management system requirements better than a product with many functional features. A final challenge lies in inserting technology into an organization and gaining the ownership and acceptance required to ensure success and use of the technology.

1.8.2 BENEFITS

With a firm theoretical and procedural basis, project management technology assists a manager in thinking a project through completely during the planning phase. It helps to establish goals and encourages the accurate estimation of resource requirements. With such technology, a project manager is able to apply tested and proven methods to realistic efforts. This can be done graphically and with the ease and utility that promote total quality management and continuous process improvement. It provides the project manager with the capability to perform "what-if" analyses and contingency planning in appropriate time frames and facilitates and enhances communication throughout the entire project effort. The use of project management technology provides useful automation throughout the planning, implementation, and reporting phases of project management. It promotes improvement of activities within these phases during future efforts and can free project managers to focus their time and energy elsewhere.

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2 STATE OF THE PROJECT MANAGEMENT TECHNOLOGY DOMAIN

2.1 BACKGROUND

Tool classifications in industry have been used to define the price and often the functionality of project management software tools. These classifications are High-end, Mid-range, and Low-end. During approximately the last 40 years, project management technology has developed from a little known art of logic manipulated with grease pencils to an advanced school of thought complemented by powerful software applications. Early project management software applications were hosted primarily on mainframe computer systems. Management of projects with more than 1,000 tasks or a large number of resources required expensive high-end tools.

Since its advent, project management technology has seen a steady migration of both low-end and high-end applications toward meaningful and efficient use in the PC, Macintosh, and workstation environments. Where once, low-end project management tools were limited to modeling a small number of tasks and few resources, many applications in this category can now manage 64,000 or more tasks and an unlimited number of resources. Some of these tools offer these capabilities in managing multiple projects. High-end tools, once only available on mainframes, have moved toward a size acceptable to PC, workstation, and Macintosh platforms. This migration has involved a delicate balance between maintaining existing capabilities and the limited memory availability of smaller platforms.

2.2 CURRENT AND FUTURE TRENDS

The maturity of project management technology is marked by specific trends within the domain. These trends define a healthy atmosphere of competition in private industry as individual vendors continually sample the marketplace and attempt to meet prospective customers' needs. These trends can be identified in two prominent areas:

- Addressing the development of a firm and educated theoretical basis within an organization with established methodologies and repeatable processes.
- Addressing the development of specific functionality of technology products with a focus on ease of use, operational platforms, groupware capabilities, and functionality of project management products.

2.2.1 DEVELOPMENT OF THEORETICAL BASIS

In accordance with the Software Engineering Institute (SEI) Capability Maturity Model (CMM), software development organizations throughout the DoD are in the process of instituting and improving project management within their organizations. Project planning, tracking, and oversight are required activities to progress from Level 1 to Level 2. Accordingly, there is a significant trend toward educating personnel to establish a firm basis for project management. This trend includes training in project management theory, acquisition, and in the use of project management technology.

2.2.2 Development of Tool Functionality

Trends in the development of tool functionality are focused on ease of use, operational platforms, and the actual functional features offered by the tools. These areas of enhancement are discussed in the following sections.

2.2.2.1 Ease of Use Trends

A variety of enhancements are directed at improving the ease of use of project management software tools. The most frequently advertised and reviewed of these enhancements include the use of graphical user interfaces (GUIs) and interactive project setup routines.

Graphical User Interface – The GUI provided by Microsoft Windows appears to be most popular for updates of existing PC applications as well as new developments. Still other PC applications are implementing proprietary GUIs and an increasing number support OS/2. VAX and UNIX applications appear to be expanding capabilities to support popular GUIs such as X-Windows, Open-Look, Motif, GEM, and DEC Windows. Even vendors of traditionally character-based applications have current GUI-oriented efforts underway.

Specific efforts are made by vendors to design their GUIs to more closely reflect the way project managers conduct business. Screen layouts and *iconized* tools provide ready execution of common tasks with the click of a button. Immediate identification of menus, buttons, and screen fields is possible simply by resting the mouse cursor over the object in question. A small name label appear that lists the objects name along with a description of its use either displayed on-screen or with the click of a button.

Interactive Project Setup Routines – The use of help routines also enhances ease of use. Some of the more common examples of these include step-by-step instructions that prompt the user to enter choices for data entry and formatting. The user's responses prompt further choices until the routine is complete or the user is satisfied with the resulting data or formatting. Still other setup routines execute macro-like sequences of commands to accomplish similar ends.

2.2.2.2 Operational Platform Trends

The hardware and software platforms used to run project management software provide an additional area of enhancement. These enhancements are focused on providing products on multiple platforms and operating environments. Among the most active efforts in this area are providing platform support for UNIX, exploiting cross-platform functionality, and making use of groupware applications.

Open Systems Environment and the UNIX Operating System – A trend particularly within the defense industry is a move toward the open systems environment. Vendors hope to provide hardware, software, and networking components that comply with multiple standards such as open systems interconnect (OSI). Accordingly, many project management tools continue to expand their platform support to include the UNIX operating system and open systems oriented networks.

Cross-Platform Compatibility – Another trend is the capability for a single tool to generate and share data across platforms. A common goal in this enhancement area is to enable the user to use common files regardless of the platform that generated them. This capability eliminates the need for complex import routines or manual reformatting of data. Many vendors whose products originated on a single platform have begun development or have existing support on multiple platforms. This enables organizations with different platforms to share data and functionality in a more consistent manner throughout the organization without having to purchase several platform versions of a single tool.

2.2.2.3 High-End Functionality

As previously mentioned, current maturity in project management technology has seen a migration of both high-end and low-end applications toward operation in the desktop computer environment. For the low-end applications, this has meant an increase in functionality to incorporate the capacity and operational

features of high-end tools. For high-end applications, this has meant scaling down the operational requirements of mainframe-level applications while maintaining the same functionality. Some common examples of this trend include continued exploitation of memory and processing power, increased use of file and application linking, the growing use of groupware technology, and user customization.

Memory and Processing Power – While not as complex in computation as some applications, project management algorithms still benefit from increased memory capacity and processing power. Algorithms such as resource leveling or "what-if" analysis are being written to take advantage of increasingly available RAM and the latest processor speed.

File and application linking – In addition to the open systems and compatibility discussed in Section 2.2.2.2, data sharing capabilities, particularly associated with Microsoft Windows, are another trend in project management technology. These capabilities are object linking and embedding (OLE) and dynamic data exchange (DDE). OLE applications allow the user to identify data from another part of the application or an external product and incorporate it into the host application. DDE applications take this one step further and allow the incorporated data in the host application to be automatically updated as the product from which it is incorporated is updated. For example, a project management tool linked externally to a spreadsheet application with task information is automatically updated when the spreadsheet is updated. Data sharing capabilities of this type are becoming more pervasive as more vendors add support of Microsoft Windows and similar GUI products to their tools.

Groupware Technology – Project management tools have long been a component of business tool suites. As the connectivity between computers, offices, departments, sites, etc., increases, project management tools are exploiting the virtues of groupware. Some applications already sense the presence of an installed LAN and include E-mail commands in the tools' menu structure. Still other tools include routines for combining external data into common viewing pools. Workflow is an additional feature becoming more and more common.

User Customization – The capability to tailor a tool's operation to fit the needs of the user is another continuing trend in current technology. This capability includes customization of the system as well as customization of the data generated and manipulated by the tool.

2.3 Tool Categories

2.3.1 Categories by Functionality

Because of the large number of features offered by current technology, it is not a simple task to classify the tools by functionality. As a result, the reader is encouraged to investigate tools of interest carefully. Some tools in a lower price category may implement several features found in higher price category tools. Similarly, some higher price category tools may not implement functionality found in that class. In general, however, higher priced tools offer more functionality as a whole than lower priced tools.

2.3.2 Categories by Cost

Current project management tools range in capabilities and associated cost. For the purposes of this report, project management tools are classified by cost into two categories:

- Low-end tools are defined as those tools that cost less than $1,000. Tools in this category generally provide full scheduling and resource management features and associated mathematical analysis. Because of the limited functionality, low-end tools are generally easier to learn and use than their high-end counterparts.
- Category C tools are defined as costing greater than $1,000. These tools generally have direct interface with relational database systems and share their functionality. They also offer increased complexity algorithms, data size, and security features. The reporting features

employed by these tools are also quite sophisticated and generally provide the user the greatest degree of flexibility. This increased functionality is not without disadvantages as these tools often have the reputation of being quite complex and difficult to learn and use.

Low-end tools often lack the processing, data size, and security interface capabilities and reporting features of category C tools but appear to be fast approaching similar functionality. High-end tools have a tendency to provide significantly more functionality than often required and are more suited to enterprise-wide project management than low-end tools.

2.3.3 Examples of Tools by Cost Category

2.3.3.1 Low-End Project Management Software

1. Microsoft Project for Windows (Microsoft Corp.)
2. Timeline (Symantec Corp.)
3. CA-SuperProject for Windows (Computer Associates International, Inc.)
4. Project Scheduler 6 (Scitor Corp.)
5. MacProject Pro (Claris Corp.)

2.3.3.2 High-End Project Management Software

1. Open Plan (Welcom Software Technology)
2. Primavera Project Planner (Primavera Systems, Inc.)
3. Artemis Prestige (Lucas Management Systems)
4. PARISS Enterprise (Computer Aided Management)
5. Project Workbench (Applied Business Technologies, Inc.)

2.4 Project Management Technology Product List and Product Sheets

Included in this report in Appendix B is the Project Management Technology Product List. This listing provides brief information on approximately 180 project management and software estimation products identified by the STSC at the time of publication. The information provided includes tool name, vendor, platform, and pricing category.

Likewise, Appendix C contains product sheets for various project management and software estimation tools. The information contained in these sheets was provided by each tool's vendor in response to a questionnaire distributed by the STSC project management team. This information is more comprehensive than that provided in the long list and contains specific information about the tool, including recommended configuration, vendor information, and a description of the tool.

2.5 References, Recommended Readings, and Glossary

Appendix D includes references to texts and recommended readings that may provide insight to project management theory, technology, and evaluation information.

Appendix E provides a glossary as an aid to define terms and acronyms common to the project management technology domain and used in this report.

3 APPLICATIONS

This section provides a description of the possible uses of project management technology and how its use might be incorporated within an organization.

3.1 TECHNOLOGY USE

There is a wide variety of applications of project management technology. Organizations may only require an automated tool to produce graphical, hard copy project schedules, or a complete project management system used to build schedules, manage resources, track progress, and report to appropriate parties. The applications are as numerous as the organizations implementing them. Currently, available project management technology has the capability to effectively meet the requirements of any organization. To take advantage of this, the organization requiring the technology must define exactly what its use will be and take appropriate steps to insert it within the organization.

3.2 TECHNOLOGY INSERTION METHODOLOGY

Once a need for project management technology has been identified, steps to insert it within the organization can be taken (refer to Conner's technology adoption methodology [Conner 82] in Appendix F). An example, incremental approach successfully implemented by the STSC and currently being followed in various forms with several Air Force organizations follows. Initial results are encouraging, and success stories, as well as setbacks, are being documented to optimize the process. Contact the STSC for details about these efforts.

3.2.1 DEFINING THE ORGANIZATION'S THEORETICAL BASE

The first step consists of defining the current theoretical base of the organization. This includes the technical knowledge possessed by key personnel within the organization and the current and desired methods of managing projects. Topics that should be addressed in this step include:

- **Training –** It has been the STSC's experience that many organizations requiring technology insertion lack needed training in basic concepts of project management theory. Only after such a project management theoretical base is in place can the technical requirements of the project management system be defined. Sufficient theoretical knowledge may already be in place and only in need of organization, or a suitable training course may be necessary. If the latter is the case, options to acquire this training should be explored.
- **Definition of the project management process –** Definition of the organization's project management process is also necessary to understand how the technology will be used and how it will improve project management activities within the organization.

3.2.2 DEFINING REQUIREMENTS FOR A PROJECT MANAGEMENT SYSTEM

The next step consists of defining the requirements of the proposed project management system. Topics that must be addressed include:

- **Interface with defined process –** A detailed understanding of the proposed system and how it will achieve the desired results must be defined. Some questions that should be answered are:
  - How will the proposed system interact with and satisfy the organization's established project management process?
  - What information is needed as input to the system?
  - What information is expected as output?

- **Operational platform –** Many organizations within the US Air Force have a host of computer systems at their service. In addition, many project management software tools are limited in the platforms they support. Accordingly, the platform used by the proposed system should be selected carefully. The existing hardware/software configuration within the organization may be sufficient, or additional acquisition may be necessary. Some platform options currently supported by project management software are:
  - PC – Stand alone configuration
  - PC – Local area network (LAN) configuration
  - Macintosh – Stand alone configuration
  - Macintosh – Local area network (LAN) configuration
  - VAX – Cluster or minicomputer configurations
  - Workstation – UNIX or similar operating environment
  - Mainframe – IBM or other configuration

- **Procurement constraints –** Due to limited and shrinking budgets, the cost and time associated with any procurement usually must be considered. A detailed plan including budget and schedule estimates should be developed for the insertion effort. Time and cost constraints must be considered with respect to this plan. If implementation of the proposed system exceeds the planned budget or schedule, other system options can be considered or the budget and schedule may be renegotiated.

- **Functionality –** Many different styles and methods to manage projects exist. Similarly, a wide variety of functionality is available in project management software tools. Individual user and organizational requirements should be collected with respect to specific project management functionality. The reader is referred to Sections 1.3 and 1.4 for specific areas of functionality that may be addressed.

3.2.3 Evaluation and Selection of Software

The next step consists of evaluating and selecting current technology. Evaluation activities should focus on two specific data points upon which selection of technology for trial use will be based. These data points are:

- A defined system requirements including the operation platform and the organization's functional requirements.
- A representative test case project that is similar to projects the organization manages.

3.2.4 Trial Use and Piloting the Selected Technology

Trial implementation efforts should be accomplished in a phased approach by identifying a low risk, "thin vertical slice" of the organization in which to pilot the selected technology. A suitable, representative project should be selected as the pilot project. Experience in implementing this pilot can be tracked and adjusted or optimized much more easily than implementing the system over an entire organization. As success is achieved, the thin vertical slice can be expanded in width, eventually filling the organization. As long as the requirements are identified and maintained and the process is implemented in a controlled low-risk manner, the chances of success will be high.

APPENDIX A: SOFTWARE ESTIMATION TECHNOLOGY

1 INTRODUCTION

Software estimation is the part of project planning devoted to estimating the size, complexity, effort, and cost of a software project, and the use of critical computer resources. From software estimation comes the information needed to develop a software project's schedule, budget and assignment of personnel and resources.

This appendix discusses the software estimation process, software tools that are available for software estimation, benefits of software estimation, and trends in software estimation technology. This appendix replaces the STSC's *Software Estimation Technology Report*, March 1993.

2 SOFTWARE ESTIMATION PROCESS

2.1 BASIC STEPS

Software estimation should be approached as a major process; it should be well planned, reviewed often, and continually updated. The basic steps required to accomplish software estimation are:

1. Identify project objectives and requirements,
2. Plan the activities,
3. Estimate product size and complexity,
4. Estimate effort, cost and resources,
5. Develop projected schedule,
6. Compare and iterate estimates,
7. Follow up.

The first, second, and fifth steps are explained in Section 1.3.2 of this report.

2.1.1 IDENTIFY PROJECT OBJECTIVES AND REQUIREMENTS

The only point that needs to be made here is that project objectives and requirements must be clearly and precisely identified to develop good estimates of effort and costs early in the project's lifecycle. (Refer to paragraph 1.3.2.1 of this report.)

2.1.2 PLAN THE ACTIVITIES

The Work Breakdown Structure (WBS) is created in this step and is used in the software estimation steps that follow. (Refer to paragraph 1.3.2.2 of the report.)

2.1.3 Estimate Product Size and Complexity

Using the WBS, the product size can be estimated by estimating the sizes of the components identified in the WBS. Estimating product size is the basis of software estimation. Size is considered by software project managers to be a major technical performance or productivity indicator allowing them to track a project during development. Estimating product size is not simple to do; typically, it is very dependent on the experience of the persons doing the estimating. One or more of the following three measures are used in software size estimation.

1. ***Source Lines of Code (SLOC).*** Estimating SLOC is the traditional technique used to estimate the size of a software project. The appeal of estimating SLOC is that it is a simple technique, at least in concept, and often is automated. However, because determining which lines of code to count can be ambiguous, rules are needed for which types of lines to count in a programming language. Two of the difficulties with using SLOC as an estimate in project planning are:
   - SLOC cannot be estimated reliably in the early phases of the development cycle unless SLOC data is available from similar, completed projects.
   - The work content of a line of code varies widely among higher-order programming languages.

2. ***Function Points.*** Using function points as a basis for size estimates grew out of the difficulties with SLOC mentioned above. Function points are derived by:
   - First, counting the number of external inputs, inquiries, outputs, master files, and interfaces;
   - Second, adjusting the counts for complexity;
   - Third, summing the results into a Function Point Count (FPC).

   The FPC is independent of the programming languages used on the project. Tables of source statements per function point have been developed through research for most programming languages and major dialects. This technique, known as Function Point Analysis (FPA), grew out of estimating the size of Information System (IS) software development projects [Albrecht & Gaffney 83]. FPA has proven useful because:
   - It is based on information that is available early in a project's lifecycle.
   - It can be used on projects with multiple programming languages and multiple platforms.

   Criticisms of using FPA are:
   - It is hard to use.
   - It does not measure scientific and real-time applications as well as it measures IS [Whitmire 95].

3. ***Object Points.*** Counting object points is a relatively new technique for software size estimation. Objects typically are screens, reports, and third-generation modules. (By definition, they are not directly related to "objects" in an object-oriented methodology.) Getting the Object Point Count is very similar to getting the FPC described above; adjustments are made to the raw count for complexity and summed to get a final count. The advantage of counting object points is that it usually takes less effort than function points and the results are comparable. To date, this technique has not yet proven itself as well as FPA has [Boehm 94].

2.1.4 Estimate Effort, Cost, and Resources

Using size estimates as input, estimates of effort, cost, and resources are prepared. Many methods can be used (see Section 2.2), and the use of more than one method is strongly recommended. It is in this step that a software estimation tool should be used to assist with the estimates. Many of the available tools use models that have been developed over the years using historical data from hundreds, even thousands, of projects. One widely used model is the COnstruction COst MOdel (COCOMO) (see Section 3.2). (For information on the tools see Section 3.)

2.1.5 Develop Projected Schedule

Using estimates of effort, cost, and resources, a tentative, projected schedule is developed (see paragraph 1.3.2.2 of this report).

2.1.6 Compare and Iterate Estimates

More than one software estimation method (see Section 2.2) should be used and their results compared, since there is no one method that is clearly superior. The strengths and weaknesses of the different methods tend to complement each other. Significant differences in estimates should be iterated for two reasons [Boehm 81]:

1. Similar components of a project may have widely varying estimates due to differences in estimators' personalities (pessimistic vs. optimistic), roles, and incentives. Iteration of the estimates can be used to resolve these differences.
2. A few components may dominate the software costs; in which case, the estimates for those components are critical to the project's success. Iteration can be used to scrutinize the critical estimates.

2.1.7 Follow Up

During the life of a software development project, estimates should be tracked against actual project data. Reconciliation of differences in estimates vs. actuals can be used to [Boehm 81]:

- Update upcoming estimates in the project.
- Identify and adjust to changes that have occurred in the project.
- Improve knowledge of estimating drivers, such as cost and productivity factors.
- Improve estimating techniques.
- Identify and adjust to new methodologies and paradigms.

2.2 Software Estimation Methods

The following five methods have been used for many years. Typically, in the past, these methods have been used without computer-based software estimation tools. Now, software estimation tools are available that incorporate these methods. (Refer to Section 3 for a discussion of software estimation tools.)

1. ***Analogy Method.*** This method compares the proposed project to previously completed, similar projects where actual project development information is known. Data from the completed projects are used to estimate the proposed project. The method's main strength is:
   - The estimates are based on actual project data and past experience.

   Limitations are:
   - Similar projects may not exist.
   - The accuracy of available historical data may be suspect. For example, DoD weapon system software projects often do not have historical precedents.

2. ***Bottom-up Method.*** This method estimates each component of the software project separately, then combines the results to produce an estimate of the entire project. Advantages of this method are:

   - It provides a more detailed and accurate basis for estimation, because it deals with low-level components.
   - It supports project tracking more directly than other methods because its estimates usually address each activity within each phase of the software development lifecycle.

   This method can promote individual responsibility when each component is estimated by the person responsible for its development. It can be difficult to perform a bottom-up estimate early in the lifecycle process, because the necessary information may not be available. This method tends to be time consuming and may not be feasible when time or personnel are limited.

3. ***Top-down Method.*** This method of estimating starts with the overall characteristics of the software project. The project is then partitioned into lower-level components and lifecycle phases. This method is more applicable to early estimations when only global properties are known. Advantages of this method are:

   - It considers system-level activities (integration, documentation, project control, configuration management, etc.), many of which may be ignored in other estimation methods.
   - It is usually faster and easier to implement than the bottom-up method.
   - It requires minimal project detail.

   This method's disadvantages are:

   - It tends to be less accurate than other methods.
   - It tends to overlook lower-level components and technical problems.
   - It provides very little detail for justifying estimates.

4. ***Expert Judgment Method.*** This method uses the experience and understanding of human experts to provide the project estimates. An advantage of this method is the experience from past project that the expert brings to the proposed project. The expert also can factor in project impacts caused by new technologies, applications, and languages. Disadvantages are:

   - Estimates can be no better than the expertise and judgment of the expert.
   - It can be hard to document the factors used by the expert who contributes to the estimate.

   Expert judgment should be used to complement other estimation methods.

5. ***Algorithmic Method.*** This method uses mathematical formulas to make software estimates. The formulas are derived from research and historical data and use inputs such as source lines of code (SLOC), number of functions to perform, and other cost factors including programming language, design methodology, skill levels, and risk assessments. Advantages of this method are:

   - Being able to generate repeatable results.
   - Easily modifying input data.
   - Easily refining and customizing formulas.
   - Gaining a better understanding of the estimation methods since the formulas can be analyzed.

   However, the results can be questionable when estimating future projects that use new technologies. The formulas generally are unable to deal with conditions such as exceptional personnel, exceptional teamwork, and exceptional matches between skill-levels and tasks.

Additionally, algorithms are usually developed within companies for internal use and may be more reflective of a company's performance characteristics than of software development in general; also, they may be proprietary.

These five methods are discussed further in Dr. Barry Boehm's book, Software Engineering Economics [Boehm 81]. As previously mentioned, it is recommended that more than one of the software estimation methods be used for comparison and verification, because their strengths and weaknesses usually complement each other.

2.3 Risks

All known risks associated with a software development project should be defined and weighed, and impacts to project costs should be determined. This information should always be included as part of the software estimation process. Poor software estimates generally result from four major risk areas, which are:

1. ***Size of the software project.*** Software size estimates tend to be optimistic resulting in underestimation. Since size estimates are central to other project estimates, poor size estimates can cause numerous problems such as cost and schedule overruns.
2. ***Development environment and process stability.*** An inadequate development environment or changes in the environment or processes on which estimates are based can result in cost and schedule overruns.
3. ***Staff skills.*** Misalignment of skills to tasks can result in miscalculations of schedules and amount of effort required as well as poor estimates of project staffing requirements.
4. ***Requirements growth.*** Unconstrained growth of requirements during the software development lifecycle results in changing project goals that can lead to frustration, customer dissatisfaction, and ultimately, cost and schedule overruns.

2.4 Software Estimation and the Capability Maturity Model (CMM)

As a final word on the software estimation process, it should be pointed out that three of the activities specified in the Software Engineering Institute's (SEI) CMM for reaching the Repeatable Level (Level 2) deal with software estimation. The three activities are found in the CMM's Software Project Planning key process area. They are [Paulk 93]:

- Estimates for the size of the software work products (or changes to the size of software work products) are derived according to a documented procedure (Activity 9).
- Estimates for the software project's effort and cost are derived according to a documented procedure (Activity 10).
- Estimates for the project's critical computer resources are derived according to a documented procedure (Activity 11).

3 Software Estimation Tools

Since the late 1970s, software estimation tools have been developed to provide a better defined and more consistent software estimation process. These tools have been developed from historical data collected from thousands of software projects, as well as research to identify key productivity factors. Early tools were hampered by the scarcity of reliable data; however, as more data became available, estimation tools were improved and continue to evolve. Most software estimation tools use algorithms, and some of the more advanced tools are rule-based or knowledge-based as well as interactive.

Software estimation tools do not guarantee good software estimates. If unreliable software size estimations and attribute ratings are input, then poor estimates will result—the Garbage In—Garbage Out (GIGO) Principle. To get good estimates requires collecting, refining, and maintaining historical

data from current and past projects to provide the necessary inputs required for the software estimation tools. The software development organization should establish a staff that is thoroughly trained in the software estimation process and use of available estimation tools; they should be involved in all software estimates for the organization. Experience and existing tools dictate what software development information needs to be maintained.

3.1 Major Functional Capabilities

The major functional capabilities that should be considered when selecting a software estimation tool are listed below. In general, the tool should:

1. ***Allow easy adaptation to an organization's development environment.*** The tool should be capable of being customized to the organization's development environment. Customization should allow the developer to define applicable inputs and modify the coefficients and exponents of the formulas used by the tool. This feature allows continuous improvement to the tool's estimation capability since the organization's historical data can be included with current project data to generate software estimates.
2. ***Be relatively easy to learn and use.*** The amount of formal training required to use the tool should be minimal, required inputs should be well-defined, and visibility into internal formulas and algorithms should be provided. The tool should include help menus and examples sufficient to assist the staff charged with supporting the tool in answering questions and providing training.
3. ***Be well-documented.*** Documentation should be at a level that is understandable to users of the tool and include the methodologies, formulas, and algorithms on which the tool is based.
4. ***Provide early estimates.*** The tool should be capable of generating estimates early in the lifecycle process when requirements and the development environment are not fully defined and should allow task detail to be added incrementally as functions, activities, and other information are refined. Since there are many unknowns early in the estimation process, the tool should reflect degrees of uncertainty based on the level of detail of the input. In general, the tool should provide sufficient information to allow initial project resource planning as well as reasonably early "go/no go" decisions.
5. ***Be based on software lifecycle phases and activities.*** The tool should be capable of providing estimates for all phases and activities of the commonly used software lifecycle models. It should allow the decomposing and mapping of software development tasks into the lifecycle phases and activities, as well as support a Work Breakdown Structure (WBS).
6. ***Allow "what if" scenarios.*** The tool should allow for the generation of "what if" scenarios and include factors for design trade-off studies.
7. ***Allow for variety in applications and languages.*** The tool should work with applications from such general categories as information systems, simulation and modeling systems, real-time systems, and accounting systems, and with higher-order languages. It is very important that the tool provide estimates specific to the application since the estimation formulas, cost drivers, and lifecycle phases may be unique to an application category.
8. ***Provide maintenance estimations separately.*** The tool should provide software maintenance estimates separately from development estimates. Software maintenance includes activities such as correcting errors, modifying the software to accommodate changes in requirements, and enhancing software performance through technological improvements.
9. ***Interface with other software tools.*** The tool should interface easily with project management and other development tools that are important to the project and the organization.

Depending on an organization's needs, the significance of these capabilities may differ and should be considered accordingly. In addition, an organization should analyze its needs and identify additional, desirable capabilities specific to those needs. The organization should then match available tools with its needs.

3.2 MODELS

Many software estimation tools use cost models that have been developed through years of research on software projects. One well-known model is the COnstruction COst MOdel (COCOMO). It is an "open model" meaning that its details are well documented and have been published. Some models used in software estimation tools are proprietary, and their details are not easily determined. Because of its openness and popularity, the COCOMO model will be discussed further as it is representative of the typical software cost model.

The complete COCOMO model and associated database of projects from which the model was developed is described in [Boehm 81]. The model has gone through two refinements: COCOMO Ada in 1989 and COCOMO 2.0 in 1994. Essentially, the model uses raw counts of size, such as source lines of code (SLOC), functions, objects, or various combinations of all three, as input. The model applies various formulas to the input to factor in complexity, reuse, reengineering, conversion, breakage, and relative economies or diseconomies of scale. Effort-multiplier cost drivers in the categories of product, personnel, platform, and project are used in the model to adjust person-month estimates derived from the input. Ranges of effort estimates are the output from the model. For users of the COCOMO, estimate ranges are becoming the preferred method of output over point estimates [Boehm 94].

3.3 INFORMATION ON SPECIFIC TOOLS

Appendix B is a list of specific software estimation tools identified by the STSC at the time this report was published. (Tool vendors are invited to contact the STSC regarding any software estimation products not in the list.)

Appendix C is product information provided by vendors for their particular software estimation tool and is arranged alphabetically by tool name. The product information is designed to help users make preliminary assessments about the tools. (Vendors are invited to provide updated information or information for tools not included.) Contact the STSC for unpublished product sheets that may be available.

4 CONCLUSIONS

Software project tasks should be defined to the smallest component to be managed. All technical aspects of the project should be understood as fully as possible since the more detail known about the project the more accurate the estimates will be. Newer methodologies are evolving that aid software developers in identifying various functions needed to support the project, such as Object-Oriented Analysis and Object-Oriented Design (OOA, OOD); therefore, organizations should actively keep abreast of evolving technologies.

4.1 BENEFITS

When the software estimation process is done correctly, the benefits to an organization should outweigh the cost to do the estimation. Major benefits that should be realized are:

- Lower cost of doing business
- Increased probability of winning new contracts
- Improved skill-levels of staff
- Deeper knowledge of the proposed project prior to beginning the software development effort
- Better understanding and application of proper software life cycle model

As the software estimation process is enhanced, refined, and continually applied, the resulting applications attain higher levels of quality and ultimately benefit all.

4.2 TRENDS

Traditional software development methodologies, the waterfall model being most typical, are being overcome by new software development processes and products. The growing use of fourth-generation languages, commercial-off-the-shelf (COTS) software, reuse, and object-oriented development, to name a few, are making significant changes in the way applications are developed within organizations. Consequently, software estimation models are changing—new approaches and greater flexibility are required in the models (read [Boehm 94] regarding COCOMO 2.0).

Software project managers, like everyone else who are computer-literate today, are using and expect to use software tools to do their jobs. For software estimation, managers increasingly desire tools that can handle new development paradigms and can integrate with project management tools. This is especially important in the capture and use of historical data and the production of project schedules, spreadsheets, and other management artifacts.

APPENDIX B: PROJECT MANAGEMENT AND SOFTWARE COST ESTIMATION TECHNOLOGY PRODUCT LISTS

INTRODUCTION

The product list in this Appendix and product sheets in the Appendix C were developed using information provided by project management and software cost estimation tool vendors. Specifically, the project management information was solicited using a project management technology questionnaire distributed by the STSC. Incomplete information and information received from vendors after editorial deadlines have not been included in this report but will be incorporated as updates are made. Questions regarding this information should be directed to STSC Customer Services at DSN 777-7703 (Commercial: 801-777-7703).

PROJECT MANAGEMENT TECHNOLOGY PRODUCT LIST

The Project Management product list contains information for a large number of project management products. Information is presented in four areas: Product Name (and version, if applicable), Product Vendor, Supported Platforms, and Pricing Category. Supported platforms include the hardware listed and its associated operating system. Products not having an assigned pricing category require contacting the vendor.

SOFTWARE COST ESTIMATION TECHNOLOGY PRODUCT LIST

The Software Cost Estimation product list contains information on some of the more prominent software cost estimation products. Information is presented in three areas: Product Name, Product Vendor, and Supported Platforms.

Product	Vendor	Platform	Cat
@RISK for Project (V.1.1)	Palisade Corp. 800-432-7475; 607-277-8000	Windows 3.X	L
12-Minute Project Planner	Baarns Publishing 800-377-9235; 818-837-1441	Apple Macintosh; PC-MS/DOS	L
Accent GraphicVUE (V.1.60)	National Information Systems, Inc. 800-441-5758; 408-985-7100	PC; DEC, Sun-4, SPARC station; HP 9000; Silicon Graphics	H
Accent Vue (V.8.0)	National Information Systems, Inc.800-441-5758; 408-985-7100	DEC VAX; AT&T UNIX System V; Sun; Silicon Graphics; HP	H
Acquisitions & Logistics Planning Support System	Program Control Corp. 619-446-6800	PC; Macintosh; DEC VAX; IBM 370; DG Eclipse MV Series; CDC; Prime; Honeywell; Cray	H
Artemis 9000/EX	Lucas Management Systems 800-477-6648; 703-277-1050	IBM/MVS/ESA, MVS/XA, VM/ESA, VM/XA, VM/SP6	H
Artemis I/CSCS (V.3.0)	Lucas Management Systems 800-477-6648; 703-277-1050	HP 9000 series 800; Sun SPARCseries; DEC VAX	H
Artemis Prestige (V.2.1)	Lucas Management Systems 800-477-6648; 703-277-1050	Sun SPARCstation/SunOS; DEC VAX/VMS	H
Artemis Schedule Publisher (V.4.1)	Lucas Management Systems 800-477-6648; 703-277-1050	Apple Macintosh Plus, SE, II	H
Artemis Schedule Publisher for Windows	Lucas Management Systems 800-477-6648; 703-277-1050	Windows 3.X	H
Artemis Strategic Planning 7000 (V.7.5)	Lucas Management Systems 800-477-6648; 703-277-1050	DECstation, VAX; IBM RS/6000; Sun-4, SPARCstation; HP 9000; PC	H
ASAPMS Project Scheduling Library	Andrew Sipos Associates (ASA) 212-321-2408	PC-MS/DOS; DEC VAX/VMS	L
AutoPLAN II (V.2.0)	Digital Tools 800-755-0065; 408-366-6920	Sun SPARCseries; HP 9000 series 700; DEC VAX/VMS	H
AutoTeam	Digital Tools 800-755-0065; 408-366-6920	Sun SPARCseries; HP 9000 series 700; DEC VAX/VMS	L
Cadence Project Master (V.1.13)	CADENCE Management Corp. 800-448-0173	Windows 3.X	L
CA-SuperProject	Computer Associates Int, Inc. 800-225-5224	Windows 3.X; OS/2; Sun/Solaris	L
CA-SuperProject for MS-DOS	Computer Associates Int, Inc. 800-225-5224	PC/MS-DOS	L
CA-SuperProject for VAX	Computer Associates Int, Inc. 800-225-5224	DEC VAX/VMS	*
Comprehensive Planning and Control System (Rel.3.2) (CPCS)	Cincom Systems, Inc. 800-543-3010; 513-662-2300	IBM, MVS/ESA, VSE/SP, VSE/ESA; DECVAX/VMS; PC; HP/HP-UX	H
CPCS Request Tracking System	Cincom Systems, Inc. 800-543-3010; 513-662-2300	IBM/MVS/XA; DEC VAX/VMS; PC-MS/DOS;	H
C-PLAN (V.2.0)	DSD Corp. 206-788-7447	DEC DECstation, VAX, MicroVAX; Sun; HP	H
CPM/PERT	Elite Software Development, Inc. 800-648-9523	PC-MS/DOS	L
Critical Path Project Management (CPPM)	Dynacomp, Inc. 800-828-6772; 716-265-4040	PC-MS/DOS	L
CSW:FEAC (Forecasted Estimate At Completion)	Leckie Associates, Inc. 603-424-7014	Apple Macintosh	L
CSW:PMDA (Performance Measure-ment Data Analysis)	Leckie Associates, Inc. 603-424-7014	Apple Macintosh	L
DECplan (V.1.2)	Digital Equipment Corp. (DEC) 800-344-4825	DEC DECsystem, DEC station/VMS; Sun/SunOS	H
Dekker Trakker Activity Based Cost and Performance	Dekker, Ltd. 800-4DEKKER; 909-384-9000	PC-MS/DOS; OS/2; DEC VAX/VMS; NCR/UNIX; Sun/SunOS; HP/HP-UX	H
DMCS (Data Management and Control System)	Structural Dynamics Research Corp. (SDRC) 513-576-2400	Sun SPARCstation; IBM RS/6000; HP 9000 Series 700; DECstation	H
EDMProjects (V.6.0)	Computervision Corp. 800-248-7728	Sun; VAX, Alpha AXP, OSF/1; IBM RS/6000;	H

Categories
L: Price < $1000
H: Price > $1000
*Price not available

Product	Vendor	Platform	Cat
EMCS-AIX and PC/DOS	IBM 800-426-3333	IBM RT, RS/6000/AIX; PC-MS/DOS; AT&T UNIX	H
Everybody's Planner	Abracadata, Ltd. 800-451-4871; 503-343-2324	PC-MS/DOS	L
Everybody's Planner-Scheduling and Flowcharting	Dynacomp, Inc. 800-828-6772; 716-265-4040	PC-MS/DOS	L
FastTrack Resource (V.1.0)	AEC Software 800-346-9413; 703-450-1980	Apple Macintosh Plus	L
FastTrack Schedule (V.3.0)	AEC Software 800-346-9413; 703-450-1980	Apple Macintosh Plus; NeXT/NextStep	L
FastTrack Schedule for Windows (V.2.1)	AEC Software 800-346-9413; 703-450-1980	Windows 3.X	L
FasTracs for Windows (V.2.0)	Applied MicroSystems, Inc. 800-998-1979; 404-552-9000	Windows 3.X	L
Finest Hour (V.5.1)	Primavera Systems, Inc. 800-423-0245; 610-667-8600	PC-MS/DOS	H
Focman (Focus Project Management System)	Information Builders, Inc. 800-969-INFO; 212-736-4433	DEC VAX/VMS; IBM 370, 30XX, 43XX/VM/CMS, MVS/TSO, CICS	H
GanttChart	PRISMA Software Corp. 800-437-2685; 319-266-7141	Windows 3.X	L
Graneda Personal for Windows	American Netronic, Inc. 800-4GRANEDA	Windows 3.X	L
Graneda Professional (V.6.1)	American Netronic, Inc. 800-4GRANEDA	PC-MS/DOS; Sun/SunOS; IBM/MVS/TSO, DEC VAX	H
Great Gantt! (V.1.4)	Varcon Systems, Inc. 800-266-6700; 619-563-6700	Apple Macintosh	L
Greatt Gantts	InverComp Software 916-344-7630	PC-MS/DOS	L
Guide Line (V.1.0)	Symantec Corp. 800-441-7234; 408-253-9600	PC-MS/DOS	L
Guide Line for Windows (V.1.0)	Symantec Corp. 800-441-7234; 408-253-9600	Windows 3.X	L
HyperProject (V.2.0)	HyperProject, Inc. 818-831-0404	Apple Macintosh	L
HyperProject Lite (V.2.0)	HyperProject, Inc. 818-831-0404	Apple Macintosh	L
iNNOVATIONS! Project Manager	WorkFlow Technologies, Inc. 512-918-0911	PC-MS/DOS	H
iNNOVATIONS! Project Manager for Windows	WorkFlow Technologies, Inc. 512-918-0911	Windows 3.X	H
InstaPlan EMS (V.4.1.2)	Micro Planning International, Inc. 800-852-7526; 303-757-2216	PC-MS/DOS	L
InterPlan	InterPlan 513-451-5956	PC; AT&T UNIX System V; Sun; SCO UNIX; XENIX; Unisy; OS/2;	H
Issues Management System	Commonwealth Research Group 313-459-4999	IBM AS/400/OS/400	H
K.I.S.S. (Keep It Scheduled Simply)	Diamond Computer Co. 214-676-2998	PC-MS/DOS	L
M2M (Critical Path Project Management)	MC2 Engineering Software 305-665-0100	PC-MS/DOS	L
MacProject Pro (V.1.5)	Claris Corp. 800-544-8554; 800-668-8948 (CD)	Apple Macintosh	L
ManagePro for Macintosh (V.2.1)	Avantos Performance Systems, Inc. 800-282-6867	Apple Macintosh SE/30, PowerBook	L
ManagePro for Windows (V.2.1)	Avantos Performance Systems, Inc. 800-282-6867	Windows 3.X	L
Manta (V.3.05)	B.A. Intelligence Networks, Inc. (BAIN) 800-799-7419	AT&T UNIX System V; DEC OpenVMS	*

Product	Vendor	Platform	Cat
Manta for Windows (V.3.05)	B.A. Intelligence Networks, Inc. (BAIN) 800-799-7419	Windows 3.X	*
Manta for Windows NT (V.3.05)	B.A. Intelligence Networks, Inc. (BAIN) 800-799-7419	Windows NT	*
MicroMan II Project and Staff Management System	Protellicess 310-393-4552	PC-MS/DOS; OS/2	H
MicroMan II Project and Staff Management System for Windows (Rel.3.0)	Protellicess 310-393-4552	Windows 3.X	L
Micro Planner for Windows (V.6.24)	Micro Planning International, Inc. 800-852-7526; 303-757-2216	Windows 3.X	L
Micro Planner Manager (V.1.2)	Micro Planning International, Inc. 800-852-7526; 303-757-2216	Apple Macintosh Plus, SE, II; Sun	L
Micro Planner Professional (V.7.3.8)	Micro Planning International, Inc. 800-852-7526; 303-757-2216	PC-MS/DOS	H
Micro Planner X-Pert (V.2.2)	Micro Planning International, Inc. 800-852-7526; 303-757-2216	Apple Macintosh Plus, SE, SE/30, II	H
Microsoft Project (V.4.0)	Microsoft Corp. 800-426-9400; 206-882-8080	PC-MS/DOS	L
Microsoft Project for Macintosh (V.3.0)	Microsoft Corp. 800-426-9400; 206-882-8080	Apple Macintosh Plus, Classic, LC, SE, II Series, Quadra, PowerBook	L
Microsoft Project for Macintosh (V.4.0)	Microsoft Corp. 800-426-9400; 206-882-8080	Mac Plus, Classic, LC, SE, II series, Quadra, PowerBook, Power Mac	L
Microsoft Project for Windows (V.4.0)	Microsoft Corp. 800-426-9400; 206-882-8080	Windows 3.X	L
MultiProject Plus	Technisoft 508-255-7900	PC; AT&T UNIX System V; Unisys; DEC; IBM AS/400;	H
MULTITRAK Enterprise-Wide Work Management System	Work Management Solutions, Inc. 617-482-6677	IBM/MVS/CICS	H
On Target (V.1.0)	Symantec Corp. 800-441-7234; 408-253-9600	Windows 3.X	H
Open Plan (V.5.1)	Welcom Software Technology 800-274-4WST; 713-558-0514	PC-MS/DOS	H
Open Plan Professional	Welcom Software Technology 800-274-4WST; 713-558-0514	Windows 3.X	H
OpenV*Scheduler	OpenVision Technologies, Inc. 800-223-OPEN; 510-426-6400	DEC VAX; HP 9000 series 700, 800; Sun; Sequent; IBM RS/6000	*
ORO Project Management Software System (V.1.3)	Nichols & Co., Inc. 310-574-3131	IBM 370, 30XX, 43XX, AS/400; PC-MS/DOS; HP 3000	H
ORO Project Management Software System for Win	Nichols & Co., Inc. 310-574-3131	Windows 3.X	H
PARISS Enterprise ViewPoint (V.6.0)	Computer Aided Management, Inc. 707-795-4100	Windows 3.X	H
Performa-Performance Management System Work and Resource	Michael-Delia, Inc. 619-792-3524	IBM/OS/MVS, MVS/XA, MVS/ESA, CICS; OS/2; PC-MS/DOS	*
Performa-Performance Management System Work and Resource Management for Win	Michael-Delia, Inc. 619-792-3524	Windows 3.X	*
Personal AS Project Management/2	IBM 800-426-3333	OS/2	L
PERT6	Dynamic Solutions, Inc. 914-949-6058	DEC 10, 20, VAX/TOPS-10, 20, VMS; Alpha	H
PERT/Time	Control Data Systems, Inc. 800-257-OPEN; 612-482-3434	Control Data CYBER/NOS/VE	H
PlanMan (V.1.0)	Inmax Publishing, Ltd. 604-980-9991	PC-MS/DOS	L

Categories
L: Price < $1000
H: Price > $1000
*Price not available

Product	Vendor	Platform	Cat
Plan & Track (V.3.5)	Mainstay 805-484-9400	Apple Macintosh series, Power Mac series	L
Plan & Track for Windows (V.3.5)	Mainstay 805-484-9400	Windows 3.X	L
PMS80 Advanced Package (V.6.3)	Pinnell Busch, Inc. 503-293-6280	PC; SCO UNIX; DEC/ULTRIX; Sun; 386/ix; AT&T UNIX Sys V	H
PMS80 Basic Package (V.6.3)	Pinnell Busch, Inc. 503-293-6280	PC; SCO UNIX; DEC; Sun; 386/ix; AT&T UNIX System V	H
Primavera Project Planner (P3) (V.5.1)	Primavera Systems, Inc. 800-423-0245; 610-667-8600	PC-MS/DOS	H
Primavera Project Planner for Windows (P3) (V.1.1)	Primavera Systems, Inc. 800-423-0245; 610-667-8600	Windows 3.X	H
Primavera SureTrak Project Manager	Primavera Systems, Inc. 800-423-0245; 610-667-8600	PC-MS/DOS	L
Project/2	Project Software & Development,Inc. 800-366-7734; 617-661-1444	DEC VAX/VMS; IBM 370, 30XX, 43XX/MVS, VS1, VM/CMS	H
Project/2 Series X (P/X) (V.1.2.2)	Project Software & Development,Inc. 800-366-7734; 617-661-1444	DEC VAX/VMS; Sun SPARCstation/SunOS, Solaris	H
Project/2 Series X (P/X) for Windows (V.1.2.2)	Project Software & Development,Inc. 800-366-7734; 617-661-1444	Windows 3.X	H
Project Accounting Management System/On-Line	GBA Systems 800-422-3267; 910-668-4555	IBM AS/400	*
ProjectBase (V.5.0)	Kapur International, Inc. 510-275-8000	PC/MS-DOS	H
Project Control One	Dynacomp, Inc. 800-828-6772; 716-265-4040	PC-MS/DOS	L
Project KickStart (V.1.0)	Experience In Software, Inc. 800-678-7008; 510-644-0694	PC-MS/DOS	L
Project Management /Job Cost	IBES Corp. 214-732-0015	AT&T UNIX System V; DEC/ULTRIX	H
Project Outlook (V.4.0)	Cambridge Management Systems 617-288-2900	Windows 3.X	L
Project Planner (Pert & CPM) (V.9.0)	Lionheart Press, Inc. 602-396-0899	PC-MS/DOS; Apple Macintosh	L
Project Planning and Scheduling	Personally Developed Software, Inc. 800-426-7279; 203-237-4504	PC-MS/DOS	L
ProjecTrak for Notes	Eden Communications, Inc. 212-489-2450	OS/2; Sun/SunOS; Apple Macintosh	L
ProjecTrak for Notes - Windows Version	Eden Communications, Inc. 212-489-2450	Windows 3.X	L
Project Scheduler 5	Scitor Corp. 415-570-7700	Apple Macintosh; PC-MS/DOS; OS/2	L
Project Scheduler 5XL	Scitor Corp. 415-570-7700	OS/2; PC-MS/DOS	L
Project Scheduler	Baarns Publishing 800-377-9235; 818-837-1441	Apple Macintosh; PC-MS/DOS	L
Project Scheduler with Critical Path	Baarns Publishing 800-377-9235; 818-837-1441	Apple Macintosh; PC-MS/DOS	L
Project: Vision (V.1.2)	Inmax Publishing, Ltd. 604-980-9991	PC-MS/DOS	L
Project Visualization System (PVS) for Win	IntelligenceWare, Inc. 800-888-2996; 310-216-6177	Windows 3.X	H
PROMIS (V.4.1)	Cambridge Management Systems 617-288-2900	PC-MS/DOS	H
PromisLAN (V.4.0)	Cambridge Management Systems 617-288-2900	PC-MS/DOS	H
ProTracs Professional (V.2.0)	Applied MicroSystems, Inc. 800-998-1979; 404-552-9000	PC-MS/DOS	L

Product	Vendor	Platform	Cat
Q.M.P.M.	Compu-Scan Technology, Inc. 905-770-8999	PC-MS/DOS	L
Quick Gantt (V.1.1)	Concord Business Tools 800-536-6677	PC-MS/DOS	L
Qwiknet Professional (Rel.3.0)	Project Software & Development,Inc. 800-366-7734; 617-661-1444	PC-MS/DOS; DEC VAX, VAXstation/VMS	H
Resource Library	Kapur International, Inc. 510-275-8000	PC/MS-DOS	L
SAM:Batch	Software Clearing House, Inc. 800-SAY-UNIX; 513-579-0455	IBM RS 6000; Motorola; Sun; AT&T UNIX System V;	*
SAS/OR Software	SAS Institute Inc. 919-677-8000	Mainframe, workstation	*
SAS/OR Software for Windows	SAS Institute Inc. 919-677-8000	Windows 3.X	*
SAS/OR Software for Windows NT	SAS Institute Inc. 919-677-8000	Windows NT	*
Schedule Graphics II (SGII)	Project Dimensions, Inc. 714-476-2246	PC-MS/DOS	L
Schedule Publisher (V.4.1)	Advanced Management Solutions, Inc. 800-794-1534	Apple Macintosh; PC-MS/DOS;	H
Schedule Publisher for Windows (V.3.0)	Advanced Management Solutions, Inc. 800-794-1534	Windows 3.X	H
Scheduling System Level 2 (V.5.2)	AlderGraf Systems, Inc. 713-467-8500	PC-MS/DOS	L
Scheduling System Level 3 (V.5.2)	AlderGraf Systems, Inc. 713-467-8500	PC-MS/DOS	L
Scheduling System Level 4 (V.5.2)	AlderGraf Systems, Inc. 713-467-8500	PC-MS/DOS	H
SDM-ProjectMaster	Silvon Software, Inc. 800-874-5866; 708-655-3313	IBM AS/400/OS/400	*
SLIM-Control	Quantitative Software Management, Inc. 800-424-6755	PC-MS/DOS	*
SQL*Time Project Accounting/ Management	Design Data Systems Corp. 800-655-6598; 813-539-1077	386/ix; DEC PDP-11, VAX; NeXT; Harris; HP; Unisys; NCR; Wang VS; Macintosh;	H
STARpro	Design Consultants, Inc. 800-697-5750	IBM 30XX, 43XX/CICS, TSO; DEC VAX/VMS	H
Star Watch COSMOS (V.3.10)	Pathfinder, Inc. 609-424-7100	PC-MS/DOS	H
Status!	Stonefield Systems Group, Inc. 800-563-1119; 306-586-3341	PC-MS/DOS	H
TaskMaster (V.1.5)	Lighthouse Design, Ltd. 800-366-2279; 415-570-7736	NextStep/Intel	H
TeamProject for Windows (V.2.1)	Strategic Systems, Inc. 800-541-TEAM; 312-541-8326	Windows 3.X	*
Time Line for Windows (V.6.1)	Symantec Corp. 800-441-7234; 408-253-9600	Windows 3.X	L
Time Machine (V.3.2)	Diversified Information Services, Inc. 800-333-1979	PC-MS/DOS	H
TIMETABLE	AccuraTech, Inc. 713-960-9385	PC-MS/DOS; AT&T UNIX System V	H
TOPS/Schedule	Hollander Associates 714-879-9000	IBM mainframe, S/3X, AS/400; DEC VAX/VMS;	H
Total Project Management (V.2.0)	Applied Business Technology Corp. 800-4-PROJECT	Windows 3.X	H
Track It	Zohn Consultants 408-578-4881	PC-MS/DOS	L
TrackStar (V.3.0)	T and B Computing, Inc. 313-930-3800	DEC VAX/VMS; HP 9000/HP-UX; Sun SPARCstation/SunOS	H

Categories
L: Price < $1000
H: Price > $1000
*Price not available

Product	Vendor	Platform	Cat
TrackTime (V.3.0)	T and B Computing, Inc. 313-930-3800	DEC VAX/VMS; HP 9000/HP-UX; Sun SPARCstation/SunOS	H
Trak (V.4.1)	MarCon & Associates, Inc. 800-477-8725; 214-343-3892	IBM 370, 30XX, 43XX, TSO, DOS/VSE, OS/MVS/XA	H
Trakker CAMS (V.2.9)	Dekker, Ltd. 800-4DEKKER	PC-MS; DEC VAX; NCR; Sun; HP	H
Trakker CAMS for Windows	Dekker, Ltd. 800-4DEKKER	Windows 3.X	H
Trakker Executive Management System	Dekker, Ltd. 800-4DEKKER	PC-MS; DEC VAX; NCR; Sun; HP	H
Trakker for Windows	Dekker, Ltd. 800-4DEKKER	Windows 3.X	H
Ultra PLANNER	Productivity Solutions, Inc. 508-359-1300	DEC VAX, VAXstation, DECstation; Sun; HP; IBM	H
VAX Software Project Manager	Digital Equipment Corp. (DEC) 800-344-4825	DEC VAX, MicroVAX, VAXstation/VMS,	H
ViewPoint (V.6.0)	International Microcomputer Software, Inc. (IMSI) 800-833-4674;	Windows 3.X	L
WBS Chart for Project (V.2.1)	Jim Spiller & Associates 707-425-2484	Windows 3.X	L
WINGS II Project Management System	AGS Management Systems, Inc. 800-220-2471	IBM 30XX, 43XX/MVS/TSO, VM/CMS	H
XPM (V.4.1)	XPM Partners, Inc. 800-416-3402; 714-707-4720	PC-MS/DOS; HP/HP-UX; Sun /SunOS, Solaris; IBM/AIX; Mac;	*
XPM for Windows (V.4.1)	XPM Partners, Inc. 800-416-3402; 714-707-4720	Windows 3.X	*
XPM for Windows NT (V.4.1)	XPM Partners, Inc. 800-416-3402; 714-707-4720	Windows NT	*

Software Cost Estimation Technology Product List

Product	Vendor	Platform
AEM	Koch Productivity Consulting 410-838-8721	DOS/Windows, OS2
CA-Estimacs	Computer Associates Int., Inc. 201-585-6720	PC (286, 386, 486, etc.) MS-DOS, Windows 3.x
CA-FPXpert	Computer Associates Int., Inc. 201-585-6720	MS-DOS
CA-Metrics	Computer Associates Int., Inc. 201-585-6720	IBM, MS-DOS
CA-Planmacs	Computer Associates Int., Inc. 201-585-6720	PC-MS/DOS
CA-Project Navigation	Computer Associates Int., Inc. 201-585-6720	MS-DOS
CB COCOMO	Decisioneering, Inc. 303-337-3531	Mac/Windows, Excel, Lotus 1-2-3
CHECKPOINT	Software Productivity Research, Inc. 617-273-0140	IBM or compatible (386 min) HP7XX & 8XX, Sun SPARC, Windows Rel. 3
COCOMOID	Air Force Cost Center 513-257-4624	MS-DOS
CoCoPro	Iconix Software Engineering, Inc. 310-458-0092	Macintosh
COSTAR	Softstar Systems 603-672-0987	DEC VAX, VAXstation,Micro VAX/VMS, PC-MS/DOS
COSTMODL	COSMIC 706-542-3265	IBM, HP7XX & 8XX, Sun SPARC, Motorola MPC (88000 or 88100)
Crystal Ball	Decisioneering 303-337-3531	Mac/Windows
GECOMO Plus	Marconi Systems Technology 703-263-1260	VMS, Unix OSF Motif, Windows
Micro Man ESTI-MATE	Protellicess Software 310-393-4552	MS-DOS, PC-Windows
PRICE S	Martin Marietta PRICE Systems 800-437-7423	Unix/Motif or MS Windows
Project Base	Kapur International, Inc. 510-275-8000	PC/MS-DOS
Project Bridge	Applied Business Technology Corp. 800-444-0724	MS-DOS/MS Win
REVIC	Air Force Cost Analysis Agency 703-746-5865	MS-DOS
SASET	Air Force Cost Analysis Agency 703-746-5865	MS-DOS
SECOMO	IIT Research Institute 315-339-7004	IBM PC, MS-DOS, VAX/VMS 3.2+
SEER-HLC	Galorath Associates, Inc. 310-670-3404	PC-MS/DOS
SEER-SEM	Galorath Associates, Inc. 310-670-3404	IBM PC, Macintosh, SUN, Windows 3.1 or higher, Sys 7, Unix
SEER-SSM	Galorath Associates, Inc. 310-670-3404	IBM PC, DOS 3.0+

Product	Vendor	Platform
SIZE Planner	Quantitative Software Mgt., Inc. 703-790-0055	IBM, PC/Windows 3.1, SUN
SIZE Plus	Marconi Systems Technology 703-263-1260	VMS, Unix OSF Motif, X-Win
SLIM	Quantitative Software Management, Inc. 703-790-0055	IBM PC/Windows 3.1, Windows NT, Windows for Workshops, OS/2
SLIM Control	Quantitative Software Management, Inc. 703-790-0055	IBM PC, Windows for Workgroups, Windows NT, OS/2
SPQR/20	Software Productivity Research, Inc. 617-273-0140	MS-DOS
SWAN	IIT Research Institute 315-339-7004	MS-DOS
VAX Software Project Manager (V.1.2)	Digital Equipment Corp. 800-344-4825	DEC VAX, Micro VAX, VAXstation/VMS, Micro VMS

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APPENDIX C: PRODUCT SHEETS (PROJECT MANAGEMENT)

INTRODUCTION

This Appendix contains product sheets for various project management followed by the more prominent software cost estimation tools. The information contained in these sheets was provided by each tool's vendor in response to a questionnaire distributed by the STSC project management team, and is arranged alphabetically by tool name. This information is more comprehensive than that provided in the long list and contains specific information about the tool, including recommended configuration, vendor information, and a description of the tool.

The product information is designed to help users make preliminary assessments about the tools. (Vendors are invited to provide updated information or information for tools not included.) Contact the STSC for unpublished product sheets that may be available.

The Project Management product sheets begin on the following page (C-2), and the Software Cost Estimation product sheets begin on page C-61.

NOT AVAILABLE IN ELECTRONIC VERSION

Acquisition & Logistics Planning Support System (ALPSS) Program Control Corp.

Product Statistics:

Version:	2.1
Last Release:	1994
First Release:	1970
Update Freq:	
Total Sold:	75

Vendor Profile:

Address:	913 West Alene Ave., Ste. C
Address:	Ridgecrest, CA 93555
Phone Number:	6144464600
Fax Number:	6194464607
BBS Number:	None
In Business:	1967
Tech Contact:	J.C. Jones
Phone:	619464600
Fax	619-446-6807
E-mail Address:	
Mkt Contact:	J.C. Jones
Phone No:	619-446-6800
Fax No:	6194464607
E-mail:	

Pricing Information:

Single User:	$750+
Multi-user:	Negotiable
Reg Maintenance:	12% List Price
Site License?:	Yes
GSA?:	No

System Configurations:

Recommended:	
HW/OS Platform:	80386+/MS-DOS
RAM:	640KB
HD Storage:	10 MB

Minimum:	
HW/OS Platform:	80386+/MS-DOS
RAM:	640KB
HD Storage:	10 MB

Multi-Platform/Environment Support:

Hardware Platform	*Software Platform:*	*Network Support:*
PC (286, 386, 486, etc.)	MS-DOS	
VAX	VMS	
Macintosh	Mac system	
HP/Apollo	UNIX	
Mainframe	MV	

Application Areas:

- Project Planning & Control
- Risk Analysis
- Work Group Management
- Multi-Project Management
- Customized Reporting
- Presentation/Graphics

Integration Capabilities:

- Standard Import/Export
- spreadsheet
- Word Processor
- MIS
- Presentation/Graphics
- Visual Basic

Product Training:

Source:	Prog. Control Corp.
Location:	Onsite/Offsite
Price Range:	$750+/day
Topics:	PM Theory
	Application Specific

Product Description:

A comprehensive user friendly management system specifically designed to cover all aspects of the acquisition and life-cycle requirements specified in the Department of Defense 5000 series of instructions. This includes Critical Path Scheduling, Integrated logistics Support, and Life-cycle costing.

Product Statistics:

Version:	
Last Release:	1993
First Release:	1992
update Freq:	Annually
Total Sold:	

Vendor Profile:

Address:	186 Lincoln St.
Address:	Boston, MA 02111
Phone Number:	800-724-9332
Fax Number:	617-695-1935
BBS Number:	
In Business:	1991
Tech Contact:	
Phone:	800-724-9332
fax	617-695-1935
E-mail Address:	
MM Contact:	Debbie Pendleton
Phone No:	800-724-9332
Fax No:	617-696-1936
E-mail:	

Pricing Information:

Single User:	$45
Multi-user:	
Reg Maintenance:	
Site License?:	Yes
GSA?:	

System Configurations:

Recommended:

HW/OS Platform: 80486/MS-DOS
RAM:
HD Storage:

Minimum:

HW/OS Platform:
RAM:
HD Storage:

Multi-Platform/Environment Support:

Hardware Platform *Software Platform:* *Network Support:*

Application Areas:

Risk Analysis
Work Group Management
Multi-Project Management

ntegration Capabilities:

Spreadsheet

Product Training:

Source:
Location:
Price Range:
Topics:

Product Description:

Artemis **I/CSCS for Windows** — Lucas Management Systems

Product Statistics:

Version:	3.1
Last **Release:**	1994
First Release:	1966
Update Freq:	**Annually**
Total Sold:	4000

'ricing Information:

Single **User:**	**$3,000+**
Multi-user:	
Rag **Maintenance:**	15% List Price
Site License?:	Y e s
GSA?:	No

/endor Profile:

Address:	12701 Fair Lakes Circle, Ste. 360
Address:	Fairfax, VA 220334914
Phone Number:	**800-477-6648**
Fax Number:	**703-222-8203**
BBS Number:	
In Business:	1976
Tech Contact:	
Phone:	**800-477-6648**
Fax:	**703-222-8203**
E-mail Address:	
Mkt Contact:	
Phone No:	**800-477-6648**
Fax No:	703-m-6203
E-mail:	

System Configurations:

Recommended:

HW/OS Platform:	**80486/Windows** 3.x
RAM:	16 MB
HD **Storage:**	40MB

Minimum:

HW/OS Platform:	**80386/Windows** 3.x
RAM:	4MB
HD **Storage:**	**40 MB**

Multi-Platform/Environment Support:

Hardware Platform

PC **(286, 386, 486,** etc.)
VAX
SUN
HP/Apollo

Software Platform:

Windows 3.x
VMS
UNIX

Network Support:

Novell Netware
DEC Pathworks
IBM LAN **Server**
Windows NT
LAN **Manager**
Banyan Vines

Application Areas:

Project Planning **& Control**
Project Accounting
Work Group Management
Multi-Project **Management**
Presentation/Graphics

Integration Capabilities:

Spreadsheet
Word Processor
Presentation/Graphics
MIS
Visual Basic

Product Training:

Source:	Lucas **Mgmt** sys
Location:	**Onsite/Offsite**
Price Range:	**$1,500+**
Topics:	

Product Description:

Enterprise-wide budgeting, **earned value,** management by **exception** functionality. **True client-server architecture. Provides** true SQL data **storage,** and open **systems technologies.**

Artemis Prestige for Windows **Lucas Management Systems**

Product Statistics:

Version:	2.1
Last Release:	1994
First Release:	1991
Update Freq:	Semi-Annually
Total Sold:	20000

Pricing Information:

Single User:	$3,000+
Multi-user:	
Reg Maintenance:	15% List Price
Site License?:	Yes
GSA?:	No

/endor Profile:

Address:	12701 Fair takes Ciroie, Ste. 350
Address:	Fairfax, VA 220334914
Phone Number:	800-477-6648
Fax Number:	7032226203
BBS Number:	
In Business:	1976
Tech Contact:	
Phone:	800-477-6648
Fax:	7032226203
E-mail Address:	
Mkt Contact:	
Phone No:	800-477-6648
Fax No:	7032226203
E-mail:	

System Configurations:

Recommended:

HW/OS Platform:	80486/Windows 3.x
RAM:	16 MB
HD Storage:	40MB

Minimum:

HW/OS Platform:	80386/Windows 3.x
RAM:	4MB
HD Storage:	40MB

Multi-Platform/Environment Support:

Hardware Platform

PC (286, 386, 486, etc.)
VAX
SUN
HP/Apollo

Software Platform:

Windows 3.x
VMS
UNIX

Network Support:

Novell Netware
DEC Pathworks
IBM LAN Server
Windows NT
LAN Manager
Banyan Vines

Application Areas:

Project Planning & Control
Project Accounting
Work Group Management
Muiti-Project Management
Presentation/Graphic

'ntegration Capabilities:.

Spreadsheet
Word Processor
Presentation/Graphics
MIS
Visual Basb

Product Training:

Source:	Lucas Mgmt Sys
Location:	Onsite/Offsite
Price Range:	$1,500+
Topics:	

Product Description:

Enterprise-wide planning, scheduling. earned value, management by exception functionality. Trua client-server architecture. Provides true SQL data storage, and open systems technologies.

Artemis Time Reporting for Windows — Lucas Management Systems

Product Statistics:

Version:	3
Last Release:	1993
Arst Release:	
Update Freq:	
Total Sold:	4000

Vendor Profile:

Address:	12701 Fair Lakes Cirde, Ste. 350
Address:	Fairfax, VA 220334914
Phone Number:	800-477-6648
Fax Number:	703-222-8203
BBS Number:	
In Business:	1978
Tech Contact:	
Phone:	800-477-6648
Fax	703-222-8203
E-mail Address:	
Mkt Contact:	
Phone No:	800-477-6648
Fax No:	703-m-8203
E-mail:	

Pricing Information:

Single User:	$3,000+
Multi-user:	
Reg Maintenance:	15% List Price
Site License?:	Yes
GSA?:	No

System Configurations:

	Recommended:	*Minimum:*
HW/OS Platform:	80486/Windows 3x	80386/Windows 3.x
RAM:	8MB	4MB
HD Storage:	20MB	40MB

Multi-Platform/Environment Support:

Hardware Platform	*Software Platform:*	*Network Support:*
PC (286, 386, 486, etc.)	Windows 3.x	Novell Netware
VAX	VMS	DEC Pathworks
SUN	UNIX	IBM LAN Server
HP/Apollo		Windows NT
		LAN Manager
		Banyan vi

Application Areas:

- Project Planning & Control
- Project Accounting
- Work Group Management
- Multi-Project Management
- Presentation/Graphics

Integration Capabilities:

- Spreadsheet
- Word Processor
- Presentation/Graphics
- MIS
- Visual Basic

Product Training:

Source:	Lucas Mgmt Sys
Location:	Onsite/Offsite
Price Range:	$1,500+
Topics:	

Product Description:

Product Statistics:

version:	1.01
Last Release:	1994
First Release:	1994
Update Freq:	Quarterly
Total Sold:	

Vendor Profile:

Address:	31 Decker Rd.
Address:	Newfield, NY 14867
Phone Number:	607-277-8000
Fax Number:	607-277-8001
BBS Number:	607-272-5228
In Business:	1984
Tech Contact:	Joseph Presco
Phone:	607-277-8000
Fax	607-277-8001
E-mail Address:	
Mkt Contact:	Joseph Presco
Phone No:	607-277-8000
Fax No:	607-277-8001
E-mail:	

Pricing Information:

Single User:	$695
Multi-user:	?
Reg Maintenance:	$150
Site License?:	Yes
GSA?:	No

System Configurations:

Recommended;

HW/OS Platform:	80486/Windows 3.x
RAM:	8 MB
HD Storage:	3MB

Minimum:

HW/OS Platform:	80286/Windows 3.x
RAM:	4MB
HD Storage:	3 MB

Multi-Platform/Environment Support:

Hardware Platform

PC (286, 386, 486, etc.)

Software *Platform:*

Windows 3.x

Network Support:

Novell Netware
DEC Pathworks
IBM LAN Server
Windows NT
LAN Manager
Banyan Vines
Lantastic
LANStep

Application Areas:

Project Planning & Control
Risk Analysis

ntegration Capabilities:

Standard Import/Export
OLE/DDE
Spreadsheet
Presentation/Graphics

Product Training:

Source:	N/A
Location:	N/A
Price Range:	N/A
Topics:	N/A

Product Description:

An add-in for Microsoft Project that allows you to add risk analysis via Monte Carlo simulation to your project model.

Business/XL Project Accounting — Smith, Dennis & Gaylord, inc.

Product Statistics:

Version:	A.01
Last Release:	1994
Rrst Release:	1996
Update Freq:	Annually+
Total Sold:	60

Vendor Profile:

Address:	3211 Scott Blvd.
Address:	Sante Clara, CA 95054
Phone Number:	406-727-l 670
Fax Number:	408-987-5716
BBS Number:	
In Business:	1973
Tech Contact:	
Phone:	406-727-l 670
Fax:	408-987-5716
E-mail Address:	
MM Contact:	Barbara Nelson
Phone No:	
Fax No:	
E-mail:	

Pricing Information:

Single User:	Contact Vendor
Multi-user:	Contact Vendor
Reg Maintenance:	Contact Vendor
Site License?:	No
GSA?:	

System Configurations:

Recommended:

HW/OS Platform:	HP 3000/MPE
RAM:	Contact Vendor
HD Storage:	Contact Vendor

Minimums

HW/OS Platform:	Contact vendor
RAM:	
HD Storage:	

Multi-Platform/Environment Support:

Hardware Platform	*Software Platform:*	*Network Support:*
PC (266, 366.466, etc.)	Windows *3.x*	Novell Netware
HP3000-9000	UNIX	
Mini-computer	MPE	
	HP-UX	
	Tandem	

Application Areas:

- Project Planning & Control
- Project Accounting
- Multi-Project Management
- Customized Reporting
- Presentation/Graphics

Integration Capabilities:

- Standard Import/Export
- Spreadsheet
- Visual Basic

Product Training:

Source:	Vendor
Location:	Onsite/Off sits
Price Range:	Contact Vendor
Topics:	Application Specific
	Report Writing

Product Description:

State-of-the-art financial and project accounting system that provides information by project job, contract, or user-defined elements. Unique project analysis in Windows client-server environment including sophisticated project summary, drill down, copy and paste, graphing, etc.

Cadence ProjectMaster

CADENCE Management Corp.

Product Statistics:

Version:	1.13
Last Release:	1994
First Release:	1967
Update Freq:	Semi-Annually
Total Sold:	

Jendor Profile:

Address:	9020 S.W. Washington Square Rd., Ste. 46
Address:	Portland, OR 97223-4426
Phone Number:	800-448-0173
Fax Number:	503-641-4345
BBS Number:	
In Business:	1963
Tech Contact:	Jay Christensen
Phone:	800-448-0173
Fax:	503-641-4345
E-mail Address:	
Mkt Contact:	Jay Christensen
Phone No:	800-448-0173
Fax No:	503-641-4345
E-mail:	

'ricing Information:

Single User:	$295
Multi-user:	Contact Vendor
Reg Maintenance:	30
Site License?:	Yes
GSA?:	No

System Configurations:

Recommended:

HW/OS Platform:	80486/Windows 3.x
RAM:	4MB
HD Storage:	1 MB

Minimum:

HW/OS Platform:	80386/Windows 3.x
RAM:	512 KB
HD Storage:	600 KB

Multi-Platform/Environment Support:

Hardware Platform

PC (286, 386, 486, etc.)

Software Platform:

Windows 3.x

MS-DOS 5.0

Network Support:

Application Areas:

Project Planning & Control

Work Group Management

Presentation/Graphics

Integration Capabilities:

Standard Import/Export

Product Training:

Source:	CADENCE Management Corp.
Location:	Onsite
Price Range:	$1,750+
Topics:	Application Specific

Product Description:

Helps control project scheduling activities. Assumptions regarding task duratfon can be attached to each task Graphically identities who is responsible for all task activities on the project

CFMS

Harper and Shuman, Inc.

Product Statistics:

Version:	2
Last Release:	1994
First Release:	1992
Update Freq:	Annually
Total Sold:	3300

Vendor Profile:

Address:	68 Moulton st
Address:	Cambridge, MA 02136
Phone Number:	617-492-4410
Fax Number:	617-876-2973
BBS Number:	
In Business:	1973
Tech Contact:	
Phone:	617424410
Fax	617-876-2973
E-mail Address:	
Mkt Contact:	B. Budow
Phone No:	
Fax No:	
E-mail:	

Pricing Information:

Single User:	$25,000
Multi-user:	
Reg Maintenance:	
Site License?:	Yes
GSA?:	

System Configurations:

Recommended:

HW/OS Platform:
RAM:
HD Storage:

Minimum:

HW/OS Platform:
RAM:
HD Storage:

Multi-Platform/Environment Support:

Hardware Platform	*Software Platform:*	*Network Support:*
VAX	VMS	DEC Pathworks
Alpha AXP		

Application Areas:

Project Planning 8 Control
Project Accounting

Integration Capabilities:

Product Training:

Source:
Location:
Price Range:
Topics:

Product Description:

A fully integrated project control system.

Comprehensive Planning and Control System — Cincom Systems, Inc.

Product Statistics:

Version:	3.3.3
Last Release:	1994
First Release:	1992
update Freq:	9-12 mo
Total Sold:	130

Vendor Profile:

Address:	2300 Montana Ave.
Address:	Cincinnati, OH 4521 1-3899
Phone Number:	800-543-3010
Fax Number:	513-481-8332
BBS Number:	
In Business:	1969
Tech Contact:	
Phone:	714-651-0740
Fax:	714-955-6581
E-mail Address:	
Mkt Contact:	Pradeep Anand
Phone No:	800-727-3525
Fax No:	
E-mail:	

Pricing Information:

Single User:	$1 8,000+
Multi-user:	
Reg Maintenance:	
Sits License?:	
GSA?:	

System Configurations:

Recommended:

HW/OS Platform:	
RAM:	
HD Storage:	

Minimum:

HW/OS Platform:	80386/Windows
RAM:	4 M B
HD Storage:	4MB

Multi-Platform/Environment Support:

Hardware Platform

- IBM Mainframes
- PC (396, 486, etc.)

Software Platform:

- *MVS*
- VSE
- CICS
- MS-DOS 5.0
- Windows 3.x

Network Support:

- Novell *Netware*
- DEC Pathworks
- IBM LAN Server
- Windows NT
- LAN Manager
- Banyan Vines
- Lantastic
- LANStep

Application Areas:

- Project Pianning & Control
- Risk Analysis
- Work Group Management
- Multi-Project Management
- Customized Reporting
- Presentation/Graphics

Integration Capabilities:

- Standard Import/Export
- Spreadsheet
- Word Processor
- Software Metrics
- MIS
- Presentation/Graphics

Product Training:

Source:	Cincom Systems
Location:	Onsite/Offsite
Price Range:	$1 ,000/day
Topics:	PM Theory
	Application Specific

Product Description:

Maintains data for ail projects, resources, requests, and documents in a central database on the mainframe. This makes it easy to generate reports. This also makes it easy to produce reliable project schedules because users do not have to resolve resource usage conflicts. CPCS does it for them. Functionality on the mainframe is extensive. On the PC, the product provides project planning and maintenance, and resource assignment capabilities among others.

CPCS Request Tracking System

Cincom Systems, Inc.

Product Statistics:

Version:	3.3.3
Last Release:	1994
First Release:	1992
Update Freq:	412 mo
Total Sold:	130

'ricing Information:

Single User:	$18,000+
Multi-user:	
Reg Maintenance:.	
Site License?:	
GSA?:	

Vendor Profile:

Address:	2300 Montana Ave.
Address:	Cincinnati, OH 4521 I-3899
Phone Number:	800-543-3010
Fax Number:	513-481-8332
BBS Number:	
In Business:	1968
Tech Contact:	
Phone:	714-651-0740
Fax	714-955-6581
E-mail Address:	
Mkt Contact:	Pradeep Anand
Phone No:	800-727-3525
Fax No:	
E-mail:	

System Configurations:

Recommended:

HW/OS Platform:	
RAM:	
HD Storage:	

Minimum:

HW/OS Platform:	80386/Windows
RAM:	4MB
HD Storage:	4MB

Multi-PlatformEnvironment Support:

Hardware Platform

IBM Mainframes
PC (386, 486, etc.)

Software Platform:

MVS
VSE
CICS
MS-DOS 5.0
Windows 3.x

Network Support:

Novel Netware
DEC Pathworks
IBM LAN Server
Windows NT
LAN Manager
Banyan Vines
Lantastic
LANStep

Application Areas:

Project Planning & Control
Risk Analysis
work Group Management
Multi-Project Management
Customized Reporting
Presentation/Graphics

Integration Capabilities:

Standard Import/Export
Spreadsheet
Word Processor
Software Metrics
MIS
Presentation/Graphics

Product Training:

Source:	Cinmm systems
Location:	Onsite/Off site
Price Range:	$1 ,000/day
Topics:	PM Theory
	Application Specific

Product Description:

Provides capabilities of induding project/task justification, explanations for deliverables, methods used, etc.: obtaining management approval, and inter-project communication. The product allows the acceptance or rejection of project work/deliverables. The information attachment capabilities assists user8 to easily analyze how the project is performing and make any necessary changes for improvement.

Critical Path **Project Management** **Dynacomp, Inc.**

Product Statistics:

Version:
Last Release: 1992
first Release: 1988
Update Freq:
Total Sold:

Vendor Profile:

Address: 178 Phillips Rd.
Address: Webster, NY 14580
Phone Number: 716-265-4040
Fax Number:
BBS Number:
In Business: 1978
Tech Contact
Phone:
Fax
E-mail Address:
Mkt Contact:
Phone No: 716-265-4040
Fax No:
E-mail:

Pricing Information:

single user: $280
Multi-user:
Rag Maintenance:
Site License?: Yes
GSA?:

System Configurations:

Recommended:
HW/OS Platform:
RAM:
HD Storage:

Minimum:
HW/OS Platform:
RAM:
HD Storage:

Multi-Platform/Environment Support:

Hardware Platform ***Software Platform:*** ***Network Support:***

Application Areas:

ntegration Capabilities:

Product Training:

Source: Manual
Location:
Price Range:
Topics:

Product Description:

CSW: PMDA (Performance Measurement Data Analysis) **Leckie Associates, Inc.**

Product Statistics:

Version:	4
Last Release:	1993
First Release:	1967
Update Freq:	
Total Sold:	

Pricing Information:

Single User:	$595
Multi-user:	
Reg Maintenance:	15% List Price
Site License?:	Yes
GSA?:	No

Vendor Profile:

Address:	P.O. Box 160
Address:	Merrimack, NH 03064
Phone Number:	603-424-7014
Fax Number:	603-429-3428
BBS Number:	
In Business:	1961
Tech Contact:	Don Leckie
Phone:	6196744201
Fax	619-674-4204
E-mail Address:	
Mkt Contact:	Jim Gerard
Phone No:	603-424-7014
Fax No:	603-429-3428
E-mail:	

System Configurations:

Recommended:

HW/OS Platform:	Macintosh/System
RAM:	1 MB
HD Storage:	700 KB

Minimum:

HW/OS Platform:	Macintosh
RAM:	1 MB
HD Storage:	700 KB

Multi-Platform/Environment Support:

Hardware Platform

PC (286, 386, 486, etc.)
Macintosh
SUN

Software Platform:

Windows 3.x
Mac System
UNIX (Sys V, SCO, etc.)
X-Windows

Network Support:

Appletalk
Multi-bunch, Single-user

Application Areas:

Performance Measurement

Integration Capabilities:

Standard Import/Export
Spreadsheet
Word Processor
Software Metrics
MIS

Product Training:

Source:	Leckie
Location:	Onsite/Offsite
Price Range:	$1,500+
Topics:	User-Tailored

Product Description:

One of several tools in the Cost/Schedule Workshop, analyzes CPR/CSSR cumulative performance measurement data by producin several analysis reports and charts. The data may be at any level of the WBS or OBS structure, from the work package level, to the cost account level, to the customer reporting level, to the total project level.

CSW:FEAC (Forecasted Estimate At Completion) **Leckie Associates, Inc.**

Product Statistics:

Version:	2
Last Release:	1993
First Release:	1987
Update Freq:	
Total Sold:	

Vendor Profile:

Address:	P.O. Box 180
Address:	Merrimack, NH 03054
Phone Number:	603-424-7014
Fax Number:	603-429-3428
BBS Number:	
In Business:	1 8 8 1
Tech Contact:	Don Leckie
Phone:	619-674-4201
Fax:	8148744204
E-mail Address:	
Mkt Contact:	Jim Gerard
Phone No:	603-424-7014
Fax No:	603-429-3428
E-mail:	

Pricing Information:

Single User:	$295
Multi-user:	
Reg Maintenance:	15% List Price
Site License?:	Yes
GSA?:	No

System Configurations:

Recommended:

HW/OS Platform:	Macintosh/System
RAM:	512 KB
HD Storage:	350 KB

Minimum:

HW/OS Platform:	Macintosh/System
RAM:	512 KB
HD Storage:	350 KB

Multi-Platform/Environment Support:

Hardware Platform

PC (288.388, 488, etc.)
Macintosh
SUN

Software Platform:

Windows 3x
Mac System
UNIX (Sys V, SW, etc.)
x-Windows

Network support:

Appletalk
Multi-launch, Single-user

Application Areas:

Performance Measurement

Integration Capabilities:

Standard Import/Export
Spreadsheet
Word Processor
Software Metrics
MIS

Product Training:

Source:	Leckie
Location:	Onsite/Offsite
Price Range:	$1,500+
Topics:	User-Tailored

Product Description:

One of several tools in the Cost/Schedule Workshop, provides information for testing the reasonability of the contractor's EAC. It may also be used to develop an EAC.

CSW:RAM (Responsibility Assignment Matrix) — **Leckie Associates, Inc.**

Product Statistics:

Version:	2
Last Release:	1993
First Release:	1989
Update Freq:	
Total Sold:	

Pricing information:

Single User:	$995
Multi-user:	
Reg Maintenance:	15% List Price
Site License?:	Yes
GSA?:	No

Vendor Profile:

Address:	P.O. Box 160
Address:	Merrimack, NH 03054
Phone Number:	603-424-7014
Fax Number:	603-429-3428
BBS Number:	
In Business:	1981
Tech Contact	Don Leckie
Phone:	619-674-4201
Fax	619-674-4204
E-mail Address:	
Mkt Contact:	Jim Gerard
Phone No:	603-424-7014
Fax No:	603-429-3428
E-mail:	

System Configurations:

Recommended:

HW/OS Platform:	Macintosh/System
RAM:	1.5 MB
HD Sbrage:	12MB

Minimum:

HW/OS Platform:	Macintosh
RAM:	1 MB
HD Storage:	12MB

Multi-Platform/Environment Support:

Hardware Platform

PC (286, 386, 486, etc.)
Macintosh
SUN

Software Platform:

Windows 3x
Mac system
UNIX (Sys V, SW, etc.)
X-Windows

Network Support:

Appletalk
Mu&launch, Single-user

Application Areas:

Project Planning & Control
Risk Analysis
Multi-Project Management
Presentation/Graphics

ntegration Capabilities:

Standard Import/Export
Spreadsheet
Word Processor
Software Metrics
MIS

Product Training:

Source:	Leckie
Location:	Onsite/Offsite
Price Range:	$1,500+
Topics:	User-Tailored

Product Description:

one of several tools ill the Cost/Schedule Workshop. Provides three dimensional project management matrixes, dictionaries, indexes, and risk assessments based upon project data for each WBS, OBS, and cost accountwithinaproject.

CSW:RAM (Responsibility Assignment Matrix) **Leckie Associates. Inc.**

Product Statistics:

Version:	3
Last Release:	1995
First Release:	1995
Update Freq:	
Total Sold:	

Vendor Profile:

Address:	P.O. Box 160
Address:	Merrimack, NH 03054
Phone Number:	603-424-7014
Fax Number:	603-429-3428
BBS Number:	
In Business:	1961
Tech Contact:	Don Leckie
Phone:	619-674-4201
Fax	619-674-4204
E-mail Address:	
Mkt Contact:	Jim Gerard
Phone No:	603-424-7014
Fax No:	603-429-3428
E-mail:	

Pricing information:

Single User:	$1495
Multi-user:	
Reg Maintenance:	15% List Price
Site License?:	Yes
GSA?:	No

System Configurations:

Recommended:

HW/OS Platform:	Macintosh/System
RAM:	1.5 MB
HD Storage:	1.2 MB

Minimum:

HW/OS Platform:	Macintosh
RAM:	1 MB
HD Storage:	1.2 MB

Multi-Platform/Environment Support:

Hardware Platform

PC (286, 386, 486, etc.)
Macintosh
SUN

Software *Platform:*

Windows 3.x
Mac System
UNIX (Sys V, SW, etc.)
x-Windows

Network Support:

Appletalk
Multi-launch, Single-user

Application *Areas:*

Project Planning & Control
Risk Analysis
Multi-Project Management
Presentation/Graphics
Project Accounting
Customized Reporting

ntegration Capabilities:

Standard Import/Export
Spreadsheet
Word Processor
Software Metrics
MIS

Product Training:

Source:	Leckie
Location:	Onsite/Offsite
Price Range:	$1,500+
Topics:	User-Tailored

Product Description:

RAM 3.0 combines functionality from version 2.0 with the following: Calendars, earned value techniques, planning packages, planning scenarios, resources, time-phased actuals, time-phased budgeting, time phased earned value, time phased rate analysis, time phased utilization analysis, vertical milestone scheduling, work pa&ages, and work scope down to work package level.

CSW:RAM (Responsibility Assignment Matrix) — **Leckie Associates, Inc.**

Product Statistics:

Version:	4
Last Release:	1995
First Release:	1995
Update Freq:	
Total Sold:	

Vendor Profile:

Address:	P.O. Box 160
Address:	Merrimack, NH 03954
Phone Number:	603-424-7014
Fax Number:	603-429-3428
BBS Number:	
In Business:	1961
Tech Contact:	Don Leckie
Phone:	6196744261
Fax:	6196744204
E-mail Address:	
Mkt Contact:	Jii Gerard
Phone No:	603-424-7014
Fax No:	6034293428
E-mail:	

Pricing Information:

Single User:	$1995
Multi-user:	
Reg Maintenance:	15% List Price
Site License?:	Yes
GSA?:	No

System Configurations:

Recommended:

HW/OS Platform:	Macintosh/System
RAM:	2MB
HD Storage:	1.9 MB

Minimum:

HW/OS Platform:	Macintosh
RAM:	1 MB
HD Storage:	1.9 MB

Multi-Platform/Environment Support:

Hardware Platform

PC (286, 386, 486, etc.)
Macintosh
SUN

Software Platform:

Windows 3.x
Mac System
UNIX (Sys V, SW, etc.)
X-Windows

Network Support:

Appletalk
Multi-launch, Single-user

Application Areas:

Project Planning & Control
Risk Analysis
Multi-Project Management
Presentation/Graphics
Project Accounting
Customized Reporting

Integration Capabilities:

Standard Import/Export
Spreadsheet
Word Processor
Software Metrics
MIS
Presentation/Graphics

Product Training:

Souroe:	Leckie
Location:	Onsite/Offsite
Prii Range:	$1,500+
Topics:	User-Tailored

Product Description:

RAM 4.0 combines all of the functionality offered in version 3.0 plus the following: Performance measurements reports & charts of CSW:PMDA, estimating capability of FEAC, and integration with CSW Risk/Producibility Assessment (RPA).

Product Statistics:

Version:	1.1
Last Release:	1994
First Release:	1992
update Freq:	Annually
Total Sold:	10

Vendor Profile:

Address:	2249 S. Brentwood Blvd.
Address:	St Louis, MO 63144
Phone Number:	800-348-8211
Fax Number:	314-444-7028
BBS Number:	
In Business:	
Tech Contact:	Kathy Anton
Phone:	314-968-9977
Fax:	314-968-5442
E-mail Address:	
Mkt contact	Kathy Anton
Phone No:	314-968-9977
Fax No:	314-968-5442
E-mail:	

Pricing Information:

Single User:	$99
Multi-user:	
Reg Maintenance:	
Site License?:	Yes
GSA?:	No

System Configurations:

Recommended:

HW/OS Platform:	80386+/Windows 3.X
RAM:	640 KB
HD Storage:	500 KB

Minimum:

HW/OS Platform:	80386+/Windows 3.X
RAM:	640 KB
HD Storage:	500 KB

Multi-Platform/Environment Support:

Hardware Platform
PC (286, 386, 486, etc.)

Software Platform:
MS-DOS
Windows 3x

Network Support:

Application Areas:
Project Planning & Control

ntegration Capabilities:
Standard Import/Export
OLE/DDE
Spreadsheet
MIS

Product Training:
Source:
Location:
Price Range:
Topics:

Product Description:

Utility for managing and tracking publication and documentation projects.

Everybody's Planner - Scheduling and Flowcharting **Dynacomp, Inc.**

Product Statistics:

Version:
Last Release: 1992
First Release: 1989
update Freq:
Total Sold:

Vendor Profile:

Address: 178 Phillips Rd.
Address: Webster, NY 14580
Phone Number: 716-265-4040
Fax Number:
BBS Number:
In Business:
Tech Contact:
Phone:
Fax
E-mail Address:
Mkt Contact:
Phone No: 716-265-4040
Fax No:
E-mail:

Pricing Information:

Single User: $100
Multi-user:
Reg Maintenance:
Site License?: Yes
GSA?:

System Configurations:

Recommended:
HW/OS Platform:
RAM:
HD Storage:

Minimum:
HW/OS Platform:
RAM:
HD Storage:

Multi-Platform/Environment Support:

Hardware Platform ***Software Platform:*** *Network Support:*

Application *Areas:*

Integration Capabilities:

Product Training:

Source: Manual
Location:
Prii Range:
Topics:

Product Description:

Product Statistics:

Version:	3.3
Last Release:	1994
First Release:	1991
update Freq:	Semi-Annually
Total Sdd:	100

Vendor Profile:

Address:	1060 first Ave., Ste. 400
Address:	King of Prussia PA 19406
Phone Number:	800-220-2471
Fax Number:	610-265-1230
BBS Number:	
In Business:	
Tech Contact:	
Phone:	
Fax:	
E-mail Address:	
Mkt Contact:	
Phone No:	
Fax No:	
E-mail:	

Pricing Information:

Single User:	$5,000
Multi-user:	Step-down pricing based on quantity
Reg Maintenance:	15% List Price
Site License?:	Yes
GSA?:	Yes

System Configurations:

Recommended:

HW/OS Platform:	80486/Windows 3.X
RAM:	4MB
HD Storage:	100 MB

Minimum:

HW/OS Platform:	80486/Windows 3.X
RAM:	6MB
HD Storage:	loo MB

Multi-Platform/Environment Support:

Hardware Platform

PC (286, 386, 486, etc.)

Software Platform:

Windows 3.x
OS/2

Network Support:

Novell Netware
DEC Pathworks
IBM LAN Server
Windows NT
LAN Manager
TCP/I P
NetBIOS

Application Areas:

Project Planning & Control
Software Cost Estimation
Risk Analysis
Project Accounting
Work Group Management
Multi-Project Management

Integration Capabilities:

Product Training:

Source:	AGS Mgmt Sys
Location:	Onsite
Price Range:	$1,400-$2,000/day
Topics:	PM Theory
	Application Specific

Product Description:

A process/project management system that integrates life cycle methololgies, project estimating, project management and tracking and time reporting.

FMS II Project Accounting — Mitchell Humphrey & Co

Product Statistics:

Version:
Last Release: 1967
First Release:
update Freq:
Total Sold: 40

Vendor Profile:

Address: 11720 Borman Dr., ste. 310
Address: St Louis, MO 63146-4192
Phone Number: 314-991-2440
Fax Number: 314-991-5288
BBS Number:
In Business:
Tech Contact:
Phone:
Fax:
E-mail Address:
Mkt Contact: Gina Ivener
Phone No:
Fax No:
E-mail:

Pricing Information:

Single User:
Multi-user:
Reg Maintenance:
Site License?: No
GSA?:

System Configurations:

Recommended:
HW/OS Platform:
RAM:
HD Storage:

Minimum:
HW/OS Platform:
RAM:
HD Storage:

Multi-Platform/Environment Support:

Hardware Platform
HP/Apollo

Software Platform:
MPE/iXX, HP-UX

Network Support:
Novell Netware
LAN Manager
Banyan Vines
TCP/IP
IPX/SPX
NFS
NetBIOS

Application Areas:

Project Accounting
Customized Reporting

Integration Capabilities:

Standard Import/Export
OLE/DDE
Spreadsheet

Product Training:

Source: M H & Co
Location: Onsite/Offsite
Price Range: $1,200/day
Topics: Both Standard and

Product Description:

A financial software solution.

Product Statistics:

Version:	1.1
Last Release:	1994
first Release:	1993
update Freq:	Semi-Annually
Total Sold:	1000

Vendor Profile:

Address:	810 Newport Center Dr., Ste. 410
Address:	Newport Beach, CA 82880
Phone Number:	714-780-8842
Fax Number:	714-760-2603
BBS Number:	
In Business:	1884
Tech Contact:	Ellen Walsh
Phone:	714-760-8642
Fax:	714-760-2603
E-mail Address:	
Mkt Contact:	Garry Jones
Phone No:	714-760-8642
Fax No:	714-760-2603
E-mail:	

Pricing Information:

Single User:	$495
Multi-user:	Volume Diiwunt
Reg Maintenance:	15% List Price
Site License?:	Yes
GSA?:	No

System Configurations:

Recommended:

HW/OS Platform:	80486/Windows 3.x
RAM:	8 MB
HD Storage:	10 MB

Minimum:

HW/OS Platform:	80386/Windows 3.x
RAM:	4MB
HD Storage:	5MB

Multi-Platform/Environment Support:

Hardware Platform

PC (286, 386, 486, *etc.)*
HP/Apollo

Software *Platform:*

Windows *3.x*
MS-DOS *5.0*
UNIX
HP-UX

Network support:

Novell Netware
Windows -NT
LAN Manager
Banyan Vii
Lantastic

Application Areas:

Presentation/Graphics

Integration Capabilities:

Presentation/Graphics

Product Training:

Source:	American Netronic, Inc.
Location:	Onsite/Offsite
Price Range:	$395+
Topics:	Application Specific

Product Description:

Graneda Professional — **American Netronic, Inc.**

Product Statistics:

Version:	6.1.1
Last Release:	1994
first Release:	1975
Update Freq:	Semi-Annually
Total Sold:	71000

Vendor Profile:

Address:	610 Newport Center Dr., Ste. 410
Address:	Newport Beach, CA 92660
Phone Number:	714-760-6642
Fax Number:	7167602603
BBS Number:	
In Business:	1964
Tech Contact:	Ellen Walsh
Phone:	714-760-8642
Fax:	714-760-2603
E-mail Address:	
Mkt contact	Garry Jones
Phone No:	714-760-8642
Fax No:	714-760-2603
E-mail:	

'ricing Information:

Single User:	$2,800+
Multi-user:	$3,500+
Reg Maintenance:	15% List Price
Site License?:	Yes
GSA?:	No

System Configurations:

Recommended:

HW/OS Platform:	80486/Windows 3.x
RAM:	6MB
HD Storage:	10 MB

Minimum:

HW/OS Platform:	80486/Windows 3.x
RAM:	640KB
HD Storage:	6MB

Multi-Platform/Environment Support:

Hardware Platform	*Software Platform:*	*Network Support:*
PC (286, 386, 486, etc.)	Windows 3.x	Novell Netware
VAX	osn	DEC Pathworks
SUN	VMS	IBM LAN Server
HP/Apollo	UNIX	Windows NT
Mainframe	ULTRIX	LAN Manager
		Banyan Vines
		Lantastic
		LANStep

Application Areas:

Presentation/Graphics

Integration Capabilities:

Presentation/Graphics

Product Training:

Source:	American Netronic, Inc.
Location:	Onsite/Offsite
Price Range:	$995+
Topics:	Application Specific

Product Description:

Product Statistics:

Version:	2
Last Release:	1994
First Release:	6/1/1994
Update Freq:	
Total Sold:	

Vendor Profile:

Address:	4931 Delhi Pike, Ste. 100
Address:	Cincinnati, OH 45233
Phone Number:	513-451-5956
Fax Number:	513-451-5613
BBS Number:	
In Business:	1986
Tech Contact:	Phil Jacob
Phone:	513-451-5956
Fax:	513-451-5613
E-mail Address:	
Mkt Contact:	Dick Robinson
Phone No:	513-255-7900
Fax No:	513-255-7910
E-mail:	

Pricing Information:

Single User:	$2,500+
Multi-user:	
Reg Maintenance:	
Site License?:	Yes
GSA?:	

System Configurations:

Recommended:	
HW/OS Platform:	80486/Windows 3.x
RAM:	1.5 MB
HD Storage:	4MB

Minimum:	
HW/OS Platform:	
RAM:	
HD Storage:	

Multi-Platform/Environment Support:

Hardware Platform	*Software Platform:*	*Network support:*
PC (286, 386, 486, *etc.)*	MS-DOS	Novel Netware
Macintosh	Windows 3x	DEC Pathworks
SUN	OS/2	IBM LAN Server
HP/Apollo	Mac System	Windows NT
	UNIX/ULTRIX	LAN Manager
		Banyan Vines
		Lantastic
		LANStep

Application Areas:

Project Planning & Control
Software Cost Estimation
Risk Analysis
Project Accounting
Multi-Project Management
Customized Reporting

ntegration Capabilities:

Product Training:

Source:
Location:
Price Range:
Topics:

Product Description:

A client-server project management system designed for "total team management". Provides each team member with a personal calendar, time sheet, and flexible project scheduling options. The calendar conveys meetings, task deadlines, and to-do lists. The time sheet tracks both project and non-project time, and can also accept supply wage and expenses.

M*PM — **Micro-Frame Technologies, Inc.**

Product Statistics:

Version:	3
Last Release:	1993
First Release:	1987
Update Freq:	Annually
Total Sold:	2,000+

Vendor Profile:

Address:	430 N. Vineyard, Ste 102
Address:	Ontario, CA 91764
Phone Number:	800-235-4142
Fax Number:	909-984-5382
BBS Number:	Contactvendor
In Business:	1984
Tech Contact:	
Phone:	800-235-4142
Fax:	909-984-5382
E-mail Address:	
Mkt Contact:	
Phone No:	800-235-4142
Fax No:	909-984-5382
E-mail:	

Pricing Information:

Single User:	$12,000
Multi-user:	Contact Vendor
Rag Maintenance:	20% List price
Site License?:	Yes
GSA?:	No

System Configurations:

Recommended:

HW/OS Platform:	80486/MS-DOS
RAM:	4MB
HD Storage:	40MB

Minimum:

HW/OS Platform:	80386/MS-DOS
RAM:	640 KB
HD Storage:	40MB

Multi-Platform/Environment Support:

Hardware Platform	*Software Platform:*	*Network Support:*
PC (286, 386, 486, etc.)	MS-DOS	Novell Netware
		DEC Pathworks
		IBM IAN Server
		Windows NT
		LAN Manager
		Banyan Vines
		Lantastic
		LANStep

Application Areas:

- Project Planning & Control
- Software Cost Estimation
- Project Accounting
- Work Group Management
- Customized Reporting

Integration Capabilities:

- Standard Import/Export
- Spreadsheet
- Sofhvare Metrics
- MIS
- Visual Basic
- Presentation/Graphics

Product Training:

Source:	Micro-Frame Tech.
Location:	On site/Offsite
Price Range:	$450+
Topics:	Application Specific

Product Description:

M2M (Critical Path Project Management) MC2 Engineering Software

Product Statistics:

Version:
Last Release: 1993
First Release:
Update Freq:
Total Sold: 190

Vendor Profile:

Address: 6107 Southwest 72nd Ave., Ste. 425E
Address: Mii, FL 33143
Phone Number: 305-665-0100
Fax Number: 305-665-8035
BBS Number:
In Business:
Tech Contact:
Phone:
Fax:
E-mail Address:
Mkt Contact:
Phone No: 305-665-0100
Fax No:
E-mail:

Fricing Information:

Single User: $99
Multi-user:
Reg Maintenance:
Site License?: Yes
GSA?:

System Configurations:

Recommended:
HW/OS Platform:
RAM:
HD Storage:

Minimum:
HW/OS Platform:
RAM:
HD Storage:

Ululti-Platform/Environment Support:

Hardware Platform	*Software Platform:*	*Network Support:*
PC (286, 386, 486, etc.)	MS-DOS	

Application Areas:

ntegration Capabilities:

roduct Training:

Source:
Location:
Prii Range:
Topics:

Product Description:

MacSchedule Mainstay

Product Statistics:

Version: 3
Last Release: 1992
First Release:
update Freq:
Total Sold:

Vendor Profile:

Address: 591-A Constitution Ave.
Address: Camarillo, CA 93012
Phone Number: 805-484-9400
Fax Number: 805-484-9428
BBS Number:
In Business:
Tech Contact:
Phone:
Fax:
E-mail Address:
Mkt Contact
Phone No: 805-484-9400
Fax No:
E-mail:

Pricing Information:

Single User: $295
Multi-user:
Reg Maintenance:
Site License?: Yes
GSA?:

System Configurations:

Recommended:
HW/OS Platform:
RAM:
HD Storage:

Minimum:
HW/OS Platform:
RAM:
HD Storage:

Multi-Platform/Environment Support:

Hardware Platform
Macintosh

Software Platform:
Apple/Macintosh System

Network Support:

Application Areas:

ntegration Capabilities:

Product Training:

Source:
Location:
Price Range:
Topics:

Product Description:

Micro/CFMS

Harper and Shuman, Inc.

Product Statistics:

Version:	11
Last Release:	1993
First Release:	1963
Update Freq:	Annually
Total Sold:	3400

'ricing Information:

Single User:	$825
Multi-user:	
Reg Maintenance:	
Site License?:	Yes
GSA?:	

Jendor Profile:

Address:	68 Moulton St.
Address:	Cambridge, MA 02136
Phone Number:	617-492-4410
Fax Number:	617-876-2973
BBS Number:	
In Business:	1973
Tech Contact:	
Phone:	617-492-4410
Fax:	617-676-2973
E-mail Address:	
Mkt Contact:	B. Budow
Phone No:	
Fax No:	
E-mail:	

System Configurations:

Recommended:

HW/OS Platform:	80386/MS-DOS
RAM:	512 KB
HD Storage:	15MB

Minimum:

HW/OS Platform:	
RAM:	
HD Storage:	

Multi-Platform/Environment Support:

Hardware Platform	*Software Platform:*	*Network Support:*
PC (286, 386, 486, etc.)	MS-DOS	Novell Netware
	Windows 3.x	

Application Areas:

Project Planning & Control
Project Accounting

Integration Capabilities:

Standard Import/Export
Spreadsheet

MIS
Presentation/Graphics

Product Training:

Source:	Harper and Shuman, Inc.
Location:	Onsite/Offsite
Price Range:	$225-$695/day
Topics:	Application Specific

Product Description:

A fully integrated project accounting package.

Microsoft Project — Microsoft Corporation

Product Statistics:

Version:	4
Last Release:	1994
First Release:	5/1/1990
update Freq:	Annually
Total Sold:	

/endor Profile:

Address:	One Microsoft Way
Address:	Redmond, WA 98052-6399
Phone Number:	800-426-9400
Fax Number:	
BBS Number:	
In Business:	
Tech Contact:	
Phone:	
Fax:	
E-mail Address:	
Mkt Contact:	
Phone No:	
Fax No:	
E-mail:	

P'ricing Information:

Single User:	$695
Multi-user:	Contact Vendor
Reg Maintenance:	Contact Vendor
Site License?:	Contact Vendor
GSA?:	Yes

System Configurations:

Recommended:

HW/OS Platform:	
RAM:	6MB
HD Storage:	16 MB

Minimum:

HW/OS Platform:	
RAM:	4MB
HD Storage:	6MB

Multi-Platform/Environment Support:

Hardware Platform

PC (266366,466, etc.)
Macintosh

Software Platform:

Windows 3.x
Macintosh System

Network Support:

Novell Netware
Windows NT
LAN Manager
Banyan Vines
Lantastic

Application Areas:

Project Planning 8 Control
Multi-Project Management
Presentation/Graphics
Customized Reporting

Integration Capabilities:

Standard Import/Export
spreadsheet
Word Processor
Presentation/Graphics

Product Training:

Source:	3rd Party Vendor
Location:	Onsite/Offsite
Price Range:	
Topics:	PM Theory
	Application Specific

Product Description:

A project planning tool from the Microsoft Office famii. Gantt charts show schedule, PERT charts show activity relationships, 'esource calendars model availability, resource histograms view workbads, resource leveling balances workloads, filtering selectively views project data, sorting, analysis, reports and plotter support

Product Statistics:

Version:	4
Last Release:	1994
First Release:	1989
Update Freq:	Annually
Total Sold:	20000

'ricing Information:

Single user:	$149.95
Multi-user:	Negotiable
Reg Maintenance:	
Site License?:	Y e s
GSA?:	No

Vendor Profile:

Address:	3114 Lost Creek Blvd., Sta. 300
Address:	Austin, TX 78746-9876
Phone Number:	800-765-0167
Fax Number:	512-328-0247
BBS Number:	
In Business:	1989
Tech Contact:	Don Elder
Phone:	512-328-0167
Fax:	512-328-0247
E-mail Address:	76702.1305@compuserv.com
Mkt Contact:	Lori Anderson
Phone No:	512-328-0167
Fax No:	512-328-0247
E-mail:	76702.1305@compuserv.com

System Configurations:

Recommended:

HW/OS Platform:	80386+/Windows 3.x
RAM:	4MB
HD Storage:	5 MB

Minimum:

HW/OS Platform:	80386/Windows 3.x
RAM:	2MB
HD Storage:	4 MB

Multi-Platform/Environment Support:

Hardware Platform

PC (286, 386, 486, etc.)

Software Platform:

Windows 3.x
OS/2

Network Support:

Novell Netware
Windows NT
LAN Manager
Banyan vies
Lantastic

Application Areas:

Project Planning & Control
Multi-Project Management
Presentation/Graphics

Integration Capabilities:

Standard Import/Export
OLE/DDE
Presentation/Graphics

Product Training:

Source:
Location:
Price Range:
Topics:

Product Description:

Great looking schedules in 15 minutes; Easy click and drag schedule creation; Presentation quality output; Customize schedules with text and graphics; Link dependent steps in any direction; Flexible schedule sizing: use predefined or user-defined symbols; Merge multiple schedules; Data exchange with other Windows applications; Build user-defined templates; Object Linking and Embedding (OLE) support.

ORO Project Management Software System — **Nichols&Co.. Inc.**

Product Statistics:

Version:	1.3
Last Release:	1994
first Release:	1991
Update Freq:	Annually
Total Sold:	100

Vendor Profile:

Address:	12555 W. Jefferson Blvd., Ste. 202
Address:	Los Angeles, CA 90006
Phone Number:	310-574-3131
Fax Number:	310-574-3140
BBS Number:	
In Business:	
Tech Contact:	c. Antonio
Phone:	310-574-3131
Fax:	
E-mail Address:	
Mkt Contact:	A. Lee
Phone No:	310-574-3131
Fax No:	
E-mail:	

Pricing Information:

Single User:	
Multi-user:	$40,000+
Reg Maintenance:	15% List Price
Site License?:	Yes
GSA?:	No

System Configurations:

	Recommended:	*Minimum:*
HW/OS Platform:		
RAM:		
HD Storage:		

Multi-Platform/Environment Support:

Hardware Platform	*Software Platform:*	*Network Support:*
PC (286, 386, 486, etc.)	VMS	Novell Netware
Mainframe	AS/400	
Mini-computer		

Application Areas:

- Project Planning & Control
- Software Cost Estimation
- Project Accounting
- Multi-Project Management
- Customized Reporting
- Work Group Management

Integration Capabilities:

- Standard Import/Export
- Spreadsheet
- Word Processor
- Software Metrics
- MIS
- Presentation/Graphics

Product Training:

Source:	Nichols & Co.
Location:	Onsite/Offsite
Price Range:	$1,200+
Topics:	All Proj Mgt Topics

Product Description:

ORO Project Management Software System **for Windows** Nichols & Co., Inc.

Product Statistics:

Version:	1.3
Last Release:	1994
First Release:	1991
update Freq:	Annually
Total Sold:	100

Pricing Information:

Single User:	$4800
Multi-user:	$40,000+
Reg Maintenance:	
Site License?:	Yes
GSA?:	

Vendor Profile:

Address:	12555 W. Jefferson Blvd., Ste. 202
Address:	Los Angeles, CA 90006
Phone Number:	310-574-3131
Fax Number:	310-574-3140
BBS Number:	
In Business:	
Tech Contact:	C. Antonio
Phone:	310-574-3131
Fax:	
E-mail Address:	
Mkt Contact:	A. Lee
Phone No:	310-574-3131
Fax No:	
E-mail:	

System Configurations:

Recommended:	*Minimum:*
HW/OS Platform:	HW/OS Platform:
RAM:	RAM:
HD Storage:	HD Storage:

Multi-Platform/Environment Support:

Hardware Platform	*Software Platform:*	*Network Support:*
PC (286, 386, 486, etc.)	Windows 3.x	Novell Netware
		Windows NT
		LAN Manager

Application Areas:

- Project Planning & Control
- Software Cost Estimation
- Project Accounting
- Multi-Project Management
- Customized Reporting
- Work Group Management

Integration Capabilities:

- Standard Import&port
- Spreadsheet
- Word Processor
- Software Metrics
- MIS
- Presentation/Graphics

Product Training:

Source:	Nichols a Co.
Location:	Onsite/Offsite
Price Range:	$1,200+
Topics:	All Proj Mgt Topics

Product Description:

Project Accounting Management Accounting System/On-Lin **GBA Systems**

Product Statistics:

Version:	22.4211
Last Release:	1994
First Release:	1988
Update Freq:	Annually
Total Sold:	70+

'ricing Information:

Single User:	$12,500-$15,500
Multi-user:	$12,500-$15,500
Reg Maintenance:	1% List Price
Site license?:	Yes
GSA?:	No

Vendor Profile:

Address:	8818 U.S. 421 North
Address:	Colfax, NC 27235
Phone Number:	910488455
Fax Number:	910-668-9576
BBS Number:	
In Business:	1975
Tech Contact:	Audry Ackert
Phone:	910-668-4555
Fax:	910-668-9576
E-mail Address:	
Mkt Contact:	John Mandrano
Phone No:	910-668-4555
Fax No:	910-668-9576
E-mail:	

iystem Configurations:

Recommended:

HW/OS Platform:	IBM AS/400
RAM:	N/A
HD Storage:	N/A

Minimum:

HW/OS Platform:	N/A
RAM:	N/A
HD Storage:	N/A

Iulti-Platform/Environment Support:

Hardware Platform	*Software Platform:*	*Network Support:*
Mini-computer	AS/400	N/A

Application Areas:

Project Accounting
Multi-Project Management
customized Reporting

ntegration Capabilities:

Standard Import/Export
spreadsheet

Product Training:

Source:	GBA Systems
Location:	Onsite/Offsite
Price Range:	$900+
Topics:	User-Tailored

'roduct Description:

This software application is most often used where the end user wanb to traok and monitor actual costs on any particular project against their budgeted costs on a timely basis. The actual costs are received from such applications as AP, PO, labor, and inventory by means of interfaces. Also accommodates multiple views of the same project so that users can monitor their resource labor hours incurred on the project and download this information to Microsoft Project for Gantt/PERT charting. Will also accommodate tracking projects in multiple currencies.

Product Statistics:

Version:
Last Release: 1992
First Release: 1987
Update Freq:
Total Sold:

Vendor Profile:

Address: 178 Phillips Rd.
Address: Webster, NY 14580
Phone Number: 7162654040
Fax Number:
BBS Number:
In Business:
Tech Contact:
Phone:
Fax:
E-mail Address:
Mkt Contact:
Phone No: 716-265-4040
Fax No:
E-mail:

Pricing Information:

Single User: $50
Multi-user:
Reg Maintenance:
Site License?: Yes
GSA?:

System Configurations:

Recommended:
HW/OS Platform:
RAM:
HD Storage:

Minimum:
HW/OS Platform:
RAM:
HD Storage:

Multi-Platform/Environment Support:

Hardware Platform ***Software Platform:*** ***Network Support:***

Application Areas:

Integration Capabilities:

Product Training:

Source: Manual
Location:
Price Range:
Topics:

Product Description:

Project Exchange

Micro Planning International, Inc.

Product Statistics:

Version:	22
Last Release:	1994
First Release:	1990
Update Freq:	Semi-Annually
Total Sold:	2000

Vendor Profile:

Address:	3601 Fbrida Ave., Ste 601
Address:	Denver, CO 60210
Phone Number:	303-757-2216
Fax Number:	303-757-2047
BBS Number:	
In Business:	
Tech Contact:	
Phone:	800-200-7648
Fax:	707-545-7648
E-mail Address:	
Mkt Contact:	Brad Pirrung
Phone No:	3030-759-1625
Fax No:	303-757-2047
E-mail:	

Pricing Information:

Single User:	$1995
Multi-user:	Contactvendor
Reg Maintenance:	$395/yr
Site License?:	No
GSA?:	

System Configurations:

Recommended:

HW/OS Platform:	Macintosh SI
RAM:	4MB
HD Storage:	2.1 MB

Minimum:

HW/OS Platform:	Macintosh Classic
RAM:	2MB
HD Storage:	2.1 MB

Multi-Platform/Environment Support:

Hardware Platform	*Software Platform:*	*Network Support:*
PC (286, 386, 486, etc.)	MS-DOS	Novell Netware
Macintosh	Windows NT	DEC Pathworks
SUN	Apple/Macintosh System	IBM LAN Server
HP/Apollo	UNIX	LAN Manager
		Banyan Vines
		Lantastic
		LANStep

Application Areas:

- Project Planning & Control
- Software Cost Estimation
- Project Accounting
- Multi-Project Management
- Work Group Management

Integration Capabilities:

- Standard Import/Export
- Spreadsheet
- Word Processor
- Presentation/Graphics

Product Training:

Source:	Micro Planning
Location:	Onsite/Offsite
Price Range:	$600+/Participant
Topics:	PM Theory
	Application Specific

Product Description:

Designed for managing large projects that require control and coordination that span the organization. The work breakdown structure allows the user to "roll-up" results, allowing it to be combined at the department level. The product is easy to use, flexible, and allows custom reporting on results of analysis. The user can merge many projects at the same time. Micro Planning International, Inc. is full service, providing consulting, training, and technical support.

Project **Kickstart** Experience In Software, Inc.

Product Statistics:

Version:	1
Last Release:	1992
First Release:	
Update Freq:	
Total Sold:	15000

Pricing information:

Single User:	$79.95
Multi-user:	$49.95
Reg Maintenance:	
Site License?:	Yes
GSA?:	

Vendor Profile:

Address:	2000 Hearst Ave., Ste. 202
Address:	Berkley, CA 94709-2176
Phone Number:	510-644-0694
Fax Number:	510-644-3823
BBS Number:	
In Business:	1983
Tech Contact:	Ray Nierenberg
Phone	510-644-0694
Fax:	510-644-3823
E-mail Address:	73477.1305@compuserv.com
Mkt Contact:	
Phone No:	510444694
Fax No:	510e4-3623
E-mail:	73477.1305@compuserv.com

System Configurations:

Recommended:

HW/OS Platform:	80486/MS-DOS
RAM:	640KB
HD Storage:	300KB

Minimum:

HW/OS Platform:	80386/MS-DOS
RAM:	256KB
HD Storage:	300KB

Multi-Platform/Environment Support:

Hardware Platform	*Software Platform:*	*Network Support:*
PC (286, 386, 486, etc.)	MS-DOS	

Application Areas:

Project Planning & Control

Integration Capabilities:

Standard Import/Export

Word Processor

Product Training:

Source:	3rd Party
Location:	Onsite
Price Range:	$1,500+
Topics:	PM Theory
	Application Specific

Product Description:

This tool helps anyone lay out a project in just minutes. It prompts users to identify the overall project goals. It then walks users through several steps to generate tasks, induding anticipating problems and using experience obtained from similar projects. Finally, users can assign up to 30 resources to the tasks. With one or two keystrokes, it sends its data to project management software such as Microsoft Project for Windows.

Project Management/Accounting System

ACCI Business Systems, Inc.

Product Statistics:

Version:	10.1
Last Release:	5/1/1994
first Release:	1982
Update Freq:	Annually
Total Sold:	875

Vendor Profile:

Address:	2900 w. Maple, Ste. 107
Address:	Troy, MI 48084
Phone Number:	800-448-0601
Fax Number:	810-649-5457
BBS Number:	
In Business:	
Tech Contact:	
Phone:	810-649-1113
Fax	810-649-5457
E-mail Address:	
Mkt Contact:	Jackie Stavros
Phone No:	713-656-3342
Fax No:	
E-mail:	

Pricing Information:

Single User:	$1,495+
Multi-user:	3495
Reg Maintenance:	$395/year
Site License?:	Y e s
GSA?:	No

System Configurations:

Recommended:

HW/OS Platform:	80386+/MS-DOS
RAM:	640 KB
HD Storage:	200MB

Minimum:

HW/OS Platform:	80386+/MS-DOS
RAM:	840KB
HD Storage:	80MB

Multi-Platform/Environment Support:

Hardware Platform	*Software Platform:*	*Network Support:*
PC (286, 386, 486, etc.)	MS-DOS	Novell Netware

Application Areas:

- Project Planning & Control
- Project Accounting
- Multi-Project Management
- Customized Reporting

ntegration Capabilities:

- Standard Import/Export
- Spreadsheet
- Word Processor

Product Training:

Source:	Pa&hill & Company
Location:	Offsite
Price Range:	$15,000 + exp.
Topics:	

Product Description:

Project Scheduler 5 **Scitor Corp.**

Product Statistics:

Version:	1.5
last Release:	
First Release:	1992
Update Freq:	
Total Sold:	

Vendor Profile:

Address:	393 Vintage Park Dr., Ste. 140
Address:	Foster City, CA 94404
Phone Number:	415-570-7700
Fax Number:	415-570-7807
BBS Number:	
In Business:	1979
Tech Contact:	
Phone:	415-570-7700
Fax:	415-570-7807
E-mail Address:	
Mkt Contact:	Sales
Phone No:	415-570-7700
Fax No:	415-570-7607
E-mail:	

Pricing information:

Single User:	$695
Multi-user:	$2835/5
Reg Maintenance:	
Site License?:	
GSA?:	No

System Configurations:

Recommended:

HW/OS Platform:	IBM XT, AT, PS/2/MS-DOS
RAM:	512 KB
HD Sbrage:	1.5 MB

Minimum:

HW/OS Platform:	IBM XT, AT, PS/2/MS-DOS
RAM:	512 KB
HD Storage:	1.5 MB

Multi-Platform/Environment Support:

Hardware *Platform*
PC (286, 386, 486, etc.)

Software Platform:
MS-DOS

Network Support:
Novell Netware
LAN Manager
Banyan Vines

Application Areas:
Project Planning & Control
Multi-Project Management

ntegration Capabilities:
Standard Import/Export

Product Training:

Source:	Scitor
Location:	Onsite/Offsite
Price Range:	
Topics:	PM Theory
	Application Specific

Product Description:

Project Scheduler 5XL

Scitor Corp.

Product Statistics:

Version: 1.5
Last Release:
First Release: 1992
Update Freq:
Total Sold:

Vendor Profile:

Address: 393 Vintage Park Dr., Ste. 140
Address: Foster City, CA 94404
Phone Number: 415-570-7700
Fax Number: 415-570-7807
BBS Number:
In Business: 1979
Tech Contact:
Phone: 415-570-7700
Fax: 415-570-7807
E-mail Address:
Mkt Contact: Sales
Phone No: 415-570-7700
Fax No: 415-570-7807
E-mail:

Pricing Information:

Single User: $695
Multi-user:
Reg Maintenance:
Site License?:
GSA?: No

System Configurations:

Recommended:

HW/OS Platform:
RAM: 512 KB
HD Storage: 1.5 MB

Minimum:

HW/OS Platform:
RAM: 512 KB
HD Storage: 1.5 MB

Multi-Platform/Environment Support:

Hardware *Platform*
PC (286, 386, 486, etc.)

Software Platform:
OS/2

Network Support:
Novell Netware
LAN Manager
Banyan vines

Application Areas:

Project Planning & Control
Multi-Project Management

Integration Capabilities:

Standard Import/Export

Product Training:

Source: Scitor
Location: Onsite/Offsite
Price Range:
Topics: PM Theory
Application Specific

Product Description:

Product Statistics:

Version:	1.5
Last Release:	
First Release:	1994
Update Freq:	
Total Sold:	

Vendor Profile:

Address:	393 Vintage Park Dr., Ste 140
Address:	Foster City, CA 94404
Phone Number:	415-570-7700
Fax Number:	415-570-7807
BBS Number:	
In Business:	1979
Tech Contact:	
Phone:	415-570-7700
Fax:	415-570-7807
E-mail Address:	
Mkt contact	Sales
Phone No:	415570-7700
Fax No:	415-570-7807
E-mail:	

Pricing Information:

Single User:	$695
Multi-user:	$2835/5
Reg Maintenance:	
Site License?:	Call
GSA?:	No

System Configurations:

Recommended:

HW/OS Platform:	80386/MS-DOS
RAM:	4MB
HD Storage:	4MB

Minimum:

HW/OS Platform:	80386/MS-DOS
RAM:	4MB
HD Storage:	4MB

Multi-Platform/Environment Support:

Hardware *Platform*
PC (286, 386, 486, etc.)

Software *Platform:*
Windows 3.x

Network Support:
Novell Netware
Windows NT
LAN Manager
Banyan Vines
Lantastic

Application Areas:
Project Planning 8 Control
Multi-Project Management
Presentation/Graphics
Customized Reporting

ntegration Capabilities:
Standard Import/Export
Spreadsheet
Word Processor
Presentation/Graphics

Product Training:

Source:	Scitor
Location:	Onsite/Offsite
Price Range:	
Topics:	PM Theory
	Application Specific

Product Description:

Project Task Control and Scheduling

Dynacomp, Inc.

Product Statistics:

Version:
Last Release: 1993
First Release 1988
update Freq:
Total Sold:

Vendor Profile:

Address: 178 Phillips Rd.
Address: Webster, NY 14580
Phone Number: 716-265-4040
Fax Number:
BBS Number:
In Business:
Tech Contact:
Phone:
Fax:
E-mail Address:
Mkt contact
Phone No: 716-265-4040
Fax No:
E-mail:

'ricing Information:

Single User: $1,895
Multi-user:
Reg Maintenance:
Site License?: Yes
GSA?:

System Configurations:

Recommended:
HW/OS Platform:
RAM:
HD Storage:

Minimum:
HW/OS Platform:
RAM:
HD Storage:

Multi-Platform/Environment Support:

Hardware Platform

Software Platform:

Network Support:

Application Areas:

Integration Capabilities:

Product Training:

Source: Manual
Location:
Price Range:
Topics:

Product Description:

Project Time Reporting System **Dynacomp, Inc.**

Product Statistics:

Version:
Last Release 1993
First Release: 1987
Update Freq:
Total Sold:

Vendor Profile:

Address: 178 Phillips Rd.
Address: Webster, NY 14580
Phone Number: 716-265-4040
Fax Number:
BBS Number:
In Business:
Tech Contact:
Phone
Fax:
E-mail Address:
Mkt Contact:
Phone No: 716-265-4040
Fax No:
E-mail:

Pricing Information:

Single User: $70
Multi-user:
Reg Maintenance:
Site License?: Yes
GSA?:

System Configurations:

Recommended:

HW/OS Platform:
RAM:
HD Storage:

Minimum:

HW/OS Platform:
RAM:
HD Storage:

Multi-Platform/Environment Support:

Hardware Platform ***Software Platform:*** ***Network Support:***

Application Areas:

ntegration Capabilities:

Product Training:

Source: Manual
Location:
Price Range:
Topics:

Product Description:

Project Visualization System (PVS) for Windows — IntelligenceWare, Inc.

Product Statistics:

Version:	12
Last Release:	1994
First Release:	1990
Update Freq:	10 mo
Total Sold:	15000

Pricing Information:

Single User:	$4900
Multi-user:	Discount Provided
Reg Maintenance:	12.5% List Price
Site License?:	Yes
GSA?:	Yes

Vendor Profile:

Address:	5933 W. Century Blvd.
Address:	Los Angeles. CA 90045
Phone Number:	31G216-6177
Fax Number:	310-417-8897
BBS Number:	
In Business:	1364
Tech Contact:	Kamran Parsage
Phone:	310-216-6196
Fax:	310-417-8897
E-mail Address:	
MM Contact:	Diana Lin
Phone No:	310-216-6177
Fax No:	310-417-8897
E-mail:	

System Configurations:

Recommended:

HW/OS Platform:	80486/Windows 3.x
RAM:	6MB
HD Storage:	60MB

Minimum:

HW/OS Platform:	80486/Windows 3.x
PAM:	4MB
HD Storage:	5 MB

Multi-Platform/Environment Support:

Hardware Platform
PC (286, 386, 486, eta.)

Software Platform:
Windows 3.x

Network Support:
Novell Netware
IBM LAN Server
LAN Manager
Banyan Vines

Application *Areas:*
Project Pianniig & Control
Multi-Project Management
Work Group Management
Presentation/Graphics

Integration Capabilities:
Standard Import/Export
spreadsheet
Software Metrics
MIS
Presentation/Graphics
OLE/DDE

Product Training:
Source:
Location: Onsite/Offsite
Price Range: $1,500+/day
Topics: PM Theory
Application Specific

Product Description:

Acts as an executive information system for project managers. It is not a project management package in the traditional sense, but tracks costs and project progress with easy to use EIS tools not supplied by traditional offerings. Theproductoffers capabilities such as drill-down querying, hypertext, and advanmd three-dimensional graphics.

Product Statistics:

Version:	93A2
Last Release:	Mar-93
First Release:	1966
Update Freq:	Semi-Annually
Total Sold:	1000

Vendor Profile:

Address:	20 University Road
Address:	Cambrii, MA 02136
Phone Number:	617-661-1444
Fax Number:	617-661-1642
BBS Number:	Contact Vendor
In Business:	1966
Tech Contact	Gloria Stelmokas
Phone:	617-661-1444
Fax:	617-661-1642
E-mail Address:	
Mkt Contact:	Karl Melvig
Phone No:	213-874-3347
Fax No:	2136744239
E-mail:	

Pricing Information:

Single User:	$50,000
Multi-user:	$50,000+
Reg Maintenance:	15% List Price
Site License?:	Yes
GSA?:	No

System Configurations:

Recommended:

HW/OS Platform:
RAM:
HD Storage:

Minimum:

HW/OS Platform:
RAM:
HD Storage:

Multi-Platform/Environment Support:

Hardware Platform	*Software Platform:*	*Network Support:*
VAX	VMS	TCPAP
Mainframe	MVS	DECNET
Minicomputer	VS1	
	CMS	

Application Areas:

Project Planning & Control
Risk Analysis
Work Group Management
Multi-Project Management
Customized Reporting
Presentation/Graphics

ntegration Capabilities:

Standard Import/Export
MIS

Product Training:

Source:	PS 8 D. Inc.
Location:	Onsite/Offsite
Price Range:	5000
Topics:	PM Theory
	Application Specific

Product Description:

Composed of five integrated modules that perform the various project management functions: Scheduling, Cost, Graphics, Relational database manager, and Screen application manager. Because it is a fully integrated system, you have the freedom to scale Project/2 to your needs. Because of its sophistication, depth, and ease of use, the Project/2 system finks you to the highest level of professionalism.

Project/2 Series X (P/X) — **Project Software & Development, Inc.**

Product Statistics:

Version:	12
last Release:	1995
First Release:	1992
Update Freq:	Semi-Annually
Total Sold:	600 Sites

Vendor Profile:

Address:	20 University Road
Address:	Cambridge, MA 02136
Phone Number:	617-661-1444
Fax Number:	617-661-1642
BBS Number:	Contact vendor
In Business:	1968
Tech Contact:	Gloria Stelmokas
Phone:	617-661-1444
Fax	617-661-1642
E-mail Address:	
Mkt Contact:	Karl Melvig
Phone No:	213-874-3347
Fax No:	213-874-3239
E-mail:	

Fricing Information:

single user:	N/A
Multi-user:	$25,000+
Reg Maintenance:	15% List Price
Site License?:	Yes
GSA?:	No

System Configurations:

Recommended:

HW/OS Platform:	80486/Windows 3.x
RAM:	6MB
HD Storage:	60MB

Minimum:

HW/OS Platform:	80386/Windows 3x
RAM:	6MB
HD Storage:	40 MB

Multi-Platform/Environment Support:

Hardware Platform	Software *Platform:*	*Network Support:*
PC (286, 386, 486, etc.)	Windows 3.x	Novel Netware
VAX	VMS	DEC Pathworks
SUN	UNIX	IBM LAN Server
	SUN OS	LAN Manager
		Banyan Vines

Application Areas:

Project Planning 8 Control
Software Cost Estimation

ntegration Capabilities:

Standard Import/Export
Presentation/Graphics
MIS
visual Basic

Product Training:

Source:	PS & D, Inc.
Location:	Onsite/Offsite
Price Range:	6000
Topics:	PM Theory
	Application Specific

Product Description:

A comprehensive project management system designed to meet the varying needs of enterprise-wide use in corporations and government bureaus. Available in most popular computing environments, it features a graphical user interface. a full arraw of scheduling and cost control functionality, extensive reports and graphics, and a wide variety of toots for data manipulation. system integration, and customiition.

ProjectBase

Kapur International, Inc.

Product Statistics:

Version:	5
Last Release:	1994
Arst Release:	1988
Update **Freq:**	**Annually**
Total Sold:	1000

'ricing Information:

Single User:	$1500
Multi-user:	1500
Reg Maintenance:	12.5% List Price
Sits License?:	Yes
GSA?:	No

Vendor Profile:

Address:	1 Annabel Lane, Ste. 108
Address:	San Ramon, CA 94853
Phone Number:	510-275-8000
Fax Number:	510-275-8115
BBS Number:	
In Business:	
Tech **Contact:**	
Phone:	510-275-6000
Fax:	510-275-8115
E-mail Address:	
Mkt Contact:	Raj Kapur
Phone No:	510-275-8000
Fax No:	510-275-8115
E-mail:	

System Configurations:

Recommended:

HW/OS Platform:	**80486/Windows** 3.x
RAM:	4MB
HD Storage:	6MB

Minimum:

HW/OS Platform:	**80486/Windows** 3.x
RAM:	4MB
HD Storage:	6MB

Multi-Platform/Environment Support:

Hardware Platform

PC (**286, 386, 486,** etc.)

Software Platform:

MS-DOS
Windows 3x
OS/2

Network Support:

Novel **Netware**
Banyan Vines

Application Areas:

Project Plannii **&** Control
Software Cost Estimation
Risk Analysis
Project Accounting
Multi-Project Management
Customized Reporting

integration Capabilities:

Standard **Import/Export**
Software Metrics
MIS

Product Training:

Source:	Cntr for Proj Mgmt
Location:	**Offsite**
Price Range:	**Negotiable**
Topics:	Proj Mgt

Product Description:

Can be used **to** automata any **project** management **methodology, create** templates. **generate comprehensive** plans, and develop defensible plans. The export **facility** allows **export** of plans and estimates **to a variety of scheduling packages.**
ProjectBase family of tools **includes: methodology customizer,** planning, **estimating, export, baseline aligner,** and method tools.

Qwiknet Professional

Project Software & Development, Inc.

Product Statistics:

Version:	3.1
Last Release:	1992
First Release:	1964
Update Freq:	
Total Sold:	13000

Vendor Profile:

Address:	20 University Road
Address:	Cambridge, MA 02136
Phone Number:	617-661-1444
Fax Number:	617-661-1642
BBS Number:	Contactvendor
In Business:	1966
Tech Contact:	Gloria Stelmokas
Phone:	617-661-1444
Fax:	617-661-1642
E-mail Address:	
Mkt Contact:	Karl Melvig
Phone No:	213-874-3347
Fax No:	213-674-3239
E-mail:	

Pricing Information:

Single User:	$2,500+
Multi-user:	$1,650/user
Reg Maintenance:	15% List Price
Site License?:	Yes
GSA?:	No

System Configurations:

Recommended:

HW/OS Platform:	80486/MS-DOS
RAM:	6MB
HD Storage:	40MB

Minimum:

HW/OS Platform:	80386/MS-DOS
RAM:	4MB
HD Storage:	20MB

Multi-Platform/Environment Support:

Hardware Platform

PC (286, 386, 486, etc.)
VAX

Software Platform:

MS-DOS
MVS

Network Support:

Novell Netware
DEC Pathworks
IBM LAN Server
LAN Manager
Banyan Vines

Application Areas:

Project Planning & Control
Work Group Management

Multi-Project Management
Presentation/Graphics

ntegration Capabilities:

Standard Import/Export
Spreadsheet

Product Training:

Source:	Project Software & Development, Inc.
Location:	Onsite/Offsite
Price Range:	5000
Topics:	PM Theory
	Application Specific

Product Description:

Qwiknet Professional and Qwiknet Graphics are DOS-based products designed for project management applications for workgroups and departments. Its easy learning curve makes it accessible to a wide range of users, and its multi-project capability provides the means by which each groups' projects can be combined or coordinated with a large unit's work.

SAS/OR

SAS institute, Inc.

Product Statistics:

version:	6.1
Last Release:	1994
First Release:	1983
Update Freq:	Annually+
Total Sold:	2555

Vendor Profile:

Address:	100 SAS Campus Dr.
Address:	Cary, NC 27513-2414
Phone Number:	919-677-8000
Fax Number:	919-677-8123
BBS Number:	Contactvendcr
In Business:	1976
Tech Contact:	Phil Gibbs
Phone:	919-677-8000
Fax:	919-677-8123
E-mail Address:	
Mkt Contact:	Renee Samy
Phone No:	9146773006
Fax No:	919-677-8123
E-mail:	sasras@unx.com.sas

Pricing Information:

Single User:	Contactvendor
Multi-user:	Contact Vendor
Reg Maintenance:	Contact Vendor
Site License?:	Contact Vendor
GSA?:	No

System Configurations:

Recommended:

HW/OS Platform:	Dependent on Platform
RAM:	Contactvendor
HD Storage:	Contactvendor

Minimum:

HW/OS Platform:	Contact Vendor
RAM:	Contact Vendor
HD Storage:	Contact Vendor

Multi-Platform/Environment Support:

Hardware Platform	*Software Platform:*	*Network Support:*
PC (286, 386, 486, etc.)	Windows NT	Novell Netware
VAX	VMS	DEC Pathworks
SUN	UNIX	IBM LAN Server
Mini-computer	ULTRIX	Windows NT
HP/Apollo	OS/2	LAN Manager
		Banyan Vines
		Lantastic
		LANStep

Application Areas:

- Project Planning & Control
- Risk Analysis
- Work Group Management
- Multi-Project Management
- Customized Reporting
- Presentation/Graphics

ntegration Capabilities:

- Standard Import/Export
- Spreadsheet
- Word Processor
- OLE/DDE
- MIS
- Presentation/Graphics

Product Training:

Source:	SAS Institute, Inc.
Location:	Onsite/Offsite
Price Range:	Contact Vendor
Topics:	Contact Vendor

Product Description:

A complete set of powerful management science tools. The software includes tools for project management, decision analysis, and mathematical programming. The project management toots (CPM, GANTT, and NETDRAW) allow the user to plan, manage and tack projects through a single, in&grated system. These tools have extensive customization options, allowing users to create graphii tailored specifically to their situations. The PROJMAN menu system complements SAS/OR providing a customizable and extendible graphic interface.

Schedule Express **for Windows** — Foundation Microsystems, Inc.

Product Statistics:

Version:	1
Last Release:	1992
First Release:	1992
Update Freq:	
Total Sold:	10000

Vendor Profile:

Address:	2013 Landings Dr.
Address:	Mountain Vi. CA 94043
Phone Number:	510-814-1895
Fax Number:	510-814-1696
BBS Number:	
In Business:	
Tech Contact:	Alan Fisher
Phone:	804-984-5500
Fax:	804-984-5501
E-mail Address:	afisher @ buckaroo.com
Mkt Contact:	Karl Schmidtmann
Phone No:	510-814-1695
Fax No:	415-428-0163
E-mail:	kschmidt @ hopper.itc.virginia.edu

'ricing Information:

Single User:	$100
Multi-user:	$449 5-user
Reg Maintenance:	
Site License?:	Yes
GSA?:	Yes

System Configurations:

Recommended:		*Minimum:*	
HW/OS Platform:	80386+/Windows 3.x	HW/OS Platform:	80286/Windows 3.x
RAM:	4MB	RAM:	1 MB
HD Storage:	2MB	HD Storage:	1 MB

Multi-Platform/Environment Support:

Hardware Platform	*Software Platform:*	*Network Support:*
PC (286, 386,486, etc.)	Windows 3.x	Windows NT

Application Areas:

Project Planning & Control
Presentation/Graphics
Customized Reporting

ntegration Capabilities:

Standard Import/Export
MIS
Presentation/Graphics

Product Training:

Source:
Location:
Price Range:
Topics:

Product Description:

Designed so that the user can create schedules quiddy, just like using a drawing package. The user points and dii, drags and drops, just like popular word processing and graphics applications; incorporates shrink-b-fit printing, connectivity to external project management applications, multiple resource management, attractive output, and easy data entry.

Product Statistics:

Version:	52
Last Release:	2/1/1994
Rrst Release:	1984
Update Freq:	Annually
Total Sold:	2ooo

'ricing Information:

Single User:	$1475
Multi-user:	1000
Reg Maintenance:	450
Site License?:	Y e s
GSA?:	No

Vendor Profile:

Address:	P.O.Box 19591
Address:	Houston, TX 77224-9591
Phone Number:	713-467-8500
Fax Number:	713-467-1062
BBS Number:	
In Business:	1974
Tech Contact:	
Phone:	713-467-8500
Fax:	713-467-1062
E-mail Address:	
Mkt Contact:	Leon Alderfer
Phone No:	713-467-8500
Fax No:	713-467-1062
E-mail:	

System Configurations:

Recommended:

HW/OS Platform:	
RAM:	540 KB
HD Storage:	20 MB

Minimum:

HW/OS Platform:	80486/MS-DOS
RAM:	640 KB
HD Storage:	20MB

Multi-Platform/Environment Support:

Hardware *Platform*	*Software Platform:*	*Network Support:*
PC (286, 386, 486, etc.)	MS-DOS	

Application Areas:

Project Planning & Control
Multi-Project Management
Presentation/Graphics
Customized Reporting

ntegration Capabilities:

Presentation/Graphics

Product Training:

Source:	AlderGraf
Location:	Onsite/Offsite
Price Range:	$1,000/day
Topics:	

Product Description:

A full-function Critical Path Method (CPM) activity and resource project scheduling system with presentation quality graphics.

Star Watch COSMOS **Pathfinder, Inc.**

Product Statistics:

Version:	3.1
Last Release:	1993
First Release:	1999
update Freq:	Every 18 Months
Total Sold:	1000

Vendor Profile:

Address:	11 Allison Dr., PO Box 5027
Address:	Cherry Hill, NJ 06034
Phone Number:	609-424-7100
Fax Number:	609-424-6414
BBS Number:	
In Business:	1975
Tech Contact:	Christopher E. Michalak
Phone:	609-424-7100
Fax:	609-424-6414
E-mail Address:	
Mkt Contact:	Christopher E. Michalak
Phone No:	609-424-7100
Fax No:	609-424-6414
E-mail:	

F'ricing information:

single user:	$4500
Multi-user:	Call
Reg Maintenance:	10% Ust Price
Site License?:	Yes
GSA?:	No

System Configurations:

Recommended:

HW/OS Platform:	80386/MS-DOS
RAM:	2MB
HD Storage:	10 MB

Minimum:

HW/OS Platform:	80286/MS-DOS
RAM:	1 MB
HD Storage:	5 MB

Multi-Platform/Environment Support:

Hardware Platform	***Software Platform:***	*Network Support:*
PC (286, 386, 486, etc.)	MS-DOS	Novell Netware LAN Manager Banyan Vines

Application Areas:

- Project Planning & Control
- Project Accounting
- Work Group Management
- Multi-Project Management

ntegration Capabilities:

Standard Import/Export

Product Training:

Source:	Pathfinder, Inc
Location:	Onsite/Offsite
Price Range:	$750/day
Topics:	PM Theory Appliition Specific

Product Description:

SureTrak Project Scheduler — Primavera Systems Inc.

Product Statistics:

Version:	2
Last Release	1992
First Release:	1953
Update Freq:	Annually
Total Sold:	16000

Jendor Profile:

Address:	1574 West 1700 souttl
Address:	Salt Lake City, UT 84104
Phone Number:	801-973-1300
Fax Number:	Sol -973-9725
BBS Number:	
In Business:	1983
Tech Contact:	Karen Denison
Phone:	801-973-1300
Fax:	Sol -973-9725
E-mail Address:	N/A
Mkt Contact:	M. Smii
Phone No:	Sol-9734300
Fax No:	Sol -9734953
E-mail:	N/A

Pricing Information:

single user:	$195
Multi-user:	N/A
Reg Maintenance:	N / A
Site License?:	No
GSA?:	Yes

System Configurations:

Recommended:

HW/OS Platform:	80486/MS-DOS
RAM:	640 KB
HD Storage:	2.5 MB

Minimum:

HW/OS Platform:	
RAM:	
HD Storage:	

Multi-Platform/Environment Support:

Hardware Platform

PC (286, 386, 486, etc.)

Software Platform:

MS-DOS

Network Support:

Novell Netware
IBM LAN Server
Banyan Vines
Lantastic
LANStep
TCPAP
IPX/SPX
NFS

Application Areas:

Project Planning & Control

ntegration Capabilities:

Standard Import/Export
Spreadsheet
Word Processor

'roduct Training:

Source:	Primavera/VARs
Location:	Onsite/Offsite
Price Range:	
Topics:	

Product Description:

Time Map

Dynacomp, Inc.

Product Statistics:

Version:
Last Release: 1992
First Release: 1986
Update Freq:
Total Sold:

Vendor Profile:

Address: 178 Phillips Rd.
Address: Webster, NY 14580
Phone Number: 716265440
Fax Number:
BBS Number:
In Business:
Tech Contact:
Phone
Fax:
E-mail Address:
Mkt Contact:
Phone No: 716-265-4040
Fax No:
E-mail:

Pricing Information:

Single User: $60
Multi-user:
Reg Maintenance:
Site License?: Y e a
GSA?:

System Configurations:

Recommended:
HW/OS Platform: MS-DOS
RAM: 512 KB
HD Storage:

Minimum:
HW/OS Platform:
RAM:
HD Storage:

Multi-Platform/Environment Support:

Hardware Platform
PC (286, 386, 486, etc.)

Software Platform:
MS-DOS

Network Support:

Application Areas:

Project Planning & Control

Integration Capabilities:

Product Training:

Source: Manual
Location:
Price Range:
Topics:

Product Description:

TimeLine

Symantic

Product Statistics:
- Version:
- Last Release:
- first Release:
- Update Freq:
- Total Sold:

/endor Profile:
- Address:
- Address:
- Phone Number:
- Fax Number:
- BBS Number:
- In Business:
- Tech Contact:
- Phone:
- Fax:
- E-mail Address:
- Mkt Contact:
- Phone No:
- Fax No:
- E-mail:

Pricing Information:
- single user:
- Multi-user:
- Reg Maintenance:
- Site License?:
- GSA?:

System Configurations:

Recommended:
- HW/OS Platform:
- RAM:
- HD Storage:

/Minimum:
- HW/OS Platform:
- RAM:
- HD Storage:

Multi-Platform/Environment Support:

Hardware Platform ***Software Platform:*** ***Network Support:***

Application Areas:

Integration Capabilities:

Product Training:
- Source:
- Location:
- Price Range:
- Topics:

Product Description:

Trak

MarCon & Associates, Inc.

Product Statistics:

Version:	4.1
Last Release:	1994
First Release:	1983
update Freq:	Annually
Total Sold:	328

'ricing Information:

Single User:	$12,500+
Multi-user:	
Reg Maintenance:	15% List Price
Site License?:	Y e s
GSA?:	

'endor Profile:

Address:	11520 N. Central Expwy., Ste. 210
Address:	Dallas, TX 75243
Phone Number:	214-343-3892
Fax Number:	214-343-3971
BBS Number:	
In Business:	
Tech Contact:	
Phone:	214-343-3892
Fax	214-343-3971
E-mail Address:	
MM Contact:	R. Marshall
Phone No:	800-477-8725
Fax No:	
E-mail:	

iystem Configurations:

Recommended;

HW/OS Platform:
RAM:
HD Storage:

Minimum:

HW/OS Platform:
RAM:
HD Storage:

Multi-Platform/Environment Support:

Hardware Platform	*Software Platform:*	Network *Support:*
Mainframe		

Application Areas:

Project Planning & Control
Project Accounting
Multi-Project Management
Customized Reporting
Work Group Management

ntegration Capabilities:

MIS

Product Training:

Source: MarCon
Location: Onsite
Price Range: $2,500/2 Days
Topics:

Product Description:

Ultra PLANNER

Productivity Solutions, Inc.

Product Statistics:

Version:	6.6
Last Release:	6/1/1994
First Release:	6/1/1991
Update Freq:	Annually
Total Sold:	3oot

Vendor Profile:

Address:	72 North Street
Address:	Medfield, MA 02062
Phone Number:	508-359-1300
Fax Number:	508-359-1333
BBS Number:	
In Business:	1987
Tech Contact:	Support
Phone:	508-359-1300
Fax	508-359-1333
E-mail Address:	
Mkt Contact:	Marketing
Phone No:	508-359-1300
Fax No:	508-359-1333
E-mail:	

Pricing Information:

Single User:	Contact Vendor
Multi-user:	
Reg Maintenance:	Contact Vendor
Site License?:	Yes
GSA?:	No

System Configurations:

Recommended:	*Minimum:*
HW/OS Platform:	HW/OS Platform:
RAM:	RAM:
HD Storage:	HD Storage:

Multi-Platform/Environment Support:

Hardware Platform	***Software Platform:***	*Network support:*
PC (286, 386, 486, etc.)	Windows NT	DEC Pathworks
VAX	VMS	Windows NT
SUN	UNIX	TCP/IP
Mini-computer	ULTRIX	DECNET
	SUN-OS	NFS

Application Areas:

- Project Planning & Control
- Software Cost Estimation
- Project Accounting
- Multi-Project Management
- Customized Reporting
- Work Group Management

Integration Capabilities:

- Standard Import/Export
- Spreadsheet
- Word Processor
- Software Metrics
- MIS

Product Training:

Source:	Productivity
Location:	Onsite/Offsite
Price Range:	Contact Vendor
Topics:	Intro to Ultra PLAN
	Proj Planning/Mgt

Product Description:

Viewpoint — Computer Aided Management

Product Statistics:

Version:	6
Last Release:	6/1/1994
First Release:	1964
update Freq:	Semi-Annually
Total Sold:	12000

Vendor Profile:

Address:	1316 Redwood Way, Ste. 115
Address:	Petaluma, CA 94964
Phone Number:	707-795-4100
Fax Number:	707-795-044 1
BBS Number:	In Dev.
In Business:	1964
Tech Contact:	John Griffiths
Phone:	707-795-4100
Fax:	707-795-0441
E-mail Address:	jgriffiths.cam@notes.worldcom.com
Mkt Contact:	Andy Nester
Phone No:	707-795-4 loo
Fax No:	707-795-0441
E-mail:	anester.cam@notes.worldcom.com

Pricing Information:

Single User:	$1,995+
Multi-user:	Contact Vendor
Reg Maintenance:	$150+/yr
Site License?:	Yes
GSA?:	No

System Configurations:

Recommended:		*Minimum:*	
HW/OS Platform:	80386+/Windows 3x	HW/OS Platform:	80386/Windows 3.x
RAM:	8 MB	RAM:	6MB
HD Storage:	12 MB	HD Storage:	12 MB

Multi-Platform/Environment Support:

Hardware Platform	*Software Platform:*	*Network Support:*
	Windows 3x	Novell Netware
	MS-DOS 5.0	DEC Pathworks
		IBM LAN Server
		Windows NT
		LAN Manager
		Banyan Vines
		Lantastic
		LANStep

Application Areas:

- Project Planning & Control
- Work Group Management
- Multi-Project Management
- Presentation/Graphics
- Customized Reporting

Integration Capabilities:

- Standard Import/Export
- MIS
- OLE/DDE
- Visual Basic

Product Training:

Source:	CAM, or 3rd party
Location:	Onsite/Offsite
Price Range:	Contact Vendor
Topics:	PM Theory
	Application Specific

Product Description:

Simple and intuitive for the low-end user, graceful and robust for the high-end efforts. An enterprise-wide system that allows standardization never before thought possible, at a price that is competitive against all other leaders in the industry. Provides flexibility, comfort and ease in handling smeller projects for the more casual, infrequent user while still providing all the power and functionality required for oomplex efforts mom commonly associated with engineering, aerospace, construction and manufacturing.

Product Statistics:

Version:	1.6
Last Release:	
First Release:	1964
Update Freq:	
Total Sold:	200

Vendor Profile:

Address:	1060 First Ave., Ste. 400
Address:	King of Prussia, PA 19406
Phone Number:	800-220-2471
Fax Number:	610-265-1230
BBS Number:	
In Business:	
Tech Contact:	
Phone:	
Fax:	
E-mail Address:	
Mkt Contact:	
Phone No:	
Fax No:	
E-mail:	

Pricing Information:

Single User:	
Multi-user:	$49,000+
Reg Maintenance:	
Site License?:	Yes
GSA?:	Yes

System Configurations:

Recommended:

HW/OS Platform:	IBM Mainframe/MVS/TSO
RAM:	
HD Storage:	

Minimum:

HW/OS Platform:	
RAM:	
HD Storage:	

Multi-Platform/Environment Support:

Hardware Platform	Software *Platform:*	*Network Support:*
IBM	MVS/TSO	
DEC		

Application Areas:

- Project Planning & Control
- Project Accounting
- Work Group Management
- Multi-Project Management
- Customized Reporting

ntegration Capabilities:

Product Training:

Source:	AGS
Location:	Onsite
Prim Range:	$1,400-$2,000/day
Topics:	PM Theory
	Application Specific

Product Description:

A mainframe based project planning, management and time reporting system.

WORK-PAC SPAR **Associates, Inc.**

Product Statistics:

Version:	4.6
Last Release:	Au994
First Release:	1976
update Freq:	Annually
Total Sold:	32

Vendor Profile:

Address:	927 West St.
Address:	Annapolis, MD 21401
Phone **Number:**	**410-263-8593**
Fax **Number:**	**410-267-0503**
BBS Number:	
In Business:	1972
Tech Contact:	Laurent **Deschamps**
Phone:	**410-263-8593**
Fax:	**410-267-0503**
E-mail Address:	**ldeschamps@spar.nsnct.com**
Mkt Contact:	**Laurent Deschamps**
Phone No:	**410-263-8593**
Fax No:	**410-267-0503**
E-mail:	**ldeschamps@spar.nsnct.com**

Pricing information:

Single user:	**$6,500+**
Multi-user:	
Reg Maintenance:	15% List Price
Site License?:	Y e s
GSA?:	**No**

System Configurations:

Recommended:

HW/OS Platform:	80466
RAM:	**8 MB**
HD Storage:	**50 MB**

Minimum:

HW/OS Platform:	80386
RAM:	2MB
HD **Storage:**	**50 MB**

Multi-Platform/Environment Support:

Hardware Platform

PC **(286, 386, 486,** etc.)

Software Platform:

MS-DOS
Windows 3x

Network Support:

Novell Netware
DEC Pathworks
IBM LAN Server
LAN Manager
Banyan Vines
TCP/IP
IPX/SPX
DECNET

Application Areas:

Project Planning **& Control**
Software Cost Estimation
Risk Analysis
Project Accounting
Work Group Management
Multi-Project Management

Integration Capabilities:

Standard Import/Export
OLE/DDE
Spreadsheet
Word Processor
Software Metrics **Applications**
MIS

Product Training:

Source:	SPAR
Location:	**Both**
Price Range:	varies
Topics:	**PM Theory**

Product Description:

Modular software for planning and **scheduling** projects, then maasuring **cost** and schedule **performance.**

APPENDIX C: PRODUCT SHEETS (SOFTWARE COST ESTIMATION)

CA-Estimacs — **Computer Associates International, Inc.**

Product Statistics:
- version:
- Last Release:
- First Release:
- Update Freq:
- Total Sold:

Vendor Profile:
- Address: 2 Executive Perk Dr.
- Address: Ft Lee, NJ 07024
- Phone Number: 201-585-6720
- Fax Number: 201-585-6746
- BBS Number:
- In Business: 1979
- Tech Contact
- Phone:
- Fax: 201-585-6731
- E-mail Address:
- Mkt Contact: Paige Sirota
- Phone No:
- Fax No:
- E-mail:

'ricing Information:
- Single User: $15.759
- Multi-user:
- Reg Maintenance:
- Site License?: $45,525
- GSA?:

System Configurations:

Recommended:
- HW/OS Platform:
- RAM:
- HD Storage:

Minimum:
- HW/OS Platform:
- RAM:
- HD Storage:

Ululti-Platform/Environment Support:

Hardware Platform | *Software Platform:* | *Network Support:*

Application Areas:

ntegration Capabilities:

Product Training:
- Source:
- Location:
- Price Range:
- Topics:

Product Description:

An estimating model using research drawn from a database of more than 13,000 completed software projects. Designed to provide software developers with time/cost/resource estimates (within +/- 15% of actuals) during the feasibility phase of the life cycle. Delivers estimates without requiring the user to understand function point9 or SLOC. Provides a Risk Analysis model for assessing project's vulnerability; a financial model for determining cost and benefits of a project; an estimate of the number of function points a project will deliver (based on the effort estimate); and, a portfolio analysis component that enables the user to conduct strategic planning b determine whether the system meets your business goals and also determine the resource requirements needed across multiple projects.

CA-FPXpert

Computer Associates International, Inc.

Product Statistics:

Version:
Last Release:
First Release:
Update Freq:
Total Sold:

Vendor Profile:

Address: 2 Executive Park Dr.
Address: Ft Lee, NJ 07024
Phone Number: 201-585-6720
Fax Number: 201-585-6746
BBS Number:
In Business: 1981
Tech Contact:
Phone:
Fax: 201-585-6731
E-mail Address:
Mkt Contact: Paige Sirota
Phone No:
Fax No:
E-mail:

Pricing Information:

Single User:
Multi-user:
Reg Maintenance:
Site License?:
GSA?:

System Configurations:

Recommended:

HW/OS Platform:
RAM:
HD Storage:

Minimum:

HW/OS Platform:
RAM:
HD Storage:

Multi-Platform/Environment Support:

Hardware Platform ***Software Platform:*** Network ***Support:***

Application Areas:

Integration Capabilities:

Product Training:

Source:
Location:
Price Range:
Topics:

Product Description:

A software repository and function pint counting tool that uses the FPA method far size estimation of Information Systems (IS) type software projects. By using the Data Administration Component of CA-FPXpert, you produce actual size counts for an application. This becomes your repository of function point data. The version capability enables you to compute the actual size of a system enhancement and then view the details (the function points that comprise) the count VIA the LOC conversion facility you can estimate the size of the information system. This product converts 14 languages; such as. COBOL, ' FORTRAN, ADA and more. Other conversion facilities available within the tool is the abilii to convert Mark II Function Points to IFPUG and vice versa.

CA-Metrics

Computer Associates International, Inc.

Product Statistics:

Version:	3
Last Release:	1992
First Release:	1992
update Freq:	
Total Sold:	

Vendor Profile:

Address:	2 Executive Park Dr.
Address:	Ft Lee, NJ 07024
Phone Number:	201-585-6720
Fax Number:	201-585-6746
BBS Number:	
In Business:	1990
Ted-i Contact:	
Phone:	
Fax	201-585-6731
E-mail Address:	
Mkt Contact	Paige Sirota
Phone No:	
Fax No:	
E-mail:	

Pricing Information:

Single User:	$7,917
Multi-user:	
Reg Maintenance:	
Site License?:	$46,626
GSA?:	

System Configurations:

Recommended:

HW/OS Platform:	MS-DOS
RAM:	640 KB
HD Storage:	6.5 MB

Minimum:

HW/OS Platform:	
RAM:	
HD Storage:	

Multi-Platform/Environment Support:

Hardware *Platform*	Software *Platform:*	*Network Support:*
IBM or compatible	MS-DOS	

Application Areas:

ntegration Capabilities:

Product Training:

Source:	
Location:	
Price Range:	
Topics:	

Product Description:

An information system repository that enables the TS shop to measure the quality and productivity of their new and maintenance development efforts. Vi quality questionnaires, CA-Metrics enables the user to assess the quality of an individual application as well as the overall success of development efforts. It enables you to define key performance measures such as, cost versus estimated cost, time to delivery, defect ratios. Provides user with the information needed to focus the attention and energy of entire enterprise on maximiiing its value.

CA-Planmacs **Computer Associates International, Inc.**

Product Statistics:

Version:	2.1
Last Release:	1992
First Release:	1985
Update Freq:	18-24 rnos.
Total Sold:	

Vendor Profile:

Address:	2 Executive Park Dr.
Address:	Ft Lee, NJ 07024
Phone Number:	201-585-6720
Fax Number:	201-585-6746
BBS Number:	
In Business:	1979
Tech Contact:	
Phone	
Fax:	201-585-6731
E-mail Address:	
Mkt Contact:	Paige Sirota
Phone No:	
Fax No:	
E-mail:	

Pricing Information:

Single User:	$7,917
Multi-user:	
Reg Maintenance	
Site License?:	$45,526
GSA?:	

System Configurations:

Recommended:	*Minimum:*
HW/OS Platform:	HW/OS Platform:
RAM:	RAM:
HD Storage:	HD Storage:

Multi-Platform/Environment Support:

Hardware Platform *Software Platform:* *Network Support:*

Application Areas:

Integration Capabilities:

Product Training:

Source:
Location:
Price Flange:
Topics:

Product Description:

A modeling planning system that gives project plans at the touch of a button which helps speed your development cycle. Designed to provide developers with time/resource/effort for each phase/task/activity of their project development methodology. Creates a project blueprint using estimates from CA-Estimacs or your own externally derived estimates that are highly accurate. Creates the detailed project plan without requiring the user to know or understand function points ardor SLOC. Utilizing this product's export facility, the user is able to create a detailed project plan in their project management tools and be managing projects within seconds.

CA-Project Navigation

Computer Associates International, Inc.

Product Statistics:
- Version:
- Last Release:
- First Release:
- update Freq:
- Total Sold:

Vendor Profile:
- Address: 2 Executive Park Dr.
- Address: Ft Lee, NJ 07024
- Phone Number: 201-585-6720
- Fax Number: 201-585-6746
- BBS Number:
- In Business: 1977
- Tech Contact.
- Phone
- Fax: 201-585-6731
- E-mail Address:
- Mkt Contact: Paige Sirota
- Phone No:
- Fax No:
- E-mail:

Pricing Information:
- single user: $23,400
- Multi-user:
- Reg Maintenance:
- Site License?: $108,000
- GSA?:

System Configurations:

Recommended:
- HW/OS Platform:
- RAM:
- HD Storage:

Minimum:
- HW/OS Platform:
- RAM:
- HD Storage:

Multi-Platform/Environment Support:

Hardware Platform | *Software Platform:* | *Network Support:*

Application Areas:

ntegration Capabilities:

Product Training:
- Source:
- Location:
- Price Range:
- Topics:

Product Description:

This solution allows user to get a dear understanding of what can be done to increase the value of information technology to their business. It provides the project manager with the ability for continuous project information in the areas of estimating, planning, managing measurement, acquisition anddedsion making. The solution includes the following products: CA-Estimacs, CA-Planmacs, CA-SuperProject, CA-Metrics and CA-FPXpert. These products provide smooth navigation through the software development lii cycle.

IProduct Statistics:

version: 1
Last Release:
First Release:
update Freq:
Total Sold:

'ricing Information:

Single User: $195
Multi-user:
Reg Maintenance:
Site License?: Y e s
GSA?:

/endor Profile:

Address: 1526 Spruce St.
Address: Boulder, CO 80302
Phone Number: 303-337-3531
Fax Number: 303-337-3560
BBS Number:
In Business:
Tech Contact:
Phone:
Fax:
E-mail Address:
Mkt Contact: Kirby Wallin
Phone No:
Fax No:
E-mail:

System Configurations:

Recommended:

HW/OS Platform: Windows/Mac
RAM: 2MB
HD Storage: 1 MB

Minimum:

HW/OS Platform: Must have crystal Ball software
RAM:
HD Storage:

Multi-Platform/Environment Support:

Hardware Platform

Add on for Mac Excel, Windows Excel, Windows Lotus 123

Software Platform:

Network Support:

Application Areas:

ntegration Capabilities:

'roduct Training:

Source:
Location:
Prii Range:
Topics:

Product Description:

A software cost estimation tool based on COCOMO. It estimates time and cost of software development projects. It allows entering of actual project data at various phases in the life cycle to support cost to complete estimating. It is designed to work with Crystal Ball, a forecasting and risk analysis program. It delivers a range of estimates that shows the best case, worst case and most likely scenarios for schedules and budgets.

CHECKPOINT — Software Productivity Research, Inc.

Product Statistics:

Version:	2.3
Last Release:	1995
First Release:	1989
update Freq:	Annually
Total Sold:	600

'ricing Information:

Single User:	$20,000
Multi-user:	Varies
Reg Maintenance:	SI ,500/user
Site License?:	$99,000/15 users
GSA?:	$13,000

Vendor Profile:

Address:	1 New England Executive Park
Address:	Burlington, MA 01603
Phone Number:	617-273-0140
Fax Number:	617-273-5176
BBS Number:	
In Business:	1985
Tech Contact:	Card Chungas
Phone:	415-954-8560
Fax	415-954-8598
E-mail Address:	carol@spr.com
Mkt Contact:	John Zimmerman
Phone No:	
Fax No:	
E-mail:	john@spr.com

System Configurations:

Recommended:

HW/OS Platform:	DOS/Unix
RAM:	8 MB
HD Storage:	13-20 MB

Minimum:

HW/OS Platform:	DOS/Unix
RAM:	4MB
HD Storage:	13-15 MB

Multi-Platform/Environment Support:

Hardware Platform
IBM or compatible
(386 min) HP7XX & 8XX,
Sun SPARC.
Motorola MPC
(88000 or 88100 board)

Software Platform:
Windows *Rd.* 3.1,
HPUX9.01 - Motif,
Sun OS 4.1.3 - XWindows

Network sllpport:
Novell,
Banyan/Vines,
IBM

Application Areas:
Cost estimation,
project management,
proposals

Integration Capabilities:
Export/Import to Excel,
Lotus, ASCII Comma Del
Export to Microsoft
Project - MPX

Product Training:

Source:	S. P. R., Inc
Location:	Onsite
Price Range:	$1,300-$7,000
Topics:	Product Impl.

Product Description:

A knowledge-based software measurement, estimation, and assessment tool that provides guidance and support for software managers and IS executives. It contains its own knowledge base of industry standards comprised of more than 5800 software projects from systems. IS and military environments, representing new projects enhancements, and maintenance programs.

Product Statistics:

version:	3.163
Last Release:	1991
first Release:	1966
update Freq:	As required
Total Sold:	

'ricing Information:

Single User:
Multi-user:
Reg Maintenance:
Site License?: F r e e
GSA?:

Vendor Profile:

Address:	4375 Chii Rd.. Ste. 6
Address:	Wright-Patterson AFB, OH 45433-5006
Phone Number:	513-257-1932
Fax Number:	513-257-0800
BBB Number:	
In Business:	
Tech Contact:	Ronnie E. Cooper
Phone:	513-257-1932
Fax:	5132574600
E-mail Address:	
Mkt Contact:	Ronnie E. Cooper
Phone No:	5134574932
Fax No:	513-257-0800
E-mail:	rcooper@wpgate1.wpaf6.af.mil

System Configurations:

Recommended:

HW/OS Platform: Min 6066
RAM: 660KB
HD Storage: 600KB

Minimum:

HW/OS Platform:
RAM:
HD Storage:

Multi-Platform/Environment Support:

Hardware Platform *Software Platform:* *Network support:*

Application *Areas:*

ntegration Capabilities:

Product Training:

Source:
Location:
Price Range:
Topics:

Product Description:

Complete implementation of all published COCOMO versions including models for basii, intermediate, detailed, maintenance and calibration (coefficient). Enhanced Ada, Ada process model, and incremental development models published at the COCOMO user group.

COSTMODL

COSMIC

Product Statistics:

Version:	1
Last Release:	1994
First Release:	
Update Freq:	
Total Sold:	

Pricing Information:

Single user:	$600 program/$29 documentation us customers
Multi-user:	$1200 program/$58 documentation for Int'l customers
Reg Maintenance:	None
Site License?:	n/a
GSA?:	n/a

Vendor Profile:

Address:	382 E. Broad St.
Address:	Athens, GA 30602-4272
Phone Number:	706-542-3265
Fax Number:	7066424807
BBS Number:	
In Business:	
Tech Contact:	
Phone:	706-542-3265
Fax:	706-542-4807
E-mail Address:	service@cosmic.uga.edu
Mkt Contact:	Tii Peacock
Phone No:	
Fax No:	
E-mail:	www.cosmic.uga.edu

System Configurations:

Recommended:

HW/OS Platform:	IBM compatible PC, MS-DOS 5.0 or
RAM:	512 KB
HD Storage:	

Minimum:

HW/OS Platform:	
RAM:	
HD Storage:	

Multi-Platform/Environment Support:

Hardware Platform	*Software Platform:*	*Network Support:*

Application Areas:

Integration Capabilities:

Training:

Price Range:

Product Description:

A tool for estimating the effort cost, and schedule required to develop software products. It was developed by the Software Technology Branch of the Spacecraft Software Division at NASA/Johnson Space Center. Fii different models are included for estimating non-Ada, Ada and products which are to be delivered as a series of incremental deliveries. The basic estimating equations can be calibrated to tha user's software development environment type of products and the set of factors which influence software development.

Crystal Ball

Decisioneering

Product Statistics:

version:	3.0.3
Last Release:	
first Release:	
Update Freq:	Every 2 yrs
Total Sold:	29,000+

Vendor Profile:

Address:	1526 Spruce St.
Address:	Boulder, CO 80302
Phone Number:	3034374531
Fax Number:	3034374560
BBS Number:	
In Business:	
Tech Contact:	
Phone:	
Fax:	
E-mail Address:	
Mkt contact	Kirby Wallin
Phone No:	
Fax No:	
E-mail:	

Pricing Information:

Single User:	$295
Multi-user:	
Reg Maintenance:	
Site License?:	Yes
GSA?:	

System Configurations:

Recommended:		*Minimum:*	
HW/OS Platform:	Windows/Mac	HW/OS Platform:	
RAM:	2 MB	RAM:	
HD Storage:	1 MB	HD Storage:	

Multi-Platform/Environment Support:

Hardware Platform | *Software Platform:* | *Network Support:*

Application Areas:

Integration Capabilities:

Product Training:

Source:
LO&On:
Price Range:
Topics:

Product Description:

A software cost, schedule and risk estimation tool that addresses all DOD software standards and requirements. Ada, DOD-STD-2167A, DOD-STD-1703, security and other current software issues are specifically supported. Knowledge bass developed from thousands of completed DOD projects are an integral part of the model.

GECOMO Plus

Marconi Systems Technology

Product Statistics:

Version: 1.3
Last Release:
first Release:
Update Freq:
Total Sold:

Vendor Profile:

Address: 4115 Pleasant Valley Rd.
Address: Chantilly, VA 22021
Phone Number: 703-263-1260
Fax Number: 703-263-1533
BBS Number:
In Business:
Tech Contact: customersupport
Phone: 703-263-1260
Fax 703-263-1533
E-mail Address:
Mkt contact Bridget Cronin
Phone No: 800-544-3525
Fax No:
E-mail:

Pricing Information:

Single User: $4,000
Multi-user: $6,000 up to 5 users
Reg Maintenance: 15% of list price
Site License?: $11,000 unlimited
GSA?:

System Configurations:

Recommended:

HW/OS Platform: VMS, Unix OSF Motif, Windows
RAM:
HD Storage:

Minimum:

HW/OS Platform:
RAM:
HD Storage:

Multi-Platform/Environment Support:

Hardware Platform ***Software Platform:*** ***Network Support:***

Application Areas:

Integration Capabilities:

Product Training:

Source:
Location:
Price Range:
Topics:

Product Description:

A cost estimating tool for software engineering projects: It is an enhancement of COCOMO. This product takes 17 cost drivers intoaccount It has implemented the Ada cost model allowing cost estimation for Ada-based projects as well as non-Ada projects.

Product Statistics:

version:	2.1
Last Release:	1994
First Release:	1992
Update Freq:	Annually
Total Sold:	100

'ricing Information:

Single User:	$5,000
Multi-user:	Yes
Reg Maintenance:	1 5%/purchase price
Site License?:	Y e s
GSA?:	

/endor Profile:

Address:	429 Santa Monica Blvd., Ste. 429
Address:	Santa Monica, CA 90401
Phone Number:	310-393-4552
Fax Number:	310-451-2888
BBS Number:	
In Business:	1984
Tech Contact:	Tech. Support
Phone	310-393-4552, x209
Fax	
E-mail Address:	
Mkt Contact:	Carlos Gonzalez
Phone No:	
Fax No:	
E-mail:	

System Configurations:

Recommended:

HW/OS Platform:	PC-Windows
RAM:	4MB
HD Storage:	5 MB

Minimum:

HW/OS Platform:	
RAM:	
HD Storage:	

Multi-Platform/Environment Support:

Hardware Platform *Software Platform:* *Network Support:*

Application Areas:

ntegration Capabilities:

Product Training:

Source:
Location:
Price Range:
Topics:

Product Description:

A PC-based estimating and planning tool for information services projects. It is used to calculate overall project effort and create project plans which include estimated hours for all project events. It uses FPA The estimation is dependent of programming language and the development environment.

PRICE S — **Martin Marietta PRICE Systems**

Product Statistics:

Version:	2
Last Release:	1994
First Release:	1977
Update Freq:	As required
Total Sold:	

Vendor Profile:

Address:	700 E. Gate Dr., Ste. 200
Address:	Mt. Laurel, NJ 08054
Phone Number:	800-437-7423
Fax Number:	
BBS Number:	
In Business:	1975
Tech Contact:	Ben Chackman
Phone:	513-252-4226
Fax:	513-252-6154
E-mail Address:	
Mkt Contact:	Earl King
Phone No:	609-866-6581
Fax No:	609-866-8889
E-mail:	

Pricing Information:

Single User:	$1,000/gov't, $15,000/comm. first copy, $2,000 add copies
Multi-user:	Same as single user
Reg Maintenance:	n/a
Site License?:	$11 ,250/gov't, $25,000/comm.
GSA?:	n/a

System Configurations:

Recommended:

HW/OS Platform:	Unix/Motif or MS Windows
RAM:	8 MB
HD Storage:	6MB

Minimum:

HW/OS Platform:	Unix/Motif or MS Windows
RAM:	4MB
HD Storage:	6MB

Multi-Platform/Environment Support:

Hardware Platform	*Software Platform:*	*Network Support:*

Application Areas:

Integration Capabilities:

Product Training:

Source:
Location:
Price Range:
Topics:

Product Description:

A full-featured software estimating tool. It estimates sofhvare size using function points and a derivative of feature points along with costs and schedules for the total software lii cycle - from system concept through maintenance and support Output costs are provided in terms of effort (hours or months) and currency. It incorporates the effects of modern development practices; the availability and use of software development tools; the experience of the software team; and the programming languages empbyed. It consists of a graphical user interface and risk analysis. This windows product provides interface capability with Microsoft Excel and Project.

Project Bridge **Applied Business Technology Corp.**

Product Statistics:

Version:	DOS 3/Win2
Last Release:	1994
First Release:	1988
update Freq:	Annually
Total Sold:	

Vendor Profile:

Address:	361 Broadway
Address:	New York, NY 10013-3992
Phone Number:	800-444-0724
Fax Number:	800-444-0726
BBS Number:	
In Business:	1981
Tech Contact:	Jon Hoaldridge
Phone:	
Fax:	
E-mail Address:	
Mkt Contact:	
Phone No:	
Fax No:	
E-mail:	

Pricing Information:

Single user:	$4,950
Multi-user:	
Reg Maintenance:	
Site License?:	
GSA?:	

System Configurations:

Recommended:

HW/OS Platform:	MS DOS/MS Win
RAM:	
HD Storage:	

Minimum:

HW/OS Platform:	
RAM:	
HD Storage:	

Multi-Platform/Environment Support:

Hardware Platform *Software Platform:* *Network Support:*

Application Areas:

Integration Capabilities:

Product Training:

Source:
Location:
Price Range:
Topics:

Product Description:

A project planning, profiling, and estimating system which shortens the planning cycle while generating accurate, dependable plans. Uses proven estimated techniques that incorporate both bottom-up and top-down approaches, as well as percent adjustment from previous projects. Techniques include Function Points and Experience Factors. Reengineering of existing project templates into the tool is also supported. Project Brii provides a seamless, two-way link with Project Workbench so that projects can be adjusted and re-estimated as actual work effort data is captured. In addition it accesses the development methodology and brings it on-line through the Windows hypertext facility.

REVIC — **Air Force Cost Analysis Agency**

Product Statistics:

version:	9.11b
Last Release:	1992
First Release:	
update Freq:	
Total Sold:	

Vendor Profile:

Address:	1111 Jefferson Davis Hwy., Ste. 403
Address:	Arlington, VA22202
Phone Number:	703-746-5865
Fax Number:	
BBS Number:	
In Business:	
Tech Contact:	
Phone:	
Fax:	
E-mail Address:	
Mkt Contact:	John B. Donald
Phone No:	
Fax No:	
E-mail:	

Pricing Information:

Single user:	
Multi-user:	
Reg Maintenance:	
site License?:	
GSA?:	Gov't owned

System Configurations:

Recommended:

HW/OS Platform: MS-DOS
RAM:
HD Storage:

Minimum:

HW/OS Platform:
RAM:
HD Storage:

Multi-Platform/Environment Support:

Hardware Platform	***Software Platform:***	*Network Support:*

Application Areas:

Integration Capabilities:

Product Training:

Source:
Location:
Price Range:
Topics:

Product Description:

REVIC (Revised Intermediate COCOMO) contains a model far estimating the cost, schedule and manpower resources for software development projects. It is based on the Intermediate COCOMO model. In addition to providing estimates on cost, manpower, and schedule, the program creates estimates for typical DOD-STD-2167A documentation sizing and long term software maintenance.

Product Statistics:
Version:
Last Release:
first Release:
update Freq:
Total Sold:

Vendor Profile:
Address: 1111 Jefferson Davis Hwy., Ste. 403
Address: Arlington, VA 22202
Phone Number: 703-746-5865
Fax Number:
BBS Number:
In Business:
Tech Contact:
Phone:
Fax:
E-mail Address:
Mkt Contact: John B. Donald
Phone No:
Fax No:
E-mail:

Pricing Information:
Site User:
Multi-user:
Reg Maintenance:
Site license?:
GSA?: Gov't owned

System Configurations:

Recommended:
HW/OS Platform: MS-DOS
RAM:
HD Storage:

Minimum:
HW/OS Platform:
RAM:
HD Storage:

Multi-Platform/Environment Support:

Hardware Platform *Software Platform:* *Network Support:*

Application Areas:

Integration Capabilities:

Product Training:
Source:
Location:
Price Range:
Topics:

Product Description:

Software Architecture Sizing and Estimating Tool (SASET) is a software cost estimation tool developed by Martin Marietta Corporation for ths Naval Center for Cost Analysis. It estimates size, development effort and support for software development. It is a forward chaining, rule-based expert system utilizing a hierarchically structured knowledge data base. Thedatabaseis composed of projects with a wide range of applications.

SECOMO

IIT Research Institute

Product Statistics:

Version:	7
Last Release:	1989
First Release:	1985
Update Freq:	
Total Sold:	800+

Vendor Profile:

Address:	201 Mill St.
Address:	Rome, NY 13440
Phone Number:	3153397004
Fax Number:	315-339-7002
BBS Number:	
In Business:	1957
Tech Contact:	
Phone:	315-339-7004
Fax:	31 S-3347002
E-mad Address:	
Mkt Contact:	Maureen Regan
Phone No:	
Fax No:	
E-mail:	mregan@mail.iitri.com

Pricing Information:

Single User:	No charge -just provide diskettes
Multi-user:	
Reg Maintenance:	
Site License?:	
GSA?:	

System Configurations:

Recommended:

HW/OS Platform:	IBM PC, MS-DOS, VAX/VMS 3.2+
RAM:	
HD Storage:	

Minimum:

HW/OS Platform:	
RAM:	
HD Storage:	

Multi-Platform/Environment Support:

Hardware Platform ***Software Platform:*** ***Network Support:***

Application Areas:

Integration Capabilities:

Product Training:

Source:	
Location:	
Price Range:	
Topics:	

Product Description:

An interactive software cost estimation tool, based cm COCOMO, that calculates the total technical and support requirements for all phases of the software development cycle. Features include a user friendly interface, on-line help, and an expanded user's manual. Version 5.3 requires an IBM-PC or compatible running under MS- DOS with at least 384 KBs of memory.

Product Statistics:

Version:	4
Last Release:	1994
First Release:	1988
Update Freq:	6mos-1 yr
Total Sold:	

Pricing Information:

Single User:	$15,000/yr
Multi-user:	
Reg Maintenance:	Included
Site License?:	$19,500
GSA?:	Can

Vendor Profile:

Address:	P. 0. Box 90579
Address:	Los Angeles, CA 90009
Phone Number:	310-670-3404
Fax Number:	310-670-6481
BBS Number:	
In Business:	1979
Tech Contact:	Tech Support Staff
Phone:	
Fax	
E-mail Address:	
Mkt Contact:	Ken Harms
Phone No:	310-670-3404
Fax No:	310-670-6481
E-mail:	info@gaseer.com

System Configurations:

Recommended:

HW/OS Platform:	IBM compatible, windows
RAM:	
HD Storage:	

Minimum:

HW/OS Platform:	
RAM:	
HD Storage:	4.5 MB

Multi-Platform/Environment Support:

Hardware Platform	*Software Platform:*	*Network Support:*
IBM PC, Mac, SUN	Windows 3.1 or higher, System 7, Unk	Yes

Application Areas:

Integration Capabilities:

Product Training:

Source:	GA SEER Technologies
Location:	Los Angeles
Price Range:	$1600/wk
Topics:	S/W, H/W models

Product Description:

A software cost, schedule and risk estimation tool that addresses all DOD software standards and requirements. Ada, DOD-STD-2167A, DOD-STD-1703, security and other current software issues are specifically supported. Knowbdge bases developed from thousands of completed DOD projects are an integral part of ths model.

SEER-SSM Galorath Associates, Inc.

Product Statistics:

Version:	2.62
Last Release:	1993
first Release:	
Update Freq:	Annually
Total Sold:	

'ricing Information:

single User:	$1,950
Multi-user:	
Reg Maintenance:	Included
Site License?:	$ 3 , 3 0 0
GSA?:	

/endor Profile:

Address:	P. 0. Box 90579
Address:	Los Angeles, CA 90009
Phone Number:	310-670-3404
Fax Number:	310-670-6481
BBS Number:	
In Business:	1979
Tech Contact:	Tech Support Staff
Phone:	
Fax:	
E-mail Address:	
MM Contact:	Ken Harms
Phone No:	310-670-3404
Fax No:	310-670-6481
E-mail:	info@gaseer.com

System Configurations:

Recommended:

HW/OS Platform:	IBM PC compatible. DOS 3.0+
RAM:	
HD Storage:	500 KB

Minimum:

HW/OS Platform:	
RAM:	
HD Storage:	

ululti-Platform/Environment Support:

*Hardware **Platform*** Software ***Platform:*** ***Network Support:***

Application Areas:

Integration Capabilities:

Product Training:

Source:
Location:
Price Range:
Topics:

Product Description:

A sofhvare size estimation tool. It produces software size estimates in lines of code or function points. Provides its own historical data base to save time in produdng the size estimates.

SIZE PLANNER Quantitative Software Management, Inc.

Product Statistics:

Version:	1.1
Last Release:	1991
First Release:	1984
Update Freq:	As required
Total Sold:	7500

Pricing Information:

Single User:	$10,000
Multi-user:	
Reg Maintenance:	Annual License
Site License?:	$10,000
GSA?:	None

Vendor Profile:

Address:	2000 Corporate Ridge, Ste. 900
Address:	McLean, VA22102
Phone Number:	703-790-0055
Fax Number:	703-749-3795
BBS Number:	
In Business:	1979
Teoh Contact:	Lawrence H. Putnam, Jr.
Phone:	
Fax	
E-mail Address:	qsm@qsm.com
Mkt Contact:	
Phone No:	703-749-3818
Fax No:	703-749-3795
E-mail:	

System Configurations:

Recommended:

HW/OS Platform:	IBM PC/Windows 3.1
RAM:	4MB
HD Storage:	1.5 MB

Minimum:

HW/OS Platform:	IBM PC/Windows 3.1
RAM:	4MB
HD Storage:	1.5 MB

Multi-Platform/Environment Support:

Hardware Platform
IBM PC compatible

Software Platform:
Windows for Workgroups, Windows NT, OS/2

Network Support:
Any network that supports windows

Application Areas:
Can be applied to any type of software application from real time to business

Integration Capabilities:

Product Training:

Source:	QSM
Location:	McLean, VA
Price Range:	$1100-1400
Topics:	SIZE PLANNER

Product Description:

A software size estimate tool that uses four independent approaches for size estimation including fuzzy logic, function points, standard component and new/reused/modified sizing. Each approach views the product from a unique perspective. The multiple perspective approach provides a cross-check on the overall estimate whii reduces the uncertainty in the size estimate.

SIZE Plus

Marconi Systems Technology

Product Statistics:

- **Version:** 12
- Last **Release:**
- First Release:
- update Freq:
- Total **Sold:**

'ricing Information:

- angle user: $2,800
- **Multi-user:** $4,000 up to 5 users
- **Reg Maintenance:** 15% of list price
- Site License?: $7,300 unlimited
- GSA?:

/endor Profile:

- **Address:** 4115 Pleasant Valley Rd.
- Address: Chantilly, VA 22021
- Phone Number: 703-263-1260
- Fax **Number:** 703-263-1533
- **BBS** Number:
- In Business:
- Tech **Contact:** Customer support
- **Phone:** 703-263-1260
- Fax 703-263-1533
- E-mail **Address:**
- Mkt **Contact:** Bridget Cronin
- **Phone No:** 800-544-3525
- **Fax No:**
- E-mail:

System Configurations:

Recommended:

- HW/OS Platform: VMS, Unix OSF Motif, X-Win
- RAM:
- HD Storage:

Minimum:

- HW/OS Platform:
- RAM:
- HD Storage:

Multi-Platform/Environment Support:

Hardware ***Platform*** | ***Software Platform:*** | ***Network Support:***

Application Areas:

Integration Capabilities:

Product Training:

- **Source:**
- **Location:**
- **Price Range:**
- Topics:

Product Description:

Used to estimate the size of software projects using the FPA method. Supports both data processing and real-the appkations.

Product Statistics:

Version:	3 2
Last Release:	1995
first Release:	1976
Update Freq:	Annually
Total Sold:	3,000+

Pricing Information:

Single User:	$16,500
Multi-user:	$30,000
Reg Maintenance	Annual License
Site License?:	$30,000
GSA?:	None

Vendor Profile:

Address:	2000 Corporate Ridge, Ste. 900
Address:	McLean, VA 22102
Phone Number:	703-790-0055
Fax Number:	703-749-3795
BBS Number:	
In Business:	1976
Tech Contact:	Lawrence H. Putnam, Jr.
Phone	
Fax:	
E-mail Address:	qsm @qsm.com
Mkt Contact:	
Phone No:	703-749-3818
Fax No:	703-749-3795
E-mail:	

System Configurations:

Recommended:

HW/OS Platform:	IBM PC/Windows 3.1
RAM:	4MB
HD Storage:	1.5 MB

Minimum:

HW/OS Platform:	IBM PC/Windows 3.1
RAM:	4MB
HD Storage:	1.5 MB

Multi-Platform/Environment Support:

Hardware Platform
IBM PC compatible

Software Platform:
Windows for Workgroups. Windows NT, OS/2

Network Support:
Any network that supports windows

Application Areas:
can be applied to any type of software application from real time to business

Iniegration Capabilities:

Product Training:

Source:	QSM
Location:	McLean, VA
Prii Range:	$1100-1400
Topics:	SUM, SUM control

Product Description:

A software cost, schedule, risk and reliability estimation tool for planning, control and risk analysis. It uses expert system methodology, and can be customized to a specific organization through the use of historic data.

SLIM Control

Quantitative Software Management, Inc.

Product Statistics:

Version:	2
Last Release	1995
Arst Release:	1989
update Freq:	Annually
Total Sold:	7500

Vendor Profile:

Address:	2000 Corporate Ridge, ste. 900
Address:	McLean, VA 22102
Phone Number:	703-790-0055
Fax Number:	703-749-3795
BBS Number:	
In Business:	1978
Tech Contact:	Lawrence H. Putnam, Jr.
Phone	
Fax:	
E-mail Address:	qsm@qsm.com
Mkt Contact:	
Phone No:	703-749-3818
Fax No:	703-749-3795
E-mail:	

'ricing Information:

Single User:	$16,500
Multi-user:	$30,000
Reg Maintenance	Annual License
Site License?:	$30,000
GSA?:	None

System Configurations:

Recommended:

H W/OS Platform:	IBM PC compatible
RAM:	4MB
HD Storage:	1.5 MB

Minimum:

HW/OS Platform:	IBM PC/Windows 3.1
RAM:	4MB
HD Storage:	1.5 MB

Multi-Platform/Environment Support:

Hardware *Platform*
IBM PC compatible

Software Platform:
Windows for Workgroups, Windows NT, OS/2

Network Support:
Any network that supports Windows

Application Areas:

Can be applied to any type of software application from real time to business

Integration Capabilities:

Product Training:

Source:	QSM
Location:	McLean, VA
Price Range:	$1100-1400
Topics:	SUM, SLIM Control

Product Description:

Controls software projects by employing advanced statistical process control techniques. Projects get noted as green, yellow or red. Red projects can be re-estimated using SUM Control's adoptive forecasting algorithms.

Product Statistics:

Version:	1.3b
last Release:	1990
first Release:	1985
update Freq:	
Total Sold:	250+

Vendor Profile:

Address:	1 New England Executive Park
Address:	Burlington, MA01603
Phone Number:	617-273-0140
Fax Number:	617-273-5176
BBS Number:	
In Business:	1965
Tech Contact:	card Chungas
Phone:	415-954-8560
Fax:	415-954-8598
E-mail Address:	carol@spr.com
Mkt Contact:	John Zimmerman
Phone No:	
Fax No:	
E-mail:	john@spr.com

Pricing Information:

Single User:	$5,000
Multi-user:	Variable discount
Reg Maintenance:	10% 10% Annuallyly
Site License?:	$25,000
GSA?:	$3,250

System Configurations:

Recommended:

HW/OS Platform: MS-DOS
RAM:
HD Storage:

Minimum:

HW/OS Platform:
RAM:
HD Storage:

Multi-Platform/Environment Support:

Hardware Platform	*Software Platform:*	*Network Support:*

Application Areas:

ntegration Capabilities:

Product Training:

Source:
Location:
Price Range:
Topics:

Product Description:

A software estimation tool that provides software project estimates for time, cost, and resource requirements. The key elements forecast by this tool are captured in its name: Software Productivity, Quality and Reliability - (SWR).

SWAN .

IIT Research Institute

Product Statistics:

Version:	1.4
last Release:	1992
First Release:	1991
Update Freq:	As required
Total Sold:	

Jendor Profile:

Address:	201 Mill St
Address:	Rome, NY 13440
Phone Number:	315-339-7004
Fax Number:	315-339-7002
BBS Number:	
In Business:	1957
Tech Contact:	
Phone:	315-339-7004
Fax:	315-339-7002
E-mail Address:	
Mkt Contact:	Maureen Regan
Phone No:	
Fax No:	
E-mail:	mregan@mail.iitri.com

Pricing Information:

Single User:	No charge -just provide diskettes
Multi-user:	
Reg Maintenance:	
Site License?:	
GSA?:	Gov't owned

System Configurations:

Recommended:
HW/OS Platform: MS-DOS
RAM:
HD Storage:

Minimum:
HW/OS Platform:
RAM:
HD Storage:

Multi-Platform/Environment Support:

Hardware Platform ***Software Platform:*** ***Network Support:***

Application Areas:

Integration Capabilities:

Product Training:
Source:
Location:
Price Range:
Topics:

Product Description:

Developed for the US Army Program Manager for Training Devices (PMTRADE) in Ada programming language. It supports the intermediate version of COCOMO, including Ada COCOMO. It includes the FPA technique to assist users in determining software size estimates.

APPENDIX D: REFERENCES AND RECOMMENDED READINGS

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APPENDIX E: ACRONYMS AND GLOSSARY

ACRONYMS

ACC	Air Combat Command
ACWP	Actual Cost of Work Performed
AFMC	Air Force Materiel Command
ALAP	As Late As Possible
ALC	Air Logistics Center
ASAP	As Soon As Possible
BCWP	Budgeted Cost of Work Performed
BCWS	Budgeted Cost of Work Scheduled
C/SCSC	Costs/Schedule Control System Criteria
CMM	Capability Maturity Model
COCOMO	COnstruction COst MOdel
COTS	Commercial off-the-shelf
CPM	Critical Path Method
DDE	Dynamic Data Exchange
DoD	Department of Defense
ECS	Electronic Customer Support
EMS	Expanded Memory Specification
ESIP	Embedded Computer Resources Support Improvement Program
FF	Finish-to-Finish Dependency
FPA	Function Point Analysis
FPC	Function Point Count
FS	Finish-to-Start Dependency
GIGO	Garbage In/Garbage Out
GUI	Graphical User Interface
IEEE	Institute of Electrical and Electronics Engineers
IS	Information System
LAN	Local Area Network

OBS	Organizational Breakdown Structure
OLE	Object Linking and Embedding
OOA	Object-Oriented Analysis
OOD	Object-Oriented Design
PC	Personal Computer
PERT	Program Evaluation and Review Technique
RAD	Requirements, Analysis & Design
RAM	Random Access Memory
SCSA	Source Code Static Analysis
SDA	Software Development Activity
SEE	Software Engineering Environment
SEI	Software Engineering Institute
SEPG	Software Engineering Process Group
SLOC	Source Lines of Code
SS	Start-to-Start Dependency
STSC	Software Technology Support Center
TPEE	Test, Preparation, Execution, and Evaluation
WBS	Work Breakdown Structure
WYSIWYG	What You See Is What You Get

Actual Cost of Work Performed (ACWP)
Actual direct costs incurred on a project at any given time.

Arrow Diagramming Method (ADM)
A scheduling method less frequently used that represents project task start and end dates as nodes connected by arrows. The arrows represent the project tasks.

Baseline
An established, fixed version of the project plan against which actual implementation of the project is measured.

Budgeted Cost of Work Performed (BCWP)
(Earned Value) The total value of work performed at any given time.

Budgeted Cost of Work Scheduled (BCWS)
(Budgeted Cost To-Date) The total budgeted cost for work scheduled to be completed at any given time.

COnstructive COst MOdel (COCOMO)
Asoftware cost estimation model developed by Dr. Barry Boehm and is described in his book, *Software Engineering Economics* [Boehm 81].

Cost Driver Attributes
Productivity factors in the software product development process that include software product attributes, computer attributes, personnel attributes, and project attributes.

Critical Path Method (CPM)
A project scheduling method that uses task duration and dependency information to identify the sequence(s) of tasks that provide the longest completion time of the project. The "critical path" identifies the sequences of tasks, any one of which, if delayed, would delay the completion date of the project.

Earned-Value Analysis
A cost analysis method based on planned and actual progress on a project. The method uses BCWS, BCWP, ACWP, and associated data to complement the project tracking process.

Forward Scheduling
A scheduling method in which the project start date is fixed, and task duration and dependency information is used to compute the corresponding project completion date.

Gantt Chart
A graphical tool to display the project schedule in which tasks are represented as horizontal bars positioned with respect to a horizontal time frame. The task bars are scaled in length to denote duration and positioned at points on the chart to denote start and completion dates.

Life Cycle
The stages and processes through which software passes during its development and operational use. Useful life of a system. Its length depends on the nature and volatility of the business, as well as the software development tools used to generate the databases and applications.

Multiple Project Scheduling
The process of developing a project schedule based on constraints imposed by other projects. These constraints may be date driven, resource driven, etc.

Paradigm A model, example, or pattern. A generally accepted way of thinking.

PERT Chart
(Network Diagram) A graphical tool to display the logical flow and precedence relationships of project tasks.

Platform
Hardware architecture of a particular model or family of computers. The term sometimes refers to the hardware and its operating system.

Precedence Diagramming Method (PDM)
A diagramming method that represents project tasks as "nodes" connected by arrows. The arrows define the precedence relationships between each task.

Priority
A level of importance assigned to a task used to define the extent of its manipulation by the project manager.

Process
The sequence of activities (in software development) described in terms of the user roles, user tasks, rules, events, work products, resource use, and the relationships between them. It may include the specific design methodology, language, documentation standards, etc.

Program Evaluation and Review Technique (PERT)
A project scheduling method often used for projects with a degree of uncertainty in the duration of its tasks. The method models the project tasks as a mathematical probability distribution. A series of weighting factors are entered by the project manager to define and "shape" the distribution. Pessimistic, most likely, and optimistic task durations are then computed from the distribution.

Project Calendar
A calendar record of the project defining workdays, non-workdays, partial workdays, etc.

Project Tracking
A method of project control that uses comparisons of planned and actual progress to identify possible problems and develop corresponding solutions.

Re-engineering
Process of restructuring and redesigning an operational (or coded) software system to make it meet certain style, structure, or performance standards.

Real-time
1. Immediate response. The term may refer to fast transaction processing systems in business; however, it is normally used to refer to process control applications. For example, in avionics and space flight, real-time computers must respond instantly to signals sent to them. 2. Any electronic operation that is performed in the same time frame as its real-world counterpart. For example, it takes a fast computer to simulate complex, solid models moving on screen at the same rate they move in the real world. Real-time video transmission produces a live broadcast.

Resource Allocation
The assigned contribution by a resource to a project or task.

Resource Calendar
A calendar report that defines the availability of a resource.

Resource Conflict
A resource allocation that violates a resource's availability. Such conflicts are often caused by assigning the resource to parallel tasks.

Resource Histogram

A graphical tool to display the resource commitments with respect to time of a project or task.

Resource Leveling

A method to resolve resource conflicts. The method delays tasks in conflict until the resource becomes available.

Resource Pool

A collection of resources that may be used concurrently on several different projects.

Resource Profile

A description of a resource with respect to project work. The profile defines the resource's availability, compensation rate, experience, etc.

Reuse

Software development technique that allows the design and construction of reusable modules, objects, or units, that are stored in a library or database for future use in new applications. Reuse can be applied to any methodology in the construction phase, but is most effective when object-oriented design methodologies are used.

Reverse Scheduling

A scheduling method in which the project completion date is fixed, and task duration and dependency information is used to compute the corresponding project start date.

Scheduling Constraints

Conditions that affect the normal scheduling of project tasks. Such conditions may include requirements that a task begin or end at a specific time, begin or end as soon as, or as late as possible, etc.

Scheduling Increments

The time unit used for project scheduling: hours, days, etc.

Scheduling Type

The method that contributes to how project tasks are scheduled. Scheduling types may be based on the project workday, resource availability, resource effort, elapsed time, etc., or a combination of these factors.

Software Development Lifecycle

The stages and processes through which software passes during its development. This includes requirements definition, analysis, design, coding, testing, and maintenance.

Software Tool

Program that aids in the development of other software programs. It may assist the programmer in the design, code, compile, link, edit, or debug phases.

Structure Diagram

A graphical tool to display the work breakdown structure of a project.

Summary Task

A task that incorporates the task information of one or more detailed tasks. Often termed a parent task.

Task Dependency

A relationship between tasks that defines their start or finish dates or both with respect to each other. These relationships may include FF, FS, and SS dependencies.

Work Breakdown Structure (WBS)

A method to define the tasks required to complete a task. The method successively divides the project into smaller units to define tasks that require one or more resources to accomplish. The WBS also defines the project hierarchy and can be used to define the project with respect to organization, end product, responsibility, etc.

WYSIWYG Reporting

A capability of project management software to represent output on-screen as close to its printed equivalent as possible.

APPENDIX F: SOFTWARE TECHNOLOGY SUPPORT CENTER OVERVIEW

1.1 THE SOFTWARE TECHNOLOGY SUPPORT CENTER

The mission of the Software Technology Support Center (STSC) is to transition technologies and exchange information to help DoD software development and support activities continuously improve their software quality and life-cycle productivity.

A planned approach is necessary for successful transition. In general, transitioning effective practices, processes, and technologies consists of a series of activities or events that occur between the time a person encounters a new idea and the daily use of that idea. Conner and Patterson's Adoption Curve [Conner 82], shown in Figure 1-1, illustrates these activities.

After encountering a new process or technology, potential customers of that technology increase their awareness of its usage, maturity, and application. If the process or technology is promising, customers try to better understand its strengths, weaknesses, costs, and applications. These first activities in the Adoption Curve take a significant amount of time.

Next, the customer evaluates and compares the processes and technologies that show the most promise. To reduce the risk, customers usually try new processes or technologies on a limited scale through beta tests, case studies, or pilot projects. A customer then adopts processes or technologies that prove effective. Finally, refined processes and technologies become essential parts of an organization's daily process (institutionalization).

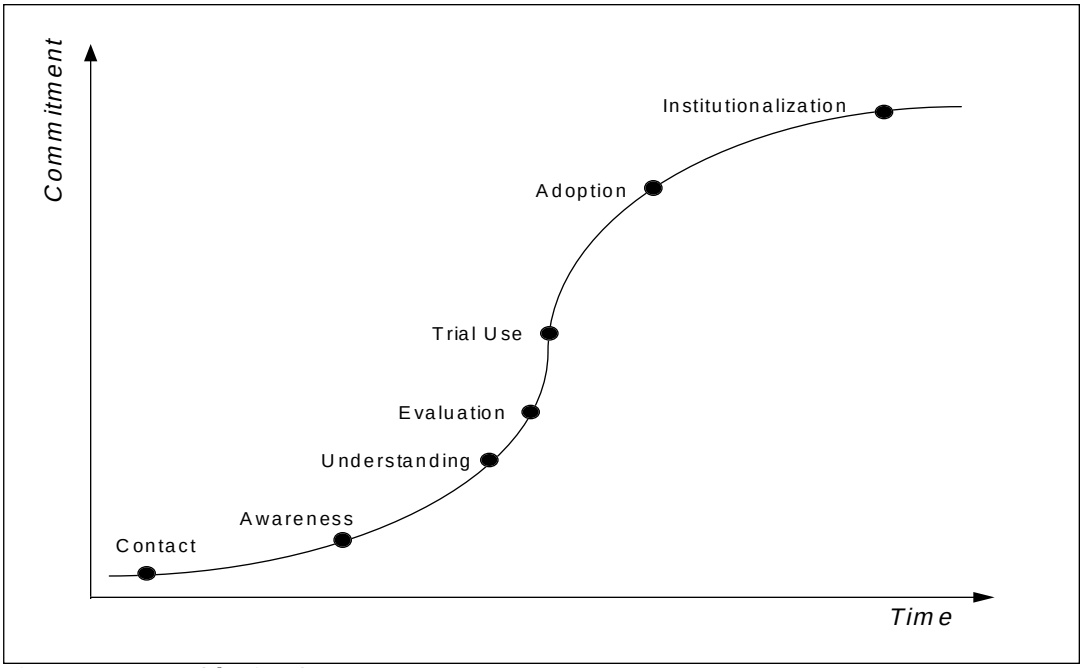

Figure 1-1 Adoption Curve.

Word processors are essential in most organization's daily operations. Yet, 30 years ago they did not exist. The institutionalization of word processors in many organizations followed a series of events similar to those identified in the adoption curve.

The STSC is researching and collecting information about technologies that will reduce the time and resources it takes to become aware, understand, evaluate, test, try, and adopt effective practices, processes, and technologies. The STSC has developed the following objectives to accomplish its mission:

- **Technology Evaluation** – Identify, validate, classify, and evaluate effective processes and technologies.
- **Information Exchange** – Facilitate the exchange of better software business practices, processes, and technologies within the DoD.
- **Insertion Projects** – Analyze and improve processes, adopt new methodologies as needed, evaluate and select effective tools, receive appropriate levels of training, and perform pilot projects to try out and confirm the technology insertion efforts.
- **STSC Associates** – Develop STSC associates who can infuse effective process and technology improvements through the use of STSC products, services, and processes.

1.2 STSC Technology Transition Approach

This section describes the STSC's approach to the objectives identified in the previous section.

1.2.1 Technology Evaluation

The first technology transition objective involves identifying, validating, and classifying processes, methods, and technologies that can potentially improve the quality or productivity of software development and maintenance. Many organizations focus on deadlines and customer needs and therefore lack the resources and time to thoroughly investigate options for improvement, leaving them vulnerable to marketing hype. The STSC has developed the infrastructure to provide information on all types of applicable technologies. Product critiques, which are essentially brief evaluations from experienced technology users, are collected. Quantitative evaluations, which are detailed, comparable, and objective, are performed on the most promising tools, methods, or processes.

1.2.2 Information Exchange

This technology transition objective exposes potential customers to available technologies and, conversely, customer requirements to technology developers. Referring to the adoption curve, this objective focuses on contact, awareness, and understanding. STSC products that accomplish this objective include *CrossTalk, The Journal for Defense Software Engineering*, the annual Software Technology Conference, specific technology reports, and electronic customer services.

- **CrossTalk** – Over 16,000 software professionals receive *CrossTalk* monthly. This publication provides a forum to exchange ideas. Articles cover leading edge, state-of-the-art, and state-of-the-practice processes and technologies in software engineering.
- **Software Technology Conference** – The annual Software Technology Conference is held each April in Salt Lake City, Utah. This conference brings together over 2,500 software professionals from government, industry, and academia to share technology solutions and exchange ideas and information.
- **Technology Reports** – STSC technology reports provide detailed information on specific software engineering technologies; this report is an example. The current list of reports includes: Test Preparation, Execution, and Evaluation, Documentation, Project Management, Requirements Analysis and Design, Reengineering, Source Code Static Analysis, Software Engineering Environments, etc.

These reports provide awareness and understanding of each topic in preparation for evaluation and selection of corresponding technologies. Over 55,000 of these reports have been distributed.

- **Electronic Customer Services** – Along with the services mentioned above, the STSC also provides customers with electronic access to information via Electronic Customer Services (ECS). ECS includes a bulletin board system that is available to obtain additional information, leave messages, add information, and confer electronically. In addition, a computerized database of practice, process, and technology information is coming on-line. ECS can be accessed via the Internet at address 137.241.33.1 or stscbbs.a1.mil or by calling 801-774-6509 with modem at 2400 or 9600 baud, 8 bit word, 1 stop bit, and no parity.

1.2.3 Technology Insertion Projects

STSC technology insertion projects are customer-oriented projects that evaluate, select, and pilot the use of new processes, methods, and technologies for a specific customer. These projects can include process definition, process improvement, methodology insertion, tool insertion, and development of a technology road map. Referring to the adoption curve, Figure 1-1, an insertion project helps cement understanding of a process or technology, tailors an evaluation of the process or technology for the customer, and pilots the use of that process or technology with appropriate levels of training. Customers move closer to adoption of the process or technology through hands-on experience. It is important to try out technology improvements in a pilot project to confirm that the technology is appropriate for the organization and that the organization is ready and able to adopt the new technology.

1.2.4 STSC Associates

Fowler and Przybylinski [Fowler 88] propose that transitioning new technologies from a developer to a consumer requires an advocate to push the technology and a receptor to pull the technology into an organization. This concept is illustrated in Figure 1-2.

Effective change comes from within the organization. The STSC Associates objective is to develop technology receptors within individual Air Force SDSAs. These receptors, STSC Associates, are trained in the use of the STSC's information, products, and services to enhance their organization's ability to incorporate advanced practices, processes, and technologies.

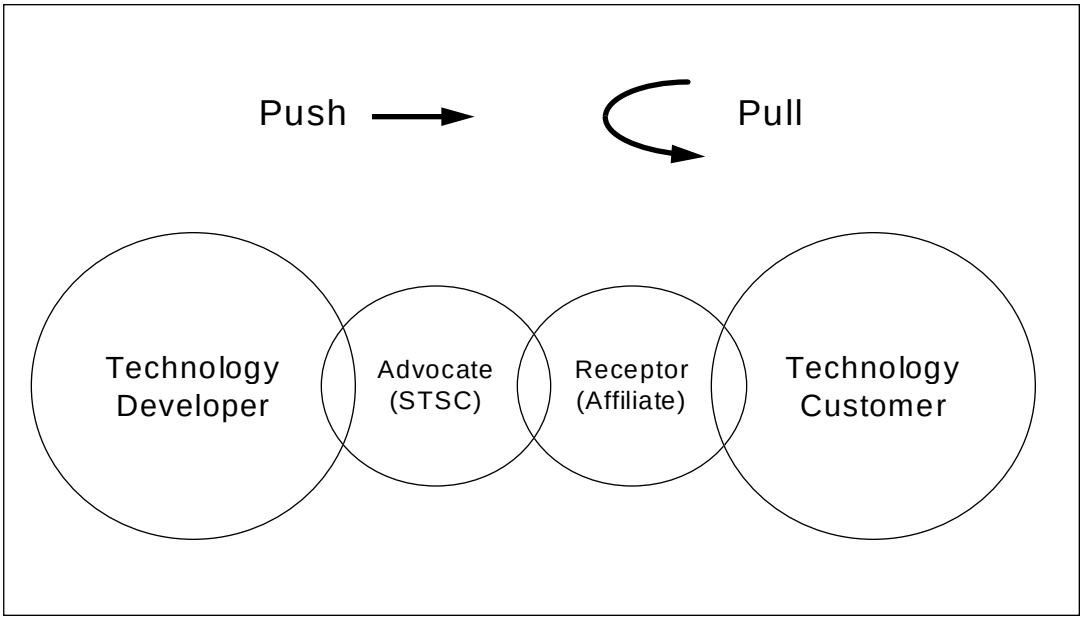

Figure 1-2 Transitioning Technology.

Referring to the adoption curve in Figure 1-1, STSC Associates complete the trek to institutionalization. Associates who come from within the organization should be politically astute and aware of internal organizational requirements. They have the highest probability of influencing the adoption and daily use of effective business practices, processes, and technologies.

1.3 Embedded Computer Resources Support Improvement Program (ESIP)

The STSC operates from the Ogden Air Logistics Center at Hill Air Force Base, Utah, under the direction and guidance of the ESIP Program Office. An Air Force program, the ESIP has the goals to reduce the software backlog and increasing software quality and productivity. Its mission is to provide an infrastructure to assist in the transitioning of technology to support all categories of embedded computer systems throughout the acquisition cycle and improve the readiness of Air Force weapon systems. ESIP is divided into four tasks: Readiness, the Software Technology Support center (STSC), Extendible Integration Support Environment (EISE), and Advanced R&D. ESIP is directed by an Air Force program management directive (PMD3118) and is led by Col. Charles Fuller. An ESIP working group has been established as a forum to share lessons learned and establish requirements for ESIP funded technology transition projects. Working group members are from the major commands, ESIP task managers, and the ESIP program office staff