

Title: Survey of the Use of Project Management Techniques Based on Project Size and Type

Course: EMGT 545/645 Term: Year: 1997

Author(s): A. Coskun, B. Desmond, A. Eghtedari, H Kassim, D. Kuran, D. Munger and J. Rawlinson

Report No: P97010

	ETM OFFICE USE ONLY
Report No.:	See Above
Type:	Student Project
Note:	This project is in the filing cabinet in the ETM department office.

Abstract: Project Management techniques vary in type, complexity and usage. What to use and how, is one of the primary decision to be made by project managers. The purpose of this paper is to find out if there is a relationship between the size of the project and/or type of the industry with the usage of Project Management Techniques.

Survey of the Use of Project Management Techniques Based on Project Size and Type

A Coskun, B Desmond, A Eghtedari, H Kassim, D Kuran, D Munger, J Rawlinson

EMP-9710

EMGT 545/645 PROJECT MANAGEMENT IN ENGINEERING & TECHNOLOGY

£ ..

TEAM PROJECT

Survey of the Use of Project Management Techniques Based on Project Size and Type



Submitted to: Dr. Dundar KOCAOGLU

Submitted by: <u>TEAM #3</u> Aysun Coskun Bert Desmond Ali Eghtedari Hafiz Kassim Dogus Kuran Dale Munger Jim Rawlinson

Portland State University Engineering Management Program 4 June 1997

TABLE OF CONTENTS

i i i

TABLE OF CONTENTS	1
ABSTRACT	2
I. INTRODUCTION	3
II. PROJECT MANAGEMENT TECHNIQUES USED TODAY (A LITERATURE SEARCH)	5
III. PROJECT MANAGEMENT TOOLS SURVEY QUESTIONNAIRE	14
IV. SURVEY QUESTIONNAIRE RESULTS AND ANALYSIS	18
IV. I. Sample Profile - Organizations	18
IV.II. Sample Profile - Projects	21
IV.III. Sample Profile - Project Management Software Packages Used	22
IV.IV. Hypothesis Testing	27
V. CONCLUSIONS	31
REFERENCES	32
APPENDIX A - Questionnaire For Project Management Tools Survey	33
APPENDIX B - Primavera Project Planner	34
APPENDIX C - SURVEY DATA	35

ABSTRACT

PM techniques vary in type, complexity and usage. What to use and how, is one of the primary decisions to be made by project managers. The purpose of this paper is to find out if there is a relation between the size of the project and/or type of the industry with the usage of PM technique.

I. INTRODUCTION

The present level of usage of project management techniques has been achieved through an evolutionary process that spans several developments. Badiru [2] describes five distinct generations of project management based on the evolution of computers and the accompanying software development.

- 1. First generation (pre-World War II). This was unstructured era of project analysis when managers executed their project plans and the so called "seat-of-the-pants" approach.
- Second generation (from mid-1950s). The emergence of formal operations research techniques led to the introduction of dedicated project scheduling techniques such as PERT and CPM. Project analysis was performed mostly manually. (The stubby pencil days).
- 3. Third generation (from early 1970). The mainframe computer implementations of PERT/CPM became prevalent. However, access to the programs was limited to only those with the necessary hardware.
- 4. Fourth generation (from early 1980s). This period marked the development of more accessible project management programs on mini-microcomputers.
- 5. Fifth generation (from mid-1980s). This generation is marked by the introduction of integrated project management packages.
- 6. Sixth generation (the 1990s). This generation incorporates real-time communication and networking capabilities into project analysis. Artificial intelligence techniques including expert systems, neural networks, and case-based reasoning for project management will play a major role in project management in this era.
- Future generation. It is expected that the increasing use of remote electronic access. Internet, and worldwide Web (WWW) will further enhance software capabilities for project management.

With the low cost and wide availability of project management software, users can buy a package, install it and start using it in one day. However, if the user is not

familiar with project management techniques, he or she will create many more problems than will be solved. This is concern is heightened when we read quotes like, 'Workers spend their time working, not learning project management concepts,'[6] in 'white papers' promoting the use of project management software packages.

1

Roman [19] stresses that Project Management software will help the project manager to plan and control projects <u>only if he understands and applies the principles and techniques of project management</u>. Project Management software will not tell him what decisions to make or how they should be implemented. George Davis of Davis & Dean, Seattle, stated that one of the primary reasons project managers fail is the misuse of project management software. 'It is easy to buy the software; what's difficult is to use it to help. You have to know which features will actually help and which are a waste of time.' [21] Webster [22] states, 'There is criticism of project management literature in regard to the inability to find guidance as to which tool and which variant to use under what circumstances.' Avots [1] states one of the reasons for project failure is that management techniques may not always suit the project's requirements or project characteristics.

These observations reinforced the professional experiences of several team members that many firms may be using the techniques for all sizes and types of projects with the attitude that 'one size fits all.' We decided that we would like to investigate the relationship between the usage of project management techniques and project size and project type or industry.

This paper documents the results of our literature search and a survey we conducted concerning the usage of selected project management techniques. Based on the literature research we developed a conceptual model and two hypotheses. The model and hypotheses guided the development of a questionnaire that was posted on the Portland State University Engineering Management Program network listserver and which was also handed out by the team members to professional and personal contacts who are project managers. We received 38 responses that were analyzed and correlated as to techniques used and project size and type.

II. PROJECT MANAGEMENT TECHNIQUES USED TODAY (A LITERATURE SEARCH)

We found textbooks, worldwide Web page articles, and published articles that discussed or presented listings of project management tools and techniques in use today.

In 1986, Roman [19] presented a list (Figure II-1) of what he called the standard analytical tools used in software applications and grouped them under the headings of network-base scheduling, resource management, and cost performance reporting.

Burke [4] grouped the analytical techniques into four groups called scheduling techniques, resource management, cost and performance measurement, and graphics and displays. These are shown in table II-1.

Meredith and Mantel [12] listed their grouping of project management techniques under the headings of project planning, resource management, tracking/monitoring, report generation, and decision aiding. These are described below.

'*Project planning*. In this initial area, consideration should be given to the number of activities per project, the use of various calendars and time units, data recording and organization, time estimation, graphics generation, Gantt chart and PERT/CPM chart capabilities, early and late starts, and the ability to handle subnetworks (i.e., nested networks).'

Resource management. The issues here are similar and include the number of resource types, the number of resources per project, sharing of resources, resource leveling, scheduling by resource load, resource updating, resource usage conflicts, multiproject resource analysis, resource planning and analysis, cost estimating, and financial modeling and analysis.'

'*Tracking/monitoring.* This area includes critical path analysis, subnetwork analysis, early warning systems, baseline and actual schedule updating and display, resource updating and display, and similar items.'

'*Report generation.* This topic includes project status summaries, computer-assisted report generation, sophisticated data evaluation, resource lists and histograms, schedule lists, task detail, updating of report periods, resource detail, resource assignments, and current Gantt and PERT/CPM diagrams.'

NETWORK-BASED SCHEDULING

- PERT and CPM methods

- Resource loading allowed
- Multiple starts/finishes
- User-defined calendars
- Expansion capability
- Track progress with actuals
- On-line editing and error checking
- Time/cost trade-off functions

COST PERFORMANCE REPORTING

- Budget cost by WBS element
- Interface with network and resources
- Collect actual cost and schedule data
- Roll up costs into WBS levels
- Track BCWS, BCWP, and ACWP
- Compute cost and schedule variances
- Use variance trends to estimate future performance

RESOURCE MANAGEMENT

- Resource loading in network
- Flexible resource availability definition
- Time-and resource-limited scheduling
- Scheduling of selected resources
- User-definable scheduling priorities
- Grouped and teamed resources
- Consumable resources and event-driven availability
- Flexible interface for integration with material and equipment control



TABLE II-1 - Important Attributes/Features to Look for inProject Management Software Systems [4].

Data Entry

5

User Interface

1. Multiple menu screens or pop-up menu window for easy data input 2. Command-driven sequences that allow users to operate the system with the menus turned off 3. Full-screen forms that users can tailor for customized applications 4. Automation of repetitive procedures through programmable subroutines or macro commands

1. Optional mousedriven interface 2. "cut and Paste" command that let users compose or draw project displays right on the computer screen 3. On-line help facilities, interactive tutorials, and user training that expedites learning 4. Complete error checking and data validation 5. Copy commands that let users save project data for later reuse or move portions of the project elsewhere 6. Features that provide for automatic display of subsequent levels of detail in the project plan, WBS, or activity sequences

Data Manipulation/ Communication 1. Automatic retrieval and display of historical project data when updating existing data 2. Ability to preview reports and plots on the computer screen prior to printing or plotting 3. Ability to save to disk and read and write files in standard communication formats 4. Project import/export to other project management systems, publication software, spreadsheets, etc. 5. Access to an independent Data **Base Management** System (DBMS) for retrieval, manipulation, reporting of project data 6. ability to interface with other corporate

DP/MIS systems

Scheduling Techniques

1. Critical Path (CPM) scheduling with availability of the following:

- AOA and AON, linear and variable time-scaled networks
- Probabilistic PERT networks with milestone notations
- As-soon-as possible and as-late-as-possible activity-based schedules
- Early start/early finish and late start/late finish activity reports

2. Multiple work-week calendars and maximum calendar lengths for projects that span several years

Flexible coding structure that allow users to code project tasks by WBS/OBS numbers or alphanumeric descriptors

4. Progress reporting and full summarization of scheduled activities by:

- User-defined status dates
- Actual finish
- Duration complete
- Duration remaining
- percent complete

5. Multiple-level project processing and provisions for linking project activities for multiple project

TABLE II-1 (cont.) - Important Attributes/Features to Look for in **Project Management Software Systems**[4].

1...

34.277

Resource	Cost and Performance	Graphics and displays	Other Feature
Resource Management 1. Ability to schedule multiple projects from a common resource pool and to monitor changes in resources availability on project completion dates and cost 2. Ability to level resources by resource availability and override constraints imposed by time- limited activities 3. Capability to level resources for a single resource class, particular activity, or the entire project 4. Ability to display resource usage histograms directly on the effect of variable resource availability over time	Cost and Performance Measurement 1. Automatic conversion of resource usage to cost 2. Full integration of resources and cost with schedule 3. Cash flow analysis 4. Detailed budgets by activity and resources 5. Reporting by: • Actual costs to date (ACWP) • Estimate at completion (EAC) • Budget to date (BCWS) • Budget at completion (BAC) • Earned value (BCWP) 6. Summarization of cost data across multiple projects	 Graphics and displays 1. Availability of the following: Work breakdown structures Network diagrams XY charts Bar (Gantt) charts Logic diagrams Resource histograms 2. Ability to display multiple curves, histograms, and plot points on the same graph to determine variances and predict trends 3. provision to edit and generate multiple-size plots 4. Ability to specify sort sequences by activity name or WBS/OBS codes 5. Ability to retain in a library or file user specifications for subsequent regeneration of bar charts, network diagrams, etc. 6. Device-independent interface for printing and plotting graphs and other 	Other Feature1. User-definableoptions reports2. General and context-specific help facility;easily assessable andinformative errormessages3. Vendor support andmaintenanceagreements thatinclude:Telephone hotlineconsultation• User training• Documentation4. Support services forvery large andexpensive systems thatinclude:• Applicationsprogramdevelopment• Consultingcontracts5. Companionproducts:
		displays	Optional plotter

er graphics system selectively print sections of the • Communication

software for networking several systems

8

7. Ability to summarize and

8. Ability to integrate text and user-defined symbols into the

bar charts and network

diagrams for top-level

reporting

graphics

Decision aiding. This area includes a number of capabilities, some involving external software packages. Generally, what-if analysis, expert system capability, multi-project tracking with cross analysis and other such types of capabilities are useful.

Appendix B shows that the tools made available by a high end enterprise software application, Primavera Project Planner, are grouped under the headings of project modeling, scheduling, resource and cost management, and reports and graphics. This listing is a good example of the extensive list of techniques available in software today.

Using these lists we developed five grouping or categories of the more commonly used techniques for use in our survey. They are as follows:

1. Scheduling techniques (CPM, Bar Gantt charts)

1 -

£

- 2. **Reporting techniques** (Progress reporting and full summarization of scheduled activities, Multiple-level project processing and linking project activities for multiple project reporting)
- 3. Resource Management techniques (Schedule multiple projects from common resource pool, Resource leveling)
- 4. Cost & Performance Measurement techniques (Resource usage to cost Conversion, Cash Flow analysis, Report - Actual cost to date (ACWP), Report -Estimate at Completion (EAC), Report - Budget to date (BCWS), Report - Budget at Completion (BAC), Report - Earned Value (BCWP), Summarization of cost data across multiple projects)
- Display techniques (Display Work Breakdown structures, Display Network Diagram, Display - XY charts, Display - Logic diagrams (Interrelationships), Display
 Resource Histograms)

<u>Project Size and Type versus Techniques Used</u> - The most commonalty used techniques regardless of size and type of projects appear to be scheduling (Gantt charts and CPM), resource allocation or management, monitoring, and reporting [5] [7] [8] [14] [20]. At one firm in New Mexico [20], small projects were managed using a simplified process of generating Gantt charts from a CPM software package and progress was monitored using a baseline for schedule and required resources. The rate of progress was monitored by actual observations of the work completed and the weekly expenses charged to a given project with this data compared to the baseline. A small (4 employees) remolding contractor in Baltimore uses scheduling, task identification, and cost data to develop project baseline data (WBS, schedules, cost estimates) for a given project. This schedule and estimate is updated as changes and delays occur and subcontractors are notified of the changes via an automatic FAX system. The baseline is used as a basis for a "post-mortem" or lessons learned review with the subcontractors and staff to improve the process after each project [14]. Several articles [5] [12] [7] [13] suggest that as projects become larger and more complex the uncertainty increases (schedules hard to determine and cost hard to estimate) the more sophisticated are the techniques used. To handle uncertainty project managers switch from CPM to PERT. Also, 'earned value' type progress monitoring is used more and resource leveling techniques are employed more often for larger complex projects. [5]

ş

Software development and implementation and R&D projects have very high uncertainty levels and it has been stated [5] [12] that the probabilistic critical path methods are better suited for larger projects in these industries. 'Recent research finds that a greater use of "project management techniques" (PERT/CPM among a number of

others) occurs on R&D type projects, on projects with greater levels of complexity, and on projects with resource limitations, than on other types of projects or those with lower levels of complexity and fewer resource limitations.' [12]

1

Bubshait [3] surveyed 48 projects to determine what project characteristics influence the implementation of project management techniques. His survey results suggest that construction projects use more techniques that non-construction projects and R&D projects use more techniques than any other type of project. This study indicates 'a positive relationship between the number of project management techniques used and the level of complexity involved in the project. Projects with many activities usually imply more (precedence) interrelationships and more multi-organizational involvement in the decision process. As such, additional project management techniques are required to support the management process.'

'Limitation of resources imposes additional constraints on projects. The results indicate a greater use of techniques when such limitations are present. The relationship is strengthened even more for projects that are labor intensive, although the number of activities in a project has a minor dampening effect.'

'Projects with a well defined deadline (and possible contractual penalty clauses) tend to use more project management techniques very early in the life of the project...' Bubshait's study highlighted the relationship between project type, complexity, and resource limitation.

We developed a conceptual model to illustrate the relationship between the use of project management techniques and size or complexity of a project (figure II-3). Where Bubshait's looked at the number of techniques used by different types of projects we

wanted to determine the type of techniques used based on size and type of project or industry. The following hypotheses were formulated using the general project management technique categories described in section I.

Hypotheses for project size:

1

ر پهرېنځ Is there a difference among projects with different sizes in the use of:

- 1. Scheduling techniques?
- 2. Reporting techniques?
- 3. Resource Management techniques?
- 4. Cost & Performance Measurements techniques?
- 5. Display techniques?

Hypotheses for industry type:

Is there a difference among different industry types in the use of:

- 1. Scheduling techniques?
- 2. Reporting techniques?
- 3. Resource Management techniques?
- 4. Cost & Performance Measurements techniques?
- 5. Display techniques?

Project Management Techniques	Logic Diagrams Limited Resource Scheduling Multiple Project Reporting					
· ·		PERT				
Increase in		Earned V	/alue			
Capability		Cash Flo	w Analysis —			
To Handle		Resource L	eveling			
Complex		СРМ				
Projects		Work Breal	down Structur	e		
and	Progress Re	porting		· · · · · · · · · · · · · · · · · · ·		
Uncertainty	Resource So	heduling				
2	Gantt Charts					
	Small Projects	Large Projects	Multiple Projects	Enterprise/Corporate Level		

 Σ^{-1}

UNCERTAINTY AND COMPLEXITY

Figure II-3 - Conceptual model showing use of project management tools with increase in project size, complexity, and uncertainty.

III. PROJECT MANAGEMENT TOOLS SURVEY QUESTIONNAIRE

As a part of the term project, our group proposed to conduct a survey aimed at finding any relationship between Project Management (PM) software and techniques selected and used by a firm based on the size of the project and the type of project. After some discussion, we concluded that we needed to make a distinction between selection of the software tool and that of using the project management techniques available in the software package. The argument was made that 1) most of the established institutions already have a PM software package in use as a standard for their PM and the possibility that they would change it very often seems very low, 2) those project managers whom our survey would reach are not in a position to select the software tool that they use and most probably follow the standards of the firm, 3) those who have selected the PM software package might not be available to respond to the questionnaire. Thus based on these arguments and considering the project's time frame, it was decided to pursue the survey only on use of the PM tools in industry and leave the PM ' software tool selection processes' to a literature research which will be covered in another part of this report. The main question in hand then became to find any correlation among the use of PM techniques based size of project and different disciplines.

Sampling survey and interviews are among the most commonly used techniques in information inquiry systems. All experts in this field believe that correct writing of the questionnaire is a key element in success of the process. Some problems encountered in such a process are addressed by sampling theory, which include among others the choice of sampling size required for reliable results, the choice of random, representative

or other sample designs to yield the highest efficiency and reliability, and the cost of sampling. It is also recommended that questionnaire be pretested using a small population before it is delivered to the larger population of respondents.

Portland State University has its own requirements in human-subject surveying. These requirements includes approval by a special committee to assure that all the legal aspects of surveys have been met and the survey results would match the funds being spent. With these requirements in mind our group encountered some constraints. First, was that we did not have enough time to go through all the required steps. Secondly, the project was a class assignment with no funding available to permit a large sample approach. We did however, attempt to overcome some of these constraints using the following techniques. First, we decided that a review by Dr. Kocaoglu would satisfy the PSU review requirements and secondly, in order to reach more people in a short time, we decided to use the Internet by posting the questionnaire over the EMP network listserver and to also use personal or professional contacts in the industry. Third, we pretested the questionnaire using some of our classmates.

فسريا

It should be noted that we have treated all responses as if they were from a practicing project manager. This might not be true for people surveyed over the Internet, since we do not have any way to verify that a respondent is indeed an active project manager. The impact of this concern on the survey results could be tested in another paper and is beyond the scope of this report.

The questionnaire has 9 main parts (see Appendix A) and a brief discussion of each part follows:

i . .

I. <u>Introduction and Purpose</u>. We assure the respondent that all information is confidential and name of the respondent and company would be kept anonymous. No where in the questionnaire do we ask for the name of the company or respondent. This was included in case an E-mail response would release their name automatically.

II. <u>Question 1</u> was intended to make sure that respondent is indeed a practicing project manager. As it was discussed before, there is no guarantee that when using Internet, we will get the actual PM to respond, however we trusted the respondents and treated them as such.

III. <u>Questions 2-5</u> collect data on the type and size of the company and typical projects:

 \cdot Q-2 helps in categorizing the respondent's institution by industry or discipline. There are also places to specify categories that have not been included in the list.

 \cdot Q-3 identifies the size of company by number of employees.

 \cdot Q-4 & Q-5 are intended to identify the number, size, and duration of typical projects that are being engaged at one time.

IV. <u>Question 6</u> addresses the use of PM tools/techniques in different aspects of project management.

V. <u>Questions 7-9</u> identify the number, brand and selection criteria for PM software in use. Question 8 recognizes the possibility of having software developed inhouse specifically for project management as oppose to using off-the-shelf generic packages.

VI. <u>Question 10</u> has a table of different techniques used in project management and classifies their use based on the size of project. These five categories are less than \$100K, between \$100K and \$500K, between \$500K and \$1M, between \$1M and \$5M and greater than \$5M. The table also asks whether the technique used is supported by the software package in use. These are the most commonly used techniques, whose use may vary based on the size and complexity of the project. These techniques are grouped under the five general headings of scheduling, reporting, resource management, cost & performance measurement, and display techniques.

50

VII. <u>Question 11</u> is intended to categorize use of the tool in five different general disciplines of project management, Planning, Scheduling, Controlling, Monitoring, and Resource leveling.

VIII. Questions 12 and 13 are intended to see how Internet and Interanet are being used in Project Management. As a new development of information technology, these are going to be widely in use in the future, and survey results would give us a good base for future forecasting of the industry development.

IX. Finally at the end of the questionnaire a list of Acronyms were given to facilitate the responses from those not familiar with terminology in engineering management field.

IV. SURVEY QUESTIONNAIRE RESULTS AND ANALYSIS

IV. I. Sample Profile - Organizations

. وندو We received 38 responses to our survey tool in a little over a four week period of time. We hope that this "medium" size sample will be representative of the entire population, but at least it will give us an insight into answering our research questions.

The following table and pie chart illustrate the breakdown of industry types where respondents work for:

Field of Work	Count	Percentage
Construction/Civil/Architect	15	39.48%
Electrical/Electronics	9	23.68%
Manufacturing		
Automotive Manufacturing	2	5.26%
Oil/Chemical Manufacturing	1	2.63%
Health Services	2	5.26%
Utility Services	1	2.63%
Design Services	1	2.63%
Computer Services	2	5.26%
Other Manufacturing	1	2.63%
Other Services	4	10.53%

Table IV-1: Breakdown of industry types among respondents

Table IV-1 shows the break down of respondents by industry as a percentage of the total count and the count out of 38 respondents for each category. As figure IV-1 depicts, a majority of our respondents were from the electrical/electronics manufacturing and construction/civil/ architecture sectors.



Figure VI-1: Breakdown of industry types among respondents

We have clustered the various industry types used in the survey into three major

functional areas:

24

1. Manufacturing Industry

Electrical/Electronics Manufacturing Automotive Manufacturing Oil/Chemical Manufacturing Other Manufacturing Wood/Paper Manufacturing (no respondent from this industry) Plastic Manufacturing (no respondent from this industry)

- 2. Service Industry
 - Health Services Utility Services Design Services Computer Services Other Services
- 3. Construction Industry Civil/Architect Construction

We can say that there was an even distribution of respondents over the three functional areas. Besides their industry type, respondents were asked their company size in terms of employment figures. Five major categories have been used for the company size as shown on the following table. As table IV-2 and figure IV-2 below indicate, more than half of the respondents were working for companies where there are more than 1000 employees.

5-04

No. of employees	Count	Percentage
Between 1 and 10	3	7.89%
Between 10 and 30	3	7.89%
Between 30 and 100	2	5.26%
Between 100 and 1000	10	26.32%
More than 1000	20	52.63%

Table IV-2: Breakdown of company size among respondents



Figure IV-2: Breakdown of company size among respondents

IV.II. Sample Profile - Projects

The number of projects engaged at one time was another statistical data that we collected from the respondents. As expected, due to the large size of the companies represented in the data base, there are a large number of firms where multiple projects are undertaken at the same time. We have given five different ranges to respondents regarding the number of projects engaged at one time in their respective company as shown on the following table. More than 70% of the respondents' companies were involved in more than 20 projects at one time. It was quite interesting to find such a high number of multiple projects that were undertaken by a given company. Some respondents felt they would not be able to answer this question for the entire company due to their company's huge size and had only answered this question for their affiliated functional unit.

No. of projects engaged at one time	Count	Percentage
Between 1 and 5	4	10.52%
Between 5 and 10	2	5.26%
Between 10 and 20	5	13.15%
More than 20	27	71.05%

Table IV-3: Breakdown of number of projects engaged at one time

The project size in the respondents' companies ranged between \$15K and \$500,000K. Since some companies were public agencies, the project size was expectedly large. The median and mean for the typical project size out of 38 respondents turned out to be \$500K and \$17906K, respectively. These typical project have lasted between 3 and 60 months depending on the project size with a median of 12 months and a mean of 15.8

months. They have been carried out by a median of 8 project team members and a mean of 17.8 individuals. The range for the range of the project staff was found to be between 2 and 200 people.

IV.III. Sample Profile - Project Management Software Packages Used

iges)

As table IV-4 illustrates, about 90% of the respondents indicated that they use a Project Management Software Package in their projects.

Number of PM software packages	Count	Percentage
None	4	10.52%
1	16	42.11%
More than 1	18	47.37%

Table IV-4: Number of PM software packages used

They were also asked to specify the name of the software package used. The following table shows the most frequently used commercial software packages. As anticipated, MS Project was the most frequently used PM software, followed by Primavera and Open Plan Pro.

Types of PM software packages	Count	Percentage
MS Project	26	68.4%
Primavera Products	4	10.5%
Open Plan Pro	4	10.5%
Others (IMSI Turbo Project, Project	6	15.8%
Workbench, @RISK etc.)	1	

Table IV-5: PM software packages used

It was an interesting finding that some companies are still using in-house developed PM software packages and some are using both commercial and in-house developed packages. However, more than 85% of respondents stated they use a commercial software packages. Strikingly, a considerable number of the companies (34%) use both commercial and special software packages.

{

Commercial vs. Special	Count	Percentage
Commercial	33	86.8%
Special (In-house)	14	36.8%
Both	13	34.2%
None	4	10.5%

Table IV-6: Types of PM software packages used

We were also interested in finding out the reasons used in selecting the PM software packages. Six criteria were provided to the respondents along with an "others" option as shown below on the pie chart. The percentage next to criteria indicates the percentage of respondents who have used this criteria for PM software selection process. As one can see, availability, capability and ease of use of the software were the most dominant three factors (in order) in the selection process.



Figure IV-3: Criteria in the selection of PM software packages

Another area of interest to us was the most used PM technique/tool depending on the size of the project. Based on the five project size categories shown in each column heading of the table IV-7, Critical Path Scheduling technique and Bar Gantt Charts were the most prominently used PM techniques. That finding was in accordance with our expectations and literature findings. The third rank is dominated by progress reporting in all project sizes. Display of Work Breakdown Structure, Cost Reporting and Resource Loading from the common resource pool occupy the fourth and fifth place in the rank depending on the size of the project as shown on the following summary table by project size.

Rank	<100K	>100K and <500K	>500K and <1M	>1M and <5M	>5M	Overall
1	Scheduling Bar Gantt charts	Scheduling Critical Path Scheduling (CPM)	Scheduling Critical Path Scheduling (CPM)	Scheduling - Critical Path Scheduling (CPM)	Scheduling Critical Path Scheduling (CPM)	Scheduling Critical Path Scheduling (CPM)
2	Scheduling Critical Path Scheduling (CPM)	Scheduling Bar Gantt charts	Scheduling Bar Gantt charts	Display Display - Work Breakdown Structures	Reporting Multiple-level project processing and linking project activities for multiple project reporting	Scheduling Bar Gantt charts
3	Reporting Progress reporting and full summarization of scheduled activities	Reporting Progress reporting and full summarizatio n of scheduled activities	Reporting Progress reporting and full summarizatio n of scheduled activities	Reporting Progress reporting and full summarization of scheduled activities	Reporting Progress reporting and full summarization of scheduled activities	Reporting Progress reporting and full summarizatio n of scheduled activities
4	Display Display - Network Diagrams	Resource Management Schedule multiple projects from common resource pool	Display Display - Work Breakdown Structures	Reporting Multiple-level project processing and linking project activities for multiple project reporting	Cost & Performance Measurement Report - Budget to date (BCWS)	Display Display - Work Breakdown Structures
5	Cost & Performance Measurement Report - Actual cost to date (ACWP)	Display Display - Work Breakdown Structures	Resource Management Schedule multiple projects from common resource pool	Scheduling Bar Gantt charts & Cost & Performance Measurement Report - Budget to date (BCWS)	Display Display - Work Breakdown Structures	Resource Management Schedule multiple projects from common resource pool

Table IV-7: Most used PM technique/tool depending on the size of the project

IV.IV. Hypothesis Testing

We had two major research questions: Is there any difference between project size and the PM techniques used and is there any difference between industry type and the PM technique used. Based on these research questions, we constructed the following hypotheses:

Hypothesis - Part 1:

Is there a significant difference between project size and the use of

- 1. Scheduling techniques?
- 2. Reporting techniques?
- 3. Resource Management techniques?

4. Cost & Performance Measurement techniques?

5. Display techniques?

All of these five tests have been conducted by using the Analysis of Variance (ANOVA) technique. The independent variable in all tests was the project size while the dependent variable was the use of a particular technique. The following clustering has been used in order to group the 19 different techniques presented in the survey tools:

- 1. Scheduling techniques (Critical Path Method, Bar Gantt charts)
- Reporting techniques (Progress reporting and full summarization of scheduled activities, Multiple-level project processing and linking project activities for multiple Project reporting)

- Resource Management techniques (Schedule multiple projects from common resource pool, Resource leveling)
- 4. Cost & Performance Measurement techniques (Resource usage to cost Conversion, Cash Flow analysis, Report - Actual cost to date (ACWP), Report - Estimate at Completion (EAC), Report - Budget to date (BCWS), Report - Budget at Completion (BAC), Report - Earned Value (BCWP), Summarization of cost data across multiple projects)
- 5. Display techniques (Display Work Breakdown structures, Display Network Diagram, Display XY charts, Display Logic diagrams (Interrelationships), Display Resource Histograms)

There were five levels of project sizes as follows:

• Size < \$100K

- \$100K < Size < \$500K
- \$500K < Size < \$1M
- \$1M < Size < \$5M
- Size > \$5M

The ANOVA results for each test are shown on the table IV-8. The results indicate that only the use of reporting and performance management techniques vary by project size. These two PM techniques were intuitively expected to be different for different project sizes. One expects a higher level of reporting and aggressive use of performance measurement techniques to used in big sized projects than compared to smaller scale projects. Moreover, one can conclude that there is not a statistically significant difference in the use of scheduling, resource management and display techniques among projects with different project sizes.

Hypothesis #	Independent Variable	Dependent Variable	Test	p-value	Conclusion
1	Project size	Scheduling techniques used	ANOVA	0.237	No difference
2	Project size	Reporting techniques used	ANOVA	0.003	Difference
3	Project size	Resource management techniques used	ANOVA	0.127	No difference
4	Project size	Performance measurement techniques used	ANOVA	0.046	Difference
5	Project size	Display techniques used	ANOVA	0.587	No difference

Table IV-8: ANOVA results for the hypothesis - part 1

Remark: In all tests, the null hypothesis is that there is no difference among different projects. A p-value that is smaller than 0.05 (confidence level) makes us reject the null hypothesis and conclude that the use of a particular technique varies by the project size.

Hypothesis - Part 2:

Is there a difference between different industry types and the use of

- 1. Scheduling techniques?
- 2. Reporting techniques?
- 3. Resource Management techniques?
- 4. Cost & Performance Measurement techniques?
- 5. Display techniques?

The same analysis has been conducted for this hypothesis as well. The independent variable in all tests was considered to be the industry type while the dependent variable is the use of a particular technique. Different industries have been categorized as follows:

- Manufacturing Industry
- Service Industry

Construction Industry

Hypothesis	Independent	Dependent Variable(s)	Test	p-value	Conclusion
#	Variable				
1	Industry type	Scheduling techniques used	ANOVA	0.922	No difference
2	Industry type	Reporting techniques used	ANOVA	0.597	No difference
3	Industry type	Resource management techniques used	ANOVA	0.034	Difference
4	Industry type	Performance measurement techniques used	ANOVA	0.023	Difference
5	Industry type	Display techniques used	ANOVA	0.414	No difference

Table IV-9: ANOVA results for the hypothesis - part 2

ANOVA results indicate that significant difference exists for resource management and cost & performance measurement techniques among different industry types. That was a reasonable finding since our team has also thought that different industries would require different resource management and cost & performance measurements techniques.

V. CONCLUSIONS

5- ----

A. As projects increase in size the allied techniques of cost and performance measurement and reporting are used more than for smaller projects.

B. The use of CPM, Gantt charts, resource leveling, and display are commonly used on all projects regardless of size.

C. Project managers use the same scheduling, reporting and display techniques regardless of project type or industry.

D. There is a difference between project types and the use of resource management and cost and performance measurement techniques.

You have good date analysis and results, you could have topped it with good conclusions! Annalis

REFERENCES

i s

[1] Avots, I., 'Why Does Project Management Fail?,' *California Management Review*, pp 77-82, December 1969.

[2] Badiru, A.B., <u>Project Management in Manufacturing and High Technology</u> <u>Operations</u>, John Wiley, Chapter 10, 1996.

[3] Bubshait, K., 'Project Characteristics That Influence the Implementation of Project Management Techniques: A Survey,' *Project Management Journal*, pp 43-47, June 1992.

[4] Burke, R., Project Management Planning and Control, John Wiley, Chapter 11, 1992.

[5] 'IS - Friendly Project Management,' *Datamation*, pp 79-81, 1 April 1996.

[6] Digit Tools White Papers, 'Enterprise-Wide Project Automation: Streamline the product development process and improving time-to-market,' Digital Tools, Cupertino, California, 1992.

[7] 'When Time is Money,' Fortune - Technology Buyer's Guide Supplement, pp 122-124, Winter 1997.

[8] Heck, M., 'Product Comparison - Project management solutions,' *Infoworld*, pp 78-92, 3 June 1996.

[9] Heck, M., 'Project Management Keeps Publisher on Schedule,' *Infoworld*, pp 88, 3 June 1996.

[10] 'Buyer's Guide - Project Management Software,' *IIE Solutions*, pp 42-45, March 1997.

[11] Kezsbom, D. S., Schilling, D. L. and Edward, K. A., <u>Dynamic Project Management</u> - <u>A Practical Guide for Managers & Engineers</u>, John Wiley, Chapter 11, 1989.

[12] Meredith, J. and Mantel, S., <u>Project Management - A Management Approach</u>, John Wiley, Chapter 7 1o 11, 1995.

[13] Microsoft Project - Case Study, 'Case Study - Astra Mereck, Inc,' http://www.microsoft.com/project/partners/case/artra.htm, May 1997.

[14], 'Case Study - Adkim Builders, INC.,' http://www.microsoft.com/project, May 1997.

[15] Nicholas, J., <u>Managing Business & Engineering Projects</u>, Prentice-Hall, Inc., Chapters 11 to 17, 1990.

[16] 'Ramping Up,' Midrange Systems, pp 23-24, 10 Nov 1995.

[17] Primavera, http://www.primavera.com/products, 27 April 1997.

[18] Rothstein, M., Ace the Technical Interview, McGraw-Hill, 1996.

[19] Roman, D. D., <u>Managing Projects: a Systems Approach</u>, Elsever Science Publishing, New York, Chapter 8, 1986.

[20] Schei, K., 'Small Project Management,' Civil Engineer, pp 42-44, January 1990.

[21] Sorgenfrei, M., 'Separating the Wheat from the Chaff,' AS/400 Systems Management, pp 36-42, January 1997.

[22] Webster, F., 'Tools For Managing Projects,' Project Management Quarterly, 1982.

APPENDIX A - Questionnaire for Project Management Tools Survey

فتدحد

Questionnaire for Project Management Tools Survey

For the "Project Management in Engineering and Technology" course at Portland State University, we are doing a term project on the selection and use of Project Management (PM) Tools in the industry. We define "PM tool" as any PM technique/system that is used to facilitate planning, controlling, scheduling and monitoring activities in a project.

The following survey has been designed for answering some of our research questions in regard to the topic stated above. The results of this survey will be a part of our term project in this course and be treated with strict confidentiality. The names of respondents and companies will be kept anonymous and no indirect or incorrect inferences/conclusions will be drawn out of the survey results.

Our team requests you to take a few minutes to share your experiences regarding the selection and use of Project Management Tools.

Thanks in advance for your time and good luck in all your endeavors!

Questions:

1. Do you use any Project Management (PM) tool for your work? PM tool is defined as any technique/system that is used to plan, control, schedule and monitor activities in a project.

Yes 🗇 No 🗇

2. How do you categorize your field of work?

Engineering Management		Civil/A	rchitect	
Electrical/Electronic Manu	ifacturing 🛛	Desigi	n Services	Ο
Automotive Manufacturing	g 🗇	Health	Services	
Wood/Paper Manufacturir	ng 🗖	Utilitie	s Services	
Oil/Chemical Manufacturi	ng 🗖	Comp	uter Services	
Plastic Manufacturing	0	Const	ruction	0
Public Agency(Please spe	ecify)			0
Other Manufacturing(Plea	se Specify)			🗇
Other Services (Please S	pecify)			🖸
How many employees are	working for y	our company?		
1-10 🗇 10-30 🗇	30-100 🗖	100-1000 🗖	More than 1000 (]

4. How many projects does your company engage at one time?

Questionnaire for Project Management Tools

3.

.

1-5 🗇 5-10 🗇 10-20 🗇 More than 20 🗇

5.	Approximately what is: The size of a typical project in your Duration of the typical project? Number of people who work on the	organiz typical	ation? project?		\$ P	onths eople
6.	Which one of the following would be	est defir	ne your	use of	the PM tools?	
	Product Development Organizational change Marketing Maintenance/ Decommissioning Re-engineering Others(Please Specify)		Contir Launc Inform Financ Const	nuous E ching ne nation S cial ruction	Development ew venture Systems	0 0 0 0 0 0
7.	How many types of PM Software pa	ackages	are yo	u using	in day to day	activities?
	1 D More than 1 D					
8.	Please list the name of software pa whether it is commercial (off the sh	ckage(s elf) or sj	i) that y pecifica	ou are Ily deve	using for P/M a eloped for your	and mark use?
		. Comm . Comm . Comm . Comm . Comm . Comm	nercial nercial nercial nercial nercial nercial		Special Special Special Special Special Special	
9.	What is/was your main criterion for	selectin	g the so	oftware	for P/M?	
	Cost of the softwareIComplexity of ProjectIEase of useIOthers(Please Specify)		Capat Client It was	oility of require availat	software ment ble	

Questionnaire for Project Management Tools

2

·

-

k-á

<u>و</u>ر د

ક્રોસ

APPENDIX A

10. In the following table please mark all the PM techniques that you would most probably use, based on the size of the project. (for a list of acronyms please see the end of this questionnaire)

Technique	<100 K	100 K>, <500 K	500 K>, <1 M	1 M >, <5 M	5 M >	Is this Technique Supported by your Software?
Critical Path (CPM)						
Scheduling						
Progress Reporting and full						
summarization of scheduled						
activities	_					
Multiple-level project						
processing and linking]		ĺ .	
project activities for multiple	I					
Project reporting						
Schedule multiple projects						
from common resource pool	· 					
Resource leveling						
Resource usage to cost]				
Conversion				L		
Cash Flow analysis					i	
Report - Actual cost to date			ļ		1	
(ACWP)	·			L		
Report - Estimate at		ţ	ł			
Completion (EAC)						
Report - Budget to date		4		ļ.		
(BCWS)	ļ		L			
Report - Budget at		ł	ł			
Completion (BAC)		ļ		<u> </u>		
Report - Earned Value			ĺ			
(BCWP)						
Summarization of cost data			1			
across multiple projects		_	{	<u> </u>		!
Display - Work Breakdown		1				
Diaplay Natural Diagrama		<u> </u>	<u> </u>	<u> </u>		· · · · · · · · · · · · · · · · · · ·
Display - Network Diagrams			 	<u> </u>		·
Display - AT charts		ļ	ļ	<u> </u>		
Display - Bar Gantt charts			ļ			
UISPIAY - LOGIC diagrams						
				<u> </u>		
Display - Resource		1				
nistograms		j	}	1	ł	

Questionnaire for Project Management Tools

19

-

11.

£.

ند غ

 $\lambda_{1} \geq \mu$

For what purposes is the PM software used? (You can select more than one)

Planning	
Scheduling	
Controlling	Ο
Monitoring	D
Resource Leveling	

12. Do you have any automated interaction with your subs in using P/M tools?

Yes 🗇 No 🗇

14. Do you use Inter/Intranet in Project Management?

Yes 🗇 No 🗇

List of Acronyms used in this questionnaire:

- ACWP -- Actual Cost of the Work Performed
- BCWP Budgeted Cost of the Work Performed
- BCWS Budgeted Cost of Work Scheduled
- CPM Critical Path Method
- EAC Estimate At Completion
- PM Project Management

Questionnaire for Project Management Tools APPENDIX B - Primavera Project Planner

.....

8-24

PRIMAVERA PROJECT PLANNER

The world's leading choice in high-end project nanagement software.

Task	Chargeba	Raa	Tetal	End	Resource	ADG SEP OCT I NOV DEC JAN I DE MAR APR
	achin	- Fn	han	camer	1	
141	- (or final definition of the	i mat				Development Schedule Target Comparison
		164	þ	11APR96	USER+	
	HE NY)) () ()	- I:	<u> </u>	1	
bhotai	T	152	ρ	11APR98	USER+	
Anabys	is Phase	-			L	
ATANO20	O TELE 4000	0			USER	ATM Exhancement Request Initiation
ATAN028	6 64LE 1000	D	1202	30400954	TESTOA-	Develop Enhancement Request Specification
ATAND34	TELE 250	10	+	048EP95A	TESTMOR+	Review Enhancement Request
ATANO35	2 54 84000	6	0	195EP95	TESTGA-	Ell Develop Stage Plans & Business Case
ATAN040	S TELE 4000	-h	4	0500795	TESTGA	Review Related Documentation
ATAN050	8 SALE 4000	10		04NOVB5	DOCUMENT	T Exception Special Change Regultements
			1		L	
ATC0060	6 TELE 2500	32	14	23DEC95	PROGENOR	R ReviewCreate Process Model
ATCOD6	TELE 2000	34	6	26DEC95	PRODENGR	R BEEREN BEEREN Review/Create Data Model
TCOOS	STELE200	25	8	30DEC95	PROGENOR	R R Rodel
Testia	g Phase	1		l	1	
ATTE042	6 GALE2000	14	D	1700795	TESTOA	Verify Change Requirements
Ngr 4			Secondaria		2000 (SAB)	n 🗤 🖓 - An
20	<u></u>	200	<u>n:////</u>	<u> </u>	4	
S.	loct _ j	19820	uncie 8			
		HOU	2 ⁻ 2000 (1911)		្រ វ	

Primavera Project Planner (P3[®]) gives today's project managers and schedulers the one thing they value most: control. It is the clear choice of professionals in projectoriented businesses. P3 is the recognized standard for high-end, high-performance scheduling and resource control. Manage multiple projects in a multiuser environment. Project teams in locations around the globe. Large, multidisciplined teams. High-intensity, short-duration projects. Critical corporate projects sharing limited resources. P3 can help you manage them all. It supports simultaneous secure access to project files by multiple users, which means up-to-the-minute information.

Control large and complex projects efficiently. P3 is designed to handle large-scale, intricate and multifaceted projects. To keep ahead of projects of up to 100,000 activities, P3 provides unlimited resources and an unlimited number of target plans.

Connect to your corporation worldwide. P3 offers impressive capability for integrating its data with information throughout your company. P3 is ODBC-compliant and, through tightly integrated companion products, supports time sheet data collection, data warehousing and risk analysis.



- Prioritize, plan and manage multiple projects
- Analyze unlimited what-if alternatives and target plans
- Share data in a secure multiuser environment
- Schedule resources realistically with advanced resource leveling options
- Interact with project data through PERT charts, bar charts and time-scaled logic diagrams
- Communicate effectively using intranets, custom reports and e-mail

Take on the Diggest project Solve the toughest resource problems No other project management software does more or does it better.

Taking the complexity out of project planning

Wirat 1987 (Holfrenks, Everythning volume) of memalike your project that similarly delivers them adding tests for evaluating filoating organizing and soler coding attavities for presentations, Pone the factors way compare project others.

Work Restar with fragmas 18% car accelerate your work with fragment More than templates magnets are groups of racks relationships and resource assignments that can become building blooks for your office paralises. You can store fragment scoredbar

with resolutive and gost datas are be used as trampleties for subsequent projects

Keep tabs on activities. It's survives, vous project data to provide insight to everyone connected to the project. With its exclusive and powerful activity coding it is easy to organize activities according to user define of auclidates, such as responsibility location, type a of work, phase, etc. Organize and reorganize project data instantly to view the project from any perspective.

PERT at work RERI streamlines the creation of logical sequences of activities. While planning, or even as the project evolves, you can track and analyze float precedence relationships and the cascading effects

of project bottlenecks. PERI can be automatically banded by activity code. PERT is completely interactive and its output can be scaled to fit to a page.

High-end scheduling,

In multiproject, multi-year environments, P3 ensures that critical tasks get the attention they deserve because float is calculated within each project. You can establish relationships among activities in separate projects. New P3 lets you schedule based upon individual resource work schedules and availabilities.

Be on target. P3's unlimited target planning is the key to intelligent

what-if analysis. By comparing actual performance to original plans, you can improve your processes and increase the accuracy of future estimates.



Use color-coded bands to instantly and clearly organize project data using activity codes, resources, cost accounts, WBS and more.

27 NEW COLLECT COLLECT COLLECTION OF System controller.

Combine necking with colors and patterns on bars to identify activity attributes.



Navigate and analyze even the most complicated networks using Trace Logic and Cosmic View. P3 can automatically reorganize activities in PERT as well as bar chart mode.

Analytical tools to keep projects running smoothly

With muge animums of project data that change daily reven homely you need a product to helpway plan for the unexpanded PS's analytical roots help you shi through all of your project cata to identify potential projects.

Analyze alternatives, Once you ye (dennihed a Datenbar) problem Panakes it easy to test alowns, charakes it as y to test alowns, charakes alternatives for finishing the project source and paire by most effectively

utilizing your entrial resources. An analy of analytical tools allows you to review the impact of different eources of actionat a summary of detailed level of the project bleranchy. And P&s unique Choisal Change feature lets you quickly and easily make significant changes to your projects and my them out before making them permanent.

Report project progress. When it comes to reporting on project goals and priorities, P3 gives you more than 150 customizable reports and graphics Analyze complex projects with concise cross-tab and matrix reports cross project reporting and a powerful custom report writer. Select and highlight activities using activity codes, custom data items, budget and variance data together with filters based on Boolean logic. For optimal coordination and communication, you can share reports in any of 28 languages, with users around the world.

Publish on the web. You can communicate throughout your enterprise, using your company's intranet web site. The Web Wizard feature automatically creates a hierarchy of project categories, projects and reports so that any user can view summary information or dig deeper to see specific details and full reports using Netscape Navigator[™] or Microsoft[®] Internet Explorer[™].

Integrate data. OLE enables you to include data in reports and projects from design specifications, drawings, spreadsheets, word processors, scanned images and even audio and video clips.



Create reports that drive your point home. P3 can automatically set up column headings, title blocks and timescales in 28 languages.

Communicate your knowledge enterprise-wide with a broad array of data-rich reports.



11



22 61 15

Controlling resources and costs-on a daily basis

Day-to-day management 1% is obaciol your most valuable coworkers intellering on a daily bas to make the most of your limited resonnes 1% s sophismeared resonnes 1% s sophismeared resonnes scheduling and leveling options letyon, ser up adminars thatritike interdetails of each persons workpatien. Patorinz Sult, stretchand crimch adminars based on maintenal availability or cristic life of the physic if And when deopedeaddates, approach. P6 goes into overdive — ser that you never mission deadline

Financhical resonaces in 25 shable vouno lessabilish resonaces margine gate of soliton resonace demands, and us forces of soliton and fonding requirements.

Builtin cost efficiencies. No other project management package gives you the precise cost control builtinto P3. P3 supports cost accounts, so that you can easily exchange, data with your accounting system. It enables you to establish budgets and forecast estimates to complete for each cost account level. You can then track actuals for this period and actual-to-date.

\$.5

Have it your way. You can customize the effects of progress on cost calculations using P3s in-depth Autocost rules. Project performance is measured and compared to plan

using earned value analysis and cost and schedule variances.



Schedule individuals precisely based on their work schedule and availability.



Model resources accurately by splitting, stretching or crunching activities, depending on resource availability.



Pinpoint and resolve potential resource loading problems with P3's resource leveling, profiles and tables. The resource table shows you how resources are budgeted period-by-period, based on total, peak or average usage.



Use resource distribution curves to model how resources will be consumed as an activity progresses. Select from the library of predefined curves or quickly create your own.

Multiproject control and communication

With P3. coninciling groups some geas is as simple as controlling a single projection, your desktap. You'rs able to coordinate independent elitors in manaple locations with relationships anong activities in separate projects

Multiuser capabilities, PS allows multiple users to concurrentially update, analyze and report on their portions of the project PS enables administrators to sectire their projects by residently access by function, department resource and obase. This allows others to review—but not modify project data.

Spread the word, via e-mail. To disseminate information acrossyour network or throng rout the world. P3 works with Microsoft Mail? cc:Mail? and any

other VIM or MAPI-compliant electronic mail system. You can embed e-mail addresses right into your project and automatically route status requests to the appropriate individuals. And to receive updates from local or remote teams, the Primavera Post Office applet lets team members turn around project information

È.à

through e-mail without the need for themto have their own copies of P3.

Integration with corporate systems. When you need to integrate your project data with corporate systems, P3's open architecture lets you choose the best method. P3's business rules and database are accessible through OLE 2.0 automation using development tools, such as Visual Basic^{**}, C++* or even Excel^{**}.

Integration of people, systems and processes has never been simpler, more reliable or complete. That's because P3 is the heart of Primavera's Concentric Project Management[™], an integrated, scalable approach to coordinating people and projects. Drill all the way down to low-level detail within multiproject summary bar charts.





Use P3's Restricted Access feature to limit access to project data on a user-byuser basis.

<u>2</u>						
may on h.	71 ABA # ##27 11-02					6
0.000		199. 1998		an ya wa sa	10000000	
				0000000000	····	CK.
Please upd	haid threes ar invite to indeparts there will	per generate.		****		
			2000000			
You sharts	nd an activity, Check the bear in the Shath	rell content. a	and the state	· · · · · · · · · · · · · · · · · · ·		
10000		- Coxe			27 W. S. A	ليستشمشه
a year break	and the mathematy schereds the bear in the Plan-	Number Providence	s and spins it.	hange ander		Section of the sectio
		Sec	er (13364).X	14 (yr 200)		10220-000
<u></u>			4. SX			
Actery II) ()encrypten	Sales?	Sumt Date.	fained.	Ministe Dieser	
CH2	General Antiput Surger Control					sectory in
	Therease The second Data on Hand Chan	ä	48-10 PM		BOULUMAN	100 03
	Firmer and Argumer Suis Simples	8	-	D	1142000	2103
Ante	Parameters and Assessed Planting	-		6	589.999.22.2	244
COM	Present Dening	- 3	127/26/96	0	10000000	20
CANE	Panager and Approver Desere	0	1	a a		11
CSAM	Perpete Country's the Conversions		45/67/30	C	Enter the second	125
-	The stars was Approve Drawings ine De	a	1.	0	P	
Contraction of the local data	Turner and the second second	100112-000	A CONTRACTOR OF		A CONTRACTOR OF THE	

Inexpensively but effectively, have remote team members receive, update and return activity status data through the Primavera Post Office.





The only project management software that delivers so much.

Features

Project Modeling

- · Unlimited project groups, projects and target plans
- Up to 100,000 activities per project
- Multiproject resource and task relationship control
- Scheduling and resource leveling at the project group and/or project level
- 20-level WBS
- · 24 user-definable activity codes for selection and sorting
- Intelligent activity ID codes
- 16 user-definable custom data items Summarization of multiple project
- groups What-if analyses
- · Earned value analyses
- Merge multiple projects · Global Change feature for mass project
- changes using Boolean logic, arithmetic, string and search-and-replace functions
- User-definable project template library (fragnets)
- True concurrent multiuser functionality for updating, analysis and reporting
- Multi-level project security definable on a per-user basis
- System administration program for user names and passwords
- Microsoft Office-compliant graphic user interface

Scheduling

- Critical path scheduling (CPM)
- Precedence diagramming method (PDM)
- Free and total float calculation
- · Finish-to-start, start-to-start, start-tofinish and finish-to-finish activity relationships
- All relationships with user-definable lead and lag (positive and negative)
- 31 activity calendars per project
- Time units in hours, days, weeks and months
- 10 types of schedule constraints (e.g., start-no-earlier-than, finish-no-laterthan, etc.)



project management

Headquarters

Two Bala Plaza • Bala Cynwyd, PA 19004-1586 • USA (610) 667-8600 • (800) 423-0245 • FAX: (610) 667-7894 È-mail: sales@primavera.com

United Kingdom Office Elsinore House • 77 Fulham Palace Rd. London • United Kingdom, W6 8JA (44) 181-748-7300 • FAX: (44) 181-748-2846 È-mail: intlsale@primavera.com www.primavera.com

- 9 types of activities for more precise schedule modeling (e.g., task, meeting, independent, milestone, flags, etc.)
- Suspend and resume dates for in-progress activities
- · Contiguous and interruptible scheduling
- Extensive updating alternatives

Resource and Cost Management

- · Resource calendars and variable availability
- · Unlimited resources per project and activity
- Activity splitting, stretching and crunching during leveling and smoothing
- Hierarchical resources
- Nonlinear resource usage profiles
- Prioritizable forward and backward leveling with smoothing
- Selective and time-limited leveling
- Variable resource pricing and availability
- Resource-driven activity durations
- · Earned value (BCWP) histograms, tables and curves
- Scheduled budget (BCWS) histograms, tables and curves
- · Cost and schedule variance calculations · Unlimited cost accounts per project with intelligent 12-character codes
- Track budget, actual cost this period, actual cost to date, percent complete, earned value, cost to complete, cost at completion
- · Autocost feature for user-defined rules for planning and updating cost

Reports and Graphics

- · Over 150 predefined tabular and matrix reports and graphics
- Custom report writer included
- · Complete customization of display and output
- Web Wizard for Inter/Intranet publishing of reports and graphics
- Unlimited presentation layouts
- Hierarchical project outlining organized by any combination of activity codes and resources
- Summarize and group activities and compare to targets
- Time-scaled bar (Gantt) charts with logic

Necking and activity code colors/patterns on Gantt bars

- Primavera's Easy Relationship Tracing (PERT) charts with Trace Logic and **Cosmic Views**
- · Resource/cost histograms tables and curves
- Production of reports and graphics in groups or one-at-a-time
- Multiple levels of sort and selection (filter)
- · User-definable bars, start- and endpoints, colors, fonts, sizes, positions • Set Language option for international
- WYSIWYG reports · Print-to-fit a specified number of pages
- OLE for attaching documents,
- spreadsheets, graphics and video

Data Exchange

- ODBC-compliant database
- Automation server accessible with any OLE 2.0-compliant development tool
- Primavera Post Office applet allows remote, two-way activity review and updating
- Exchange project and activity data with MAPI/VIM-compliant mail systems
- Read/write .MPX files
- Full clipboard support
- Import/export dBase*, Lotus* data Shares data with SureTrak Project Manager*

Available Add-On Products

DataStore[™] for Primavera -Warehouses P3 data in normalized tables in Oracle®. TimeSheet Professional for Primavera -Collect, track and report hours with time sheet front-end for P3.

Monte Carlo" for Primavera -Quantify, analyze and mitigate risk.

LBMS Process Engineer Link - Build realistic, resource-loaded multiproject IT plans in P3.

System Requirements

Intel® or compatible 486 or higher PC 16MB RAM 32MB hard disk space Windows[®] 3.1, Windows 95 or Windows NT[™] Workstation



Copyright © 1996 Primavera Systems, Inc. Trademarks (™) and registered trademarks (®) referenced in this brochure are owned by their respective companies.

APPENDIX C - Survey Data

in the second

Ţ

1.1

	Q1	Q2	Q3	Q4		Q5		Q6	Q7	Q8		Q9	Q	10 - PI	M Tec	hniqu	ies Us	sed	Q11	Q12	Q13
Survey ID	Use PM tool?	Field of Work	# of Employees	# of Projects	Size of a Project	Duration of a Project	# of People in a Project	Use of PM Tools	# of types of PM Softwares	Name of the Software Packages Used	Commercial or Special	Main criterion for PM Software Selection	<100 K	100 K>, <500 K	500 K>, <1 M	1 M>, <5 M	> 5 M	Supported by Software?	Purposes of using PM Softwares	Automated Interaction with subs?	Use of Inter/Intranet in PM?
1	Ý	С	>1000	>20	250K	12	10	М	В	Artemis	S	F	1	1	1				P	N	N
										MS-Project	C				3	3	3		С		
													4	4	4				M		
															5	5	5				
													7	7	7						
		L											8	8	8	8	8				-
				L										10	10	10	10				
			<u> </u>	L											13	13	13			 	
					l	L	L								14	14	14			 	
					ļ								1/	17	17			_			
	Y	CA	>1000	>20				PD	<u> </u>	MS-Project	C	F	1		1				<u> </u>	N	N
																14	14		- <u>N</u> -	[
														 							
3	v	50	>1000	>20	500.000K	24		- <u>M</u>		MS-Project										N	Ň
			~1000	-20	500,000K					WIS-FTUJECI	— <u> </u>	<u> </u>					2		5	_ <u> </u>	
										Primavera	C						3		č		
										WOMP	s						4		M		
																	8			[
																	9				
																	10				
																	11				
																	12			L	
																	14				
		ŀ											· .				15				
											 			ļ			16				
																	10		ŀ	[
	~	CA	1-10	1-5	120 K	12	10										18				N
			1-10		1201			<u> </u>	<u> </u>		<u> </u>			5						┟──└──	
				······										6							
					······									16						1	
5	Y	OM	>1000	5-10	30 K	3	3	IS	A	MS-Project	С	F	1					Y	Р	N	N
										······································	1		2					Y	S		
													9					Y	С		
													14					Y	М		
													15					Y			
													17					Y			
6	Y	MÖ	30-100	1-5	40000 K	30	20	C	В	MS-Project	C	E					1	Y	Р	N	N
										PERT	С						2	Y	S	I	
										·			L		L		5	<u>Y</u>	C		
											ļ					L	7	Υ ····	<u>M</u>	ļ	
														 			9		·	ļ	
															L		10	1			

ده ا ··· · · · ·····

yenerer e Ziza -----

the second s

¥

																	_				
	Q1	Q2	Q3	Q4		Q5		Q6	Q7	Q8		Q9	Q	10 - P	M Tec	hniqu	ies Us	sed	Q11	Q12	Q13
Survey ID	Use PM tool?	Field of Work	# of Employees	# of Projects	Size of a Project	Duration of a Project	# of People in a Project	Use of PM Tools	# of types of PM Softwares	Name of the Software Packages Used	Commercial or Special	Main criterion for PM Software Selection	<100 K	100 K>, <500 K	500 K>, <1 M	1 M>, <5 M	> 5 M	Supported by Software?	Purposes of using PM Softwares	Automated Interaction with subs?	Use of Inter/Intranet in PM?
																	13	Ý			
		ļ				Ļ						L	<u> </u>		L		14	Y			
		I						l				L					15	<u>Y</u>			
	L				L	<u> </u>											17	<u> </u>	<u> </u>		
77	Y	CA	>1000	>20	250 K	12	10	<u> </u>	В	BMS	<u>s</u>	G	1		L	<u> </u>		Y	P	N	<u> </u>
		Ì				 	<u> </u>	L	 	OPEN PLAN PRO			2					<u>Υ</u>	<u> </u>	<u> </u>	
		ļ			ļ	<u> </u>	L				<u> </u>	ļ					3	<u> </u>	<u> M</u>	<u> </u>	
		i				┟────	<u> </u>		<u> </u>	<u> </u>	 	ļ				14		<u> </u>	<u> </u>	}	
		<u> </u>				╉────			 		 		15					<u> </u>	l	<u> </u>	
	<u> </u>		>1000		20.1/	┢╌╦━╴		- DO		MO Destant			14	}	┝			<u> </u>		<u> </u>	N
		- 03	>1000	20	30 N	<u> </u>			- B	MS-Project Project Profiles	1-2-	<u> </u>	+							l	
	<u> </u>			 		┨─────		<u> </u>	i	Project Promes	<u> </u>		<u> </u>		┣				<u> </u>	}	
						+	'		 				6								
									{				8								
						<u> </u>					1		15								
						<u>├</u>					<u> </u>		17	 							
9	Y	EE	>1000	10-20	1000 K	6	15	PD	В	MS-Project		D				1			P	Ŷ	- Y
						<u> </u>				In-house	s		2	2		2			Ś		
						+				In-house	ŝ		<u> </u>	3		3			Ċ		
						<u> </u>					1					4			M		
																5			RL		
											1					6					
		_														8					
																9					
																10					
																11					
																13				L	
													14	14		14					
						<u> </u>					 		15	15	ļ	15					ļ
					h						 		16	16	ļ	16	L		ļ		
									.	<u> </u>			17	17	 	17			ļ	├ ───	ļ
			> 1000		1000 1/				<u> </u>	NO Desired	<u> </u>	<u>-</u>		[<u> </u>	19			<u> </u>		<u> </u>
- 10		<u>- so</u>	>1000	>20	4000 K	18	5	<u> </u>	L B	MS-Project		В				1	1	Y	<u> </u>	N	N
										In-nouse/PC based	<u> </u>			<u> </u>	<u> </u>	4	2				
						 			[Mainframe Application	<u> </u>				<u> </u>		3		1V1	<u> </u>	
						<u> </u>					<u> </u>			 	┝━━		6			<u>├</u>	
						<u> </u>					<u> </u>		7	7		5	7	<u>⊢⊹</u>	<u>├</u> ────		
					,						<u> </u>		8	<u> - '-</u>	<u>⊢'</u> −			├ - ┆	<u>├</u>		
											<u> </u>		9	9	9	9	9	├ <u>-</u>	l	<u>├</u> ─────	
						<u>├</u>				·	<u> </u>		10	10	10	10	10	⊢ ý	<u>├</u>		t
						t					<u> </u>		11	11	11		11	Ý		t	
						t			i		t			<u>†</u>	12	12	12	- ż	t	t	├────

The I Provide Company

2

								<u></u>													
	Q1	Q2	Q3	Q4		Q5		Q6	Q7	Q8		Q9	Q	10 - P	M Teo	chniqu	ies Us	sed	Q11	Q12	Q13
Survey ID	Use PM tool?	Field of Work	# of Employees	# of Projects	Size of a Project	Duration of a Project	# of People in a Project	Use of PM Tools	# of types of PM Softwares	Name of the Software Packages Used	Commercial or Special	Main criterion for PM Software Selection	<100 K	100 K>, <500 K	500 K>, <1 M	1 M>, <5 M	~ 5 M	Supported by Software?	Purposes of using PM Softwares	Automated Interaction with subs?	Use of Inter/Intranet in PM?
															13	13	13	Y			
	L		ļ			 		ļ						<u> </u>	14	14	14	<u> </u>		<u> </u>	
		 			}	<u> </u>								17	17	17	17	<u>√</u>			
11		<u> </u>	100-1000	>20	10000 K	48	50	PD		OPEN PLAN PRO		<u> </u>	<u> </u>	1	19	13	13	<u></u>	- p	<u> </u>	N
	┠╼╧╼┥	<u> </u>	100-1000	- 20	10000 1		<u> </u>	C C		OFLITEARTIN				12		t			s		<u> </u>
		t			{			<u> </u>	[<u> </u>	├ ──	3				Ý	č		
														4				Y	М		
														5				Y			
						 								8				Y			
			 		}	}						 	 	9	<u> </u>	<u> </u>	<u> </u>	<u> </u>	}		
		<u>├</u>	{i		<u> </u>				ļ			{		10			┟───				┨─────
		<u>├</u> ───	[{				[<u></u>		<u>├</u>		12				├ <u>-</u> ;	[
		h												13	<u> </u>			Ŷ			<u> </u>
														14				Y			
														15				Y			
														17			<u> </u>	<u> Y </u>			
		L											ļ	18		ļ					
12		CA	100-1000	>20	5000 K	24	60	PD		COMIS	6						┠╌┲╴				
	<u> </u>	<u> </u>	100-1000			24		č	<u> </u>	PROMIS	s		2	2	2	2	2		s	<u> '</u>	<u>├──</u> ─
		<u> </u>								MS-Project	c	<u> </u>	<u> </u>	3	3	3	3	Ŷ	Ċ	<u>}</u>	
										@ Risk, Crystalball	С					4	4	Y	M		
										Criterium Decision +	С					5	5	Y	RL		
										RMS	S			7	7	7	7	<u>Y</u>			
			[ļ	[<u> </u>	8	8	8	8	8	<u> </u>			ļ
					f										10	10	10				
			h										<u> </u>	╂───	11	11		├ ─ ┆──			l
h												<u> </u>	12	12	12	12	12	Ý	<u> </u>	[1
													13	13	13	13	13	Y			
													14	14	14	14	14	Y			
					ļ	[]								ļ		15	15	Ŷ	ļ	ļ	
						[·····		┠	17	17	17		40	<u> ∛</u>	 	┟────	↓
									<u> </u>			<u> </u>				10	10	<u> </u>	┣────	<u> </u>	<u> </u>
13	Y	CA	10-30	>20	50 K	3	5		<u> </u>		<u> </u>	<u>├</u>	4	4		19	19		<u>├</u>	N	N
						┝╌┷╾┤	<u>`</u>	— <u> </u>			<u> </u>	t	8	8		 	<u> </u>	<u>├──</u> ──		<u>├──</u> ^^	t
						l							10	10		<u> </u>	<u> </u>		l	t	l
14	Y	CA	>1000	>20	1000 K	36	15	F	A	FUDS DATABASE	S	E		1	1	1	1	N	Р	N	N
														2	2	2	2	N	S		
														3	3	3	3	N			
					L								4	4	4	4	4	N		(

i i i

الانتيارية من من من المراكز الإنجاز المراكز المراكز المراكز المراكز المراكز المراكز المراكز المراكز المراكز الم There is

246 A.

ین ستان در در ا

joutstern en voe

A. mar

fam.

and the second second second second

·····	, a	a d B K K Z C Z J S Z S K	·· · · ·		د دروی د در در د

	Q1	Q2	Q3	Q4		Q5		Q6	Q7	Q8		Q9	Q	10 - Pl	M Tec	:hniqu	ies Us	ed	Q11	Q12	Q13
Survey ID	Use PM tool?	Field of Work	# of Employees	# of Projects	Size of a Project	Duration of a Project	# of People in a Project	Use of PM Tools	# of types of PM Softwares	Name of the Software Packages Used	Commercial or Special	Main criterion for PM Software Selection	<100 K	100 K>, <500 K	500 K>, <1 M	1 M>, <5 M	> 5 M	Supported by Software?	Purposes of using PM Softwares	Automated Interaction with subs?	Use of Inter/Intranet in PM?
													5	5	5	5	5	Ň			
														8	8	8	8	N			
														9	9	9	9	<u>N</u>			
														10	10	10	10	<u>N</u>	Į	<u> </u>	
														11	11	11	11	N	[[
														13	13	13	13	<u>N</u>	 	ļ	
														14	14	14	14	N	<u> </u>	ļ	
15	Y	CA	>1000	>20	20000 K	36	20	R	<u> </u>	Budget Management	s	В				1	1	<u>Y</u>		<u>N</u>	¥
								CD		PROMIS	<u> </u>	D	2	2	2	2	2	Y	<u> </u>		
L								<u> </u>			<u>s</u>	}					3				
									<u> </u>	OPEN PLAN PRO	<u> </u>	<u> </u>				4	4			<u> </u>	┟╼╍╍╌┥
									<u> </u>	· · · · · · · · · · · · · · · · · · ·		<u> </u>	6	6	6	6	6		<u> </u>		
							F						- 7	7	- -	7	- 7	N	<u> </u>	<u> </u>	
													8	8	8	8	8	Y			
						·			<u> </u>				9	9	9	9	9		<u> </u>		
									[10	10	10	10	10	Ŷ	<u>†</u>		
													11	11	11	11	11	Ý	<u> </u>	<u> </u>	
		·											12	12	12	12	12	Y			
													14	14	14	14	14	Y		[
													15	15	15	15	15	Y			
													16	16	16	16	16	Y			
													17	17	17	17	17	Y			
													18	18	18	18	18	Y			
																	19	Y			
16	Y	CA	100-1000	>20	60 K	12	8	PD	В	MS-Project	C	F	1	1	1	1	1	Y	P	N	N
										CEFMS	S	·		2	2	2	2	Y	S		
									l			ļ	3	3	3	3	3	Y	RL	ļ	
											<u> </u>		4	4	4	4	4	Y		 	
											<u> </u>		5	5	5	5			ļ	 	
									 				10		10	10				┠	
												}i	11	11	11	10	11			╂────	
							<u> </u>		} ────			łi	17	17	17	17	17		<u> </u>	t	
17	- <u>v</u> -	ΔM	>1000	>20	50 K	6	50	<u> </u>		MS-Project			1	<u></u>		+			- B		N
			-1000	-20				<u> </u>	<u> </u>	NI3-F10ject	<u> </u>		5		1-2	13	5	N	5		
												<u>-</u>			<u> </u>	3	3	N	c	 	
					·				<u>├</u>				4	4	4	1 Ă	4	Ŷ	<u>M</u>	<u>├</u>	tt
															<u> </u>	5	5	Ň	RL	t	
											·		·····	6	6	6	6	Y	t	<u> </u>	
					······								7	7	7	7	7	Y	1	<u> </u>	
	{														8	8	8	Y	1	l	
													9	9	9	9	9	Y			
													10	10	10	10	10	Y			

•

	Q1	Q2	Q3	Q4		Q5		Q6	Q7	Q8		Q9	٩	10 - PI	M Teo	chniqu	ies Us	sed	Q11	Q12	Q13
Survey ID	Use PM tool?	Field of Work	# of Employees	# of Projects	Size of a Project	Duration of a Project	# of People in a Project	Use of PM Tools	# of types of PM Softwares	Name of the Software Packages Used	Commercial or Special	Main criterion for PM Software Selection	<100 K	100 K>, <500 K	500 K>, <1 M	1 M>, <5 M	~ 5 M	Supported by Software?	Purposes of using PM Softwares	Automated Interaction with subs?	Use of Inter/Intranet in PM?
							1	1						11	11	11	11	Ŷ			
															12	12	12	Ý			
													13	13	13	13	13	Y			
	<u> </u>		L										14	14	14	14	14	Y			
		1	_		L	<u> </u>	<u> </u>						15	15	15	15	15	Y			[
	<u> </u>		<u> </u>	<u> </u>		<u> </u>					ļ		16	16	16	16	16	Y		ļ	
J		I	 		 	∔	<u> </u>	<u> </u>	 		<u> </u>	<u> </u>	17	17	17	17	17	Y	ļ		
	<u> </u>			ļ			<u></u>		ļ		ļ	ļ	18	18	18	18	18	<u> </u>	 	 	ļ
L							ļ				L		19	19	19	19	19	Y	<u></u>	ļ	L
18	<u> </u>	CS	1-10	1-5		8	2	PD_	<u> </u>	IMSI TurboProject	C	FF	 							<u> </u>	N
j		 		·		<u> </u>	<u> </u>	L	 				ļ						<u> </u>	 	
 		┠────	<u> </u>	ļ	├ ────	+	 	┠────	 		 	·		┣						 	<u> </u>
			>1000	10.00	100 1	10	+	00		LIC Deciset								~~~			
18	<u> </u>			10-20	100 K	10			- <u> </u>	MS-Project	<u> </u>	<u> </u>	┝╌┷	<u> </u>	<u> </u>	1	+	T	F	<u>↓ </u>	
			┟				┟────	 	╂	<u></u>		{	17	17	17	17	17	~~~~	┟	┨────	
20	N	MO	100-1000	1-5		6	5	- DD	<u> </u>		<u> </u>	 	1 2	<u> </u>	<u> </u>	<u> </u>	<u> </u>	- <u>'</u>			N
	<u> </u>		100-1000				<u> </u>	M	<u> </u>			<u></u>	<u>⊢∸</u>							<u> </u>	<u>├───</u> ─
21	-v-	CA	1-10	10-20	200K	12	-	- M-		MS-Project		F							<u> </u>	N	
	<u> </u>		<u> </u>	10 20		+	<u> </u>	c	<u> </u>	1110-1 10/000	<u>├──</u> ─	┨╼╌╼╧╼╾╼╸							f	<u> </u>	
22	Y	FE	100-1000	>20	250 K	5	20	IS	B			A	1	1	1	1		Y	5	N	Y
		<u>├──</u>				<u> </u>	<u> </u>	F				D		2	2	2		Ŷ	M		
		<u> </u>	1			1	<u> </u>	Ċ			<u> </u>	E				3		N	C		
						1	<u> </u>		1		<u> </u>	F	<u> </u>				5	N			
		<u> </u>	<u> </u>										7	7	7	7		-			
										MS-Project	С					8		-			
										P2	С					10		-			
																11		-			
		L										<u> </u>				12		-			
		 					ļ		L		·	L	13	13	13	13					ļ
	ļ	 			L	<u> </u>	<u> </u>	 	 		 	 	 	 	ļ	14			<u> </u>	 	
				[<u> </u>	<u> </u> -			<u> </u>	 	1		+		15		<u> </u>	 		┣━━━
		 					<u> </u>	 	 				11	11	$\frac{1}{10}$	11		<u> </u>	·	{	
- 22			>1000	>20	1001		<u> </u>			MC Droinet		l			19	-		<u> </u>			
23		10	-1000	>20	100K	$\overset{\circ}{\vdash}$	3	-13	<u>↓ ^</u>	MS-Project			<u>↓</u>	<u> </u>	<u> '-</u>						
- 24		<u> </u>	>1000	>20	COOOL	60	15					 						<u> </u>	<u> </u>	<u> </u>	
<u>_</u>	'	<u> </u>	21000		0000	1 00	- 10	<u> </u>	<u> </u>	Budget Management	1-8-	6	┣	<u>├</u>				├	+	t	<u> </u>
						<u> </u>	┼───	 	 	Duuger management	<u> </u>			1		12	12	\vdash		t	
						1	<u> </u>	}	ł			·	<u> </u>	<u>├</u>		1		<u>├</u>	P	N	
						+	<u> </u>	<u> </u>	<u> </u>	}	<u>├</u>	1				5	5	$ - \dot{v} - $	is -	<u>├''</u>	<u>├──</u> └──
						<u> </u>	<u> </u>		 		<u>├</u> ───					6	6	1 Ý	<u>t č</u> –	<u> </u>	
			h		├	†	1		h		<u> </u>		1			7	7	Ý	<u>м</u>	1	t
						1	1		l							8	8	Ŷ	1		
			the second s		_		_								_	_	_				

4

ł	2	 n Mi	÷**)		•	**************************************	•	

	Q1	Q2	Q3	Q4		Q5		Q6	Q7	Q8		Q9	Q10 - PM Techniques Used						Q11	Q12	Q13
Survey ID	Use PM tool?	Field of Work	# of Employees	# of Projects	Size of a Project	Duration of a Project	# of People in a Project	Use of PM Tools	# of types of PM Softwares	Name of the Software Packages Used	Commercial or Special	Main criterion for PM Software Selection	<100 K	100 K>, <500 K	500 K>, <1 M	1 M>, <5 M	> 5 M	Supported by Software?	Purposes of using PM Softwares	Automated Interaction with subs?	Use of Inter/Intranet in PM?
	 	l						_								9	9	Y			
	┣───				<u> </u>	ļ					<u> </u>	ļ				10	10	<u> </u>			
						<u>}</u>			[┢				_	11	12				
}	<u>├───</u>	<u></u>			l	<u> </u>			}		<u> </u>					13	13	- Ý		<u> </u>	
											1		14	14	14	14	14	Ý			
						<u> </u>							15	15	15	15	15	Y			
													16	16	16	16	16	Ŷ			
													17	17	17	17	17	Y			
													18	18	18	18	18	Y			
		L											19	19	19	19	19	Y		<u> </u>	
25	Y	CA	>1000	>20	50000 K	20	200	PD	A	MS-Project	ļ	D	$\frac{1}{10}$							<u>N</u>	μ_γ
											┢───	F	16		, ,			Y	<u> </u>	<u> </u>	
											╆		18								
					h	 		F			<u> </u>								<u>├</u> ────	}	
26	Ŷ	CA	>1000	>20	1000 K	12	7	PD	A	MS - Project		G				1	_	Ŷ	P	N	Ŷ
							<u> </u>	L					2			2		Y	S		
								IS								3		-	С		
								C								5		Y	M		
																10		Y	RL		
										· · · · · · · · · · · · · · · · · · ·	<u> </u>		14		L	14		<u>Y</u>			
											<u> </u>	 	15			15		<u>Y</u>	┟────	┠	
											+					18			┠────		
													19			19		Ŷ			
27	Y	CA	30-100	>20	15 K	3	3	IS	В	Lotus	l c	В		1	1			<u>-</u>	P	N	N
										MS-Project	Ċ	D	2	2	2			Ŷ	s		
													4	4	1			Y	С		
													5	5				Y	M		
													11	11					RL		
													16	16				•			
	~~~~		100 1000	- 20	150.14					MO Deviced			17	1/	17				<u> </u>		
20	Y	EE	100-1000	>20	150 K	ь	8		B	MS-Project			1	-	1			Y	P	<u>N</u>	N
										Primavera			<u> </u>		5			- V		<u> </u>	
				<b> </b>							<u> </u>		15	15	15						
				I									17	17	17				<u> </u>	<u>├</u>	
29	Ŷ	EE	>1000	>20	500 K	8	10	PD	A	MS-Project	tc	F	<u>  </u>		1			 Y	P P	t N	Y
											<u> </u>			2	2	2		Ŷ	S	t	
														4	4			Y	c	1	
														14	14			Y	M		
	]													15	15			Ŷ	RL		
														17	17			Y		L	

	Q1	Q2	Q3	Q4	Q5				Q7	Q8		Q9	Q	10 - Pl	M Tec	hniqu	Q11	Q12	Q13		
Survey ID	Use PM tool?	Field of Work	# of Employees	# of Projects	Size of a Project	Duration of a Project	# of People in a Project	Use of PM Tools	# of types of PM Softwares	Name of the Software Packages Used	Commercial or Special	Main criterion for PM Software Selection	<100 K	100 K>, <500 K	500 K> ≺1 M	1 M>, <5 M	> 5 M	Supported by Software?	Purposes of using PM Softwares	Automated Interaction with subs?	Use of Inter/Intranet in PM?
30	Y	CA	100-1000	10-20	750 K	18	9	С	A	Primavera	С	D		1	1	1	1	Ŷ	P	Y	Y
												В		3	3	3	3	<u>Y</u>	S		
						ļ									4	4	4	<u>Y</u>	<u> </u>		
					······	ļ									9	9	9	<u> </u>	<u>M</u>	L	
								·	[					14	14			<u> </u>		ļ	
		1.1.1	100 1000	10.00	5501/	<u> </u>								17	1/	17	1/	Y			
31	Y	<u>ww</u>	100-1000	10-20	500 K	8	6	PD	A	MS-Project	С	<u> </u>			1			- <u>Y</u>		Υ	<u> </u>
									<b></b>		<u> </u>			3	3				- <del>3</del> -		
			·			<b> </b>							<b> </b>	15	15					}	
						<b> </b>								17	17						
										<u> </u>				19	19						
32	Y	FF	100-1000	>20	100 K	3	4	CD	B	MS-Project	C	C	$\overline{1}$					Ý	P P		
			100-1000		100 1	<u>                                     </u>	<u>├</u> ───	<u> </u>		Magic	s	F	12	2				Ý	s		
						<u> </u>							4	4				Ŷ	č		
						{							<u> </u>	5				Y	M	[	
						<u> </u>							8	8				Ŷ			
													10	10				Y			
						1							11	11				Y			
														18				Y			
33	Y	AM	100-1000	>20	500 K	24	12	PD	В	MS-Project	С	С		1	1			Y	P	N	Y Y
										In-house	S	D		2	2			Y	s	L	
							L					F	<u> </u>	4	4			Y		<b></b>	
						<u>ا</u> ــــــ	Í							7	7			<u>Y</u>		ļ	
						ļ	l						L	14	14			Y	ļ	ļ	ļ
L						<u> </u>							<u> </u>	17	17			<u>Y</u>	<u> </u>	I	
34	Ŷ	CA	>1000	>20	800K	18	A	<u> </u>		MS-Project	C	<u> </u>	ļ	i							Y
35	Ŷ	EE	100-1000	>20	1000K	12	04	<u> </u>				<u> </u>	ļ	10	- 10				<u> </u>	<u>N</u>	<u> </u>
36	- <u>Y</u>	DS		>20	25K	4		<u> </u>		MS-Project	<u> </u>		<b> </b>	12	12				P	<u> </u>	· · · ·
						ļ					<u> </u>	<u> </u>			3				<u> </u>		
			>1000	200	5001/					MC Design		<u> </u>	┠───	4	4		10			- N -	
- 31		<u>_</u>	>1000	-20	JUUK	<u>⊢°</u>	<u> </u>	<u> </u>		MO-Project	<u> </u>		┣	+	<u> </u>	3	14		<u>├──</u> └──		╏╌╌╌╵╴╌╴┤
						·						<u> </u>			4			4	<b>├</b> ────	<u> </u>	
- 38	~~	FE	>1000	>20	500 K	12		CD	B	MS-Project		<u> </u>			1			- <del>-</del>	- P		
	'		- 1000	-20	N	<u> _'</u>				Project Workbench	- č	F		14	14	14		- ÷		┢──┶──	<b> '</b>
						<u> </u>		MD		- TOJOC WOINDERICH	<u> </u>	}		17	17	17		⊢ ý –	<del>č</del>	<u> </u>	
						<u> </u>						<u> </u>		18	18	18		Ý	<u>м</u>	t	[
				{		<u>├</u> ───	<u>├</u> ─────		<b>F</b>			[	1	1	_				1	1	ļ

7

بمعدمت