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The Assessment of Program Managers' Preceptions of Importance of Stability to Overall Project Outcomes

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THESIS

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Abstract

This research investigates the manager's perceptions of the importance of stability to overall project outcomes. The assessment is based on the importance and usefulness of both the general attributes of management for the activities in a specific program, and the specific measures being employed by the managers. The classical measures of Cost, Schedule, Performance were assessed as well as Earned Value and proposed measures of Stability. In this research, the scope is limited to the management of relatively complex, large-scale projects involving the design, development and delivery of military aircraft and support systems. In order to obtain data for the research, a survey method was employed. The population being sampled for the survey included the managers at various levels in the programs managed by System Program Offices (SPOs) such as C-17, F-16 and F-22.

Results indicated that the newer measures of Stability and Earned Value were well-received and had both importance and usefulness to the managers. Perceptions differed between programs depending on their size; and between managers depending on their level of authority. This was pronounced with regard to the newly introduced *Stability* concept.

THE ASSESSMENT OF PROGRAM MANAGERS' PERCEPTIONS OF IMPORTANCE OF STABILITY TO OVERALL PROJECT OUTCOMES

1. INTRODUCTION

1.1. Overview

This research investigates the manager's perceptions of the importance of stability to overall project outcomes. The concern regarding the performance of a project is how *stable* it is. The relative *stability* of a project refers to how resistant to disruption (stable) or sensitive to disruption (unstable) the activities and resources are under conditions of uncertainty (Swartz, 1999). If a project, throughout its life cycle, is going according to the plan, it is said to be stable. Similarly, if there are many deviations from the project's original schedule, it is said to be unstable.

In order to synchronize the performance of multiple, interdependent activities in a large project, a schedule is developed. The schedule represents the planned start and stop times for the activities and provides instructions for the resources needed to perform the activities. On a basic level, performance to the schedule is important in order to ensure that the objectives are met and the constraints are satisfied. Once the project begins, however, variability in the duration of the activities and disruptions to the resources begin to occur. Variability and disruption cause deviations to the schedule. These deviations, in turn, may cause other deviations to future scheduled events. These deviations in the timing of activities or the

allocation of resources indicate instability in the execution of the project. This instability represents a loss in the synchronization of the project. Loss of synchronization in the activities and resources in the project may result in a degradation of project performance. Recent research has shown (Swartz, 1999), however, that this loss of synchronization or instability may have complex or unanticipated effects on overall project outcomes.

1.2. Scope

The focus of this current effort is to assess project manager's perceptions of the importance and usefulness of various performance measures. Opinions were solicited on a proposed class of stability measures. The assessment is based on both the general attributes of management for the activities in a specific program and the specific measures being employed by the managers. In this research, the scope is limited to the management of relatively complex, large-scale projects. Projects studied involve the design, development and delivery of military aircraft and support systems. Specifically, the research surveyed the attitudes of managers in the System Program Offices located at the Wright-Patterson Air Force Base, under the Aeronautical System Center (ASC) of the Air Force Materiel Command.

1.3. Research Problem and Questions

The overall research problem is the assessment of the managers' perceptions of the importance of stability to overall project outcomes, and the usefulness of stability measures in managing project tasks.

Several investigative questions surround this issue:

- What are the fundamental measures used for overall project performance?
- What are the fundamental measures used for managing specific project tasks?
- What is relationship between different performance measures from the manager's perspective?
- Which performance measures are relatively more important than others?
- Does the size (by means of both cost and time period) of the project have an effect on the decisions or perceptions?
- Besides traditional performance attributes, how important is the concept of stability?
- Besides traditional performance measures, how important are the specific stability measures?
- Are program managers previously using the stability measures in performance measurement?
- How can the analysis results be used in future projects?

1.4. Methodology

In order to obtain data for the research, a survey method was employed. The population being sampled for the survey was the *on-hand* managers at various levels in the programs managed by System Program Offices (SPOs) such as C-17, F-16 and F-22. The plan for this research was tailored based on the nature of the data collection method, *survey* method, because, there are also bureaucratic steps to be achieved as well as the survey procedure

itself. Upon starting the research, we divided the whole process into three sections. The first section was the gathering of information and reviewing literature before the survey. Second was the preparation of the survey. For this purpose, necessary items were selected to be included in the survey, and the survey has been constructed by following procedures of social research guidelines and statistical rules. After the finalized version was established, and upon approval (Compliance with the Air Force Instruction, AFI 36-2601), it was sent to the predetermined recipients. Most of the risk involved in getting the data for the research existed here. Close follow-up was required to get the questionnaires back in time to perform the analysis and write the report. The third section was the gathering of the data, performing the analysis, and drawing conclusions. Although these sections looked distinctive, they were interrelated and continuously improved with the overall process towards the end.

1.5. Anticipated Results

The objective of this research was to assess the manager's perceptions of the importance of stability to overall project outcomes and the achievement of subordinate objectives. At the end of the analysis, we anticipate that managers are generally using the major traditional measures like cost and schedule (or Earned Value, which is the integrated approach described in Chapter 2). At this point, our conclusion looks like a verification of upcoming procedures performed by the program managers in order to measure their program performances. On the other hand, they might be using or prefer to use stability measures besides traditional ones or some other measures that we are currently unaware of. At this point, the conclusion will

present a picture of the *state-of-the-art* approach used by the managers in those programs in the Air Force.

However, results might differ between programs depending on their size, and between managers depending on their level of authority. The results could therefore be helpful in providing managers some suggested answers to the questions- "Are we looking good, or are we in trouble? And, how do we know?"

1.6. Summary

In this chapter, the objective of this research, several investigative questions and scope of the research are explained. In addition, the methodology being followed through the research and the anticipated results are given.

Next, there will be a literature review in the second chapter in which background information about the research is provided. In Chapter 2, besides background information, there are also excerpts from previous efforts made in the similar research area. In Chapter 3, the Methodology being followed from the preparation of survey to the analysis and presentation is presented. Next in Chapter 4, the Analysis and Results section, the findings from the answers given to the survey are analyzed, classified and become ready for conclusions. In the end, in Chapter 5, Conclusions and Recommendations section, the answers to the research questions are answered.

2. LITERATURE REVIEW

2.1 Introduction

In this chapter, general literature is reviewed along with significant prior studies. Starting from a broader perspective of project management, research is presented through specific project performance issues. First, project management and the unique characteristics of project management will be described. Then, various guidelines will be introduced relating to performance measurement in general. Also, characteristics of successful performance measurement will be identified for programs. Third, specific project performance measures will be reviewed. In addition to a review of traditional measures, such as cost, schedule and performance measures, a new concept of stability for projects and some stability measures will be introduced. In the last section, two significant prior studies directly related to this thesis will be detailed.

2.2. Project Management

While there are several definitions of projects in the literature, one of the best has been offered by Tuman who states (Tuman, 1983):

> A project is an organization of people dedicated to a specific purpose or objective. Projects generally involve large, expensive, unique or high-risk undertakings, which have to be completed by a certain date, for a certain amount of money, within some expected level of performance. At a minimum, all projects need to have well defined objectives and sufficient resources to carry out all the required tasks.

Modern project management is often said to have begun with the *Manhattan Project* in 1945 (Meredith & Mantel, 2000:8). In its early days, project management was used mainly for large, complex research and development (R&D) projects like the development of the Atlas Intercontinental Ballistic Missile and similar military weapon systems. Large construction programs like dams, ships, and freeways were also organized as projects.

As the techniques of project management were improved, mostly by government and military, the use of project organizations started to spread. Private firms also found that project management was helpful on small projects such as building a warehouse or developing a new engine design; and with a growing importance, in computer software.

In the broadest sense, a project is a specific, finite task to be completed. Whether large or small-scale or whether long or short-run is not particularly relevant. What is relevant is that the project is seen as a unit. There are some additional attributes that characterize projects.

2.2.1. Project Management Characteristics

A project is usually a one-time activity with a well-defined set of desired end results. It can be divided into subtasks that must be accomplished in order to achieve the project goals. The project is complex enough that the subtasks require careful attention and control in terms of schedule, precedence, cost and performance (Meredith & Mantel, 2000:9).

Projects have life cycles. From the beginning, they progress to a buildup phase, then peak and decline towards the end, termination. Every project has these development stages, known as life cycle phases, through which it proceeds. Although the precise definitions and boundaries of these operational phases tend to vary by industry, and by company, the basic

idea remains the same. Generally these steps can be labeled as Concept Exploration, Program Definition & Risk Reduction, Engineering and Manufacturing Development and Production, Fielding/Development, and Operational Support. Some projects end as the operation reaches its steady state (Meredith & Mantel, 2000:9).

Projects often interact with other projects or other organization functions simultaneously. These functions might be marketing, finance, manufacturing and the like, and within the life cycle of the project, the project manager (PM) should keep these interactions coordinated and appropriate (Meredith & Mantel, 2000:10). More than most managers, the PM usually deals with conflicts between the project and the organization's resources. Also, stakeholders in any project could define success and failure in different ways resulting in more conflict for the PM (Meredith & Mantel, 2000:10).

Every project has some unique elements. No two projects can be exactly the same. Some degree of customization is a characteristic of projects. Because of this, their management tasks cannot be reduced to routine or recurring actions (Meredith & Mantel, 2000:10).

In summary, projects are one-time events, which makes them different from routine organization activities. Projects have structured phases, which are unique to them, and because of this, tasks are highly customized. A high degree of coordination is required among resource that come in and out of the project.

2.2.2. Project Management: Advantages and Limitations

Actual experience with formal techniques of project management indicates that the majority of organizations using formal techniques experience better control and customer

relationships, and probably an increase in their project's return on investment (Meredith & Mantel, 2000:12). Other reported advantages include lower costs, higher quality and reliability and higher profit margins. On the negative side, formal techniques of project management create a great organizational complexity. Many firms reported low personnel utilization, more management difficulties and organizational conflicts (Meredith & Mantel, 2000:12). Probably the most notable limitation is that the PM often lacks authority within the organization in which he or she operates to accomplish the desired outcomes. Because of the difference in authority level between the PM and the managers in the parent organization, it is hard to maintain full cooperation throughout the project.

2.2.3. Managing Projects

From the point of a project manager, the existence of controllable project elements is essential to keep the project on its way to the ultimate end. There are six basic elements of a project that a manager can control (Culp & Smith, 1992). These are scope, time, people, cost, results and communication.

Every project begins with the definition of its *scope*. Scope means the focus of the project in order to achieve its objectives. Even if it is precisely defined at the start of the project, you cannot assume that everyone working on the project will be working toward the same scope throughout the project. The scope change is common and the manager's assessment of how overall efforts relate to the scope is essential.

There is usually a finite amount of *time* in which the work must be done. Unless your customer agrees to a change, you can't control the time available once the schedule has been

agreed upon. You can control the time at which the work on a given project task is done relative to the overall project schedule and relative to other tasks. You may also be able to control the amount of time required to do a task by the resources you assign.

The number and type of *people* working on the project, and when they perform this work, are critical elements. Bringing people together, even when they belong to the same organization and contribute their efforts to the same objectives, does not necessarily mean that they will behave like a team. Organizing the team's work, that team members are mutually dependent and recognize it, will produce a strong impetus for the group to form a team. Project success will be associated with teamwork, and project failure will surely result if the group does not work as a team (Meredith & Mantel, 2000:165).

Obviously, *cost* control is important. No matter how technically successful the project is, you won't get many chances to do more projects if your costs consistently exceed the budget. Although important, tracking costs is all too often confused with project control. Analyzing the costs in relation to overall progress and taking appropriate action constitutes control-tracking alone does not.

There is no point in finishing on time and on budget if the *result* won't work. For every project, there are specific deliverables and performance targets. For project success, above all, these deliverable objectives and performance targets must be met.

Critical *communication* occurs in at least five ways: from project manager to the team, among team members, from team to project manager, between project manager and the customer, between project manager and the organization's upper management. Projects planned to a very fine level of detail with wall-sized PERT charts showing the relationships

between a multitude of tasks can fail because the project manager doesn't effectively communicate with the project team. If the manager does not really know what the team is doing, a sophisticated control system will surely fail.

2.2.4. Leading the Project to Success

Project management is a continuing, iterative process. Even on a project progressing satisfactorily, planning and estimating *to completion* is an essential component of managing the project. Being on time, on budget, and on specification, while maintaining good human relations, will enable the project to conform to valid customer requirements, and to improve people's lives. The principles described in the following paragraphs, prove their value to the extent that they enable one to manage projects more successfully and effectively (Dreger, 1992). Dreger's 10 principles have been organized into three topical areas for clarity: defining the work, defining the schedule, and monitoring and control.

Defining the Work. It is necessary to clearly state project objectives, in terms of specific deliverable items, well before schedule begins. Defective objectives are frequently the main cause of project difficulties. Most project delays result from last-minute addition of new features, or by neglecting to include all essential work in the baseline schedule. In order to maintain an organized structure within the project, establishing a good Work Breakdown Structure (WBS) in product terms at higher levels and process terms (manageable work units) at the lower levels is essential. The definition of WBS is, "a basic project document that describes all the work that must be done to complete the project and forms the basis for costing, scheduling and work responsibility." (Meredith & Mantel, 2000:171). Listing all

activities needed to accomplish the project provide adequate detail to indicate what must be done and how long it should take.

Defining the Schedule. Defining the network and keeping it simple is the very best way possible to determine the critical path, calculate early and late schedules dates, and accomplish the activities. The PM should let the project team make its own viable, easily understood schedule that properly integrates network relationships, calendar deadlines and resource constraints. Although they may not know exactly how long it takes to do the work, they will at least think through the entire project to ensure all pieces have been included in the baseline. Estimating activity durations by using standards (if available), analyzing similar activities, modifying estimates by differences and using rational analytical methods, and using more detailed networks are the procedures being followed. Choosing a set of milestones will help you manage the project better. Creating milestones would provide a better oversight for the PM and easiness on controlling the critical activities. Milestones also make the entire project network simpler by dividing it into several subparts.

Monitoring and Control. Communication within the project team will provide accountability for every activity. Accurate status reports that indicate (1) what was accomplished, (2) what will be done next, (3) slippages and variances, (4) what problems might cause what delays, and (5) what will be done about it – including a request for assistance if appropriate- will clear out possible problems.

In summary, projects are managed according to the unique characteristics of project management. Within this context, the project managers' major responsibilities and duties are to meet the objectives and performance requirements of the particular project they manage.

At this time there is a need to gauge the performance of the project. In the following sections, general and project performance measurement issues will be discussed.

2.3. Performance Measurement

As a process, performance measurement is not simply concerned with collecting data associated with a predefined performance goal or standard. Performance measurement is better thought of as an overall management system involving prevention and detection aimed at achieving conformance of the work product or service to your customer's requirements. Additionally, it is concerned with process optimization through increased efficiency and effectiveness of the process or product. These actions occur in a continuous cycle, allowing options for expansion and improvement of the work process or product as better techniques are discovered and implemented. Performance measurement is primarily managing outcome; and one of its main purposes is to reduce or eliminate overall variation in the work product or process. The goal is to arrive at sound decisions about actions affecting the product or process and its output (Arveson, 1998).

2.3.1. Why Should We Measure Performance?

Performance measurement improves the management and delivery of products and services. In a world of diminishing resources, improving the management of programs and services is critical. Performance measurement improves communications internally among employees, as well as externally between the organization and as customers and stakeholders.

The emphasis on measuring and improving performance (i.e., "results-oriented management") has created a new climate, affecting all government agencies, and most private sector and nonprofit institutions as well. A results-oriented organization requires timely and accurate information on programs and supporting services, whether at Headquarters, Field Elements, or contractor locations. Collecting and processing accurate information depends on the effective communication of mission- critical activities.

Performance measurement helps justify programs and their costs. The public, Congress, and Office of Management and Budget are increasingly taking a more "results-oriented" look at government programs, and the cost-effectiveness of program expenditures is increasingly being called into question. In an era of shrinking Federal budgets, the demonstration of good performance and sustainable public impacts with positive results help justify programs and their costs. Performance measurement demonstrates the accountability of Federal stewardship of taxpayer resources. Federal employees and contractors want their day-to-day activities to contribute to a better society. Performance measurement can show that we are addressing the needs of society by making progress toward national goals. Performance measurement is mandated by the Government Performance and Results Act (GPRA) of 1993, and is central to other legislation and administration initiatives. In addition to holding Federal Agencies accountable for achieving program results, the GPRA also promotes a focus on service quality and customer satisfaction, and seeks to improve executive and Congressional decision making by clarifying and stating organizational performance expectations, measures, and program costs "up front."

2.3.2. Performance-Based Management

Performance Based Management is "A systematic approach to performance improvement through an ongoing process of establishing strategic performance objectives; measuring performance; collecting, analyzing, reviewing, and reporting performance data; and using that data to drive performance improvement." (Artley, Ellison, Kennedy, 2000). According to the Government Performance and Results Act of 1993 (GPRA), signed by former president Clinton, all high performance organizations whether public or private must be interested in developing and deploying effective performance measurement and performance management systems, since it is only through such systems that they can remain high-performance organizations (Artley, Ellison, Kennedy, 2000). Following these guidelines, The Department of Energy (DOE) developed a program to establish and maintain a Performance-Based Management Program. In this section, the differences between performance measurement and Performance-Based Management and the benefits of Performance-Based Management will be briefly discussed.

Performance measurement is the comparison of actual levels of performance to pre-established target levels of performance. To be effective, performance measurement must be linked to the organizational strategic plan. Performance-based management essentially uses performance measurement information to manage and improve performance and to demonstrate what has been accomplished. In other words, performance measurement is a critical component of performance-based management.

Performance-Based Management follows a continuous cycle of "Plan-Do-Check-Act" (Artley, Ellison, Kennedy, 2000). The first step is to define the organization's mission and to

establish its strategic performance objectives. The second step is to establish performance measures based on and linked to the outcomes of the strategic planning phase. Following that, the next steps are to do the work then collect performance data and to analyze, review and report that data. The last step is for management to use the reported data to drive performance improvement.

Performance-based management has many benefits. It provides a structured approach to focusing on strategic performance objectives. In other words, performance-based management focuses on the achievement of results, not on the number of activities. It provides a mechanism for accurately reporting performance to upper management and stakeholders. It brings all interested parties into the planning and evaluation of performance. Performance-based management involves those who should be in the process. It provides a mechanism for linking performance and budget expenditures. At the beginning of the cycle, performance-based management provides a framework for showing what goals will be accomplished and what resources will be necessary to accomplish those goals. At the end of the cycle, it shows what was actually accomplished and what resources actually were used to achieve those goals. Therefore, performance-based management takes the uncertainty out of budget allocations and provides an effective accounting for dollars spent. In the end, performance-based management shares responsibility for performance improvement. In the performance-based management process, performance improvement becomes a joint responsibility between the organization and its customers and management. This jointness assures input from both sides and increases involvement in the process, ownership of results, and accountability for performance (Artley, Ellison, Kennedy, 2000).

2.3.3. The Balanced Scorecard Approach

The balanced scorecard is a *management system* (not only a measurement system) that enables organizations to clarify their vision and strategy and translate them into action (Arveson, 1998). It provides feedback around both the internal business processes and external outcomes in order to continuously improve strategic performance and results. Kaplan and Norton describe the innovation of the Balanced Scorecard as follows:

> "The balanced scorecard retains traditional financial measures. But financial measures tell the story of past events, an adequate story for industrial age companies for which investments in long-term capabilities and customer relationships were not critical for success. These financial measures are inadequate, however, for guiding and evaluating the journey that information age companies must make to create future value through investment in customers, suppliers, employees, processes, technology, and innovation." (Kaplan & Norton, 1996)

The balanced scorecard management process, derived from Deming's Total Quality Management, is a *continuous cyclical process*, like the perfromance-based management. It has neither beginning nor end. Its task is not directly concerned about the mission of the organization, but rather with internal processes (diagnostic measures) and external outcomes (strategic measures). The system's control is based on performance metrics that are tracked continously over time to look for trends, best and worst practices, and areas for improvement. It delivers information to managers for guiding their decisions.

The balanced scorecard measurement system has some advantages. It improves the bottom line by reducing process cost and improving productivity and mission effectiveness. A performance measurement system such as the Balanced Scorecard allows an agency to

align its strategic activities to the strategic plan. It permits -- often for the first time -- real deployment and implementation of the strategy on a continuous basis. With it, an agency can get feedback needed to guide the planning efforts. Without it, an agency is 'flying blind'. Measurement of process efficiency provides a rational basis for selecting what business process improvements to make first. It allows managers to identify best practices in an organization and expand their usage elsewhere. The visibility provided by a measurement system supports better and faster budget decisions and control of processes in the organization. This means it can reduce risk. Visibility provides accountability and incentives based on real data, not anecdotes and subjective judgements. This serves for reinforcement and the motivation that comes from competition. It permits benchmarking of process performance against outside organizations. Collection of process cost data for many past projects allows us to learn how to estimate costs more accurately for future projects (Arveson, 1998).

In summary, performance measurement and its integration with management is presented in this chapter. In addition, various approaches like performance-based management and balanced scorecard are discussed in relation to performance measurement. In the next section, the subject of performance measurement will be described as they relate to specific project attributes and measures.

2.4. Project Performance Measurement

In order to properly manage projects, accurate information is needed to diagnose performance. Accurate information relies on accurate measurements or control systems, especially for larger and more complex projects. Performance is reflected by measurements upon which corrective action is suggested and taken (Chang & Ibbs, 1999). In this section of the literature review, we are going to be investigating performance measures and performance norms in projects. The conditions which exist in performance norms in the real world need to be analyzed in order to derive meaningful levels. To achieve this purpose, the performance norms were sought from research studies, project documents and interviews with project managers. The information from research studies, project documents, and interviews must be refined continually until a satisfactory level is achieved (Von Winterfeldt & Edwards, 1986). Accurate measurements help ensure successful projects.

In this section, from the broader review of performance measurement, several major specific measures existing within the projects will be discussed. Along with traditional attributes like schedule, cost, net present value, and earned value, the concept of stability and stability measures will be introduced.

2.4.1. Main Project Objectives

There are three main project objectives that would fit in to almost all projects. These are *Cost, Schedule and Performance (Quality).* These attributes are referred as traditional measures, which generally describe the overall project performance. Cost refers to the budget of the project and compliance with the resource allocation to the project by means of

monetary units. Schedule refers to the overall plan of the project, milestones and time constraints. Performance or quality refers to the deliverables in accordance with projects' purpose and objectives. In the following sections, specific measures related to these main attributes will be presented as well as new concepts in the area.

2.4.2. Schedules

A schedule is the conversion of a project action plan into an operating timetable, and serves as the basis for monitoring and controlling project activity. Taken together with the plan and budget, is probably the major tool for the management of projects (Meredith & Mantel, 2000:302). In a project environment, the scheduling function is more important than it would be in an ongoing operation because projects lack the continuity of day-to-day operations and often present much more complex problems of coordination. Indeed, project scheduling is so important that a detailed schedule is sometimes a customer requirement.

The basic approach of all scheduling techniques is to form a network of activity and event relationships. Such a network is a powerful tool for planning and controlling purposes and has some benefits. It provides a consistent framework for planning, monitoring and controlling the project. Cash inflows and outflows are associated with scheduled project activities and these cash flows form the project budget plan. One can focus mainly on those that need to be monitored for maintaining adequate control over the project.

2.4.3. Analysis of Cost on Defense Acquisition Contracts

Cost data on defense contracts are regularly reported on cost management reports prepared by defense contractors (Christensen, 1993). These reports include the Cost Performance Report (CPR) and the Cost/Schedule Status Report. Significant contracts include research, evaluation, test and development contracts with estimated cost of $60 million or more, or procurement contracts with estimated cost of $250 million or more (DOD I-5000.2, 1991). Cost/Schedule control systems criteria are not a system. Instead they are minimal standards for contractors' internal management control systems. The purpose of the criteria are to foster reliable decision-making by contractor and government personnel. One of the requirements is that data reported by the contractor be summarized from the same systems that the contractors use for internal management. Another requirement of the criteria is a disciplined budgeting system. A time-phased budget of all the authorized work on the contract, termed the *Performance Measurement Baseline,* is developed by the contractor (Christensen, 1993). The baseline is simply the summation of budgets assigned to elements of work on the contract. Because each element of work has a schedule, the budget for the work is said to be time-phased.

The budgeted cost of work scheduled (BCWS) is the performance measurement baseline, i.e., the originally scheduled project cost. The budgeted cost of work performed (BCWP) is the originally estimated cost of work that has been completed. The actual cost of work performed (ACWP) is the incurred cost for completed items. The estimate at completion is the projected project completion cost. Therefore, ACWP can be thought of as "actual cost," BCWP can be thought of as "actual work" and BCWS is "work plan." Two

variances (actual cost – actual work = cost variance, and planned work – actual work = scheduled variance) make it possible to predict project overruns and/or project slippage at any given point in the project.

Time-phased budgets assigned to work elements, termed the Budgeted Cost of Work Scheduled, form the basis for earned value measurement and reporting. If work is accomplished at a time different from what was planned to be accomplished, then a schedule variance is identified. A schedule variance often signals a cost variance.

According to empirical studies (Christensen & Payne, 1992), once a contract is 20% complete, the Cumulative Cost Performance Index (CPI) generally does not change by more than 10 percent. The cost performance index is a ratio of BCWP to ACWP. A CPI that is less than 1 means that for every dollar spent, less than one dollar of work is accomplished. It follows that when the cumulative CPI is less than 1, the contract is experiencing a cost overrun, and because an unfavorable cumulative CPI only worsens, a contract is not likely to recover from a cost overrun. Therefore, if the predicted overrun at completion is less than the overrun to date, the contractor's estimated final cost of contract (EAC) is unrealistically optimistic (Christensen, 1993).

2.4.4. Cost Variance Metric

Cost performance is determined by comparison of the actual costs and the cost schedule combination for the same work scope. The resultant metric is the cost variance. The cost variance is a true measure of cost performance as it compares the actual costs incurred to the value of work accomplished and eliminates the effects of schedule status variations,

which are inherently present in a simple comparison of actual costs to a budget. A comparison of actual costs to budgets or prior forecasts may still be useful for evaluation of actual vs. planned program staffing levels. (EVMS Work Team, 1996).

2.4.5. Schedule Variance Metric

The time-phased budget is the schedule (plan) for expenditure of the resources necessary to accomplish program work scope requirements. The budget for a period is compared to the cost and schedule combination for the same period to determine and quantify the schedule performance for the program. The resultant metric is the schedule variance. It represents the quantity, i.e., the value, of the work that is ahead of or behind schedule. The specific activities and events that are contributing to the variance can be identified in program schedules. Program schedules will involve time-oriented listings or graphic representations of the work to be done on the program. The schedule activities and events are monitored for management information. Each process provides useful and valuable information that aids in comprehending program conditions. The schedule variance metric provides early insight into detail schedule conditions and overall schedule performance and should be used in conjunction with milestone status reports, critical path data, and other schedule status information used by the company. The schedule variance metric considers both ahead-of-schedule and behind-schedule data in the computation of an overall schedule position. Other techniques, such as critical path analysis, are preferred indicators of long range projections; but, a trend analysis of the changes in the schedule

variance metric can provide a valid and useful indication of current performance and near term projections (EVMS Work Team, 1996).

2.4.6. Earned Value Management System (EVMS)

The Earned Value Management System (EVMS) for program management is designed to effectively integrate the work scope of a program with the schedule and cost elements for optimum program planning and control. The primary purpose of the system is to support program management. The basic concepts of an EVMS are (EVMS Work Team, 1996):

- Plan all work scope for the program to completion.
- Integrate program work scope, schedule, and cost objectives into a baseline plan against which accomplishments may be measured.
- Objectively assess accomplishments at the work performance level.
- Analyze significant variances from the plan and forecast impacts.
- Provide data to higher levels for management decision-making and implementation of management actions.

The essence of earned value management is that at some level of detail appropriate for the degree of technical, schedule, and cost risk or uncertainty associated with the program, a target value (i.e., budget) is established for each scheduled element of work. As these elements of work are completed, their target values are *earned*. As such, work progress is quantified and the earned value becomes a metric against which to measure both what was spent to perform the work and what was scheduled to have been accomplished.

Schedule variances, which cannot be seen in a stand-alone budget versus actual cost tracking system, are isolated and quantified, and the cost variances are true cost variances that are not distorted by schedule performance. This provides for early identification of performance trends and variances from the management plan, and allows management decision making while there is adequate time to implement effective corrective actions. Without earned value, one can only compare planned expenditures with how much has been spent, which does not provide an objective indication of how much of the planned work was actually accomplished.

For the benefits of earned value to be fully realized, thorough planning, combined with the establishment and disciplined maintenance of a baseline for performance measurement are needed. The combination of advance planning, baseline maintenance, and earned value analysis yields earlier and better visibility into program performance than is provided by non-integrated methods of planning and control. (EVMS Work Team, 1996)

There are other criteria for progress as well. Milestones completed or missed are qualitative criteria for measuring how you are doing on the time scale. Usually the end of a project task is a very clear and easily compared to the task milestone. The earned value concept is the most effective criterion for tracking progress because it combines all facets of productivity into a single value. Also, it enables you to estimate how much it will cost to finish the project.

While these techniques are primarily used on government projects today, they are also valid for projects in the private sector and more companies are voluntarily implementing such methods for project control (Stuckenbruck, 1989).

2.4.7. Net Present Value (NPV)

NPV is an absolute measure of the value or expected value of an R&D project in constant dollar terms. It is calculated by discounting (or inflating) the cost and benefit time series to the reference year and subtracting the present value of costs from the present value of benefits to yield the net present value of the investment. Varying forms of this measure are widely used by industry, where it is often referred to as *discounted cash flow*. Like most metrics, its use is affected by the selection of a discount rate, which is used to adjust the time series of benefits and costs for risk, time preferences of money, and inflation. This selection is not straightforward because of different views with respect to how many of these three factors to include in determining the discount rate (Tassey, 1998).

2.4.8. Measures of Stability (Swartz, 1999)

Scheduling stability refers to the ability of the schedule to resist or absorb unplanned variance or events. Stability measures will represent the degree of deviation from schedule for the resources and activities in the project. A project that is executed very closely to the schedule will be considered to be more stable. A project that is executed with numerous (and/or large) deviations from the schedule will be considered to have been (relatively) less stable.

Stability is an important issue in scheduling when resources are limited and must be carefully managed. The schedule represents a plan for how to best use the resources available in order to achieve some set of objectives within the constraints imposed upon the

project. When the schedule or plan cannot be met, several direct and indirect undesirable consequences may result.

First, the desired objectives toward which the schedule is optimized may not be achieved. If the schedule is unable to resist an unplanned variation, or loses validity when a disturbance occurs, the resources may not be put to their best use from that point forward. In addition, when the schedule breaks down or loses validity, resources that must be secured from outside the system may be brought in (and paid for) too early or too late, resulting in idle time and additional costs. Learning and unlearning, as well as other tangible set up costs, may take place when resources are set up and broken down as priorities change. When the schedule loses validity, local decisions (based on the invalid schedule) may no longer integrate well with the global objectives.

This study defined several project management stability measures. It tried to provide insight into the relationships between the traditional factors of project performance and some proposed stability measures. These traditional factors included the nature of the project environment (activity variability and resource disruption), and the scheduling and execution methods used to manage the project. The results demonstrated that studying both project stability and the relationships between project stability, other outcome measures, and the traditional factors of project performance could be extended into practical significance for the management of projects.

The stability measures divide into two distinct groups, the offset measures and the deviation measures. Activity Deviation is the total amount of earliness or lateness for activities in a project (sum of days early or days late for all tasks). It is scaled based on total

size of project and measures how much time the project is "off-track" in terms scheduled completion. Resource Offset is the total man-days of overtime or undertime (idleness) experienced by resources used to complete the project. Scaled based on total size of the project. measures how much time resources spend waiting to work or catching up in terms of scheduled activity. Idleness and overuse appear to behave similarly; they covary both in raw and ratio form. The activity deviation measures seem to consist of a trivial earliness component, and a much more prevalent lateness component. First, while the traditional and stability measures exhibit strong covariation in some areas, in others the relationships are weak. Second, the overall correlations between the types of measures are lower than those within each type of measure, indicating that perhaps there are differing degrees of commonality or overlap between and among the types of measures. Overall, it can be said that duration, stability, and value are distinct aspects of project performance; and that these aspects are related to each other.

In summary, the link between the project management and the subpart of project management –performance measurement- has been established. Within the scope of the current research, the next and the final step in literature review is a discussion of two specific significant prior studies dealing directly with performance measurement in projects.

2.5. Project Performance Measurement Studies

It has been noted that all projects share the generic goals of Cost, Schedule and Performance (Chang & Ibbs, 1999). It is the job of the project manager to trade off achievement of these goals in such a way that the total project is optimized. One key question

for the project manager to answer is whether or not the relative degrees of importance or weights of the three generic goals change over the life of a project.

In order to assess program managers' perceptions on performance measures, some research has been performed.

2.5.1. Tradeoffs On Projects (Kloppenborg & Mantel, 1990)

It has been generally assumed that performance is the most important of the three goals during the initial stage of the project life cycle when attention is focused on the technical specifications on the project (Meredith & Mantel, 2000:8). Once the specifications are set and work on the project begins in earnest, it is felt that cost is the most heavily weighted goal. Finally, as the project approaches completion, the assumption is that emphasis turns to finishing the project on time; that is, that schedule is the most important of the goals.

While these assumptions are intuitively satisfying, anecdotal evidence casts some doubt on the matter (Kloppenborg & Mantel, 1990). In order to test the assumptions as well as to determine if cost, schedule and performance goal weights do change systematically over the life of the project, a survey was sent to the members of Project Management institute (PMI). PMI members were asked to report their individual opinions about the relative importance of cost, schedule and performance goals at various stages of the project life cycle. At the same time, the managers' choice of relative weights on those three goals were investigated in order to find out the influence of some environmental or situational factors such as project manager's educational or work background and organizational departments under which the project was being carried out. It is believed that making choices about the relative weights of

the three generic project goals is an extremely important task, usually carried out by the project managers.

A mail survey was sent to approximately 500 randomly selected members of PMI. Sixty percent responded, representing five major industrial groups, six types of departments within their organizations and four specific job titles. Questions oriented toward measuring the relative strength of goal weights during various stages of the project life cycle were asked with two different wordings in order to test consistency of responses as well as to improve the likelihood that questions were interpreted as intended. Respondents were also encouraged to add verbal comments to amplify their answers or make inputs. Standard analysis-of-variance statistical techniques were used to analyze results.

If the project life cycle is divided into 4 major parts -formation, buildup, main program and phaseout, the findings from this research could be examined within these parts initially. The weights of the three main goals displayed no significant difference between each other during the project formation phase. This is the only stage that cost did not weight significantly lower than the other two objectives. Another finding is that the importance of each factor during this stage is lower than any other stage in the project life cycle. These two findings are related. During the conceptual stage of the project decision makers mainly deal with the fundamental design of the project and for this reason the focus is on the activity itself instead of tradeoffs. This is consistent with the low scores appeared for the three generic goals in the formulation stage.

During the buildup stage, project managers place the heaviest weight on schedule and are relatively least concerned with the cost. The buildup stage is the period of detailed

scheduling and the acquisition/deployment of resources. Since senior management often sets deadlines, the preoccupation of project managers with schedule is understandable.

During the main program stage, cost will be sacrificed to attain schedule and/or performance goals. The weights on schedule and performance do not differ significantly. While the weights on schedule and performance are greater in this stage, cost is more important than any other stage, because cost is a important consideration in the management of this stage in the project life cycle.

It was assumed that the completion of the project is on schedule would be the most important objective with some allowed slippage in project performance and cost. Respondents in this research weighted performance the most heavily. It is clearly more important to finish a project correctly than quickly.

Looking at the results from the project manager's background and experience perspective, neither educational background nor area of experience is associated with significant variation in goal weights. Apparently, the most project managers take seriously their responsibility for all three types of goals.

In summary, the importance assigned to cost, schedule and performance goals varies systematically across the project life cycle (Figure 2-1). These results suggest a slight change in preference over the different stages in a project. The primary managerial implications of these findings are that a number of separate variables should be taken into account when making tradeoffs. Second, conscious decisions should be made concerning which of the project objectives to subject to primary control and which should be left

comparatively free. Finally, the background of the project manager has less impact on the choice of goals to be emphasized than had been assumed.

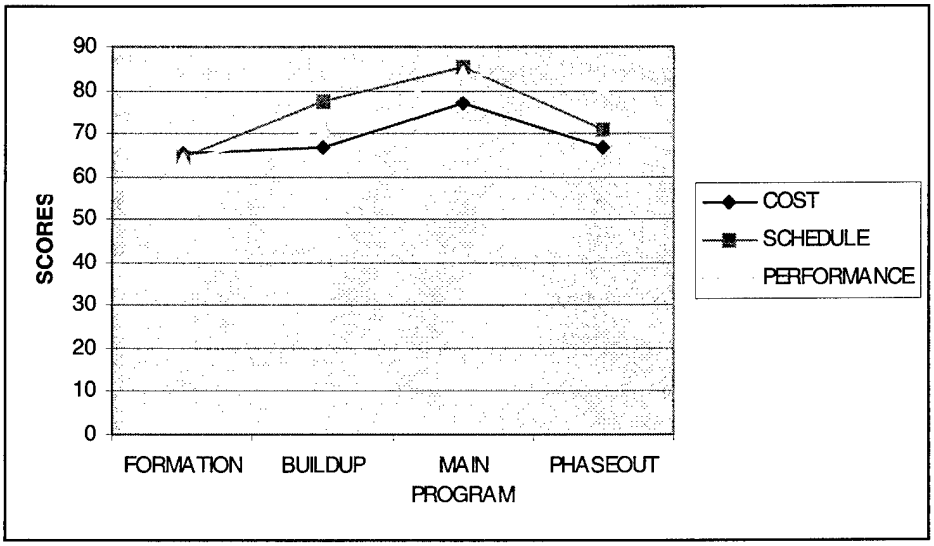


Figure 2-1 Objectives by Life Cycle Stages (Kloppenborg & Mantel, 1990)

2.5.2. Effectiveness Assessment on Air Force Program Engineering & Manufacturing Development (EMD) Schedules (ASC, 2000)

Although this study had different objectives, a survey method was employed to acquire the opinions of project managers within the US Air Force on the assessment of effectiveness on Air Force EMD Schedules. The focus is mainly on schedules and risks involved with the schedules.

This is a routine survey conducted by the metrics department within the ASC. The population surveyed are the program managers in the SPOs. This survey has a relatively limited scope, but the similarity of the methodology provides insights to the current research. Only the issues and results that are relevant to this study will be summarized here.

Causes of significant changes to project schedules were found to be technical, cost growth, budget cuts, requirements creep, program restructure and other program delays. Among these, the highest percentage (%Slip) belongs to program restructure, and the lowest percentage belongs to technical problems. In the risk mitigation area, the use of a schedule is found to exist in early work stages in order to minimize the effect of schedule slips. Findings indicate that early work includes planning extra time for design reviews, adding schedule time for higher risk sub-elements of program, planning based on similar programs then adjusting, preparing alternative cost/budget plans prior to RFP (Request for Proposal) and detailing schedules.

Another finding from this survey is the use of schedule in the decision process during program execution. Generally schedules drive most every decision to some degree. They provide metrics such as earned value, daily tracking and exit criteria for each phase, identifying critical path and bottlenecks to management's attention and focusing on accomplishments and behind schedule concerns. Schedules also support recurring planning activities based on budget and tasking, aid resources allocation-personnel assets and again assist in coordinating external events that support the program.

2.6. Summary

In this chapter, general literature regarding performance measurement is reviewed along with significant prior research into performance measurement for programs.

In the first section, after a brief description of a project, an introduction was made to project management. Then unique characteristics of project management that make it

different were described. Advantages and limitations that are being observed within an organization are explained. Finally the principles that lead a project to a success are given at the end of the section.

In the second section, various guidelines were introduced in performance measurement. Also, characteristics of successful performance measurement were identified for programs. Evaluation criteria for performance measures were introduced at the end of the section. In the third section, specific project performance measures were described. Besides a review of traditional measures, such as cost, schedule and performance measures, stability concept for projects and stability measures were introduced for the first time. Also as a hybrid measure, earned value, was briefly reviewed.

In the last section, two significant prior research studies relevant to this thesis were detailed. First, the tradeoffs between the three main objectives of a project (Cost, Schedule and Performance), and the project managers' perceptions of importance were discussed. This provided general guidance about what the results of this thesis might look like at the end. The second study was based on schedules and risks associated with them. Because schedule is one of the main objectives of this research, the findings from this study are believed to have importance.

In the next chapter, *Methodology*, the steps followed in constructing the survey and the initial data analysis will be introduced.

3. METHODOLOGY

3.1 Introduction

A survey method is employed for the collection of data for this research. Because the objective of the research was to assess the manager's perceptions of the importance and usefulness of stability within the performance measures being used in the Air Force projects, it was believed that sending out a survey to a sample of program managers in the Aeronautical System Center at WPAFB would be a good source of data for further analyses. In this chapter, the preparation procedure of the particular survey questionnaire is explained.

3.2 Planning and Designing the Survey

The survey questionnaire was designed as a "cross-sectional survey" (Dooley, 1999), which collects data from the chosen sample at one time. There are various types of surveys, such as face-to-face interviews, telephone interviews or mail-out questionnaires. Because of the nature of the research and the environment of a military installation, it is very difficult to obtain data through the first two medium types. Although historically return rate for mail surveys seems low, it was chosen as the best way to obtain the data required for the research.

3.2.1 Expectations of Survey Results

Surveys are used so often today because they offer many advantages to the researcher. The flexibility of the survey is the most important one, because the entire design can be manipulated so as to create the questions varying from basic demographics to complex attitudes and preferences. In this way, the researcher is able to obtain the data that is necessary for the research. Again, because the surveys are custom-designed they can be specialized to meet the needs such as cost, time and number of respondents. Generally, samples are selected for surveys with the intent of generalizing the results to a greater population. With a careful instrument composition, those needs could be efficiently met.

Despite the advantages of surveys, this research method has some disadvantages and limitations. Causality (cause and effect relationship) is difficult to measure using survey research (Alreck & Settle, 1995:6). Also including questions that might be sensitive to the recipients could be a disadvantage. They may decline to give information. The questions should be carefully worded, keeping the status of the people in the sample in mind. The preparation of a survey requires a thorough effort

3.2.2 Planning the Survey Project

The survey project is a series of steps linked to one another (Figure 3-1). Within the network of these steps, the decisions made at the earlier stages affect outcomes at later stages. Besides the natural forward linkage of steps, there are backward links that serve as

feedback to the earlier steps. For example, the data processing method has to be planned for in both sampling design and instrumentation steps for compatibility.

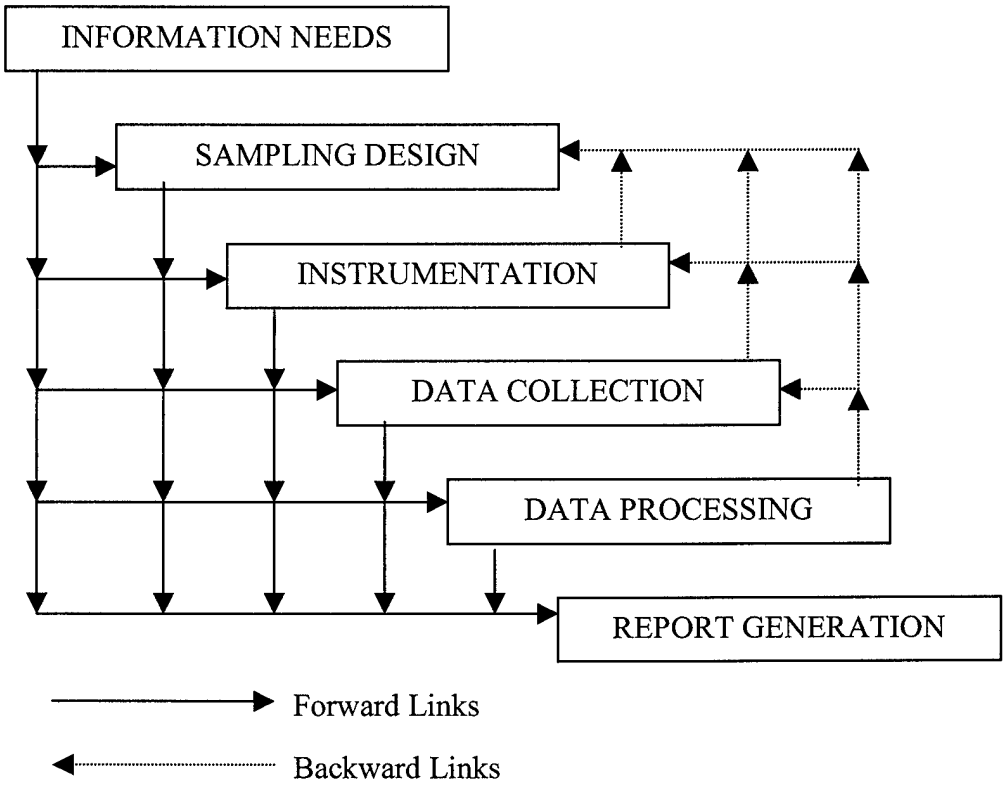


Figure 3-1 Linkage in the Survey Process (Alreck & Settle, 1995:26)

At this point, the researcher plans the elements of the survey via an outline of an entire project. Planning sequence depends on the specific needs for the research. The basic outline for this research can be summarized as follows:

- Listing the information needs. The most important thing here is to identify the necessary information for the research that would be obtained via survey. This is also the most basic step in constructing the survey medium.

- Classify the types of information. The necessary information should be classified in a way that the structure of the survey makes sense.
- Specify the sample size and design. Because the statistical analyses will be employed by using the data obtained from the surveys, sample size and design issues should be properly specified for the overall quality of the research
- Describe the data collection method. The method should be chosen by keeping in mind the environment and the status of the respondents.
- Outline the data processing method. The data comes with the survey in raw form. All variables in the survey should be specified and precoded for post survey data processing.
- Describe the types of reports required. The researcher needs to consider the form of presentation for the statistical results prior to final survey analysis.

Each of these steps will be described in detail in the following sections of this chapter.

3.2.3 Designing the Sample

The main reason for sampling is economy. To survey every individual in the target population ordinarily is much too expensive, time and effort consuming. A small fraction of the entire population usually represents the parent population with enough accuracy if selected properly.

Another critical selection before sampling is the target population. The target population should be selected in a way that the required information for the research could be sought.

From this perspective, the target population was selected as the "on-hand" program managers within the Aeronautical System Center (ASC) at Wright Patterson Air Force Base. A list of the target population was provided by ASC officials. According to the list of managers provided by ASC, the number of people in the population was 455.

The unit of analysis is the individual manager in a program office. As a result, the sampling frame happened to be an address list including names, ranks (grades if civilian) and office symbols.

3.2.3.1 Sample Size Determination

Sample size determines the degree of statistical confidence. A higher reliability can be bought through a larger sample by additional time, effort and money. Conversely, there is a minimum sample size below which the data are worthless. The object of proper sample size is to find the optimum point between those two extremes for the survey project currently ongoing. When sample size increases, sample error decreases and sample reliability increases. Similarly, when population variance increases, sampling error increases and sample reliability decreases. In sample size determination, there are minimum and maximum practical sample sizes that apply virtually to all surveys. Normally, a size of 30 or less would not provide certain practical results. It is seldom necessary to sample more than 10% of the population to obtain adequate confidence. For a population size of 455 for this research, a sample size of 45-50 would be enough. But in order to maintain the required number of usable surveys, we sent 120 surveys out, anticipating that the expected nonresponse rate for

surveys would be around 25%. Another reason for keeping the number of surveys initially being sent higher is the difficulties encountered in the survey approval process. Because the people in the system program offices are busy, and they work with sensitive information, they might not be willing to share information by means of surveys even though they were Air Force level approved. For these reasons we anticipated a response rate of around 30-40 percent.

3.2.3.2 Sample Selection

There are times when it's useful to divide a population into two or more segments (strata) and sample a portion of each. The selection of sample strata is usually based on some demographic characteristics. In this research, we used stratified sampling in order to get opinions of people from different authority levels. In our population, there are military and civilian employees ranging from lieutenant to colonel for military and GS levels for civilian. According to their proportions in the population, we stratified the sample based on these proportions in order to make sure that we had the opinions from a wide range of levels.

After dividing the entire population into specific groups (i.e. civilian, majors, captains), we assigned numbers to each one of the names in the population list. By using a random number generator, we selected the previously identified number of names as the overall sample. Below. Table 3-1 below indicates the number of surveys sent according to the rank status of the sample. We could not differentiate the grades for the civilian personnel ahead of time since this information was not revealed by the ASC officials.

Table 3-1 Sample classification

Civilian	59
Lieutenant	5
Captain	14
Major	14
LtC	14
Colonel	14
Total	**120**

3.3 Developing Survey Instruments

The survey is structured in three parts, starting with demographic questions and two parts with the scale items representing the constructs to be surveyed. In the first part, questions are asked about general position of the respondent and his/her personal information like sex and age. This part is designed to take the least time to complete. The questions in the demographics part are structured as both open ended and with alternative answers for the respondent to choose from. Questions asking rank/grade, age, career field, experience, name of the program and duties with regard to the program are in the form of open-end types. Questions regarding the program itself and the respondent's sex are to be selected from the choices provided. The demographics categories were selected in anticipation of their role as potential mediating or moderating factors.

3.3.1 Creating Item Scales

A response scale is a presentation of the categories along which respondents will arrange their opinions (Alreck & Settle, 1995:113). The positions or perceptions of various

individuals can then be compared with one another. Scales can be coded with numbers and the numeric codes that represent answers to questions are more easily manipulated than words. The use of numeric database saves time and helps ensure accuracy, reliability and validity. Scales can be arranged so as to capture answers to many questions quickly and in very little space. They are both efficient and practical.

Following the demographics section, there are two parts, which are constructed as item scales. The first one represents the constructs of general project attributes, and the second one is the specific performance measures.

- *General Attributes:* Characteristics that a project or task will assume as it is executed.
    - *Cost*: How much does the project or task cost (a lot or a little)?
    - *Earned Value*: Deviation or variance measure combining performance, schedule and cost parameters of a project. Baseline is the budget that is spread over time to accomplish the scope of work and against which progress can be measured. Earned Value is described as, "how much progress am I making against my original plan?"
    - *Performance (Quality):* How many desirable features does the project or task successfully deliver (many or few)?
    - *Schedule*: How long does the project or task take to complete (a short time or a long time)?

- *Stability*: Deviation or variance recovery measure combining cost, schedule and performance. Measures the ability of a project or task to get "back on track" after being disrupted.

- *Specific Performance Measures:* The metrics used to measure performance of a project based on the project attributes.
  - *Activity Deviation*: The total amount of earliness or lateness for activities in a project (sum of days early or days late for all tasks). Scaled based on total size of project. Measures how much time the project is "off-track" in terms scheduled completion.
  - *Cost Variance*: The difference between "Budgeted Cost Of Work Performed" and "Actual Cost Of Work Performed".
  - *Cumulative Cost Performance Index (CPI):* The ratio of "Budgeted Cost Of Work Performed" over "Actual Cost Of Work Performed", that measures efficiency and can be used to predict the final range of costs.
  - *Resource Offset*: The total man-days of overtime or undertime (idleness) experienced by resources used to complete the project. Scaled based on total size of the project. measures how much time resources spend waiting to work or catching up in terms of scheduled activity.
  - *Schedule Variance*: The difference between "Budgeted Cost Of Work Scheduled" and "Budgeted Cost Of Work Performed".

- *The Schedule Performance Index (SPI):* The ratio of "Budgeted Cost Of Work Scheduled" over "Budgeted Cost Of Work Performed", that is useful in assessing how much work has been accomplished.

For both the general project attributes and the specific performance measures, a linear scale and a ranking scale is used to measure each construct. At the and of the page for each section, a space is provided for additional inputs from the respondents.

When items are to be judged on a single dimension and arrayed on a scale with equal intervals, a simple, linear numeric scale with extremes labeled appropriately the most advisable method of scaling. For this research, we used multiple-rating list, which is slightly different from a linear numeric scale. Instead of requiring the respondent to write down numbers next to the constructs, number scales are provided for each construct for easiness and better visual pattern.

For the ranking section of each part, respondents were asked to rank the constructs they previously identified. For clarity, they were provided with an appendix at the last page of the survey, which briefly describes the constructs existing in the survey apart from the instructions in the beginning of every one of the scales.

3.3.2 Building The Questionnaire

Research surveys usually depend on heavily on the voluntary cooperation of respondents. Research experience consistently shows that nearly all who refuse to cooperate

do so within the first few seconds after initial contact (Alreck & Settle, 1995:144). It is essential that the introduction of the survey be composed and delivered effectively. As an introduction and a requirement stated in AFI-36-2601, the very first page of the survey is dedicated to provide the respondent enough information about the research, researcher and the contents along with a greeting. In addition, importance of the research and confidentiality issues are briefly mentioned within the introduction page. Because the people in the population we targeted are assumed to be busy, in order to increase return rate, the entire survey was designed to be completed in about a few minutes (and this was stated in the introduction).

A measurement of any kind is valid to the degree it measures which it's supposed to measure. To be valid, a measurement should be free of extraneous factors that systematically push or pull the results. Biases in the questions might be the reason for low validity. The researcher might unintentionally lead the sample units to wrong directions. High validity requires every response to cluster around one target construct. In order to protect validity, the survey was being printed in three different versions. The places of the questions were changed in each version to avoid possible bias resulting from the order of the items in the survey.

The most fundamental test of reliability is *repeatability*- the ability to get the same data values from several measurements from the same recipient. If the answers don't vary over time, it is said to be highly reliable. If they follow a random pattern, it would be low. For the research survey, in order to eliminate the random error and increase reliability, both likert scale and ranking techniques were employed for the same type of data. This is a way of

getting the same answers via different questions. The results of validity analysis will be presented at the end of this chapter. A sample of survey being used is in Appendix A.

3.3.2.1 Precoding The Questionnaire

In order to process the returned survey data on the computer, the categorical data obtained from the demographic part should be represented by numeric codes. Most of the variables in this section are coded as they were. For example, the variable age has values directly from the responses, so the experience in years does. Only sex (Male for 0, Female for 1), project assignment (1-3), program stage (1-4) and program level (1-3) variables were converted to numeric codes. In Table 3-2, the nature of the demographic variables are presented.

Table 3-2 Demographic Data

DEMOGRAPHICS	VARIABLE	NATURE OF THE DATA	RANGE
RANK/GRADE	DE1	CATEGORICAL	GS 12-15 2^{ND} LT.-COL
AGE	DE2	NUMERIC	
SEX	DE3	CATEGORICAL	MALE-FEMALE
EXPERIENCE IN THE CAREER FIELD	DE4	NUMERIC	
APDP LEVEL OF MANAGER	DE5	CATEGORICAL	1-3
ACAT LEVEL OF PROGRAM	DE6	CATEGORICAL	1-4
PROGRAM PHASE	DE7	NUMERIC	1-4

3.3.3 Mailing the Survey

Every survey has been printed on both sides of a regular A4 copying paper in a total of three sheets and stapled. Along with a return envelope, it was put in a large envelope and labeled with the recipient's name and address. Because the survey recipients are located on the base, local distribution was utilized. For tracking purposes, the name list was used to make follow-ups. Four weeks after the initial mailing was chosen to be the cut-off date based on the response rate and expected number of returned usable questionnaires. In the early dates after the initial mailing, for surveys returned because of the wrong addressing, we resampled and mailed additional surveys in order to maintain the response rate.

3.4 Collecting And Processing The Data

After starting to get the surveys back, the questionnaires were sight-edited for usability. It is important to see if the survey is usable for further analysis or obviously incomplete. Because of the nature of mail-out surveys, there will be incomplete and blank questionnaires in the returned stack. These should be set aside as *declined to participate.* If respondents randomly complete or fail to complete and return the questionnaire, there will no nonresponse bias. Whether the survey recipients complete and return the questionnaire, set it aside and forget it, or just throw it away depends on their characteristics, attitudes, opinions and interest in the topic. As a result, some types of people are likely to be overrepresented and others underrepresented in the received sample, creating biased results. Nonresponse bias is an important problem if there is a direct connection between the purposes of the survey and

the information needs, on the one hand, and likelihood to respond, on the other (Alreck & Settle, 1995). The classification of the received surveys are presented in the Table3-3.

Table 3-3 Returned Surveys Classification

RANGE	SENT	RECEIVED	RESPONSE %
Civilian	59	23	39%
GS 12	N/A	5	9%
GS 13	N/A	13	24%
GS 15	N/A	5	9%
Lieutenant	5	5	100%
Captain	14	10	71%
Major	14	6	43%
Lt. Colonel	14	6	43%
Colonel	14	4	29%
Total	**120**	**54**	**45%**

The received survey percentages are generally in accordance with the overall response rate. The minimum percentage belongs to the colonels, and this was expected. The percentage is satisfactory to draw the conclusion that the non-response rate for each strata is random. The next step after collecting the number of surveys as identified in the cut-off date is to start initial data processing.

3.5 Validity Analysis of the Survey

In order to analyze the overall face validity of the data obtained via three versions of survey, the Tukey-Kramer Means Comparison method was used. This test is an exact alpha-level test if the sample sizes are the same and conservative if the sample sizes are different (Sall, Leighton, Creighton, 2000). The means comparison method can be thought of as

testing whether or not the actual difference in the means is greater than the difference that would be significant. This difference is called the LSD (least significant difference). The Tukey-Kramer Means Comparison table shows the actual absolute difference in the means minus the LSD, which is the difference that would be significant. Pairs with a positive value are significantly different (Sall, Leighton, Creighton, 2000).

Twenty project attribute variables and twenty-four performance measure variables were tested with The Tukey-Kramer Means Comparison method and it was concluded that there are no significant differences between the A, B, and C versions of the surveys with a .05 alpha level.

3.6 Initial Reliability Analysis

Before the final data processing, all the data were entered into the previously prepared spreadsheet for easy manipulation. In order to synchronize the numeric scale with the rankings, the data from the rankings part were reversed. A rank of "first" was changed to "last" so that smaller values were less important on both the scales and ranking. In order to check the internal validity between the numeric scale and rankings, Cronbach's Alpha (Sall, Leighton, Creighton, 2000) was used. The same statistic is also used for the correlation figures between the importance versus usefulness of each construct.

Item reliability indicates how consistent a set of instruments measures an overall response. Cronbach's alpha is one measure of reliability. Two primary applications for Cronbach's alpha are industrial instrument reliability and questionnaire analysis. Cronbach's

alpha is based on the average correlation of items in a measurement scale. The standardized alpha can be requested if the items have variances that differ widely. The items in the scale can be continuous, as in a Likert scale, or categorical. It is suggested that a Cronbach's alpha of .7 as a rule-of-thumb acceptable level of agreement (Sall, Leighton, Creighton, 2000).

The Table 3-2 describes the Cronbach's Alpha values along with correlation values for the precoded variables from both General Project Attributes and Specific Performance Measures. The same statistic is also used for the correlation figures between the importance versus usefulness of each construct and is depicted in the same table.

Table 3-4 Reliability Analysis Results Spreadsheet

PROJECT ATTRIBUTES					
NUMERIC SCALE vs. RANKING SCALE			IMPORTANCE vs. USEFULNESS		
CRONBACH'S ALPHA		CORRELATION	CRONBACH'S ALPHA		CORRELATION
0.7482	Cost Importance	0.6014	0.8927	Cost Scaled	0.8169
0.6934	Cost Usefulness	0.5466	0.8962	Schedule Scaled	0.8146
0.444	Schedule Importance	0.2908	0.819	Performance Scaled	0.7044
0.4588	Schedule Usefulness	0.2985	0.8732	Earned Value Scaled	0.7816
0.6516	Performance Importance	0.4955	0.8802	Stability Scaled	0.7894
0.6106	Performance Usefulness	0.443	0.8914	Cost Ranked	0.8055
0.5689	Earned Value Importance	0.4183	0.8335	Schedule Ranked	0.7153
0.7376	Earned Value Usefulness	0.6101	0.8535	Performance Ranked	0.7464
0.5144	Stability Importance	0.3474	0.6719	Earned Value Ranked	0.5121
0.4923	Stability Usefulness	0.3307	0.8463	Stability Ranked	0.7337
PERFORMANCE MEASURES					
NUMERIC SCALE vs. RANKING SCALE			IMPORTANCE vs. USEFULNESS		
CRONBACH'S ALPHA		CORRELATION	CRONBACH'S ALPHA		CORRELATION
0.5250	Schedule Variance Importance	0.3570	0.8547	Schedule Variance Scaled	0.7482
0.4475	Schedule Variance Usefulness	0.2947	0.8523	SPI Scaled	0.7451
0.5990	SPI Importance	0.4326	0.8669	Cost Variance Scaled	0.7738
0.6118	SPI Usefulness	0.4529	0.8706	CPI Scaled	0.7746
0.4705	Cost Variance Importance	0.3527	0.8622	Activity Deviation Scaled	0.7591
0.4247	Cost Variance Usefulness	0.2716	0.8657	Resource Offset Scaled	0.7645
0.6750	CPI Importance	0.5095	0.9735	Schedule Variance Ranked	0.9484
0.5730	CPI Usefulness	0.4044	0.9346	SPI Ranked	0.8774
0.6326	Activity Deviation Importance	0.4664	0.9588	Cost Variance Ranked	0.9210
0.7137	Activity Deviation Usefulness	0.5577	0.9425	CPI Ranked	0.8914
0.4093	Resource Offset Importance	0.2575	0.8443	Activity Deviation Ranked	0.7347
0.5030	Resource Offset Usefulness	0.3378	0.9790	Resource Offset Ranked	0.9589

According to the Cronbach's Alpha analysis results, the level of aggreement between the importance data and the usefulness data for each variable was high, except the result for the Earned Value Ranking pair (.6719, close to the pre-accepted level, .7). This indicates that most respondents perceived the importance of a variable or attribute to be commensurate with its usefulness. However, most of the reliability results for aggreement between scaled data and the ranked data are lower than the .7 level, even though we synchronized the data. This may be an artifact of the structure of the survey. The suggested reason for this differentation is that the respondents were free to choose importance/usefulness values from open scales, while they were obligated to rank them into a discrete order in the following part. In other words, a respondent was able to give the same or close importance/usefulness values for many of the constructs on the scale, but they then had to differentiate their previously given perceptions in the ranking section. Therefore, it is proposed that the reliability values of constructs between the two scales have decreased below the .7 level. It is noted that three of the consructs demonstrated Cronbach's Alpha of higher than .7. As a result, further analysis will keep all variables separate and no attempt will be made to create compound constructs.

3.7 Summary

In this chapter, the research methodology was presented. The data collection method was the mail-out survey, therefore, the procedure of preparing the survey, creating the content and handling the data were described in this chapter. An initial reliability analysis has been

performed and the results were performed and presented. In the next chapter, the analyses performed to answer the research questions will be presented.

4. THE ANALYSIS

4.1. Introduction

This chapter presents the results of statistical tests and analysis of the data obtained by the procedures outlined in Chapter 3, *Methodology*. This chapter consists of two sections. In the first section, differences of means tests will be performed in order to analyze each construct with regard to others. Second, the effects of various demographics data on each of the items will be presented.

4.2. Differences of Means Tests

In this section, the Tukey-Kramer Means Comparison method was chosen to identify the levels of differences between the variables within each scale. The survey has eight different scales, which are project attributes (scaled), project attributes (ranked), performance measures (scaled), and performance measures (ranked), each for both importance and usefulness.

According to the statistical results, the data obtained from both scale and the rankings are in accordance with each other. Table 4-1 and 4-2 display the relationships between the constructs. Software outputs are presented in the Appendix B.

4.2.1. Project Attributes

According to the scaled importance of project attributes, there is no statistically significant difference between cost, schedule, and performance. However, the importance of

these three is greater than stability and earned value. There is, again, no significant difference between earned value and stability by means of importance (Table 4-1). For the same construct, but in the ranked order, the result is the same.

Table 4-1 Project Attributes Differences of Means

SCALED IMPORTANCE P <.0001			SCALED USEFULNESS P <.0002		
VARIABLES	MEAN VALUES		VARIABLES	MEAN VALUES	
Performance	6.14815	A	Schedule	5.88679	A
Schedule	6.01852	A	Performance	5.84906	A B
Cost	5.87037	A	Cost	5.4717	A B
Stability	5.09434	B	Stability	5.0566	B C
Earned Value	4.90741	B	Earned Value	4.75472	B C
RANKED IMPORTANCE P <.0001			**RANKED USEFULNESS P <.0001**		
VARIABLES	MEAN VALUES		VARIABLES	MEAN VALUES	
Cost	2.27778	A	Performance	2.55556	A
Performance	2.42593	A	Cost	2.57407	A
Schedule	2.74074	A	Schedule	2.68519	A
Stability	3.85185	B	Earned Value	3.75926	B
Earned Value	4.03704	B	Stability	3.81481	B

According to the scaled usefulness of project attributes, there is no statistically significant difference between cost, schedule, and performance. While stability is strictly ranked fourth, its usefulness is not statistically significantly different from any of the other variables other than schedule. Earned Value is ranked last overall but has significant differences with both schedule and performance.

For the same construct but in the ranked order in Table 4-1, the distinction is more apparent between the cost, schedule, and performance versus stability and earned value. Now, these two groups of variables are significantly different from each other.

In summary, for both usefulness and importance levels of project attributes, cost, schedule and performance are significantly ahead of the other two attributes earned value and stability. But, in the scaled usefulness analysis, the stability attribute demonstrated that its usefulness comes right after the first three attributes.

4.2.2. Performance Measures

According to the scaled importance of performance measures, schedule variance, SPI, cost variance and CPI displayed no significant differences among them. Next, activity deviation had an overlap with those constructs except cost variance. This demonstrates that activity deviation comes fifth after the first group of four. Although it has no significant difference with resource offset, this item has significantly lower importance compared to the first four measures, and takes the last place (Table 4-2).

The analysis of ranking importance data for the performance measures defines a distinction within the first-four group. There is a significant difference between cost variance and SPI, which indicates that SPI takes the fourth place.

Table 4-2 Performance Measures Differences of Means

SCALED IMPORTANCE P <.0001			SCALED USEFULNESS P <.0001		
VARIABLES	MEAN VALUES		VARIABLES	MEAN VALUES	
Cost Variance	5.62	A	Cost Variance	5.26	A
Schedule Variance	5.39216	A B	Schedule Variance	5.03922	A B
CPI	5.2	A B	CPI	4.86	A B
SPI	4.98	A B	SPI	4.46	A B C
Activity Deviation	4.56863	B C	Activity Deviation	4.15686	B C
Resource Offset	3.7551	B C	Resource Offset	3.55102	B C
RANKED IMPORTANCE P <.0001			**RANKED USEFULNESS P <.0001**		
VARIABLES	MEAN VALUES		VARIABLES	MEAN VALUES	
Cost Variance	2.39216	A	Cost Variance	2.43137	A
Schedule Variance	2.64706	A B	Schedule Variance	2.66667	A
CPI	3.08	A B	CPI	3.16	A B
SPI	3.48	B	SPI	3.54	B C
Activity Deviation	4.34694	C	Activity Deviation	4.22449	B C D
Resource Offset	4.89583	C	Resource Offset	4.79167	C D

When we look at the usefulness data for the linear scale in Table 4-2, we observe, again, the first place is occupied by schedule variance, SPI, cost variance and CPI without having any significant difference. Activity deviation has an overlap on all of the measures except cost variance. This suggests that activity deviation comes right after the first four measures, although it has no significant difference with resource offset, which takes the last place in usefulness.

From the ranking perspective in Table 4-2, there is no significant difference between cost variance, schedule variance and CPI, but SPI has significant difference with cost variance and schedule variance while overlapping with both CPI and activity deviation. This indicates the separation of SPI from the top group of four with taking the fourth place. Again,

resource offset demonstrates significant difference with all measures except activity deviation and takes the last place.

In summary, for both the importance and usefulness analysis of the performance measures data, cost variance, schedule variance, and CPI has the highest levels. With respect to importance, SPI is also considered in this group, but from usefulness perspective, SPI comes after the first three. Although activity deviation and resource offset measures displayed no significant difference between themselves, activity deviation measure showed close relationships with the other measures in three out of four analyses. For this reason activity deviation takes the fifth and resource offset measure takes the last, sixth place by means of importance and usefulness.

4.3. Demographics Analyses

In this section, possible relations between certain demographics and the importance and usefulness of project attributes and performance measures are investigated. For the categorical demographic data, by using the differences of means test, all of the variables will be analyzed with regard to those demographics. For the non-categorical or numeric data, correlation analysis will be employed to the variables in order to observe whether any trends exist with regard to the corresponding demographics data.

First, respondents' ranks/grades and project attributes and performance measures data is analyzed. After employing the Tukey-Kramer Means Comparison method for each of the variables with regard to rank/grade variable, it was observed that there are no significant difference between given importance and usefulness levels for each of the attributes and

measures between various ranks and grades. The analysis results are presented briefly as associated P values in Table 4-3 and detailed in Appendix D.

Table 4-3 P Values of Differences of Mean Tests for Rank/Grade Variable

VARIABLES	PROJECT ATTRIBUTES			
	S/I	S/U	R/I	R/U
Cost	0.0894	0.2262	0.3648	0.311
Schedule	0.5229	0.6498	0.4223	0.3859
Performance	0.4932	0.4403	0.8227	0.7412
Earned Value	0.724	0.3558	0.9928	0.5601
Stability	0.2829	0.2696	0.1982	0.3136
VARIABLES	PERFORMANCE MEASURES			
	S/I	S/U	R/I	R/U
Schedule Variance	0.7807	0.8992	0.5622	0.6
SPI	0.7816	0.7652	0.5282	0.3715
Cost Variance	0.6905	0.9075	0.4405	0.3908
CPI	0.8352	0.9897	0.1989	0.0679
Activity Deviation	0.667	0.5084	0.4515	0.3552
Resource Offset	0.4706	0.7478	0.436	0.3296

S/I : Scaled Importance R/I : Ranked Importance
S/U : Scaled Usefulness R/U : Ranked Usefulness

Second, the respondents' age variable and the other variables are analyzed with JMP software. The correlation results indicate that the highest correlation value is .4471, belonging to schedule importance (project attribute). The remaining values are lower than this .4471, indicating that the relationship between the age demographic variable and the project attribute and performance measure variables is weak. Table 4-4 summarizes the overall correlation values of main variables with regard to age variable.

Third, differences of means tests were performed to investigate the relationship resulting from the respondents' gender. Out of 44 variables, only 5 of them demonstrated any difference (11.3%). And in all of these 5 differences, male respondents have given more

importance to cost (3), earned value (1), and activity deviation (1) than female respondents. The analysis results are presented briefly as associated P values in Table 4-5 and detailed in Appendix E.

Table 4-4 Correlation Values for Age Variable

VARIABLES P Value .2110	PROJECT ATTRIBUTES			
	S/I	S/U	R/I	R/U
Cost	-0.251	-0.0545	0.1835	0.204
Schedule	-0.3071	-0.1453	0.4771	0.456
Performance	0.0565	0.0231	0.0341	0.0487
Earned Value	0.3084	0.2065	0.1081	-0.0018
Stability	0.3607	0.3797	-0.0765	0.0301
VARIABLES	PERFORMANCE MEASURES			
	S/I	S/U	R/I	R/U
Schedule Variance	0.0561	0.0887	0.2816	0.3195
SPI	0.03	0.0941	0.0257	0.0799
Cost Variance	0.1205	0.0785	0.2772	0.2552
CPI	0.0329	0.0493	0.1449	0.1052
Activity Deviation	0.2933	0.3016	-0.1735	-0.2506
Resource Offset	0.2857	0.2743	-0.1442	-0.1108

Table 4-5 P Values of Differences of Mean Tests for Gender Variable

VARIABLES	PROJECT ATTRIBUTES			
	S/I	S/U	R/I	R/U
Cost	0.0275	0.0973	0.011	0.0121
Schedule	0.2194	0.9399	0.1908	0.7666
Performance	0.2552	0.4175	0.1843	0.0779
Earned Value	0.3373	0.9577	0.6747	0.9796
Stability	0.414	0.0778	0.9622	0.4776
VARIABLES	PERFORMANCE MEASURES			
	S/I	S/U	R/I	R/U
Schedule Variance	0.6465	0.6112	0.7818	0.7434
SPI	0.1288	0.143	0.5137	0.3332
Cost Variance	0.5275	0.943	0.3318	0.1992
CPI	0.1344	0.2551	0.661	0.9597
Activity Deviation	0.0152	0.1455	0.966	0.3447
Resource Offset	0.1122	0.1914	0.7931	0.8721

Fourth, respondents' experiences in the program management area with regard to the variables were investigated by correlation analysis. The highest obtained correlation value was .4153 and belongs to schedule importance (project attribute). The results, again, seem to indicate that the correlation is weak between the target demographic variable and other variables. Correlation values are shown in Table 4-6 below.

Table 4-6 Correlation Values for Experience in Program Management Area Variable

VARIABLES P Value .7078	PROJECT ATTRIBUTES			
	S/I	S/U	R/I	R/U
Cost	-0.0253	0.1613	0.0534	0.1225
Schedule	-0.167	-0.0246	0.4153	0.341
Performance	0.2638	0.1551	0.011	0.0584
Earned Value	0.3454	0.3335	-0.0665	-0.1476
Stability	0.311	0.2146	0.122	0.222
VARIABLES	PERFORMANCE MEASURES			
	S/I	S/U	R/I	R/U
Schedule Variance	0.0023	0.0391	0.3383	0.3521
SPI	0.0922	0.2365	0.0295	0.0865
Cost Variance	0.2012	0.2203	0.1944	0.2291
CPI	0.1281	0.2078	0.0157	-0.0348
Activity Deviation	0.121	0.2025	0.0793	-0.0643
Resource Offset	0.2754	0.3102	-0.0232	0.028

Fifth, respondents' APDP levels are analyzed with the differences of means tests. According to the results, 8 out of 44 variables displayed difference within the predetermined ADPD levels (18.2%). Within these 8 differences are in a way those respondents having 3 as APDP level are in a tendency to give more importance to 6 out of 8 variables than levels 1 and 2. The remaining 2 respondents with levels 1 and 2 (with no significant difference) are in a tendency to higher importance levels compared to level 3 respondents. The P values are summarized in the Table 4-7 and detailed test results are presented in Appendix F.

Table 4-7 P Values of Differences of Mean Tests for Manager's APDP Level Variable

VARIABLES	PROJECT ATTRIBUTES			
	S/I	S/U	R/I	R/U
Cost	0.2591	0.154	0.748	0.667
Schedule	0.453	0.3664	0.0006	0.0017
Performance	0.0083	0.2622	0.2108	0.0519
Earned Value	0.0409	0.6514	0.5234	0.6603
Stability	0.0078	0.565	0.8832	0.7308
VARIABLES	PERFORMANCE MEASURES			
	S/I	S/U	R/I	R/U
Schedule Variance	0.9509	0.9478	0.085	0.0768
SPI	0.9078	0.7273	0.9875	0.9873
Cost Variance	0.117	0.0914	0.995	0.9841
CPI	0.4454	0.1544	0.0675	0.0362
Activity Deviation	0.9628	0.9653	0.6931	0.8112
Resource Offset	0.5309	0.7352	0.6295	0.4385

The sixth variable (ACAT level of the program) was analyzed with differences of means test because of its categorical nature. The results indicate that, by means of ACAT levels, the data for all variables show no significant difference. The P values are presented in Table 4-8 and detailed results are in Appendix G.

Table 4-8 P Values of Differences of Mean Tests for Program's ACAT Level Variable

VARIABLES	PROJECT ATTRIBUTES			
	S/I	S/U	R/I	R/U
Cost	0.1662	0.6716	0.4986	0.4854
Schedule	0.0647	0.4828	0.6462	0.493
Performance	0.0099	0.5603	0.4168	0.2756
Earned Value	0.9169	0.4249	0.3292	0.9324
Stability	0.0617	0.1456	0.3054	0.1784
VARIABLES	PERFORMANCE MEASURES			
	S/I	S/U	R/I	R/U
Schedule Variance	0.5463	0.6768	0.1852	0.1062
SPI	0.2321	0.2497	0.5292	0.5539
Cost Variance	0.241	0.4738	0.6075	0.2999
CPI	0.0567	0.1651	0.2103	0.0953
Activity Deviation	0.3955	0.5407	0.4488	0.1537
Resource Offset	0.6637	0.5724	0.8663	0.7289

The seventh and last demographic variable (phase of the program) was investigated by correlation analysis. The highest obtained absolute correlation value was .3572. The results, again, seem to indicate that the correlation is weak between the target demographic variable and other variables. The correlation values are shown in Table 4-9.

Table 4-9 Correlation Values for the Phase of the Program Variable

VARIABLES P Value .8939	PROJECT ATTRIBUTES			
	S/I	S/U	R/I	R/U
Cost	-0.2353	-0.2076	0.1225	0.1942
Schedule	-0.1717	-0.3295	0.0356	-0.0108
Performance	-0.0247	-0.1077	0.0043	0.0973
Earned Value	0.197	0.0334	-0.0148	-0.1357
Stability	0.2451	0.1251	-0.3503	-0.3439
VARIABLES	PERFORMANCE MEASURES			
	S/I	S/U	R/I	R/U
Schedule Variance	-0.3572	-0.3406	0.3518	0.2909
SPI	-0.0849	0.0322	0.0525	0.1342
Cost Variance	-0.0652	0.0681	-0.0692	-0.0325
CPI	-0.0178	0.1541	-0.2784	-0.2475
Activity Deviation	-0.148	-0.042	-0.0662	-0.1994
Resource Offset	-0.0059	0.0221	-0.1353	-0.0612

4.4. Summary

In this chapter, various analyses were performed on the data obtained by the survey. Project attribute variables and performance measure variables were analyzed within themselves and by means of importance and usefulness issues. The relationships of variables with the demographics were investigated.

In the next and final chapter, Chapter 5 *Conclusions and Recommendations*, the overall results and conclusions as well as answers to investigative questions will be presented.

5. CONCLUSIONS AND RECOMMENDATIONS

5.1. Introduction

This research investigated the manager's perceptions of the importance and usefulness of stability and other measures to overall project outcomes. The assessment was based on both the general attributes of management for the activities in a specific program and the specific measures being employed by the managers. In this research, the scope was limited to the management of relatively complex, large-scale projects. Projects studied involved the design, development and delivery of military aircraft and support systems. Specifically, the research surveyed the attitudes of managers in the System Program Offices located at the Wright-Patterson Air Force Base, under the Aeronautical System Center (ASC) of the Air Force Materiel Command.

By using the data obtained by the survey, various analyses were performed and detailed in Chapter 4, *Analysis*. According to the results of the analyses, in this chapter, research questions that were identified in Chapter 1 will be addressed. Next, additional notes on project performance measurement and inputs from the respondents will be given. Finally, conclusions and recommendations will be presented.

5.2. Research Questions

Several research questions were asked at the beginning of this effort, and these questions are presented and answered here.

- **What are the fundamental measures used for overall project performance?**

Based on the literature review and the prior research performed in the field, there are three main objectives used for overall project performance. These are Cost, Schedule and Performance (Quality). These objectives are generally applicable to almost all projects. In addition, there are several newer composite concepts in the performance measurement area. One of them is the Earned Value concept, which is basically a composite version of schedule and cost attributes. In commercial project management, Net Present Value is also of interest. Another measurement concept, which is the object of the current research, is the stability attribute

- **What are the fundamental measures used for managing specific project tasks?**

Specific measures that are used in various projects depend on the type and nature of the project. In parallel with the general project attributes described in the previous question, six specific measures were identified. Four measures representing Cost, Schedule, Performance (Quality), and Earned Value attributes were studied. These are Cost Variance, Cost Performance Index (CPI), Schedule Variance, and Schedule Performance Index (SPI). The remaining two measures belong to the stability attribute –Activity Deviation and Resource Offset.

- **What is the relationship between different performance measures from the manager's perspective?**

The analysis results indicate that the different performance measures are closely related to each other. According to the survey results, program managers revealed very close importance and usefulness levels within the linear scales for both project attributes and performance measures. Differences of means tests performed in the analysis chapter indicated that mean values for the attributes and performance measures are very close to each other. In addition, the means for some of the measures were clustered into groups in which there are no significant differences among them.

This close relationship makes it difficult to differentiate either project attributes or performance measures. In the next question, statistical analysis results indicate relative importance among those measures.

- **Which performance measures are relatively more important than others?**

From the perspective of project attributes, analysis results indicated that for both usefulness and importance levels of project attributes, Cost, Schedule and Performance are significantly ahead of the other two attributes, Earned Value and Stability. However, there is no significant difference among those three. But, in scaled usefulness analysis, the stability attribute demonstrated that its usefulness comes right after the first three attributes although there is no significant difference with Earned Value.

For both the importance and usefulness analyses of the performance measures, Cost Variance, Schedule Variance, and CPI have the highest levels. By means of importance, SPI is also considered in this group, but from usefulness perspective, SPI falls out of the group of first three. Activity Deviation importance and usefulness values were generally very close to the higher cluster in three out of four analyses. For this reason, Activity Deviation takes the fifth and resource offset measure takes the last, sixth place by means of importance and usefulness.

- **Does the size (by means of both cost and time period) of the project have an effect on the decisions or perceptions?**

The sizes of the projects are classified by their ACAT levels from the cost perspective, and by their project stages from the time period perspective. According to the results described in Chapter 4, the size of the project by means of both cost and time period does not affect the managers' perceptions of importance or usefulness.

- **Besides traditional performance attributes, how important is the concept of stability?**

Among the five attributes contained in the survey, Stability followed the three main objectives –Cost, Schedule, and Performance (Quality) in the usefulness scale. Although there is no significant difference between Stability and Earned Value, the overlap of confidence interval of Stability with first three attributes indicated that by means of usefulness, Stability comes fourth. For the importance characteristic, there are two groups.

The higher group consists of traditional three attributes, and the lower group includes Earned Value and Stability. There is no significant difference within each group.

- **Besides traditional performance measures, how important are the specific stability measures?**

The analysis results of the performance measures are similar to the findings mentioned in the previous question. Cost, Schedule and Performance measures again took the first places. Because these measures were interrelated, the statistical analysis results indicated no significant difference among each other and put them in the first place of both importance and usefulness. Although Activity Deviation and Resource Offset measures displayed no significant difference between themselves, the Activity Deviation measure showed close relationships with the other measures in three out of four analyses. For this reason, Activity Deviation takes the fifth and Resource Offset measure takes the last, sixth place with respect to importance and usefulness. In other words, they demonstrated that they have the least importance and usefulness according to the project managers. This result might be an outcome of the effect that these measures are relatively new. The next question identifies this possibility more clearly.

- **Are program managers previously using the stability measures in performance measurement?**

Out of 54 surveys received, 7 project managers specifically indicated that they are either not familiar with the Stability measures or they are not currently using these measures in general. However, some of the managers put emphasis on the importance of stability as a concept but mentioned they were not applying the specific stability measures. Under these circumstances, the general perception of importance of Stability resulted higher than the relative importance of specific stability measures –Activity Deviation and Resource Offset. As expected, no evidence was found that stability measures (like Activity Deviation and Resource Offset) were being explicitly used.

- **How can the analysis results be used in future projects?**

In general, the analysis results showed that project managers see the traditional attributes and measures as primarily important (as anticipated). However, there are potentially important measures and attributes besides the primary objectives. With the current research, the stability measures were introduced to the program management field along with the traditional ones and their importance levels were related to them. For future projects, the analysis results could present a picture describing the fundamental elements of a project performance measurement guideline. According to the analysis results in Chapter 4, the concept of stability is associated closely with the traditional attributes. But, specific stability measures require more attention compared to the traditional measures, because they are currently undeveloped.

5.3. Additional Notes on Project Attributes and Performance Measures

Within the composition of the survey, there were blank spaces left for additional thoughts of project managers for both project attributes and performance measures. The reason behind this was to identify if there are any other attributes or measures that program managers use and to get their opinions about them. After examining all the surveys that were returned, several additional attributes and some important implications were encountered.

In addition to the existing project attributes, respondents proposed several additional objectives. Risk assessment and task management with an average importance and usefulness, metric utility with only usefulness, innovativeness, subcontractor management and experience level in the software arena were observed. On the other side, the major implication was that the type of the contract of a project plays an important role in deciding which performance measure to choose. For example, for fixed-price contracts, the Cost attribute loses its importance relative to schedule and performance –and maybe also to stability. In this case, for future research, the use of a more sophisticated survey with branching in order to differentiate the flow of the constructs could be a more effective way of collecting data from a broader population. For example, "type of contract" could be the major branching factor. Also having the respondents come up with the items through the survey instead of obligating them to choose from a scale could be a better approach by means of capturing the opinions of the managers quite specifically. On the other side, sampling a wider range of population becomes a necessity in this case.

5.4. Conclusions and Recommendations

The Cost, Schedule and Performance objectives turned out to have the greatest importance and usefulness and Stability and Earned Value attributes followed them respectively. In the performance measures section, composite measures such as Cost Variance, CPI, Schedule Variance and SPI were preferred to the stability measures –Activity Deviation and Resource Offset. However, it could be argued that conceptually, "variance" measures could be *de facto* stability measures. This idea could be explored in future study.

At this point, an assessment of managers' perceptions of importance of stability to overall project outcomes end up with a lower level of importance than the traditional project objectives. Similarly, specific stability measures have the same lower level relative to the measures based on cost, schedule, and performance. The main reason behind this outcome is that the projects studied in this research are generally large-scale Air Force weapon system programs and they are being managed based on the traditional measures. However, the objective of the current research was to find out the relative importance of stability and it turned out to be very close to the traditional measures.

Major recommendation arising from this research would be to expand the scope to a wider variety of projects, especially based on the contract types. Because different contract types become effective on the selection of performance measurement metrics, the generalizability of the attributes and specific measures existing in this research cannot be justified within certain types of contracts.

Another recommendation would be to assess the managers' perceptions in a larger population. Because current research targeted primarily the major Air Force projects, it is believed that the extension of the targeted population would yield broader results.

5.5. Summary

In this final chapter, Chapter 5, *Conclusions and Recommendations*, the previously determined research questions were addressed. The additional inputs created by the survey respondents were presented and their implications were addressed. In the last section, the final conclusions and recommendations were made.

This research investigated the program managers' perceptions of importance of stability as well as other performance metrics. The outcomes of the research created a general knowledge on those metrics' importance and it is hoped that this knowledge would be useful to managers and researchers in this area.

Appendix A: Program Managers' Survey

Dear Sir or Madam:

We need the opinions of program managers from different programs within the ASC. This survey is being conducted by a thesis student in the Air Force Institute of Technology (AFIT) in order to collect data for the research. The purpose of the research is to determine your opinion on performance measures used to monitor the project performance. It is very important to learn your opinions because you represent the managers who have similar experiences in the area. Because the survey will serve as a data source for the research, it is also very important for the researcher to have your precious inputs. We are only asking a small number of people for their opinion, so each answer is very important to us.

The questionnaire has been designed so that you can complete it very quickly and easily. It consists of three parts and takes only a few minutes, and you need only to write down a couple of words regarding to your duty and circle and jot numbers on the scale. At the end of the survey there is an Attachment, which briefly describes the constructs mentioned in the survey. A postpaid return envelope has been enclosed for your convenience.

You can be absolutely sure that all of the information you shall provide will be strictly kept confidential. Your answers will be accumulated and combined with others for use in statistical analysis only.

If you have any questions regarding either the survey or the research, please feel free to contact us through the following emails and phone numbers:

Researcher : 1Lt. Yigit Sen, (TURKEY)
Email: yigit.sen@afit.edu
Phone: 937-426-1362

Thesis Advisor: Maj. Stephen M, Swartz, Ph.D. USAF
Email: stephen.swartz@afit.edu
Phone: 937-255-6565 Ext. 4285

Please complete and return the questionnaire as soon as possible. We appreciate your help. Again, thank you for your cooperation and time.

Lt.Yigit Sen

PART – 1 DEMOGRAPHICS

1. What is your rank (if military), pay grade (if civilian)? .....
2. What is your age ..... And sex? Male ( ) Female ( )
3. What is your career field? .....
4. How many years of experience do you have in this career field? .....
5. How many years of experience do you have in program management? .....
6. What is your APDP level? .....
7. Are you (Select one of the following)?
   a) Assigned exclusively to one program at this time?
   b) Assigned primarily to one program, but perform some work on other programs as required
   c) Perform significant work on more than one program at this time.
8. What is the name of the program that you currently spend the majority of your time and effort on?

   .....

9. Answer the following questions with respect to your answer to the previous question:
   a) What is the ACAT level of the program?
      i. ACAT I, Major Defense Acquisition Program
      ii. ACAT II, Major Systems Other than ACAT I
      iii. ACAT III, All Other Programs
   b) What stage of accomplishment is the program in?
      i. Concept Exploration
      ii. Program Definition & Risk Reduction
      iii. Engineering And Manufacturing Development
      iv. Production, Fielding/Development And Operational Support
   c) What are your primary duties with regard to the program?

   .....

10. How many years have you been working on this project? .....

PART – 2 PROJECT ATTRIBUTES

The performance of a project can be characterized using the general attributes of Cost (high or low), Schedule (fast or slow), and Performance (a lot or a little). Additional attributes are Earned Value (Budget vs. Performance milestones over time) and Stability (ability to absorb disruption and get back on track). Specific definitions are included in the Appendix.

For each general project attribute below, please evaluate how IMPORTANT (to the project as a whole) and USEFUL (for you personally managing your piece of project) the attribute is.

		Not very			Somewhat			Extremely
1. ***Cost***	Overall Importance	1	2	3	4	5	6	7
	Specific Usefulness	1	2	3	4	5	6	7
2. ***Schedule***	Overall Importance	1	2	3	4	5	6	7
	Specific Usefulness	1	2	3	4	5	6	7
3. ***Performance (Quality)***	Overall Importance	1	2	3	4	5	6	7
	Specific Usefulness	1	2	3	4	5	6	7
4. ***Earned Value***	Overall Importance	1	2	3	4	5	6	7
	Specific Usefulness	1	2	3	4	5	6	7
5. ***Stability***	Overall Importance	1	2	3	4	5	6	7
	Specific Usefulness	1	2	3	4	5	6	7

Please rank the project attributes listed below in their order of both importance (to the project as a whole) and usefulness (for you in managing your work). Jot the number 1 next to the one you prefer most, number 2 by your second choice, and so forth. If you think there are different measures that are significant other than the ones listed here, please write them down in the space provided at the end and rank them for both scales.

IMPORTANCE		**USEFULNESS**
	Cost	
	Schedule	
	Performance (Quality)	
	Earned Value	
	Stability	

Additional General Attributes (not listed) and how you rank them

.....

PART – 3 PERFORMANCE MEASURES

Several specific metrics have been developed to assess the performance of a project. These measures are specific sub-elements of the general attributes previously discussed. Definitions are included in the Appendix.

For each specific performance metric below, please evaluate how IMPORTANT (to the project as a whole) and USEFUL (for you personally managing you piece of the project) the measure is.

		Not very			Somewhat			Extremely
1. *Schedule Variance*	Importance	1	2	3	4	5	6	7
	Usefulness	1	2	3	4	5	6	7
2. *Schedule Performance Index (SPI)*	Importance	1	2	3	4	5	6	7
	Usefulness	1	2	3	4	5	6	7
3. *Cost Variance*	Importance	1	2	3	4	5	6	7
	Usefulness	1	2	3	4	5	6	7
4. *Cost Performance Index (CPI)*	Importance	1	2	3	4	5	6	7
	Usefulness	1	2	3	4	5	6	7
5. *Activity Deviation*	Importance	1	2	3	4	5	6	7
	Usefulness	1	2	3	4	5	6	7
6. *Resource Offset*	Importance	1	2	3	4	5	6	7
	Usefulness	1	2	3	4	5	6	7

Please rank the performance measures listed below in their order of preference for both importance and usefulness. If you think there are different measures that are significant other than the ones listed here, please write them down in the space provided at the end and rank them for both scales.

IMPORTANCE		**USEFULNESS**
	Schedule Variance	
	The Schedule Performance Index (SPI)	
	Cost Variance	
	Cumulative Cost Performance Index (CPI)	
	Activity Deviation	
	Resource Offset	

Additional Measures (not listed) and how you rank them

.....

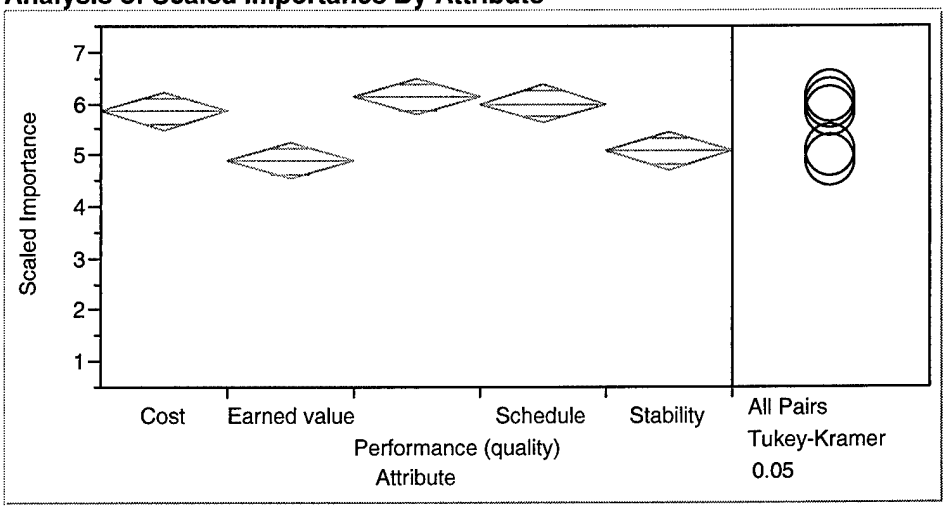
APPENDIX

- ***GENERAL ATTRIBUTES:*** Characteristics that a project or task will assume as it is executed.
  - **Cost:** How much does the project or task cost (a lot or a little)?
  - **Earned Value:** Deviation or variance measure combining performance, schedule and cost parameters of a project. Baseline is the budget that is spread over time to accomplish the scope of work and against which progress can be measured. Earned Value is described as, "how much progress am I making against my original plan?"
  - **Performance (Quality):** How many desirable features does the project or task successfully deliver (many or few)?
  - **Schedule:** How long does the project or task take to complete (a short time or a long time)?
  - **Stability:** Deviation or variance recovery measure combining cost, schedule and performance. Measures the ability of a project or task to get "back on track" after being disrupted.

- ***SPECIFIC PERFORMANCE MEASURES:***
  - **Activity Deviation:** The total amount of earliness or lateness for activities in a project (sum of days early or days late for all tasks). Scaled based on total size of project. Measures how much time the project is "off-track" in terms scheduled completion.
  - **Cost Variance:** The difference between "Budgeted Cost Of Work Performed" and "Actual Cost Of Work Performed".
  - **Cumulative Cost Performance Index (CPI)**: The ratio of "Budgeted Cost Of Work Performed" over "Actual Cost Of Work Performed", that measures efficiency and can be used to predict the final range of costs.
  - **Resource Offset:** The total man-days of overtime or undertime (idleness) experienced by resources used to complete the project. Scaled based on total size of the project. measures how much time resources spend waiting to work or catching up in terms of scheduled activity.
  - **Schedule Variance:** The difference between "Budgeted Cost Of Work Scheduled" and "Budgeted Cost Of Work Performed".
  - **The Schedule Performance Index (SPI):** The ratio of "Budgeted Cost Of Work Scheduled" over "Budgeted Cost Of Work Performed", that is useful in assessing how much work has been accomplished.

Appendix B: Differences of Means Tests for Project Attributes

Analysis of Scaled Importance By Attribute



Oneway Anova

Summary of Fit

Rsquare	0.128841
Adj Rsquare	0.115642
Root Mean Square Error	1.32995
Mean of Response	5.609665
Observations (or Sum Wgts)	269

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Attribute	4	69.06064	17.2652	9.7611	<.0001
Error	264	466.95423	1.7688		
C. Total	268	536.01487			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
Cost	54	5.87037	0.18098	5.5140	6.2267
Earned value	54	4.90741	0.18098	4.5511	5.2638
Performance (quality)	54	6.14815	0.18098	5.7918	6.5045
Schedule	54	6.01852	0.18098	5.6622	6.3749
Stability	53	5.09434	0.18268	4.7346	5.4540

Std Error uses a pooled estimate of error variance

Means Comparisons

Dif=Mean[i]-Mean[j]	Performance (quality)	Schedule	Cost	Stability	Earned value
Performance (quality)	0.00000	0.12963	0.27778	1.05381	1.24074
Schedule	-0.12963	0.00000	0.14815	0.92418	1.11111
Cost	-0.27778	-0.14815	0.00000	0.77603	0.96296
Stability	-1.05381	-0.92418	-0.77603	0.00000	0.18693
Earned value	-1.24074	-1.11111	-0.96296	-0.18693	0.00000

Alpha=
0.05

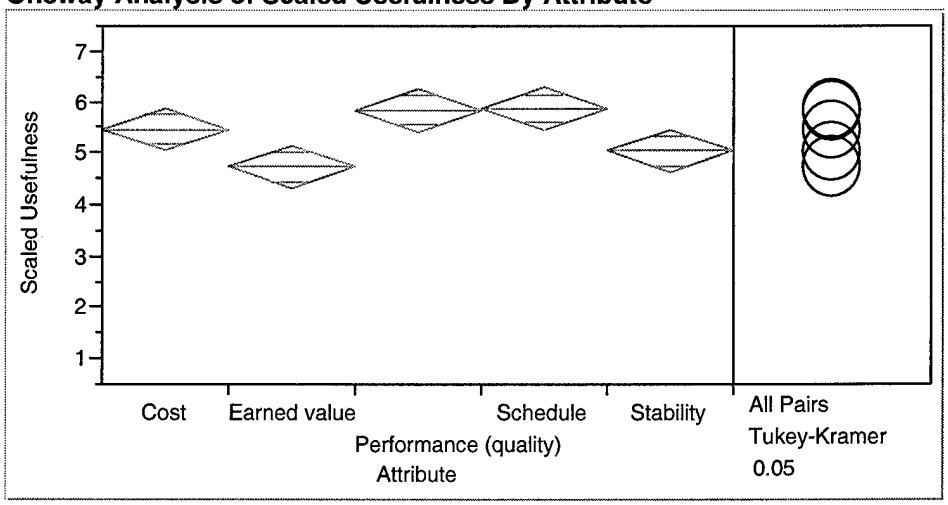
Comparisons for all pairs using Tukey-Kramer HSD

q*
2.74673

Abs(Dif)-LSD	Performance (quality)	Schedule	Cost	Stability	Earned value
Performance (quality)	-0.70302	-0.57339	-0.42525	0.347477	0.537717
Schedule	-0.57339	-0.70302	-0.55488	0.217847	0.408088
Cost	-0.42525	-0.55488	-0.70302	0.069699	0.259940
Stability	0.347477	0.217847	0.069699	-0.70962	-0.5194
Earned value	0.537717	0.408088	0.259940	-0.5194	-0.70302

Positive values show pairs of means that are significantly different.

Oneway Analysis of Scaled Usefulness By Attribute



Oneway Anova

Summary of Fit

Rsquare	0.079525
Adj Rsquare	0.065364
Root Mean Square Error	1.519061
Mean of Response	5.403774
Observations (or Sum Wgts)	265

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Attribute	4	51.83396	12.9585	5.6157	0.0002
Error	260	599.96226	2.3075		
C. Total	264	651.79623			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
Cost	53	5.47170	0.20866	5.0608	5.8826
Earned value	53	4.75472	0.20866	4.3438	5.1656
Performance (quality)	53	5.84906	0.20866	5.4382	6.2599
Schedule	53	5.88679	0.20866	5.4759	6.2977
Stability	53	5.05660	0.20866	4.6457	5.4675

Std Error uses a pooled estimate of error variance

Means Comparisons

Dif=Mean[i]-Mean[j]	Schedule	Performance (quality)	Cost	Stability	Earned value
Schedule	0.00000	0.03774	0.41509	0.83019	1.13208
Performance (quality)	-0.03774	0.00000	0.37736	0.79245	1.09434
Cost	-0.41509	-0.37736	0.00000	0.41509	0.71698
Stability	-0.83019	-0.79245	-0.41509	0.00000	0.30189
Earned value	-1.13208	-1.09434	-0.71698	-0.30189	0.00000

Alpha=
0.05

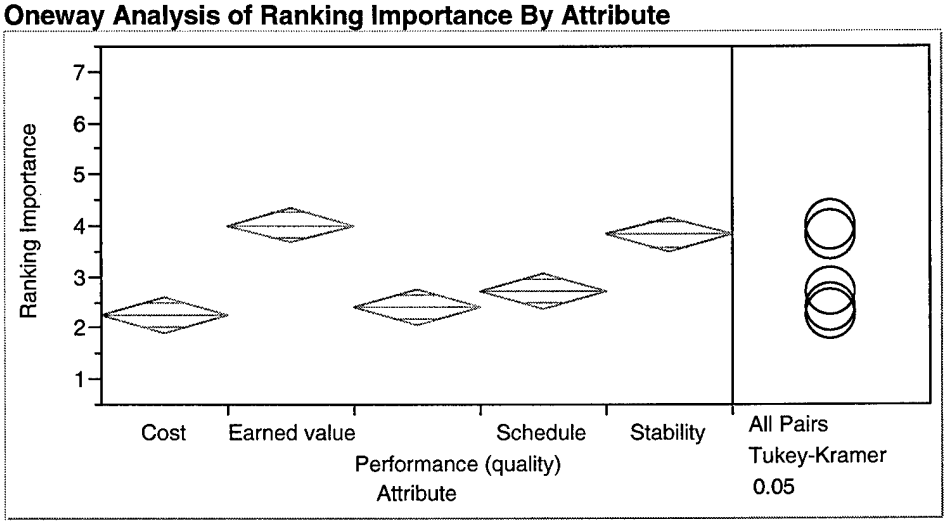
Comparisons for all pairs using Tukey-Kramer HSD

q^*
2.74703

Abs(Dif)-LSD	Schedule	Performance (quality)	Cost	Stability	Earned value
Schedule	-0.81062	-0.77288	-0.39552	0.019573	0.321460
Performance (quality)	-0.77288	-0.81062	-0.43326	-0.01816	0.283724
Cost	-0.39552	-0.43326	-0.81062	-0.39552	-0.09363
Stability	0.019573	-0.01816	-0.39552	-0.81062	-0.50873
Earned value	0.321460	0.283724	-0.09363	-0.50873	-0.81062

Positive values show pairs of means that are significantly different.

Oneway Analysis of Ranking Importance By Attribute



Oneway Anova
Summary of Fit

Rsquare	0.251645
Adj Rsquare	0.240349
Root Mean Square Error	1.278484
Mean of Response	3.066667
Observations (or Sum Wgts)	270

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Attribute	4	145.65185	36.4130	22.2774	<.0001
Error	265	433.14815	1.6345		
C. Total	269	578.80000			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
Cost	54	2.27778	0.17398	1.9352	2.6203
Earned value	54	4.03704	0.17398	3.6945	4.3796
Performance (quality)	54	2.42593	0.17398	2.0834	2.7685
Schedule	54	2.74074	0.17398	2.3982	3.0833
Stability	54	3.85185	0.17398	3.5093	4.1944

Std Error uses a pooled estimate of error variance

Means Comparisons

Dif=Mean[i]-Mean[j]	Earned value	Stability	Schedule	Performance (quality)	Cost
Earned value	0.00000	0.18519	1.29630	1.61111	1.75926
Stability	-0.18519	0.00000	1.11111	1.42593	1.57407
Schedule	-1.29630	-1.11111	0.00000	0.31481	0.46296
Performance (quality)	-1.61111	-1.42593	-0.31481	0.00000	0.14815
Cost	-1.75926	-1.57407	-0.46296	-0.14815	0.00000

Alpha=
0.05

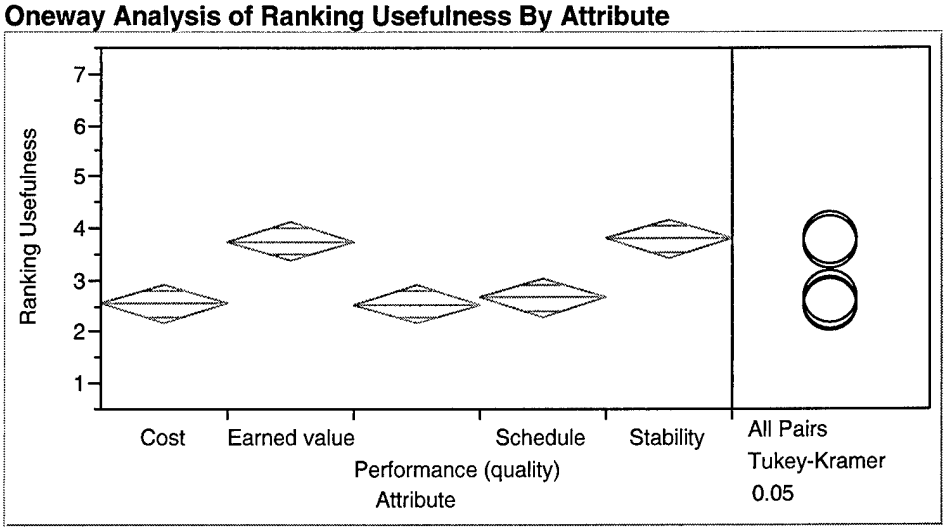
Comparisons for all pairs using Tukey-Kramer HSD

q^*
2.74666

Abs(Dif)-LSD	Earned value	Stability	Schedule	Performance (quality)	Cost
Earned value	-0.67580	-0.49062	0.62050	0.93531	1.08346
Stability	-0.49062	-0.67580	0.43531	0.75013	0.89827
Schedule	0.62050	0.43531	-0.67580	-0.36099	-0.21284
Performance (quality)	0.93531	0.75013	-0.36099	-0.67580	-0.52765
Cost	1.08346	0.89827	-0.21284	-0.52765	-0.67580

Positive values show pairs of means that are significantly different.

Oneway Analysis of Ranking Usefulness By Attribute



Oneway Anova

Summary of Fit

Rsquare	0.157349
Adj Rsquare	0.14463
Root Mean Square Error	1.357305
Mean of Response	3.077778
Observations (or Sum Wgts)	270

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Attribute	4	91.16296	22.7907	12.3710	<.0001
Error	265	488.20370	1.8423		
C. Total	269	579.36667			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
Cost	54	2.57407	0.18471	2.2104	2.9378
Earned value	54	3.75926	0.18471	3.3956	4.1229
Performance (quality)	54	2.55556	0.18471	2.1919	2.9192
Schedule	54	2.68519	0.18471	2.3215	3.0489
Stability	54	3.81481	0.18471	3.4511	4.1785

Std Error uses a pooled estimate of error variance

Means Comparisons

Dif=Mean[i]-Mean[j]	Stability	Earned value	Schedule	Cost	Performance (quality)
Stability	0.00000	0.05556	1.12963	1.24074	1.25926
Earned value	-0.05556	0.00000	1.07407	1.18519	1.20370
Schedule	-1.12963	-1.07407	0.00000	0.11111	0.12963
Cost	-1.24074	-1.18519	-0.11111	0.00000	0.01852
Performance (quality)	-1.25926	-1.20370	-0.12963	-0.01852	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

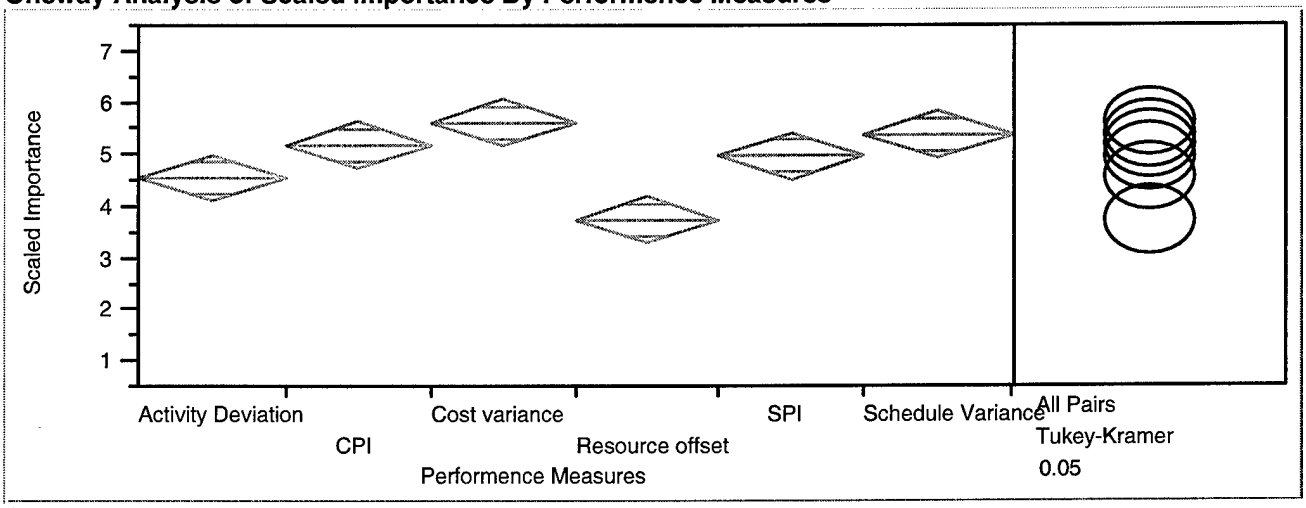
q^*
2.74666

Abs(Dif)-LSD	Stability	Earned value	Schedule	Cost	Performance (quality)
Stability	-0.71747	-0.66191	0.412165	0.523276	0.541794
Earned value	-0.66191	-0.71747	0.356609	0.467720	0.486239
Schedule	0.412165	0.356609	-0.71747	-0.60635	-0.58784
Cost	0.523276	0.467720	-0.60635	-0.71747	-0.69895
Performance (quality)	0.541794	0.486239	-0.58784	-0.69895	-0.71747

Positive values show pairs of means that are significantly different.

Appendix C: Differences of Means Tests for Performance Measures

Oneway Analysis of Scaled Importance By Performence Measures



Oneway Anova

Summary of Fit

Rsquare	0.130618
Adj Rsquare	0.115882
Root Mean Square Error	1.595001
Mean of Response	4.923588
Observations (or Sum Wgts)	301

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Performence Measures	5	112.75463	22.5509	8.8643	<.0001
Error	295	750.48789	2.5440		
C. Total	300	863.24252			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
Activity Deviation	51	4.56863	0.22334	4.1291	5.0082
CPI	50	5.20000	0.22557	4.7561	5.6439
Cost variance	50	5.62000	0.22557	5.1761	6.0639
Resource offset	49	3.75510	0.22786	3.3067	4.2035
SPI	50	4.98000	0.22557	4.5361	5.4239
Schedule Variance	51	5.39216	0.22334	4.9526	5.8317

Std Error uses a pooled estimate of error variance

Means Comparisons

Dif=Mean[i]-Mean[j]	Cost variance	Schedule Variance	CPI	SPI	Activity Deviation	Resource offset
Cost variance	0.00000	0.22784	0.42000	0.64000	1.05137	1.86490
Schedule Variance	-0.22784	0.00000	0.19216	0.41216	0.82353	1.63705
CPI	-0.42000	-0.19216	0.00000	0.22000	0.63137	1.44490
SPI	-0.64000	-0.41216	-0.22000	0.00000	0.41137	1.22490
Activity Deviation	-1.05137	-0.82353	-0.63137	-0.41137	0.00000	0.81353
Resource offset	-1.86490	-1.63705	-1.44490	-1.22490	-0.81353	0.00000

Alpha=
0.05

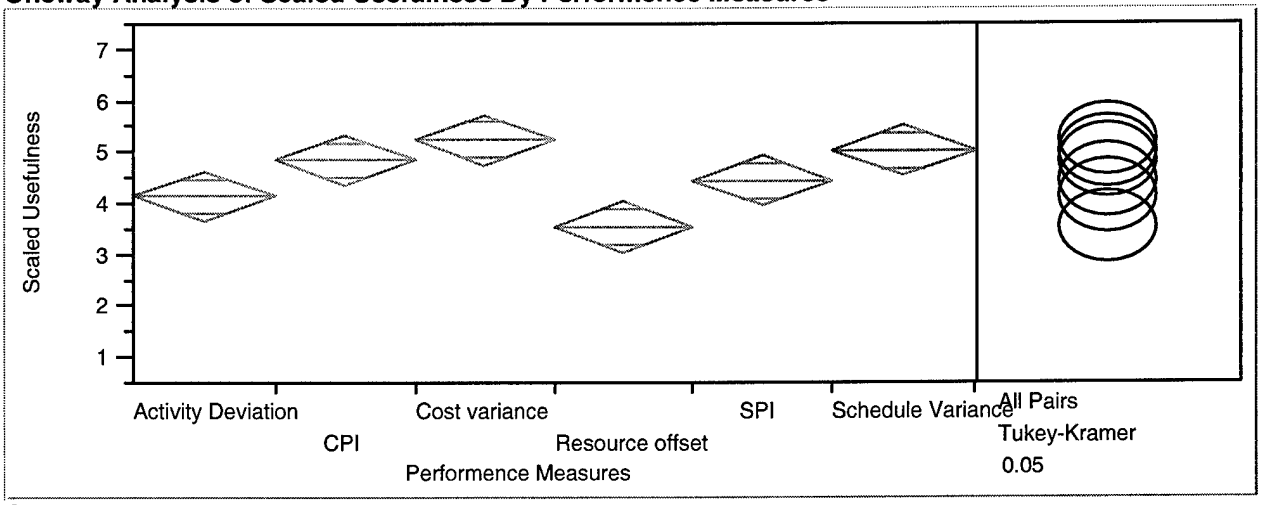
Comparisons for all pairs using Tukey-Kramer HSD

q*
2.86855

Abs(Dif)-LSD	Cost variance	Schedule Variance	CPI	SPI	Activity Deviation	Resource offset
Cost variance	-0.91507	-0.68273	-0.49507	-0.27507	0.140800	0.945172
Schedule Variance	-0.68273	-0.90605	-0.71842	-0.49842	-0.08252	0.721803
CPI	-0.49507	-0.71842	-0.91507	-0.69507	-0.2792	0.525172
SPI	-0.27507	-0.49842	-0.69507	-0.91507	-0.4992	0.305172
Activity Deviation	0.140800	-0.08252	-0.2792	-0.4992	-0.90605	-0.10173
Resource offset	0.945172	0.721803	0.525172	0.305172	-0.10173	-0.92436

Positive values show pairs of means that are significantly different.

Oneway Analysis of Scaled Usefulness By Performence Measures



Oneway Anova

Summary of Fit

Rsquare	0.099162
Adj Rsquare	0.083894
Root Mean Square Error	1.74943
Mean of Response	4.55814
Observations (or Sum Wgts)	301

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Performence Measures	5	99.3834	19.8767	6.4946	<.0001
Error	295	902.8491	3.0605		
C. Total	300	1002.2326			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
Activity Deviation	51	4.15686	0.24497	3.6748	4.6390
CPI	50	4.86000	0.24741	4.3731	5.3469
Cost variance	50	5.26000	0.24741	4.7731	5.7469
Resource offset	49	3.55102	0.24992	3.0592	4.0429
SPI	50	4.46000	0.24741	3.9731	4.9469
Schedule Variance	51	5.03922	0.24497	4.5571	5.5213

Std Error uses a pooled estimate of error variance

Means Comparisons

Dif=Mean[i]-Mean[j]	Cost variance	Schedule Variance	CPI	SPI	Activity Deviation	Resource offset
Cost variance	0.00000	0.22078	0.40000	0.80000	1.10314	1.70898
Schedule Variance	-0.22078	0.00000	0.17922	0.57922	0.88235	1.48820
CPI	-0.40000	-0.17922	0.00000	0.40000	0.70314	1.30898
SPI	-0.80000	-0.57922	-0.40000	0.00000	0.30314	0.90898
Activity Deviation	-1.10314	-0.88235	-0.70314	-0.30314	0.00000	0.60584
Resource offset	-1.70898	-1.48820	-1.30898	-0.90898	-0.60584	0.00000

Alpha=
0.05

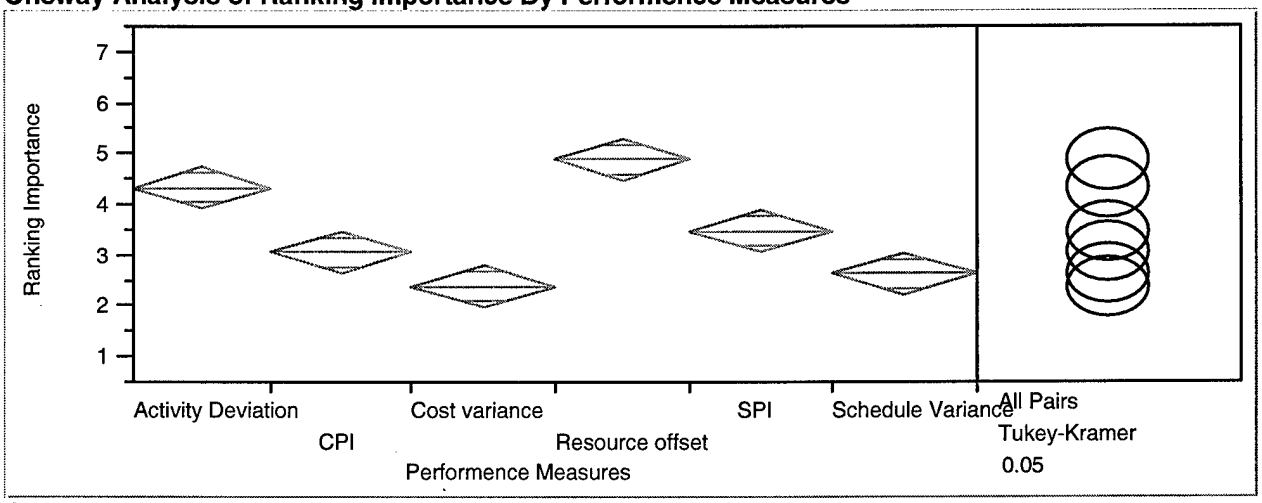
Comparisons for all pairs using Tukey-Kramer HSD

q^*
2.86855

Abs(Dif)-LSD	Cost variance	Schedule Variance	CPI	SPI	Activity Deviation	Resource offset
Cost variance	-1.00367	-0.77795	-0.60367	-0.20367	0.10440	0.70020
Schedule Variance	-0.77795	-0.99378	-0.81952	-0.41952	-0.11143	0.48433
CPI	-0.60367	-0.81952	-1.00367	-0.60367	-0.29560	0.30020
SPI	-0.20367	-0.41952	-0.60367	-1.00367	-0.69560	-0.09980
Activity Deviation	0.10440	-0.11143	-0.29560	-0.69560	-0.99378	-0.39803
Resource offset	0.70020	0.48433	0.30020	-0.09980	-0.39803	-1.01386

Positive values show pairs of means that are significantly different.

Oneway Analysis of Ranking Importance By Performence Measures



Oneway Anova
Summary of Fit

Rsquare	0.271905
Adj Rsquare	0.25948
Root Mean Square Error	1.470466
Mean of Response	3.454849
Observations (or Sum Wgts)	299

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Performence Measures	5	236.59534	47.3191	21.8840	<.0001
Error	293	633.54513	2.1623		
C. Total	298	870.14047			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
Activity Deviation	49	4.34694	0.21007	3.9335	4.7604
CPI	50	3.08000	0.20796	2.6707	3.4893
Cost variance	51	2.39216	0.20591	1.9869	2.7974
Resource offset	48	4.89583	0.21224	4.4781	5.3135
SPI	50	3.48000	0.20796	3.0707	3.8893
Schedule Variance	51	2.64706	0.20591	2.2418	3.0523

Std Error uses a pooled estimate of error variance

Means Comparisons

Dif=Mean[i]-Mean[j]	Resource offset	Activity Deviation	SPI	CPI	Schedule Variance	Cost variance
Resource offset	0.00000	0.54889	1.41583	1.81583	2.24877	2.50368
Activity Deviation	-0.54889	0.00000	0.86694	1.26694	1.69988	1.95478
SPI	-1.41583	-0.86694	0.00000	0.40000	0.83294	1.08784
CPI	-1.81583	-1.26694	-0.40000	0.00000	0.43294	0.68784
Schedule Variance	-2.24877	-1.69988	-0.83294	-0.43294	0.00000	0.25490
Cost variance	-2.50368	-1.95478	-1.08784	-0.68784	-0.25490	0.00000

Alpha=
0.05

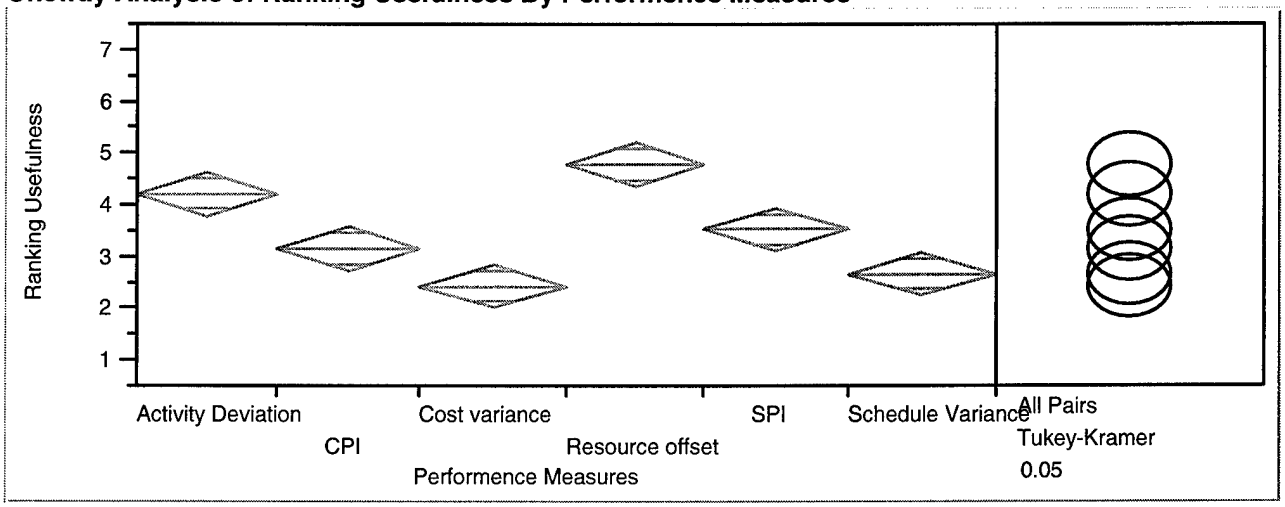
Comparisons for all pairs using Tukey-Kramer HSD

q*
2.86868

Abs(Dif)-LSD	Resource offset	Activity Deviation	SPI	CPI	Schedule Variance	Cost variance
Resource offset	-0.86106	-0.30776	0.56343	0.96343	1.40047	1.65538
Activity Deviation	-0.30776	-0.85223	0.01899	0.41899	0.85605	1.11095
SPI	0.56343	0.01899	-0.84366	-0.44366	-0.00657	0.24833
CPI	0.96343	0.41899	-0.44366	-0.84366	-0.40657	-0.15167
Schedule Variance	1.40047	0.85605	-0.00657	-0.40657	-0.83535	-0.58045
Cost variance	1.65538	1.11095	0.24833	-0.15167	-0.58045	-0.83535

Positive values show pairs of means that are significantly different.

Oneway Analysis of Ranking Usefulness By Performence Measures



Oneway Anova

Summary of Fit

Rsquare	0.236265
Adj Rsquare	0.223232
Root Mean Square Error	1.502479
Mean of Response	3.451505
Observations (or Sum Wgts)	299

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Performence Measures	5	204.61641	40.9233	18.1282	<.0001
Error	293	661.43042	2.2574		
C. Total	298	866.04682			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
Activity Deviation	49	4.22449	0.21464	3.8021	4.6469
CPI	50	3.16000	0.21248	2.7418	3.5782
Cost variance	51	2.43137	0.21039	2.0173	2.8454
Resource offset	48	4.79167	0.21686	4.3649	5.2185
SPI	50	3.54000	0.21248	3.1218	3.9582
Schedule Variance	51	2.66667	0.21039	2.2526	3.0807

Std Error uses a pooled estimate of error variance

Means Comparisons

Dif=Mean[i]-Mean[j]	Resource offset	Activity Deviation	SPI	CPI	Schedule Variance	Cost variance
Resource offset	0.00000	0.56718	1.25167	1.63167	2.12500	2.36029
Activity Deviation	-0.56718	0.00000	0.68449	1.06449	1.55782	1.79312
SPI	-1.25167	-0.68449	0.00000	0.38000	0.87333	1.10863
CPI	-1.63167	-1.06449	-0.38000	0.00000	0.49333	0.72863
Schedule Variance	-2.12500	-1.55782	-0.87333	-0.49333	0.00000	0.23529
Cost variance	-2.36029	-1.79312	-1.10863	-0.72863	-0.23529	0.00000

Alpha=0.05

Comparisons for all pairs using Tukey-Kramer HSD

q^*
2.86868

Abs(Dif)-LSD	Resource offset	Activity Deviation	SPI	CPI	Schedule Variance	Cost variance
Resource offset	-0.87980	-0.30813	0.38071	0.76071	1.25823	1.49353
Activity Deviation	-0.30813	-0.87078	-0.18192	0.19808	0.69562	0.93092
SPI	0.38071	-0.18192	-0.86203	-0.48203	0.01554	0.25084
CPI	0.76071	0.19808	-0.48203	-0.86203	-0.36446	-0.12916
Schedule Variance	1.25823	0.69562	0.01554	-0.36446	-0.85353	-0.61824
Cost variance	1.49353	0.93092	0.25084	-0.12916	-0.61824	-0.85353

Positive values show pairs of means that are significantly different.

Appendix D: Differences of Means Tests for Ranks/Grades Variable

Oneway Analysis of COST S/I By Rank/Grade

Means Comparisons

Dif=Mean[i]-Mean[j]	1LT.	2LT.	COL	GS15	LT.COL	CAPT	MAJ	GS12	GS13
1LT.	0.00000	0.25000	0.25000	0.66667	0.83333	0.88889	1.14286	1.25000	2.23077
2LT.	-0.25000	0.00000	0.00000	0.41667	0.58333	0.63889	0.89286	1.00000	1.98077
COL	-0.25000	0.00000	0.00000	0.41667	0.58333	0.63889	0.89286	1.00000	1.98077
GS15	-0.66667	-0.41667	-0.41667	0.00000	0.16667	0.22222	0.47619	0.58333	1.56410
LT.COL	-0.83333	-0.58333	-0.58333	-0.16667	0.00000	0.05556	0.30952	0.41667	1.39744
CAPT	-0.88889	-0.63889	-0.63889	-0.22222	-0.05556	0.00000	0.25397	0.36111	1.34188
MAJ	-1.14286	-0.89286	-0.89286	-0.47619	-0.30952	-0.25397	0.00000	0.10714	1.08791
GS12	-1.25000	-1.00000	-1.00000	-0.58333	-0.41667	-0.36111	-0.10714	0.00000	0.98077
GS13	-2.23077	-1.98077	-1.98077	-1.56410	-1.39744	-1.34188	-1.08791	-0.98077	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q^*
3.25714

Abs(Dif)-LSD	1LT.	2LT.	COL	GS15	LT.COL	CAPT	MAJ	GS12	GS13
1LT.	-6.15976	-4.61972	-4.61972	-4.03793	-3.87126	-3.70232	-3.51348	-3.61972	-2.28926
2LT.	-4.61972	-3.07988	-3.07988	-2.39487	-2.22820	-1.97851	-1.83716	-2.07988	-0.50964
COL	-4.61972	-3.07988	-3.07988	-2.39487	-2.22820	-1.97851	-1.83716	-2.07988	-0.50964
GS15	-4.03793	-2.39487	-2.39487	-2.51471	-2.34804	-2.07338	-1.94705	-2.22820	-0.58560
LT.COL	-3.87126	-2.22820	-2.22820	-2.34804	-2.51471	-2.24005	-2.11371	-2.39487	-0.75227
CAPT	-3.70232	-1.97851	-1.97851	-2.07338	-2.24005	-2.05325	-1.94105	-2.25628	-0.54684
MAJ	-3.51348	-1.83716	-1.83716	-1.94705	-2.11371	-1.94105	-2.32817	-2.62288	-0.95403
GS12	-3.61972	-2.07988	-2.07988	-2.22820	-2.39487	-2.25628	-2.62288	-3.07988	-1.50964
GS13	-2.28926	-0.50964	-0.50964	-0.58560	-0.75227	-0.54684	-0.95403	-1.50964	-1.70841

Positive values show pairs of means that are significantly different.

Oneway Analysis of COST S/U By Rank/Grade

Means Comparisons

Dif=Mean[i]-Mean[j]	1LT.	GS15	2LT.	COL	LT.COL	CAPT	MAJ	GS12	GS13
1LT.	0.00000	0.20000	0.75000	0.75000	1.33333	1.55556	1.71429	2.25000	2.38462
GS15	-0.20000	0.00000	0.55000	0.55000	1.13333	1.35556	1.51429	2.05000	2.18462
2LT.	-0.75000	-0.55000	0.00000	0.00000	0.58333	0.80556	0.96429	1.50000	1.63462
COL	-0.75000	-0.55000	0.00000	0.00000	0.58333	0.80556	0.96429	1.50000	1.63462
LT.COL	-1.33333	-1.13333	-0.58333	-0.58333	0.00000	0.22222	0.38095	0.91667	1.05128
CAPT	-1.55556	-1.35556	-0.80556	-0.80556	-0.22222	0.00000	0.15873	0.69444	0.82906
MAJ	-1.71429	-1.51429	-0.96429	-0.96429	-0.38095	-0.15873	0.00000	0.53571	0.67033
GS12	-2.25000	-2.05000	-1.50000	-1.50000	-0.91667	-0.69444	-0.53571	0.00000	0.13462
GS13	-2.38462	-2.18462	-1.63462	-1.63462	-1.05128	-0.82906	-0.67033	-0.13462	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
3.26076

Abs(Dif)-LSD	1LT.	GS15	2LT.	COL	LT.COL	CAPT	MAJ	GS12	GS13
1LT.	-7.52326	-5.62749	-5.19766	-5.19766	-4.41265	-4.05195	-3.97276	-3.69766	-3.13595
GS15	-5.62749	-3.36450	-3.01860	-3.01860	-2.08793	-1.61166	-1.60064	-1.51860	-0.61482
2LT.	-5.19766	-3.01860	-3.76163	-3.76163	-2.85055	-2.39121	-2.37004	-2.26163	-1.40707
COL	-5.19766	-3.01860	-3.76163	-3.76163	-2.85055	-2.39121	-2.37004	-2.26163	-1.40707
LT.COL	-4.41265	-2.08793	-2.85055	-2.85055	-3.07136	-2.58153	-2.57868	-2.51722	-1.57427
CAPT	-4.05195	-1.61166	-2.39121	-2.39121	-2.58153	-2.50775	-2.52217	-2.50233	-1.47774
MAJ	-3.97276	-1.60064	-2.37004	-2.37004	-2.57868	-2.52217	-2.84352	-2.79861	-1.82361
GS12	-3.69766	-1.51860	-2.26163	-2.26163	-2.51722	-2.50233	-2.79861	-3.76163	-2.90707
GS13	-3.13595	-0.61482	-1.40707	-1.40707	-1.57427	-1.47774	-1.82361	-2.90707	-2.08658

Positive values show pairs of means that are significantly different.

Oneway Analysis of SCHEDULE S/I By Rank/Grade

Means Comparisons

Dif=Mean[i]-Mean[j]	1LT.	GS15	CAPT	MAJ	GS12	GS13	COL	LT.COL	2LT.
1LT.	0.00000	0.33333	0.66667	0.85714	1.00000	1.23077	1.25000	1.33333	1.50000
GS15	-0.33333	0.00000	0.33333	0.52381	0.66667	0.89744	0.91667	1.00000	1.16667
CAPT	-0.66667	-0.33333	0.00000	0.19048	0.33333	0.56410	0.58333	0.66667	0.83333
MAJ	-0.85714	-0.52381	-0.19048	0.00000	0.14286	0.37363	0.39286	0.47619	0.64286
GS12	-1.00000	-0.66667	-0.33333	-0.14286	0.00000	0.23077	0.25000	0.33333	0.50000
GS13	-1.23077	-0.89744	-0.56410	-0.37363	-0.23077	0.00000	0.01923	0.10256	0.26923
COL	-1.25000	-0.91667	-0.58333	-0.39286	-0.25000	-0.01923	0.00000	0.08333	0.25000
LT.COL	-1.33333	-1.00000	-0.66667	-0.47619	-0.33333	-0.10256	-0.08333	0.00000	0.16667
2LT.	-1.50000	-1.16667	-0.83333	-0.64286	-0.50000	-0.26923	-0.25000	-0.16667	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
3.25714

Abs(Dif)-LSD	1LT.	GS15	CAPT	MAJ	GS12	GS13	COL	LT.COL	2LT.
1LT.	-4.63596	-3.20744	-2.78878	-2.64732	-2.66505	-2.17110	-2.41505	-2.20744	-2.16505
GS15	-3.20744	-1.89262	-1.39439	-1.29997	-1.44935	-0.72047	-1.19935	-0.89262	-0.94935
CAPT	-2.78878	-1.39439	-1.54532	-1.46154	-1.63657	-0.85739	-1.38657	-1.06105	-1.13657
MAJ	-2.64732	-1.29997	-1.46154	-1.75223	-1.91181	-1.16318	-1.66181	-1.34759	-1.41181
GS12	-2.66505	-1.44935	-1.63657	-1.91181	-2.31798	-1.64357	-2.06798	-1.78268	-1.81798
GS13	-2.17110	-0.72047	-0.85739	-1.16318	-1.64357	-1.28578	-1.85511	-1.51535	-1.60511
COL	-2.41505	-1.19935	-1.38657	-1.66181	-2.06798	-1.85511	-2.31798	-2.03268	-2.06798
LT.COL	-2.20744	-0.89262	-1.06105	-1.34759	-1.78268	-1.51535	-2.03268	-1.89262	-1.94935
2LT.	-2.16505	-0.94935	-1.13657	-1.41181	-1.81798	-1.60511	-2.06798	-1.94935	-2.31798

Positive values show pairs of means that are significantly different.

Oneway Analysis of SCHEDULE S/U By Rank/Grade

Means Comparisons

Dif=Mean[i]-Mean[j]	1LT.	CAPT	GS15	GS12	MAJ	GS13	LT.COL	COL	2LT.
1LT.	0.00000	0.55556	0.60000	1.00000	1.28571	1.30769	1.33333	1.50000	1.75000
CAPT	-0.55556	0.00000	0.04444	0.44444	0.73016	0.75214	0.77778	0.94444	1.19444
GS15	-0.60000	-0.04444	0.00000	0.40000	0.68571	0.70769	0.73333	0.90000	1.15000
GS12	-1.00000	-0.44444	-0.40000	0.00000	0.28571	0.30769	0.33333	0.50000	0.75000
MAJ	-1.28571	-0.73016	-0.68571	-0.28571	0.00000	0.02198	0.04762	0.21429	0.46429
GS13	-1.30769	-0.75214	-0.70769	-0.30769	-0.02198	0.00000	0.02564	0.19231	0.44231
LT.COL	-1.33333	-0.77778	-0.73333	-0.33333	-0.04762	-0.02564	0.00000	0.16667	0.41667
COL	-1.50000	-0.94444	-0.90000	-0.50000	-0.21429	-0.19231	-0.16667	0.00000	0.25000
2LT.	-1.75000	-1.19444	-1.15000	-0.75000	-0.46429	-0.44231	-0.41667	-0.25000	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
3.26076

Abs(Dif)-LSD	1LT.	CAPT	GS15	GS12	MAJ	GS13	LT.COL	COL	2LT.
1LT.	-5.04692	-3.20619	-3.30933	-2.98994	-2.52940	-2.39573	-2.52131	-2.48994	-2.23994
CAPT	-3.20619	-1.68231	-1.94609	-1.70008	-1.06830	-0.79536	-1.10310	-1.20008	-0.95008
GS15	-3.30933	-1.94609	-2.25705	-1.99396	-1.40391	-1.17029	-1.42763	-1.49396	-1.24396
GS12	-2.98994	-1.70008	-1.99396	-2.52346	-1.95109	-1.73280	-1.97026	-2.02346	-1.77346
MAJ	-2.52940	-1.06830	-1.40391	-1.95109	-1.90756	-1.65106	-1.93783	-2.02252	-1.77252
GS13	-2.39573	-0.79536	-1.17029	-1.73280	-1.65106	-1.39976	-1.73569	-1.84818	-1.59818
LT.COL	-2.52131	-1.10310	-1.42763	-1.97026	-1.93783	-1.73569	-2.06040	-2.13693	-1.88693
COL	-2.48994	-1.20008	-1.49396	-2.02346	-2.02252	-1.84818	-2.13693	-2.52346	-2.27346
2LT.	-2.23994	-0.95008	-1.24396	-1.77346	-1.77252	-1.59818	-1.88693	-2.27346	-2.52346

Positive values show pairs of means that are significantly different.

Oneway Analysis of PERFORMANCE S/I By Rank/Grade

Means Comparisons

Dif=Mean[i]-Mean[j]	GS15	GS13	COL	CAPT	LT.COL	1LT.	MAJ	GS12	2LT.
GS15	0.00000	0.28205	0.41667	0.44444	0.50000	0.66667	0.80952	0.91667	1.41667
GS13	-0.28205	0.00000	0.13462	0.16239	0.21795	0.38462	0.52747	0.63462	1.13462
COL	-0.41667	-0.13462	0.00000	0.02778	0.08333	0.25000	0.39286	0.50000	1.00000
CAPT	-0.44444	-0.16239	-0.02778	0.00000	0.05556	0.22222	0.36508	0.47222	0.97222
LT.COL	-0.50000	-0.21795	-0.08333	-0.05556	0.00000	0.16667	0.30952	0.41667	0.91667
1LT.	-0.66667	-0.38462	-0.25000	-0.22222	-0.16667	0.00000	0.14286	0.25000	0.75000
MAJ	-0.80952	-0.52747	-0.39286	-0.36508	-0.30952	-0.14286	0.00000	0.10714	0.60714
GS12	-0.91667	-0.63462	-0.50000	-0.47222	-0.41667	-0.25000	-0.10714	0.00000	0.50000
2LT.	-1.41667	-1.13462	-1.00000	-0.97222	-0.91667	-0.75000	-0.60714	-0.50000	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
3.25714

Abs(Dif)-LSD	GS15	GS13	COL	CAPT	LT.COL	1LT.	MAJ	GS12	2LT.
GS15	-1.72594	-1.19337	-1.51299	-1.13112	-1.22594	-2.56227	-0.85363	-1.01299	-0.51299
GS13	-1.19337	-1.17255	-1.57465	-1.13390	-1.25747	-2.71765	-0.87399	-1.07465	-0.57465
COL	-1.51299	-1.57465	-2.11384	-1.76864	-1.84633	-3.09227	-1.48086	-1.61384	-1.11384
CAPT	-1.13112	-1.13390	-1.76864	-1.40922	-1.52000	-2.92890	-1.14144	-1.32419	-0.82419
LT.COL	-1.22594	-1.25747	-1.84633	-1.52000	-1.72594	-3.06227	-1.35363	-1.51299	-1.01299
1LT.	-2.56227	-2.71765	-3.09227	-2.92890	-3.06227	-4.22767	-3.05296	-3.09227	-2.59227
MAJ	-0.85363	-0.87399	-1.48086	-1.14144	-1.35363	-3.05296	-1.59791	-1.76657	-1.26657
GS12	-1.01299	-1.07465	-1.61384	-1.32419	-1.51299	-3.09227	-1.76657	-2.11384	-1.61384
2LT.	-0.51299	-0.57465	-1.11384	-0.82419	-1.01299	-2.59227	-1.26657	-1.61384	-2.11384

Positive values show pairs of means that are significantly different.

Oneway Analysis of PERFORMANCE S/U By Rank/Grade

Means Comparisons

Dif=Mean[i]-Mean[j]	GS15	GS13	1LT.	CAPT	LT.COL	GS12	2LT.	MAJ	COL
GS15	0.00000	0.36923	0.60000	0.71111	0.76667	0.85000	1.10000	1.31429	1.60000
GS13	-0.36923	0.00000	0.23077	0.34188	0.39744	0.48077	0.73077	0.94505	1.23077
1LT.	-0.60000	-0.23077	0.00000	0.11111	0.16667	0.25000	0.50000	0.71429	1.00000
CAPT	-0.71111	-0.34188	-0.11111	0.00000	0.05556	0.13889	0.38889	0.60317	0.88889
LT.COL	-0.76667	-0.39744	-0.16667	-0.05556	0.00000	0.08333	0.33333	0.54762	0.83333
GS12	-0.85000	-0.48077	-0.25000	-0.13889	-0.08333	0.00000	0.25000	0.46429	0.75000
2LT.	-1.10000	-0.73077	-0.50000	-0.38889	-0.33333	-0.25000	0.00000	0.21429	0.50000
MAJ	-1.31429	-0.94505	-0.71429	-0.60317	-0.54762	-0.46429	-0.21429	0.00000	0.28571
COL	-1.60000	-1.23077	-1.00000	-0.88889	-0.83333	-0.75000	-0.50000	-0.28571	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
3.26076

Abs(Dif)-LSD	GS15	GS13	1LT.	CAPT	LT.COL	GS12	2LT.	MAJ	COL
GS15	-2.25073	-1.50349	-3.29837	-1.27384	-1.38824	-1.53726	-1.28726	-0.76948	-0.78726
GS13	-1.50349	-1.39584	-3.46228	-1.20128	-1.35896	-1.55400	-1.30400	-0.72330	-0.80400
1LT.	-3.29837	-3.46228	-5.03278	-3.64010	-3.67718	-3.72876	-3.47876	-3.09014	-2.97876
CAPT	-1.27384	-1.20128	-3.64010	-1.67759	-1.82005	-1.99963	-1.74963	-1.19025	-1.24963
LT.COL	-1.38824	-1.35896	-3.67718	-1.82005	-2.05462	-2.21381	-1.96381	-1.43227	-1.46381
GS12	-1.53726	-1.55400	-3.72876	-1.99963	-2.21381	-2.51639	-2.26639	-1.76626	-1.76639
2LT.	-1.28726	-1.30400	-3.47876	-1.74963	-1.96381	-2.26639	-2.51639	-2.01626	-2.01639
MAJ	-0.76948	-0.72330	-3.09014	-1.19025	-1.43227	-1.76626	-2.01626	-1.90221	-1.94483
COL	-0.78726	-0.80400	-2.97876	-1.24963	-1.46381	-1.76639	-2.01639	-1.94483	-2.51639

Positive values show pairs of means that are significantly different.

Oneway Analysis of EARNED VALUE S/I By Rank/Grade

Means Comparisons

Dif=Mean[i]-Mean[j]	GS15	COL	GS12	CAPT	GS13	LT.COL	MAJ	2LT.	1LT.
GS15	0.00000	0.91667	0.91667	1.16667	1.32051	1.66667	1.88095	1.91667	2.16667
COL	-0.91667	0.00000	0.00000	0.25000	0.40385	0.75000	0.96429	1.00000	1.25000
GS12	-0.91667	0.00000	0.00000	0.25000	0.40385	0.75000	0.96429	1.00000	1.25000
CAPT	-1.16667	-0.25000	-0.25000	0.00000	0.15385	0.50000	0.71429	0.75000	1.00000
GS13	-1.32051	-0.40385	-0.40385	-0.15385	0.00000	0.34615	0.56044	0.59615	0.84615
LT.COL	-1.66667	-0.75000	-0.75000	-0.50000	-0.34615	0.00000	0.21429	0.25000	0.50000
MAJ	-1.88095	-0.96429	-0.96429	-0.71429	-0.56044	-0.21429	0.00000	0.03571	0.28571
2LT.	-1.91667	-1.00000	-1.00000	-0.75000	-0.59615	-0.25000	-0.03571	0.00000	0.25000
1LT.	-2.16667	-1.25000	-1.25000	-1.00000	-0.84615	-0.50000	-0.28571	-0.25000	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q^*
3.25714

Abs(Dif)-LSD	GS15	COL	GS12	CAPT	GS13	LT.COL	MAJ	2LT.	1LT.
GS15	-3.16791	-2.62516	-2.62516	-1.72522	-1.38758	-1.50124	-1.17172	-1.62516	-3.75995
COL	-2.62516	-3.87988	-3.87988	-3.04726	-2.73345	-2.79183	-2.47486	-2.87988	-4.88463
GS12	-2.62516	-3.87988	-3.87988	-3.04726	-2.73345	-2.79183	-2.47486	-2.87988	-4.88463
CAPT	-1.72522	-3.04726	-3.04726	-2.58659	-2.22547	-2.39189	-2.05089	-2.54726	-4.78378
GS13	-1.38758	-2.73345	-2.73345	-2.22547	-2.15217	-2.36193	-2.01190	-2.54115	-4.84795
LT.COL	-1.50124	-2.79183	-2.79183	-2.39189	-2.36193	-3.16791	-2.83839	-3.29183	-5.42661
MAJ	-1.17172	-2.47486	-2.47486	-2.05089	-2.01190	-2.83839	-2.93291	-3.40343	-5.58011
2LT.	-1.62516	-2.87988	-2.87988	-2.54726	-2.54115	-3.29183	-3.40343	-3.87988	-5.88463
1LT.	-3.75995	-4.88463	-4.88463	-4.78378	-4.84795	-5.42661	-5.58011	-5.88463	-7.75976

Positive values show pairs of means that are significantly different.

Oneway Analysis of EARNED VALUE S/U By Rank/Grade

Means Comparisons

Dif=Mean[i]-Mean[j]	GS15	GS12	GS13	CAPT	COL	MAJ	LT.COL	1LT.	2LT.
GS15	0.00000	1.10000	1.67692	1.93333	2.10000	2.17143	2.43333	2.60000	3.35000
GS12	-1.10000	0.00000	0.57692	0.83333	1.00000	1.07143	1.33333	1.50000	2.25000
GS13	-1.67692	-0.57692	0.00000	0.25641	0.42308	0.49451	0.75641	0.92308	1.67308
CAPT	-1.93333	-0.83333	-0.25641	0.00000	0.16667	0.23810	0.50000	0.66667	1.41667
COL	-2.10000	-1.00000	-0.42308	-0.16667	0.00000	0.07143	0.33333	0.50000	1.25000
MAJ	-2.17143	-1.07143	-0.49451	-0.23810	-0.07143	0.00000	0.26190	0.42857	1.17857
LT.COL	-2.43333	-1.33333	-0.75641	-0.50000	-0.33333	-0.26190	0.00000	0.16667	0.91667
1LT.	-2.60000	-1.50000	-0.92308	-0.66667	-0.50000	-0.42857	-0.16667	0.00000	0.75000
2LT.	-3.35000	-2.25000	-1.67308	-1.41667	-1.25000	-1.17857	-0.91667	-0.75000	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q^*
3.26076

Abs(Dif)-LSD	GS15	GS12	GS13	CAPT	COL	MAJ	LT.COL	1LT.	2LT.
GS15	-3.87594	-3.01105	-1.54805	-1.48492	-2.01105	-1.41699	-1.27759	-4.11332	-0.76105
GS12	-3.01105	-4.33343	-2.92712	-2.84937	-3.33343	-2.76974	-2.62253	-5.35175	-2.08343
GS13	-1.54805	-2.92712	-2.40375	-2.40104	-3.08096	-2.37853	-2.26825	-5.43666	-1.83096
CAPT	-1.48492	-2.84937	-2.40104	-2.88895	-3.51604	-2.85032	-2.72995	-5.79323	-2.26604
COL	-2.01105	-3.33343	-3.08096	-3.51604	-4.33343	-3.76974	-3.62253	-6.35175	-3.08343
MAJ	-1.41699	-2.76974	-2.37853	-2.85032	-3.76974	-3.27576	-3.14762	-6.12295	-2.66260
LT.COL	-1.27759	-2.62253	-2.26825	-2.72995	-3.62253	-3.14762	-3.53823	-6.45275	-3.03919
1LT.	-4.11332	-5.35175	-5.43666	-5.79323	-6.35175	-6.12295	-6.45275	-8.66685	-6.10175
2LT.	-0.76105	-2.08343	-1.83096	-2.26604	-3.08343	-2.66260	-3.03919	-6.10175	-4.33343

Positive values show pairs of means that are significantly different.

Means Comparisons

Dif=Mean[i]-Mean[j]	GS15	MAJ	COL	GS12	CAPT	GS13	LT.COL	2LT.	1LT.
GS15	0.00000	0.82857	0.90000	0.90000	1.51111	1.63077	1.73333	1.90000	3.40000
MAJ	-0.82857	0.00000	0.07143	0.07143	0.68254	0.80220	0.90476	1.07143	2.57143
COL	-0.90000	-0.07143	0.00000	0.00000	0.61111	0.73077	0.83333	1.00000	2.50000
GS12	-0.90000	-0.07143	0.00000	0.00000	0.61111	0.73077	0.83333	1.00000	2.50000
CAPT	-1.51111	-0.68254	-0.61111	-0.61111	0.00000	0.11966	0.22222	0.38889	1.88889
GS13	-1.63077	-0.80220	-0.73077	-0.73077	-0.11966	0.00000	0.10256	0.26923	1.76923
LT.COL	-1.73333	-0.90476	-0.83333	-0.83333	-0.22222	-0.10256	0.00000	0.16667	1.66667
2LT.	-1.90000	-1.07143	-1.00000	-1.00000	-0.38889	-0.26923	-0.16667	0.00000	1.50000
1LT.	-3.40000	-2.57143	-2.50000	-2.50000	-1.88889	-1.76923	-1.66667	-1.50000	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
3.26076

Abs(Dif)-LSD	GS15	MAJ	COL	GS12	CAPT	GS13	LT.COL	2LT.	1LT.
GS15	-3.08473	-2.02733	-2.37185	-2.37185	-1.20936	-0.93588	-1.22007	-1.37185	-1.94291
MAJ	-2.02733	-2.60707	-2.98564	-2.98564	-1.77543	-1.48436	-1.80877	-1.98564	-2.64272
COL	-2.37185	-2.98564	-3.44883	-3.44883	-2.31983	-2.05798	-2.31501	-2.44883	-2.95308
GS12	-2.37185	-2.98564	-3.44883	-3.44883	-2.31983	-2.05798	-2.31501	-2.44883	-2.95308
CAPT	-1.20936	-1.77543	-2.31983	-2.31983	-2.29922	-1.99532	-2.34839	-2.54206	-3.25233
GS13	-0.93588	-1.48436	-2.05798	-2.05798	-1.99532	-1.91307	-2.30466	-2.51952	-3.29227
LT.COL	-1.22007	-1.80877	-2.31501	-2.31501	-2.34839	-2.30466	-2.81596	-2.98167	-3.60151
2LT.	-1.37185	-1.98564	-2.44883	-2.44883	-2.54206	-2.51952	-2.98167	-3.44883	-3.95308
1LT.	-1.94291	-2.64272	-2.95308	-2.95308	-3.25233	-3.29227	-3.60151	-3.95308	-6.89767

Positive values show pairs of means that are significantly different.

Oneway Analysis of STABILITY S/U By Rank/Grade

Means Comparisons

Dif=Mean[i]-Mean[j]	GS15	COL	GS12	MAJ	2LT.	GS13	CAPT	LT.COL	1LT.
GS15	0.00000	0.85000	0.85000	1.45714	1.60000	1.75385	2.04444	2.26667	3.60000
COL	-0.85000	0.00000	0.00000	0.60714	0.75000	0.90385	1.19444	1.41667	2.75000
GS12	-0.85000	0.00000	0.00000	0.60714	0.75000	0.90385	1.19444	1.41667	2.75000
MAJ	-1.45714	-0.60714	-0.60714	0.00000	0.14286	0.29670	0.58730	0.80952	2.14286
2LT.	-1.60000	-0.75000	-0.75000	-0.14286	0.00000	0.15385	0.44444	0.66667	2.00000
GS13	-1.75385	-0.90385	-0.90385	-0.29670	-0.15385	0.00000	0.29060	0.51282	1.84615
CAPT	-2.04444	-1.19444	-1.19444	-0.58730	-0.44444	-0.29060	0.00000	0.22222	1.55556
LT.COL	-2.26667	-1.41667	-1.41667	-0.80952	-0.66667	-0.51282	-0.22222	0.00000	1.33333
1LT.	-3.60000	-2.75000	-2.75000	-2.14286	-2.00000	-1.84615	-1.55556	-1.33333	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
3.26076

Abs(Dif)-LSD	GS15	COL	GS12	MAJ	2LT.	GS13	CAPT	LT.COL	1LT.
GS15	-3.36010	-2.71393	-2.71393	-1.65371	-1.96393	-1.04193	-0.91889	-0.95039	-2.21987
COL	-2.71393	-3.75671	-3.75671	-2.72283	-3.00671	-2.13386	-1.99815	-2.01273	-3.18988
GS12	-2.71393	-3.75671	-3.75671	-2.72283	-3.00671	-2.13386	-1.99815	-2.01273	-3.18988
MAJ	-1.65371	-2.72283	-2.72283	-2.83981	-3.18711	-2.19397	-2.09009	-2.14624	-3.53676
2LT.	-1.96393	-3.00671	-3.00671	-3.18711	-3.75671	-2.88386	-2.74815	-2.76273	-3.93988
GS13	-1.04193	-2.13386	-2.13386	-2.19397	-2.88386	-2.08385	-2.01318	-2.10930	-3.66719
CAPT	-0.91889	-1.99815	-1.99815	-2.09009	-2.74815	-2.01318	-2.50447	-2.57786	-4.04462
LT.COL	-0.95039	-2.01273	-2.01273	-2.14624	-2.76273	-2.10930	-2.57786	-3.06734	-4.40514
1LT.	-2.21987	-3.18988	-3.18988	-3.53676	-3.93988	-3.66719	-4.04462	-4.40514	-7.51342

Positive values show pairs of means that are significantly different.

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Oneway Analysis of COST R/I By Rank/Grade

Means Comparisons

Dif=Mean[i]-Mean[j]	GS12	GS13	MAJ	GS15	CAPT	LT.COL	1LT.	2LT.	COL
GS12	0.00000	0.30769	0.42857	0.66667	0.88889	1.00000	1.00000	1.50000	1.75000
GS13	-0.30769	0.00000	0.12088	0.35897	0.58120	0.69231	0.69231	1.19231	1.44231
MAJ	-0.42857	-0.12088	0.00000	0.23810	0.46032	0.57143	0.57143	1.07143	1.32143
GS15	-0.66667	-0.35897	-0.23810	0.00000	0.22222	0.33333	0.33333	0.83333	1.08333
CAPT	-0.88889	-0.58120	-0.46032	-0.22222	0.00000	0.11111	0.11111	0.61111	0.86111
LT.COL	-1.00000	-0.69231	-0.57143	-0.33333	-0.11111	0.00000	0.00000	0.50000	0.75000

Dif=Mean[i]-Mean[j]	GS12	GS13	MAJ	GS15	CAPT	LT.COL	1LT.	2LT.	COL
1LT.	-1.00000	-0.69231	-0.57143	-0.33333	-0.11111	0.00000	0.00000	0.50000	0.75000
2LT.	-1.50000	-1.19231	-1.07143	-0.83333	-0.61111	-0.50000	-0.50000	0.00000	0.25000
COL	-1.75000	-1.44231	-1.32143	-1.08333	-0.86111	-0.75000	-0.75000	-0.25000	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
3.25714

Abs(Dif)-LSD	GS12	GS13	MAJ	GS15	CAPT	LT.COL	1LT.	2LT.	COL
GS12	-2.92248	-2.05545	-2.16193	-2.00118	-1.59474	-1.66785	-3.62085	-1.42248	-1.17248
GS13	-2.05545	-1.62110	-1.81671	-1.68087	-1.21100	-1.34753	-3.59673	-1.17083	-0.92083
MAJ	-2.16193	-1.81671	-2.20919	-2.06130	-1.62253	-1.72797	-3.84695	-1.51908	-1.26908
GS15	-2.00118	-1.68087	-2.06130	-2.38620	-1.95607	-2.05286	-4.13083	-1.83452	-1.58452
CAPT	-1.59474	-1.21100	-1.62253	-1.95607	-1.94832	-2.06718	-4.24547	-1.87252	-1.62252
LT.COL	-1.66785	-1.34753	-1.72797	-2.05286	-2.06718	-2.38620	-4.46417	-2.16785	-1.91785
1LT.	-3.62085	-3.59673	-3.84695	-4.13083	-4.24547	-4.46417	-5.84497	-4.12085	-3.87085
2LT.	-1.42248	-1.17083	-1.51908	-1.83452	-1.87252	-2.16785	-4.12085	-2.92248	-2.67248
COL	-1.17248	-0.92083	-1.26908	-1.58452	-1.62252	-1.91785	-3.87085	-2.67248	-2.92248

Positive values show pairs of means that are significantly different.

Oneway Analysis of COST R/U By Rank/Grade

Means Comparisons

Dif=Mean[i]-Mean[j]	GS12	GS13	CAPT	MAJ	GS15	LT.COL	1LT.	2LT.	COL
GS12	0.00000	0.00000	0.11111	0.14286	0.33333	1.00000	1.00000	1.50000	1.50000
GS13	0.00000	0.00000	0.11111	0.14286	0.33333	1.00000	1.00000	1.50000	1.50000
CAPT	-0.11111	-0.11111	0.00000	0.03175	0.22222	0.88889	0.88889	1.38889	1.38889
MAJ	-0.14286	-0.14286	-0.03175	0.00000	0.19048	0.85714	0.85714	1.35714	1.35714
GS15	-0.33333	-0.33333	-0.22222	-0.19048	0.00000	0.66667	0.66667	1.16667	1.16667
LT.COL	-1.00000	-1.00000	-0.88889	-0.85714	-0.66667	0.00000	0.00000	0.50000	0.50000
1LT.	-1.00000	-1.00000	-0.88889	-0.85714	-0.66667	0.00000	0.00000	0.50000	0.50000
2LT.	-1.50000	-1.50000	-1.38889	-1.35714	-1.16667	-0.50000	-0.50000	0.00000	0.00000
COL	-1.50000	-1.50000	-1.38889	-1.35714	-1.16667	-0.50000	-0.50000	0.00000	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
3.25714

Abs(Dif)-LSD	GS12	GS13	CAPT	MAJ	GS15	LT.COL	1LT.	2LT.	COL
GS12	-3.05314	-2.46879	-2.48356	-2.56347	-2.45379	-1.78713	-3.82744	-1.55314	-1.55314
GS13	-2.46879	-1.69358	-1.76121	-1.88136	-1.79771	-1.13104	-3.48079	-0.96879	-0.96879
CAPT	-2.48356	-1.76121	-2.03543	-2.14422	-2.05346	-1.38679	-3.66247	-1.20578	-1.20578
MAJ	-2.56347	-1.88136	-2.14422	-2.30796	-2.21172	-1.54506	-3.75878	-1.34918	-1.34918
GS15	-2.45379	-1.79771	-2.05346	-2.21172	-2.49288	-1.82621	-3.99709	-1.62046	-1.62046
LT.COL	-1.78713	-1.13104	-1.38679	-1.54506	-1.82621	-2.49288	-4.66375	-2.28713	-2.28713
1LT.	-3.82744	-3.48079	-3.66247	-3.75878	-3.99709	-4.66375	-6.10629	-4.32744	-4.32744
2LT.	-1.55314	-0.96879	-1.20578	-1.34918	-1.62046	-2.28713	-4.32744	-3.05314	-3.05314
COL	-1.55314	-0.96879	-1.20578	-1.34918	-1.62046	-2.28713	-4.32744	-3.05314	-3.05314

Positive values show pairs of means that are significantly different.

Oneway Analysis of SCHEDULE R/I By Rank/Grade

Means Comparisons

Dif=Mean[i]-Mean[j]	GS15	LT.COL	COL	GS13	GS12	MAJ	2LT.	CAPT	1LT.
GS15	0.00000	0.00000	0.08333	0.56410	0.58333	0.76190	1.08333	1.11111	2.33333
LT.COL	0.00000	0.00000	0.08333	0.56410	0.58333	0.76190	1.08333	1.11111	2.33333
COL	-0.08333	-0.08333	0.00000	0.48077	0.50000	0.67857	1.00000	1.02778	2.25000
GS13	-0.56410	-0.56410	-0.48077	0.00000	0.01923	0.19780	0.51923	0.54701	1.76923
GS12	-0.58333	-0.58333	-0.50000	-0.01923	0.00000	0.17857	0.50000	0.52778	1.75000
MAJ	-0.76190	-0.76190	-0.67857	-0.19780	-0.17857	0.00000	0.32143	0.34921	1.57143
2LT.	-1.08333	-1.08333	-1.00000	-0.51923	-0.50000	-0.32143	0.00000	0.02778	1.25000
CAPT	-1.11111	-1.11111	-1.02778	-0.54701	-0.52778	-0.34921	-0.02778	0.00000	1.22222
1LT.	-2.33333	-2.33333	-2.25000	-1.76923	-1.75000	-1.57143	-1.25000	-1.22222	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q^*
3.25714

Abs(Dif)-LSD	GS15	LT.COL	COL	GS13	GS12	MAJ	2LT.	CAPT	1LT.
GS15	-2.28592	-2.28592	-2.47241	-1.39002	-1.97241	-1.44087	-1.47241	-0.97564	-1.94324
LT.COL	-2.28592	-2.28592	-2.47241	-1.39002	-1.97241	-1.44087	-1.47241	-0.97564	-1.94324
COL	-2.47241	-2.47241	-2.79967	-1.78307	-2.29967	-1.80307	-1.79967	-1.35149	-2.17667
GS13	-1.39002	-1.39002	-1.78307	-1.55298	-2.24461	-1.65836	-1.74461	-1.16988	-2.33957
GS12	-1.97241	-1.97241	-2.29967	-2.24461	-2.79967	-2.30307	-2.29967	-1.85149	-2.67667
MAJ	-1.44087	-1.44087	-1.80307	-1.65836	-2.30307	-2.11635	-2.16022	-1.64611	-2.66128
2LT.	-1.47241	-1.47241	-1.79967	-1.74461	-2.29967	-2.16022	-2.79967	-2.35149	-3.17667
CAPT	-0.97564	-0.97564	-1.35149	-1.16988	-1.85149	-1.64611	-2.35149	-1.86645	-2.95129
1LT.	-1.94324	-1.94324	-2.17667	-2.33957	-2.67667	-2.66128	-3.17667	-2.95129	-5.59935

Positive values show pairs of means that are significantly different.

Oneway Analysis of SCHEDULE R/U By Rank/Grade

Means Comparisons

Dif=Mean[i]-Mean[j]	GS15	COL	GS13	LT.COL	MAJ	GS12	CAPT	2LT.	1LT.
GS15	0.00000	0.08333	0.33333	0.33333	0.76190	0.83333	1.33333	1.33333	2.33333
COL	-0.08333	0.00000	0.25000	0.25000	0.67857	0.75000	1.25000	1.25000	2.25000
GS13	-0.33333	-0.25000	0.00000	0.00000	0.42857	0.50000	1.00000	1.00000	2.00000
LT.COL	-0.33333	-0.25000	0.00000	0.00000	0.42857	0.50000	1.00000	1.00000	2.00000
MAJ	-0.76190	-0.67857	-0.42857	-0.42857	0.00000	0.07143	0.57143	0.57143	1.57143
GS12	-0.83333	-0.75000	-0.50000	-0.50000	-0.07143	0.00000	0.50000	0.50000	1.50000
CAPT	-1.33333	-1.25000	-1.00000	-1.00000	-0.57143	-0.50000	0.00000	0.00000	1.00000
2LT.	-1.33333	-1.25000	-1.00000	-1.00000	-0.57143	-0.50000	0.00000	0.00000	1.00000
1LT.	-2.33333	-2.25000	-2.00000	-2.00000	-1.57143	-1.50000	-1.00000	-1.00000	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q^*
3.25714

Abs(Dif)-LSD	GS15	COL	GS13	LT.COL	MAJ	GS12	CAPT	2LT.	1LT.
GS15	-2.48844	-2.69882	-1.79391	-2.15510	-1.63601	-1.94882	-0.93829	-1.44882	-2.32211
COL	-2.69882	-3.04770	-2.21439	-2.53216	-2.02293	-2.29770	-1.34005	-1.79770	-2.56884
GS13	-1.79391	-2.21439	-1.69056	-2.12724	-1.59203	-1.96439	-0.86898	-1.46439	-2.47280
LT.COL	-2.15510	-2.53216	-2.12724	-2.48844	-1.96935	-2.28216	-1.27162	-1.78216	-2.65544
MAJ	-1.63601	-2.02293	-1.59203	-1.96935	-2.30384	-2.63007	-1.60066	-2.13007	-3.03626
GS12	-1.94882	-2.29770	-1.96439	-2.28216	-2.63007	-3.04770	-2.09005	-2.54770	-3.31884
CAPT	-0.93829	-1.34005	-0.86898	-1.27162	-1.60066	-2.09005	-2.03180	-2.59005	-3.54324
2LT.	-1.44882	-1.79770	-1.46439	-1.78216	-2.13007	-2.54770	-2.59005	-3.04770	-3.81884
1LT.	-2.32211	-2.56884	-2.47280	-2.65544	-3.03626	-3.31884	-3.54324	-3.81884	-6.09540

Positive values show pairs of means that are significantly different.

Oneway Analysis of PERFORMANCE R/I By Rank/Grade

Means Comparisons

Dif=Mean[i]-Mean[j]	1LT.	2LT.	MAJ	CAPT	COL	LT.COL	GS13	GS15	GS12
1LT.	0.00000	0.00000	0.14286	0.22222	0.50000	0.83333	0.84615	1.00000	1.00000
2LT.	0.00000	0.00000	0.14286	0.22222	0.50000	0.83333	0.84615	1.00000	1.00000
MAJ	-0.14286	-0.14286	0.00000	0.07937	0.35714	0.69048	0.70330	0.85714	0.85714
CAPT	-0.22222	-0.22222	-0.07937	0.00000	0.27778	0.61111	0.62393	0.77778	0.77778
COL	-0.50000	-0.50000	-0.35714	-0.27778	0.00000	0.33333	0.34615	0.50000	0.50000
LT.COL	-0.83333	-0.83333	-0.69048	-0.61111	-0.33333	0.00000	0.01282	0.16667	0.16667
GS13	-0.84615	-0.84615	-0.70330	-0.62393	-0.34615	-0.01282	0.00000	0.15385	0.15385
GS15	-1.00000	-1.00000	-0.85714	-0.77778	-0.50000	-0.16667	-0.15385	0.00000	0.00000
GS12	-1.00000	-1.00000	-0.85714	-0.77778	-0.50000	-0.16667	-0.15385	0.00000	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
3.25714

Abs(Dif)-LSD	1LT.	2LT.	MAJ	CAPT	COL	LT.COL	GS13	GS15	GS12
1LT.	-5.98379	-4.73060	-4.38046	-4.23783	-4.23060	-3.73686	-3.54475	-3.57019	-3.73060
2LT.	-4.73060	-2.99189	-2.50917	-2.32040	-2.49189	-1.89788	-1.57311	-1.73121	-1.99189
MAJ	-4.38046	-2.50917	-2.26166	-2.05295	-2.29489	-1.66353	-1.28031	-1.49687	-1.79489
CAPT	-4.23783	-2.32040	-2.05295	-1.99460	-2.26484	-1.61892	-1.21083	-1.45225	-1.76484
COL	-4.23060	-2.49189	-2.29489	-2.26484	-2.99189	-2.39788	-2.07311	-2.23121	-2.49189
LT.COL	-3.73686	-1.89788	-1.66353	-1.61892	-2.39788	-2.44287	-2.07547	-2.27620	-2.56455
GS13	-3.54475	-1.57311	-1.28031	-1.21083	-2.07311	-2.07547	-1.65960	-1.93444	-2.26542
GS15	-3.57019	-1.73121	-1.49687	-1.45225	-2.23121	-2.27620	-1.93444	-2.44287	-2.73121
GS12	-3.73060	-1.99189	-1.79489	-1.76484	-2.49189	-2.56455	-2.26542	-2.73121	-2.99189

Positive values show pairs of means that are significantly different.

Oneway Analysis of PERFORMANCE R/U By Rank/Grade

Means Comparisons

Dif=Mean[i]-Mean[j]	2LT.	1LT.	MAJ	GS15	CAPT	GS12	COL	LT.COL	GS13
2LT.	0.00000	0.50000	0.64286	0.66667	0.83333	1.00000	1.25000	1.33333	1.34615
1LT.	-0.50000	0.00000	0.14286	0.16667	0.33333	0.50000	0.75000	0.83333	0.84615
MAJ	-0.64286	-0.14286	0.00000	0.02381	0.19048	0.35714	0.60714	0.69048	0.70330
GS15	-0.66667	-0.16667	-0.02381	0.00000	0.16667	0.33333	0.58333	0.66667	0.67949
CAPT	-0.83333	-0.33333	-0.19048	-0.16667	0.00000	0.16667	0.41667	0.50000	0.51282
GS12	-1.00000	-0.50000	-0.35714	-0.33333	-0.16667	0.00000	0.25000	0.33333	0.34615
COL	-1.25000	-0.75000	-0.60714	-0.58333	-0.41667	-0.25000	0.00000	0.08333	0.09615
LT.COL	-1.33333	-0.83333	-0.69048	-0.66667	-0.50000	-0.33333	-0.08333	0.00000	0.01282
GS13	-1.34615	-0.84615	-0.70330	-0.67949	-0.51282	-0.34615	-0.09615	-0.01282	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q^*
3.25714

Abs(Dif)-LSD	2LT.	1LT.	MAJ	GS15	CAPT	GS12	COL	LT.COL	GS13
2LT.	-2.93276	-4.13710	-1.95676	-2.01056	-1.65903	-1.93276	-1.68276	-1.34390	-1.02530
1LT.	-4.13710	-5.86552	-4.29106	-4.31320	-4.03856	-4.13710	-3.88710	-3.64653	-3.45796
MAJ	-1.95676	-4.29106	-2.21696	-2.28367	-1.89969	-2.24247	-1.99247	-1.61701	-1.24110
GS15	-2.01056	-4.31320	-2.28367	-2.39459	-2.01928	-2.34390	-2.09390	-1.72792	-1.36753
CAPT	-1.65903	-4.03856	-1.89969	-2.01928	-1.95517	-2.32570	-2.07570	-1.68595	-1.28568
GS12	-1.93276	-4.13710	-2.24247	-2.34390	-2.32570	-2.93276	-2.68276	-2.34390	-2.02530
COL	-1.68276	-3.88710	-1.99247	-2.09390	-2.07570	-2.68276	-2.93276	-2.59390	-2.27530
LT.COL	-1.34390	-3.64653	-1.61701	-1.72792	-1.68595	-2.34390	-2.59390	-2.39459	-2.03419
GS13	-1.02530	-3.45796	-1.24110	-1.36753	-1.28568	-2.02530	-2.27530	-2.03419	-1.62680

Positive values show pairs of means that are significantly different.

Oneway Analysis of EARNED VALUE R/I By Rank/Grade

Means Comparisons

Dif=Mean[i]-Mean[j]	GS12	COL	MAJ	2LT.	GS15	GS13	1LT.	LT.COL	CAPT
GS12	0.000000	0.000000	0.357143	0.500000	0.500000	0.500000	0.500000	0.500000	0.833333
COL	0.000000	0.000000	0.357143	0.500000	0.500000	0.500000	0.500000	0.500000	0.833333
MAJ	-0.35714	-0.35714	0.000000	0.142857	0.142857	0.142857	0.142857	0.142857	0.476190
2LT.	-0.5	-0.5	-0.14286	0.000000	0.000000	0.000000	0.000000	0.000000	0.333333
GS15	-0.5	-0.5	-0.14286	0.000000	0.000000	0.000000	0.000000	0.000000	0.333333
GS13	-0.5	-0.5	-0.14286	0.000000	0.000000	0.000000	0.000000	0.000000	0.333333
1LT.	-0.5	-0.5	-0.14286	0.000000	0.000000	0.000000	0.000000	0.000000	0.333333
LT.COL	-0.5	-0.5	-0.14286	0.000000	0.000000	0.000000	0.000000	0.000000	0.333333
CAPT	-0.83333	-0.83333	-0.47619	-0.33333	-0.33333	-0.33333	-0.33333	-0.33333	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
3.25714

Abs(Dif)-LSD	GS12	COL	MAJ	2LT.	GS15	GS13	1LT.	LT.COL	CAPT
GS12	-2.93057	-2.93057	-2.24053	-2.43057	-2.17523	-1.86968	-4.13363	-2.17523	-1.65717
COL	-2.93057	-2.93057	-2.24053	-2.43057	-2.17523	-1.86968	-4.13363	-2.17523	-1.65717
MAJ	-2.24053	-2.24053	-2.21530	-2.45481	-2.16290	-1.80009	-4.28774	-2.16290	-1.61242
2LT.	-2.43057	-2.43057	-2.45481	-2.93057	-2.67523	-2.36968	-4.63363	-2.67523	-2.15717
GS15	-2.17523	-2.17523	-2.16290	-2.67523	-2.39280	-2.04548	-4.47652	-2.39280	-1.85098
GS13	-1.86968	-1.86968	-1.80009	-2.36968	-2.04548	-1.62559	-4.30090	-2.04548	-1.46382
1LT.	-4.13363	-4.13363	-4.28774	-4.63363	-4.47652	-4.30090	-5.86113	-4.47652	-4.03530
LT.COL	-2.17523	-2.17523	-2.16290	-2.67523	-2.39280	-2.04548	-4.47652	-2.39280	-1.85098
CAPT	-1.65717	-1.65717	-1.61242	-2.15717	-1.85098	-1.46382	-4.03530	-1.85098	-1.95371

Positive values show pairs of means that are significantly different.

Oneway Analysis of EARNED VALUE R/U By Rank/Grade

Means Comparisons

Dif=Mean[i]-Mean[j]	COL	LT.COL	2LT.	1LT.	GS12	GS13	CAPT	MAJ	GS15
COL	0.00000	0.16667	0.25000	0.50000	0.50000	0.73077	0.83333	1.07143	1.83333
LT.COL	-0.16667	0.00000	0.08333	0.33333	0.33333	0.56410	0.66667	0.90476	1.66667
2LT.	-0.25000	-0.08333	0.00000	0.25000	0.25000	0.48077	0.58333	0.82143	1.58333
1LT.	-0.50000	-0.33333	-0.25000	0.00000	0.00000	0.23077	0.33333	0.57143	1.33333
GS12	-0.50000	-0.33333	-0.25000	0.00000	0.00000	0.23077	0.33333	0.57143	1.33333
GS13	-0.73077	-0.56410	-0.48077	-0.23077	-0.23077	0.00000	0.10256	0.34066	1.10256
CAPT	-0.83333	-0.66667	-0.58333	-0.33333	-0.33333	-0.10256	0.00000	0.23810	1.00000
MAJ	-1.07143	-0.90476	-0.82143	-0.57143	-0.57143	-0.34066	-0.23810	0.00000	0.76190
GS15	-1.83333	-1.66667	-1.58333	-1.33333	-1.33333	-1.10256	-1.00000	-0.76190	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
3.25714

Abs(Dif)-LSD	COL	LT.COL	2LT.	1LT.	GS12	GS13	CAPT	MAJ	GS15
COL	-3.26507	-2.81392	-3.01507	-4.66253	-2.76507	-1.90939	-1.94144	-1.82275	-1.14726
LT.COL	-2.81392	-2.66592	-2.89726	-4.65415	-2.64726	-1.71486	-1.76697	-1.66418	-0.99925
2LT.	-3.01507	-2.89726	-3.26507	-4.91253	-3.01507	-2.15939	-2.19144	-2.07275	-1.39726
1LT.	-4.66253	-4.65415	-4.91253	-6.53014	-5.16253	-4.56105	-4.53395	-4.36490	-3.65415
GS12	-2.76507	-2.64726	-3.01507	-5.16253	-3.26507	-2.40939	-2.44144	-2.32275	-1.64726
GS13	-1.90939	-1.71486	-2.15939	-4.56105	-2.40939	-1.81114	-1.89972	-1.82406	-1.17640
CAPT	-1.94144	-1.76697	-2.19144	-4.53395	-2.44144	-1.89972	-2.17671	-2.08891	-1.43364
MAJ	-1.82275	-1.66418	-2.07275	-4.36490	-2.32275	-1.82406	-2.08891	-2.46816	-1.80704
GS15	-1.14726	-0.99925	-1.39726	-3.65415	-1.64726	-1.17640	-1.43364	-1.80704	-2.66592

Positive values show pairs of means that are significantly different.

Oneway Analysis of STABILITY R/I By Rank/Grade

Means Comparisons

Dif=Mean[i]-Mean[j]	1LT.	GS15	2LT.	CAPT	GS13	COL	LT.COL	MAJ	GS12
1LT.	0.00000	0.33333	0.75000	0.77778	0.84615	1.50000	1.50000	2.14286	2.25000
GS15	-0.33333	0.00000	0.41667	0.44444	0.51282	1.16667	1.16667	1.80952	1.91667
2LT.	-0.75000	-0.41667	0.00000	0.02778	0.09615	0.75000	0.75000	1.39286	1.50000
CAPT	-0.77778	-0.44444	-0.02778	0.00000	0.06838	0.72222	0.72222	1.36508	1.47222
GS13	-0.84615	-0.51282	-0.09615	-0.06838	0.00000	0.65385	0.65385	1.29670	1.40385
COL	-1.50000	-1.16667	-0.75000	-0.72222	-0.65385	0.00000	0.00000	0.64286	0.75000
LT.COL	-1.50000	-1.16667	-0.75000	-0.72222	-0.65385	0.00000	0.00000	0.64286	0.75000
MAJ	-2.14286	-1.80952	-1.39286	-1.36508	-1.29670	-0.64286	-0.64286	0.00000	0.10714
GS12	-2.25000	-1.91667	-1.50000	-1.47222	-1.40385	-0.75000	-0.75000	-0.10714	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q^*
3.25714

Abs(Dif)-LSD	1LT.	GS15	2LT.	CAPT	GS13	COL	LT.COL	MAJ	GS12
1LT.	-6.49393	-4.62649	-4.38390	-4.06251	-3.91909	-3.63390	-3.45982	-2.76609	-2.88390
GS15	-4.62649	-2.65114	-2.54739	-1.97570	-1.75350	-1.79739	-1.48447	-0.74517	-1.04739
2LT.	-4.38390	-2.54739	-3.24696	-2.73161	-2.52937	-2.49696	-2.21406	-1.48527	-1.74696
CAPT	-4.06251	-1.97570	-2.73161	-2.16464	-1.92281	-2.03717	-1.69792	-0.94902	-1.28717
GS13	-3.91909	-1.75350	-2.52937	-1.92281	-1.80109	-1.97167	-1.61248	-0.85601	-1.22167
COL	-3.63390	-1.79739	-2.49696	-2.03717	-1.97167	-3.24696	-2.96406	-2.23527	-2.49696
LT.COL	-3.45982	-1.48447	-2.21406	-1.69792	-1.61248	-2.96406	-2.65114	-1.91184	-2.21406
MAJ	-2.76609	-0.74517	-1.48527	-0.94902	-0.85601	-2.23527	-1.91184	-2.45447	-2.77098
GS12	-2.88390	-1.04739	-1.74696	-1.28717	-1.22167	-2.49696	-2.21406	-2.77098	-3.24696

Positive values show pairs of means that are significantly different.

Oneway Analysis of STABILITY R/U By Rank/Grade

Means Comparisons

Dif=Mean[i]-Mean[j]	GS15	1LT.	GS13	CAPT	2LT.	COL	LT.COL	MAJ	GS12
GS15	0.00000	0.16667	1.24359	1.38889	1.41667	1.66667	1.66667	1.88095	2.16667
1LT.	-0.16667	0.00000	1.07692	1.22222	1.25000	1.50000	1.50000	1.71429	2.00000
GS13	-1.24359	-1.07692	0.00000	0.14530	0.17308	0.42308	0.42308	0.63736	0.92308
CAPT	-1.38889	-1.22222	-0.14530	0.00000	0.02778	0.27778	0.27778	0.49206	0.77778
2LT.	-1.41667	-1.25000	-0.17308	-0.02778	0.00000	0.25000	0.25000	0.46429	0.75000
COL	-1.66667	-1.50000	-0.42308	-0.27778	-0.25000	0.00000	0.00000	0.21429	0.50000
LT.COL	-1.66667	-1.50000	-0.42308	-0.27778	-0.25000	0.00000	0.00000	0.21429	0.50000
MAJ	-1.88095	-1.71429	-0.63736	-0.49206	-0.46429	-0.21429	-0.21429	0.00000	0.28571
GS12	-2.16667	-2.00000	-0.92308	-0.77778	-0.75000	-0.50000	-0.50000	-0.28571	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q^*
3.25714

Abs(Dif)-LSD	GS15	1LT.	GS13	CAPT	2LT.	COL	LT.COL	MAJ	GS12
GS15	-2.74653	-4.97162	-1.10428	-1.11834	-1.65405	-1.40405	-1.07986	-0.76567	-0.90405
1LT.	-4.97162	-6.72760	-3.85978	-3.79223	-4.06863	-3.81863	-3.63829	-3.37130	-3.31863
GS13	-1.10428	-3.85978	-1.86590	-1.91753	-2.54692	-2.29692	-1.92479	-1.59281	-1.79692
CAPT	-1.11834	-3.79223	-1.91753	-2.24253	-2.83090	-2.58090	-2.22945	-1.90530	-2.08090
2LT.	-1.65405	-4.06863	-2.54692	-2.83090	-3.36380	-3.11380	-2.82071	-2.51740	-2.61380
COL	-1.40405	-3.81863	-2.29692	-2.58090	-3.11380	-3.36380	-3.07071	-2.76740	-2.86380
LT.COL	-1.07986	-3.63829	-1.92479	-2.22945	-2.82071	-3.07071	-2.74653	-2.43234	-2.57071
MAJ	-0.76567	-3.37130	-1.59281	-1.90530	-2.51740	-2.76740	-2.43234	-2.54279	-2.69597
GS12	-0.90405	-3.31863	-1.79692	-2.08090	-2.61380	-2.86380	-2.57071	-2.69597	-3.36380

Positive values show pairs of means that are significantly different.

Oneway Analysis of SCHEDULE VARIANCE S/I By Rank/Grade

Means Comparisons

Dif=Mean[i]-Mean[j]	2LT.	1LT.	GS15	GS13	MAJ	GS12	CAPT	LT.COL	COL
2LT.	0.00000	0.50000	0.70000	0.91667	1.21429	1.25000	1.37500	1.66667	1.75000
1LT.	-0.50000	0.00000	0.20000	0.41667	0.71429	0.75000	0.87500	1.16667	1.25000
GS15	-0.70000	-0.20000	0.00000	0.21667	0.51429	0.55000	0.67500	0.96667	1.05000
GS13	-0.91667	-0.41667	-0.21667	0.00000	0.29762	0.33333	0.45833	0.75000	0.83333
MAJ	-1.21429	-0.71429	-0.51429	-0.29762	0.00000	0.03571	0.16071	0.45238	0.53571
GS12	-1.25000	-0.75000	-0.55000	-0.33333	-0.03571	0.00000	0.12500	0.41667	0.50000
CAPT	-1.37500	-0.87500	-0.67500	-0.45833	-0.16071	-0.12500	0.00000	0.29167	0.37500
LT.COL	-1.66667	-1.16667	-0.96667	-0.75000	-0.45238	-0.41667	-0.29167	0.00000	0.08333
COL	-1.75000	-1.25000	-1.05000	-0.83333	-0.53571	-0.50000	-0.37500	-0.08333	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
3.26851

Abs(Dif)-LSD	2LT.	1LT.	GS15	GS13	MAJ	GS12	CAPT	LT.COL	COL
2LT.	-3.48240	-5.00616	-2.60370	-1.92670	-1.87253	-2.23240	-1.64085	-1.51232	-1.73240
1LT.	-5.00616	-6.96480	-5.19491	-4.70929	-4.55061	-4.75616	-4.34860	-4.15279	-4.25616
GS15	-2.60370	-5.19491	-3.11476	-2.40479	-2.36942	-2.75370	-2.13260	-2.01548	-2.25370
GS13	-1.92670	-4.70929	-2.40479	-2.01057	-2.04462	-2.51004	-1.78955	-1.71243	-2.01004
MAJ	-1.87253	-4.55061	-2.36942	-2.04462	-2.63245	-3.05111	-2.38814	-2.28756	-2.55111
GS12	-2.23240	-4.75616	-2.75370	-2.51004	-3.05111	-3.48240	-2.89085	-2.76232	-2.98240
CAPT	-1.64085	-4.34860	-2.13260	-1.78955	-2.38814	-2.89085	-2.46243	-2.36806	-2.64085
LT.COL	-1.51232	-4.15279	-2.01548	-1.71243	-2.28756	-2.76232	-2.36806	-2.84337	-3.09565
COL	-1.73240	-4.25616	-2.25370	-2.01004	-2.55111	-2.98240	-2.64085	-3.09565	-3.48240

Positive values show pairs of means that are significantly different.

Oneway Analysis of SCHEDULE VARIANCE S/U By Rank/Grade

Means Comparisons

Dif=Mean[i]-Mean[j]	1LT.	GS15	MAJ	GS13	LT.COL	2LT.	GS12	CAPT	COL
1LT.	0.00000	0.20000	0.57143	0.66667	1.16667	1.25000	1.25000	1.50000	1.75000
GS15	-0.20000	0.00000	0.37143	0.46667	0.96667	1.05000	1.05000	1.30000	1.55000
MAJ	-0.57143	-0.37143	0.00000	0.09524	0.59524	0.67857	0.67857	0.92857	1.17857
GS13	-0.66667	-0.46667	-0.09524	0.00000	0.50000	0.58333	0.58333	0.83333	1.08333
LT.COL	-1.16667	-0.96667	-0.59524	-0.50000	0.00000	0.08333	0.08333	0.33333	0.58333
2LT.	-1.25000	-1.05000	-0.67857	-0.58333	-0.08333	0.00000	0.00000	0.25000	0.50000
GS12	-1.25000	-1.05000	-0.67857	-0.58333	-0.08333	0.00000	0.00000	0.25000	0.50000
CAPT	-1.50000	-1.30000	-0.92857	-0.83333	-0.33333	-0.25000	-0.25000	0.00000	0.25000
COL	-1.75000	-1.55000	-1.17857	-1.08333	-0.58333	-0.50000	-0.50000	-0.25000	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q^*
3.26851

Abs(Dif)-LSD	1LT.	GS15	MAJ	GS13	LT.COL	2LT.	GS12	CAPT	COL
1LT.	-7.88661	-5.90894	-5.39029	-5.13772	-4.85683	-4.98491	-4.98491	-4.41496	-4.48491
GS15	-5.90894	-3.52700	-2.89394	-2.50174	-2.41018	-2.69095	-2.69095	-1.87919	-2.19095
MAJ	-5.39029	-2.89394	-2.98086	-2.55700	-2.50734	-2.81679	-2.81679	-1.95763	-2.31679
GS13	-5.13772	-2.50174	-2.55700	-2.27667	-2.28834	-2.63636	-2.63636	-1.71206	-2.13636
LT.COL	-4.85683	-2.41018	-2.50734	-2.28834	-3.21969	-3.51639	-3.51639	-2.67841	-3.01639
2LT.	-4.98491	-2.69095	-2.81679	-2.63636	-3.51639	-3.94330	-3.94330	-3.16500	-3.44330
GS12	-4.98491	-2.69095	-2.81679	-2.63636	-3.51639	-3.94330	-3.94330	-3.16500	-3.44330
CAPT	-4.41496	-1.87919	-1.95763	-1.71206	-2.67841	-3.16500	-3.16500	-2.78834	-3.16500
COL	-4.48491	-2.19095	-2.31679	-2.13636	-3.01639	-3.44330	-3.44330	-3.16500	-3.94330

Positive values show pairs of means that are significantly different.

Oneway Analysis of SPI S/I By Rank/Grade

Means Comparisons

Dif=Mean[i]-Mean[j]	GS12	CAPT	2LT.	LT.COL	GS15	GS13	MAJ	COL	1LT.
GS12	0.00000	0.12500	0.25000	0.58333	0.95000	1.02273	1.17857	1.75000	1.75000
CAPT	-0.12500	0.00000	0.12500	0.45833	0.82500	0.89773	1.05357	1.62500	1.62500
2LT.	-0.25000	-0.12500	0.00000	0.33333	0.70000	0.77273	0.92857	1.50000	1.50000
LT.COL	-0.58333	-0.45833	-0.33333	0.00000	0.36667	0.43939	0.59524	1.16667	1.16667
GS15	-0.95000	-0.82500	-0.70000	-0.36667	0.00000	0.07273	0.22857	0.80000	0.80000
GS13	-1.02273	-0.89773	-0.77273	-0.43939	-0.07273	0.00000	0.15584	0.72727	0.72727
MAJ	-1.17857	-1.05357	-0.92857	-0.59524	-0.22857	-0.15584	0.00000	0.57143	0.57143
COL	-1.75000	-1.62500	-1.50000	-1.16667	-0.80000	-0.72727	-0.57143	0.00000	0.00000
1LT.	-1.75000	-1.62500	-1.50000	-1.16667	-0.80000	-0.72727	-0.57143	0.00000	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
3.27268

Abs(Dif)-LSD	GS12	CAPT	2LT.	LT.COL	GS15	GS13	MAJ	COL	1LT.
GS12	-3.94505	-3.29151	-3.69505	-3.01798	-2.79260	-2.23479	-2.31834	-2.19505	-4.48766
CAPT	-3.29151	-2.78957	-3.29151	-2.55474	-2.35560	-1.69468	-1.83391	-1.79151	-4.29257
2LT.	-3.69505	-3.29151	-3.94505	-3.26798	-3.04260	-2.48479	-2.56834	-2.44505	-4.73766
LT.COL	-3.01798	-2.55474	-3.26798	-3.22112	-3.01167	-2.39213	-2.50871	-2.43465	-4.85949
GS15	-2.79260	-2.35560	-3.04260	-3.01167	-3.52856	-2.93644	-3.03824	-2.94260	-5.31164
GS13	-2.23479	-1.69468	-2.48479	-2.39213	-2.93644	-2.37895	-2.54163	-2.53024	-5.09995
MAJ	-2.31834	-1.83391	-2.56834	-2.50871	-3.03824	-2.54163	-2.98217	-2.92548	-5.39292
COL	-2.19505	-1.79151	-2.44505	-2.43465	-2.94260	-2.53024	-2.92548	-3.94505	-6.23766
1LT.	-4.48766	-4.29257	-4.73766	-4.85949	-5.31164	-5.09995	-5.39292	-6.23766	-7.89009

Positive values show pairs of means that are significantly different.

Oneway Analysis of SPI S/U By Rank/Grade

Means Comparisons

Dif=Mean[i]-Mean[j]	GS12	LT.COL	GS15	MAJ	CAPT	GS13	1LT.	2LT.	COL
GS12	0.00000	0.25000	0.45000	0.53571	0.62500	0.97727	1.25000	1.50000	2.25000
LT.COL	-0.25000	0.00000	0.20000	0.28571	0.37500	0.72727	1.00000	1.25000	2.00000
GS15	-0.45000	-0.20000	0.00000	0.08571	0.17500	0.52727	0.80000	1.05000	1.80000
MAJ	-0.53571	-0.28571	-0.08571	0.00000	0.08929	0.44156	0.71429	0.96429	1.71429
CAPT	-0.62500	-0.37500	-0.17500	-0.08929	0.00000	0.35227	0.62500	0.87500	1.62500
GS13	-0.97727	-0.72727	-0.52727	-0.44156	-0.35227	0.00000	0.27273	0.52273	1.27273
1LT.	-1.25000	-1.00000	-0.80000	-0.71429	-0.62500	-0.27273	0.00000	0.25000	1.00000
2LT.	-1.50000	-1.25000	-1.05000	-0.96429	-0.87500	-0.52273	-0.25000	0.00000	0.75000
COL	-2.25000	-2.00000	-1.80000	-1.71429	-1.62500	-1.27273	-1.00000	-0.75000	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
3.27268

Abs(Dif)-LSD	GS12	LT.COL	GS15	MAJ	CAPT	GS13	1LT.	2LT.	COL
GS12	-4.27295	-3.65065	-3.60368	-3.25185	-3.07548	-2.55100	-5.50613	-2.77295	-2.02295
LT.COL	-3.65065	-3.48885	-3.45914	-3.07622	-2.88852	-2.33960	-5.52704	-2.65065	-1.90065
GS15	-3.60368	-3.45914	-3.82184	-3.45262	-3.26996	-2.73201	-5.81963	-3.00368	-2.25368
MAJ	-3.25185	-3.07622	-3.45262	-3.23005	-3.03819	-2.48013	-5.74581	-2.82328	-2.07328
CAPT	-3.07548	-2.88852	-3.26996	-3.03819	-3.02143	-2.45561	-5.78442	-2.82548	-2.07548
GS13	-2.55100	-2.33960	-2.73201	-2.48013	-2.45561	-2.57669	-6.03884	-3.00555	-2.25555
1LT.	-5.50613	-5.52704	-5.81963	-5.74581	-5.78442	-6.03884	-8.54590	-6.50613	-5.75613
2LT.	-2.77295	-2.65065	-3.00368	-2.82328	-2.82548	-3.00555	-6.50613	-4.27295	-3.52295
COL	-2.02295	-1.90065	-2.25368	-2.07328	-2.07548	-2.25555	-5.75613	-3.52295	-4.27295

Positive values show pairs of means that are significantly different.

Oneway Analysis of COST VARIANCE S/I By Rank/Grade

Means Comparisons

Dif=Mean[i]-Mean[j]	2LT.	GS13	1LT.	GS15	COL	GS12	LT.COL	CAPT	MAJ
2LT.	0.00000	0.40909	0.50000	0.70000	0.75000	1.00000	1.00000	1.25000	1.78571
GS13	-0.40909	0.00000	0.09091	0.29091	0.34091	0.59091	0.59091	0.84091	1.37662
1LT.	-0.50000	-0.09091	0.00000	0.20000	0.25000	0.50000	0.50000	0.75000	1.28571
GS15	-0.70000	-0.29091	-0.20000	0.00000	0.05000	0.30000	0.30000	0.55000	1.08571
COL	-0.75000	-0.34091	-0.25000	-0.05000	0.00000	0.25000	0.25000	0.50000	1.03571
GS12	-1.00000	-0.59091	-0.50000	-0.30000	-0.25000	0.00000	0.00000	0.25000	0.78571
LT.COL	-1.00000	-0.59091	-0.50000	-0.30000	-0.25000	0.00000	0.00000	0.25000	0.78571
CAPT	-1.25000	-0.84091	-0.75000	-0.55000	-0.50000	-0.25000	-0.25000	0.00000	0.53571
MAJ	-1.78571	-1.37662	-1.28571	-1.08571	-1.03571	-0.78571	-0.78571	-0.53571	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
3.27268

Abs(Dif)-LSD	2LT.	GS13	1LT.	GS15	COL	GS12	LT.COL	CAPT	MAJ
2LT.	-3.52048	-2.49785	-5.06637	-2.63982	-2.77048	-2.52048	-2.21374	-1.79882	-1.33486
GS13	-2.49785	-2.12293	-5.10918	-2.39441	-2.56603	-2.31603	-1.93588	-1.47250	-1.03055
1LT.	-5.06637	-5.10918	-7.04096	-5.25390	-5.31637	-5.06637	-4.87762	-4.53072	-4.03675
GS15	-2.63982	-2.39441	-5.25390	-3.14881	-3.28982	-3.03982	-2.71476	-2.28830	-1.82952
COL	-2.77048	-2.56603	-5.31637	-3.28982	-3.52048	-3.27048	-2.96374	-2.54882	-2.08486
GS12	-2.52048	-2.31603	-5.06637	-3.03982	-3.27048	-3.52048	-3.21374	-2.79882	-2.33486
LT.COL	-2.21374	-1.93588	-4.87762	-2.71476	-2.96374	-3.21374	-2.87446	-2.43881	-1.98418
CAPT	-1.79882	-1.47250	-4.53072	-2.28830	-2.54882	-2.79882	-2.43881	-2.48935	-2.04101
MAJ	-1.33486	-1.03055	-4.03675	-1.82952	-2.08486	-2.33486	-1.98418	-2.04101	-2.66123

Positive values show pairs of means that are significantly different.

Oneway Analysis of COST VARIANCE S/U By Rank/Grade

Means Comparisons

Dif=Mean[i]-Mean[j]	1LT.	GS15	GS13	LT.COL	GS12	CAPT	MAJ	2LT.	COL
1LT.	0.00000	0.00000	0.18182	0.83333	1.00000	1.00000	1.14286	1.25000	1.25000
GS15	0.00000	0.00000	0.18182	0.83333	1.00000	1.00000	1.14286	1.25000	1.25000
GS13	-0.18182	-0.18182	0.00000	0.65152	0.81818	0.81818	0.96104	1.06818	1.06818
LT.COL	-0.83333	-0.83333	-0.65152	0.00000	0.16667	0.16667	0.30952	0.41667	0.41667
GS12	-1.00000	-1.00000	-0.81818	-0.16667	0.00000	0.00000	0.14286	0.25000	0.25000
CAPT	-1.00000	-1.00000	-0.81818	-0.16667	0.00000	0.00000	0.14286	0.25000	0.25000
MAJ	-1.14286	-1.14286	-0.96104	-0.30952	-0.14286	-0.14286	0.00000	0.10714	0.10714
2LT.	-1.25000	-1.25000	-1.06818	-0.41667	-0.25000	-0.25000	-0.10714	0.00000	0.00000
COL	-1.25000	-1.25000	-1.06818	-0.41667	-0.25000	-0.25000	-0.10714	0.00000	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
3.27268

Abs(Dif)-LSD	1LT.	GS15	GS13	LT.COL	GS12	CAPT	MAJ	2LT.	COL
1LT.	-8.39296	-6.50116	-6.01679	-5.57689	-5.63522	-5.29472	-5.20162	-5.38522	-5.38522
GS15	-6.50116	-3.75345	-3.01913	-2.76032	-2.98113	-2.38331	-2.33216	-2.73113	-2.73113
GS13	-6.01679	-3.01913	-2.53057	-2.36047	-2.64695	-1.93945	-1.90836	-2.39695	-2.39695
LT.COL	-5.57689	-2.76032	-2.36047	-3.42641	-3.66418	-3.03845	-2.99225	-3.41418	-3.41418
GS12	-5.63522	-2.98113	-2.64695	-3.66418	-4.19648	-3.63426	-3.57692	-3.94648	-3.94648
CAPT	-5.29472	-2.38331	-1.93945	-3.03845	-3.63426	-2.96736	-2.92865	-3.38426	-3.38426
MAJ	-5.20162	-2.33216	-1.90836	-2.99225	-3.57692	-2.92865	-3.17224	-3.61264	-3.61264
2LT.	-5.38522	-2.73113	-2.39695	-3.41418	-3.94648	-3.38426	-3.61264	-4.19648	-4.19648
COL	-5.38522	-2.73113	-2.39695	-3.41418	-3.94648	-3.38426	-3.61264	-4.19648	-4.19648

Positive values show pairs of means that are significantly different.

Oneway Analysis of CPI S/I By Rank/Grade

Means Comparisons

Dif=Mean[i]-Mean[j]	2LT.	CAPT	LT.COL	GS13	GS12	COL	GS15	MAJ	1LT.
2LT.	0.00000	0.25000	0.50000	0.63636	1.00000	1.25000	1.40000	1.42857	2.00000
CAPT	-0.25000	0.00000	0.25000	0.38636	0.75000	1.00000	1.15000	1.17857	1.75000
LT.COL	-0.50000	-0.25000	0.00000	0.13636	0.50000	0.75000	0.90000	0.92857	1.50000
GS13	-0.63636	-0.38636	-0.13636	0.00000	0.36364	0.61364	0.76364	0.79221	1.36364
GS12	-1.00000	-0.75000	-0.50000	-0.36364	0.00000	0.25000	0.40000	0.42857	1.00000
COL	-1.25000	-1.00000	-0.75000	-0.61364	-0.25000	0.00000	0.15000	0.17857	0.75000
GS15	-1.40000	-1.15000	-0.90000	-0.76364	-0.40000	-0.15000	0.00000	0.02857	0.60000
MAJ	-1.42857	-1.17857	-0.92857	-0.79221	-0.42857	-0.17857	-0.02857	0.00000	0.57143
1LT.	-2.00000	-1.75000	-1.50000	-1.36364	-1.00000	-0.75000	-0.60000	-0.57143	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
3.27268

Abs(Dif)-LSD	2LT.	CAPT	LT.COL	GS13	GS12	COL	GS15	MAJ	1LT.
2LT.	-4.01162	-3.22416	-3.16209	-2.67612	-3.01162	-2.76162	-2.40575	-2.12735	-4.34292
CAPT	-3.22416	-2.83664	-2.81392	-2.24979	-2.72416	-2.47416	-2.08427	-1.75763	-4.26743
LT.COL	-3.16209	-2.81392	-3.27547	-2.74294	-3.16209	-2.91209	-2.53534	-2.22775	-4.62785
GS13	-2.67612	-2.24979	-2.74294	-2.41910	-2.94885	-2.69885	-2.29630	-1.95079	-4.56191
GS12	-3.01162	-2.72416	-3.16209	-2.94885	-4.01162	-3.76162	-3.40575	-3.12735	-5.34292
COL	-2.76162	-2.47416	-2.91209	-2.69885	-3.76162	-4.01162	-3.65575	-3.37735	-5.59292
GS15	-2.40575	-2.08427	-2.53534	-2.29630	-3.40575	-3.65575	-3.58810	-3.29336	-5.61477
MAJ	-2.12735	-1.75763	-2.22775	-1.95079	-3.12735	-3.37735	-3.29336	-3.03250	-5.49357
1LT.	-4.34292	-4.26743	-4.62785	-4.56191	-5.34292	-5.59292	-5.61477	-5.49357	-8.02323

Positive values show pairs of means that are significantly different.

Oneway Analysis of CPI S/U By Rank/Grade

Means Comparisons

Dif=Mean[i]-Mean[j]	LT.COL	CAPT	GS15	GS13	GS12	MAJ	2LT.	COL	1LT.
LT.COL	0.00000	0.37500	0.50000	0.68182	0.75000	0.78571	1.00000	1.25000	1.50000
CAPT	-0.37500	0.00000	0.12500	0.30682	0.37500	0.41071	0.62500	0.87500	1.12500
GS15	-0.50000	-0.12500	0.00000	0.18182	0.25000	0.28571	0.50000	0.75000	1.00000
GS13	-0.68182	-0.30682	-0.18182	0.00000	0.06818	0.10390	0.31818	0.56818	0.81818
GS12	-0.75000	-0.37500	-0.25000	-0.06818	0.00000	0.03571	0.25000	0.50000	0.75000
MAJ	-0.78571	-0.41071	-0.28571	-0.10390	-0.03571	0.00000	0.21429	0.46429	0.71429
2LT.	-1.00000	-0.62500	-0.50000	-0.31818	-0.25000	-0.21429	0.00000	0.25000	0.50000
COL	-1.25000	-0.87500	-0.75000	-0.56818	-0.50000	-0.46429	-0.25000	0.00000	0.25000
1LT.	-1.50000	-1.12500	-1.00000	-0.81818	-0.75000	-0.71429	-0.50000	-0.25000	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
3.27268

Abs(Dif)-LSD	LT.COL	CAPT	GS15	GS13	GS12	MAJ	2LT.	COL	1LT.
LT.COL	-3.73190	-3.11587	-3.41405	-2.59870	-3.42239	-2.81043	-3.17239	-2.92239	-5.48174
CAPT	-3.11587	-3.23192	-3.55995	-2.69667	-3.58328	-2.93464	-3.33328	-3.08328	-5.73093
GS15	-3.41405	-3.55995	-4.08809	-3.30452	-4.08607	-3.49912	-3.83607	-3.58607	-6.08078
GS13	-2.59870	-2.69667	-3.30452	-2.75619	-3.70589	-3.02133	-3.45589	-3.20589	-5.93308
GS12	-3.42239	-3.58328	-4.08607	-3.70589	-4.57062	-4.01571	-4.32062	-4.07062	-6.47679
MAJ	-2.81043	-2.93464	-3.49912	-3.02133	-4.01571	-3.45507	-3.83714	-3.58714	-6.19585
2LT.	-3.17239	-3.33328	-3.83607	-3.45589	-4.32062	-3.83714	-4.57062	-4.32062	-6.72679
COL	-2.92239	-3.08328	-3.58607	-3.20589	-4.07062	-3.58714	-4.32062	-4.57062	-6.97679
1LT.	-5.48174	-5.73093	-6.08078	-5.93308	-6.47679	-6.19585	-6.72679	-6.97679	-9.14125

Positive values show pairs of means that are significantly different.

Oneway Analysis of ACTIVITY DEVIATION S/I By Rank/Grade

Means Comparisons

Dif=Mean[i]-Mean[j]	GS12	GS13	2LT.	GS15	CAPT	COL	1LT.	LT.COL	MAJ
GS12	0.00000	0.16667	0.75000	1.10000	1.25000	1.50000	1.50000	1.50000	1.50000
GS13	-0.16667	0.00000	0.58333	0.93333	1.08333	1.33333	1.33333	1.33333	1.33333
2LT.	-0.75000	-0.58333	0.00000	0.35000	0.50000	0.75000	0.75000	0.75000	0.75000
GS15	-1.10000	-0.93333	-0.35000	0.00000	0.15000	0.40000	0.40000	0.40000	0.40000
CAPT	-1.25000	-1.08333	-0.50000	-0.15000	0.00000	0.25000	0.25000	0.25000	0.25000
COL	-1.50000	-1.33333	-0.75000	-0.40000	-0.25000	0.00000	0.00000	0.00000	0.00000
1LT.	-1.50000	-1.33333	-0.75000	-0.40000	-0.25000	0.00000	0.00000	0.00000	0.00000
LT.COL	-1.50000	-1.33333	-0.75000	-0.40000	-0.25000	0.00000	0.00000	0.00000	0.00000
MAJ	-1.50000	-1.33333	-0.75000	-0.40000	-0.25000	0.00000	0.00000	0.00000	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
3.26851

Abs(Dif)-LSD	GS12	GS13	2LT.	GS15	CAPT	COL	1LT.	LT.COL	MAJ
GS12	-4.08356	-3.16755	-3.33356	-2.77401	-2.28647	-2.58356	-4.95668	-2.22777	-2.11969
GS13	-3.16755	-2.35765	-2.75088	-2.14066	-1.55260	-2.00088	-4.67751	-1.55418	-1.41324
2LT.	-3.33356	-2.75088	-4.08356	-3.52401	-3.03647	-3.33356	-5.70668	-2.97777	-2.86969
GS15	-2.77401	-2.14066	-3.52401	-3.65245	-3.14227	-3.47401	-5.92623	-3.09696	-2.98151
CAPT	-2.28647	-1.55260	-3.03647	-3.14227	-2.88752	-3.28647	-5.87535	-2.86887	-2.73886
COL	-2.58356	-2.00088	-3.33356	-3.47401	-3.28647	-4.08356	-6.45668	-3.72777	-3.61969
1LT.	-4.95668	-4.67751	-5.70668	-5.92623	-5.87535	-6.45668	-8.16713	-6.23775	-6.17377
LT.COL	-2.22777	-1.55418	-2.97777	-3.09696	-2.86887	-3.72777	-6.23775	-3.33422	-3.21293
MAJ	-2.11969	-1.41324	-2.86969	-2.98151	-2.73886	-3.61969	-6.17377	-3.21293	-3.08688

Positive values show pairs of means that are significantly different.

Oneway Analysis of ACTIVITY DEVIATION S/U By Rank/Grade

Means Comparisons

Dif=Mean[i]-Mean[j]	GS12	GS13	GS15	MAJ	LT.COL	1LT.	2LT.	CAPT	COL
GS12	0.00000	0.00000	0.60000	0.71429	0.83333	1.00000	1.75000	1.75000	2.00000
GS13	0.00000	0.00000	0.60000	0.71429	0.83333	1.00000	1.75000	1.75000	2.00000
GS15	-0.60000	-0.60000	0.00000	0.11429	0.23333	0.40000	1.15000	1.15000	1.40000
MAJ	-0.71429	-0.71429	-0.11429	0.00000	0.11905	0.28571	1.03571	1.03571	1.28571
LT.COL	-0.83333	-0.83333	-0.23333	-0.11905	0.00000	0.16667	0.91667	0.91667	1.16667
1LT.	-1.00000	-1.00000	-0.40000	-0.28571	-0.16667	0.00000	0.75000	0.75000	1.00000
2LT.	-1.75000	-1.75000	-1.15000	-1.03571	-0.91667	-0.75000	0.00000	0.00000	0.25000
CAPT	-1.75000	-1.75000	-1.15000	-1.03571	-0.91667	-0.75000	0.00000	0.00000	0.25000
COL	-2.00000	-2.00000	-1.40000	-1.28571	-1.16667	-1.00000	-0.25000	-0.25000	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
3.26851

Abs(Dif)-LSD	GS12	GS13	GS15	MAJ	LT.COL	1LT.	2LT.	CAPT	COL
GS12	-4.21529	-3.44177	-3.39897	-3.02217	-3.01468	-5.66495	-2.46529	-1.90055	-2.21529
GS13	-3.44177	-2.43370	-2.57315	-2.12089	-2.14732	-5.20473	-1.69177	-0.97096	-1.44177
GS15	-3.39897	-2.57315	-3.77027	-3.37630	-3.37642	-6.13029	-2.84897	-2.24847	-2.59897
MAJ	-3.02217	-2.12089	-3.37630	-3.18646	-3.19752	-6.08720	-2.70074	-2.04956	-2.45074
LT.COL	-3.01468	-2.14732	-3.37642	-3.19752	-3.44177	-6.27229	-2.93135	-2.30281	-2.68135
1LT.	-5.66495	-5.20473	-6.13029	-6.08720	-6.27229	-8.43057	-5.91495	-5.57293	-5.66495
2LT.	-2.46529	-1.69177	-2.84897	-2.70074	-2.93135	-5.91495	-4.21529	-3.65055	-3.96529
CAPT	-1.90055	-0.97096	-2.24847	-2.04956	-2.30281	-5.57293	-3.65055	-2.98066	-3.40055
COL	-2.21529	-1.44177	-2.59897	-2.45074	-2.68135	-5.66495	-3.96529	-3.40055	-4.21529

Positive values show pairs of means that are significantly different.

Oneway Analysis of RESOURCE OFFSET S/I By Rank/Grade

Means Comparisons

Dif=Mean[i]-Mean[j]	2LT.	GS12	GS15	1LT.	GS13	MAJ	LT.COL	CAPT	COL
2LT.	0.00000	0.50000	0.60000	1.00000	1.09091	1.42857	1.83333	1.87500	2.33333
GS12	-0.50000	0.00000	0.10000	0.50000	0.59091	0.92857	1.33333	1.37500	1.83333
GS15	-0.60000	-0.10000	0.00000	0.40000	0.49091	0.82857	1.23333	1.27500	1.73333
1LT.	-1.00000	-0.50000	-0.40000	0.00000	0.09091	0.42857	0.83333	0.87500	1.33333
GS13	-1.09091	-0.59091	-0.49091	-0.09091	0.00000	0.33766	0.74242	0.78409	1.24242
MAJ	-1.42857	-0.92857	-0.82857	-0.42857	-0.33766	0.00000	0.40476	0.44643	0.90476
LT.COL	-1.83333	-1.33333	-1.23333	-0.83333	-0.74242	-0.40476	0.00000	0.04167	0.50000
CAPT	-1.87500	-1.37500	-1.27500	-0.87500	-0.78409	-0.44643	-0.04167	0.00000	0.45833
COL	-2.33333	-1.83333	-1.73333	-1.33333	-1.24242	-0.90476	-0.50000	-0.45833	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q^*
3.27706

Abs(Dif)-LSD	2LT.	GS12	GS15	1LT.	GS13	MAJ	LT.COL	CAPT	COL
2LT.	-3.64915	-3.14915	-2.86189	-4.76982	-1.92228	-1.80606	-1.49787	-1.28526	-1.60820
GS12	-3.14915	-3.64915	-3.36189	-5.26982	-2.42228	-2.30606	-1.99787	-1.78526	-2.10820
GS15	-2.86189	-3.36189	-3.26390	-5.25325	-2.29256	-2.19322	-1.89162	-1.66704	-2.03550
1LT.	-4.76982	-5.26982	-5.25325	-7.29831	-5.29925	-5.08843	-4.74084	-4.59873	-4.62571
GS13	-1.92228	-2.42228	-2.29256	-5.29925	-2.20052	-2.15750	-1.87672	-1.61387	-2.11893
MAJ	-1.80606	-2.30606	-2.19322	-5.08843	-2.15750	-2.75850	-2.46638	-2.22448	-2.65645
LT.COL	-1.49787	-1.99787	-1.89162	-4.74084	-1.87672	-2.46638	-2.97952	-2.74542	-3.14915
CAPT	-1.28526	-1.78526	-1.66704	-4.59873	-1.61387	-2.22448	-2.74542	-2.58034	-3.03547
COL	-1.60820	-2.10820	-2.03550	-4.62571	-2.11893	-2.65645	-3.14915	-3.03547	-4.21368

Positive values show pairs of means that are significantly different.

Oneway Analysis of RESOURCE OFFSET S/U By Rank/Grade

Means Comparisons

Dif=Mean[i]-Mean[j]	GS15	GS12	GS13	1LT.	2LT.	MAJ	COL	CAPT	LT.COL
GS15	0.00000	0.15000	0.40000	0.40000	0.90000	0.97143	1.40000	1.52500	1.56667
GS12	-0.15000	0.00000	0.25000	0.25000	0.75000	0.82143	1.25000	1.37500	1.41667
GS13	-0.40000	-0.25000	0.00000	0.00000	0.50000	0.57143	1.00000	1.12500	1.16667
1LT.	-0.40000	-0.25000	0.00000	0.00000	0.50000	0.57143	1.00000	1.12500	1.16667
2LT.	-0.90000	-0.75000	-0.50000	-0.50000	0.00000	0.07143	0.50000	0.62500	0.66667
MAJ	-0.97143	-0.82143	-0.57143	-0.57143	-0.07143	0.00000	0.42857	0.55357	0.59524
COL	-1.40000	-1.25000	-1.00000	-1.00000	-0.50000	-0.42857	0.00000	0.12500	0.16667
CAPT	-1.52500	-1.37500	-1.12500	-1.12500	-0.62500	-0.55357	-0.12500	0.00000	0.04167
LT.COL	-1.56667	-1.41667	-1.16667	-1.16667	-0.66667	-0.59524	-0.16667	-0.04167	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q^*
3.27706

Abs(Dif)-LSD	GS15	GS12	GS13	1LT.	2LT.	MAJ	COL	CAPT	LT.COL
GS15	-3.56542	-3.63170	-2.64060	-5.77549	-2.88170	-2.32951	-2.71699	-1.68883	-1.84696
GS12	-3.63170	-3.98626	-3.04155	-6.05283	-3.23626	-2.71201	-3.05565	-2.07720	-2.22227
GS13	-2.64060	-3.04155	-2.40381	-5.88810	-2.79155	-2.15423	-2.67187	-1.49449	-1.69443
1LT.	-5.77549	-6.05283	-5.88810	-7.97252	-5.80283	-5.45523	-5.50954	-4.85439	-4.92245
2LT.	-2.88170	-3.23626	-2.79155	-5.80283	-3.98626	-3.46201	-3.80565	-2.82720	-2.97227
MAJ	-2.32951	-2.71201	-2.15423	-5.45523	-3.46201	-3.01333	-3.46162	-2.36407	-2.54113
COL	-2.71699	-3.05565	-2.67187	-5.50954	-3.80565	-3.46162	-4.60294	-3.69155	-3.81959
CAPT	-1.68883	-2.07720	-1.49449	-4.85439	-2.82720	-2.36407	-3.69155	-2.81871	-3.00289
LT.COL	-1.84696	-2.22227	-1.69443	-4.92245	-2.97227	-2.54113	-3.81959	-3.00289	-3.25477

Positive values show pairs of means that are significantly different.

Oneway Analysis of SCHEDULE VARIANCE R/I By Rank/Grade

Means Comparisons

Dif=Mean[i]-Mean[j]	GS12	LT.COL	COL	GS13	MAJ	CAPT	GS15	1LT.	2LT.
GS12	0.00000	0.08333	0.25000	0.40385	0.53571	1.00000	1.25000	1.25000	1.58333
LT.COL	-0.08333	0.00000	0.16667	0.32051	0.45238	0.91667	1.16667	1.16667	1.50000
COL	-0.25000	-0.16667	0.00000	0.15385	0.28571	0.75000	1.00000	1.00000	1.33333
GS13	-0.40385	-0.32051	-0.15385	0.00000	0.13187	0.59615	0.84615	0.84615	1.17949
MAJ	-0.53571	-0.45238	-0.28571	-0.13187	0.00000	0.46429	0.71429	0.71429	1.04762
CAPT	-1.00000	-0.91667	-0.75000	-0.59615	-0.46429	0.00000	0.25000	0.25000	0.58333
GS15	-1.25000	-1.16667	-1.00000	-0.84615	-0.71429	-0.25000	0.00000	0.00000	0.33333
1LT.	-1.25000	-1.16667	-1.00000	-0.84615	-0.71429	-0.25000	0.00000	0.00000	0.33333
2LT.	-1.58333	-1.50000	-1.33333	-1.17949	-1.04762	-0.58333	-0.33333	-0.33333	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
3.26851

Abs(Dif)-LSD	GS12	LT.COL	COL	GS13	MAJ	CAPT	GS15	1LT.	2LT.
GS12	-3.20706	-2.84429	-2.95706	-2.18940	-2.30704	-1.77739	-1.79248	-3.82080	-1.88068
LT.COL	-2.84429	-2.61855	-2.76096	-1.91796	-2.07092	-1.53276	-1.57969	-3.73219	-1.70706
COL	-2.95706	-2.76096	-3.20706	-2.43940	-2.55704	-2.02739	-2.04248	-4.07080	-2.13068
GS13	-2.18940	-1.91796	-2.43940	-1.77895	-1.99439	-1.44189	-1.54056	-3.86052	-1.72553
MAJ	-2.30704	-2.07092	-2.55704	-1.99439	-2.42431	-1.88304	-1.94141	-4.13433	-2.08215
CAPT	-1.77739	-1.53276	-2.02739	-1.44189	-1.88304	-2.26773	-2.33561	-4.56058	-2.48719
GS15	-1.79248	-1.57969	-2.04248	-1.54056	-1.94141	-2.33561	-2.86848	-4.96835	-2.97890
1LT.	-3.82080	-3.73219	-4.07080	-3.86052	-4.13433	-4.56058	-4.96835	-6.41411	-4.90377
2LT.	-1.88068	-1.70706	-2.13068	-1.72553	-2.08215	-2.48719	-2.97890	-4.90377	-3.70319

Positive values show pairs of means that are significantly different.

Oneway Analysis of SCHEDULE VARIANCE R/U By Rank/Grade

Means Comparisons

Dif=Mean[i]-Mean[j]	GS12	LT.COL	GS13	COL	MAJ	CAPT	GS15	1LT.	2LT.
GS12	0.00000	0.50000	0.57692	0.75000	0.78571	1.12500	1.50000	1.50000	1.83333
LT.COL	-0.50000	0.00000	0.07692	0.25000	0.28571	0.62500	1.00000	1.00000	1.33333
GS13	-0.57692	-0.07692	0.00000	0.17308	0.20879	0.54808	0.92308	0.92308	1.25641
COL	-0.75000	-0.25000	-0.17308	0.00000	0.03571	0.37500	0.75000	0.75000	1.08333
MAJ	-0.78571	-0.28571	-0.20879	-0.03571	0.00000	0.33929	0.71429	0.71429	1.04762
CAPT	-1.12500	-0.62500	-0.54808	-0.37500	-0.33929	0.00000	0.37500	0.37500	0.70833
GS15	-1.50000	-1.00000	-0.92308	-0.75000	-0.71429	-0.37500	0.00000	0.00000	0.33333
1LT.	-1.50000	-1.00000	-0.92308	-0.75000	-0.71429	-0.37500	0.00000	0.00000	0.33333
2LT.	-1.83333	-1.33333	-1.25641	-1.08333	-1.04762	-0.70833	-0.33333	-0.33333	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
3.26851

Abs(Dif)-LSD	GS12	LT.COL	GS13	COL	MAJ	CAPT	GS15	1LT.	2LT.
GS12	-3.24201	-2.45954	-2.04459	-2.49201	-2.08802	-1.68266	-1.57564	-3.62607	-1.66844
LT.COL	-2.45954	-2.64709	-2.18594	-2.70954	-2.26509	-1.85113	-1.77629	-3.95225	-1.90868
GS13	-2.04459	-2.18594	-1.79834	-2.44844	-1.94064	-1.51218	-1.48965	-3.83489	-1.68027
COL	-2.49201	-2.70954	-2.44844	-3.24201	-2.83802	-2.43266	-2.32564	-4.37607	-2.41844
MAJ	-2.08802	-2.26509	-1.94064	-2.83802	-2.45073	-2.03362	-1.97035	-4.18717	-2.11626
CAPT	-1.68266	-1.85113	-1.51218	-2.43266	-2.03362	-2.29245	-2.23879	-4.48801	-2.39565
GS15	-1.57564	-1.77629	-1.48965	-2.32564	-1.97035	-2.23879	-2.89974	-5.02250	-3.01500
1LT.	-3.62607	-3.95225	-3.83489	-4.37607	-4.18717	-4.48801	-5.02250	-6.48402	-4.96085
2LT.	-1.66844	-1.90868	-1.68027	-2.41844	-2.11626	-2.39565	-3.01500	-4.96085	-3.74355

Positive values show pairs of means that are significantly different.

Oneway Analysis of SPI R/I By Rank/Grade

Means Comparisons

Dif=Mean[i]-Mean[j]	GS13	1LT.	CAPT	GS15	2LT.	COL	LT.COL	MAJ	GS12
GS13	0.00000	0.15385	0.52885	0.55385	0.82051	0.90385	0.98718	1.15385	1.90385
1LT.	-0.15385	0.00000	0.37500	0.40000	0.66667	0.75000	0.83333	1.00000	1.75000
CAPT	-0.52885	-0.37500	0.00000	0.02500	0.29167	0.37500	0.45833	0.62500	1.37500
GS15	-0.55385	-0.40000	-0.02500	0.00000	0.26667	0.35000	0.43333	0.60000	1.35000
2LT.	-0.82051	-0.66667	-0.29167	-0.26667	0.00000	0.08333	0.16667	0.33333	1.08333
COL	-0.90385	-0.75000	-0.37500	-0.35000	-0.08333	0.00000	0.08333	0.25000	1.00000
LT.COL	-0.98718	-0.83333	-0.45833	-0.43333	-0.16667	-0.08333	0.00000	0.16667	0.91667
MAJ	-1.15385	-1.00000	-0.62500	-0.60000	-0.33333	-0.25000	-0.16667	0.00000	0.75000
GS12	-1.90385	-1.75000	-1.37500	-1.35000	-1.08333	-1.00000	-0.91667	-0.75000	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
3.27268

Abs(Dif)-LSD	GS13	1LT.	CAPT	GS15	2LT.	COL	LT.COL	MAJ	GS12
GS13	-1.81278	-4.64232	-1.54795	-1.87825	-2.13974	-1.73871	-1.29385	-1.12719	-0.73871
1LT.	-4.64232	-6.53607	-4.52705	-4.66282	-4.67001	-4.41722	-4.15867	-3.99201	-3.41722
CAPT	-1.54795	-4.52705	-2.31085	-2.60977	-2.83724	-2.45520	-2.03767	-1.87100	-1.45520
GS15	-1.87825	-4.66282	-2.60977	-2.92302	-3.10855	-2.75033	-2.36525	-2.19858	-1.75033
2LT.	-2.13974	-4.67001	-2.83724	-3.10855	-3.77360	-3.44655	-3.10137	-2.93470	-2.44655
COL	-1.73871	-4.41722	-2.45520	-2.75033	-3.44655	-3.26804	-2.89996	-2.73329	-2.26804
LT.COL	-1.29385	-4.15867	-2.03767	-2.36525	-3.10137	-2.89996	-2.66834	-2.50167	-2.06663
MAJ	-1.12719	-3.99201	-1.87100	-2.19858	-2.93470	-2.73329	-2.50167	-2.66834	-2.23329
GS12	-0.73871	-3.41722	-1.45520	-1.75033	-2.44655	-2.26804	-2.06663	-2.23329	-3.26804

Positive values show pairs of means that are significantly different.

Oneway Analysis of SPI R/U By Rank/Grade

Means Comparisons

Dif=Mean[i]-Mean[j]	GS13	1LT.	GS15	CAPT	2LT.	COL	LT.COL	MAJ	GS12
GS13	0.00000	0.30769	0.50769	0.68269	0.97436	1.05769	1.14103	1.30769	2.05769
1LT.	-0.30769	0.00000	0.20000	0.37500	0.66667	0.75000	0.83333	1.00000	1.75000
GS15	-0.50769	-0.20000	0.00000	0.17500	0.46667	0.55000	0.63333	0.80000	1.55000
CAPT	-0.68269	-0.37500	-0.17500	0.00000	0.29167	0.37500	0.45833	0.62500	1.37500
2LT.	-0.97436	-0.66667	-0.46667	-0.29167	0.00000	0.08333	0.16667	0.33333	1.08333
COL	-1.05769	-0.75000	-0.55000	-0.37500	-0.08333	0.00000	0.08333	0.25000	1.00000
LT.COL	-1.14103	-0.83333	-0.63333	-0.45833	-0.16667	-0.08333	0.00000	0.16667	0.91667
MAJ	-1.30769	-1.00000	-0.80000	-0.62500	-0.33333	-0.25000	-0.16667	0.00000	0.75000
GS12	-2.05769	-1.75000	-1.55000	-1.37500	-1.08333	-1.00000	-0.91667	-0.75000	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
3.27268

Abs(Dif)-LSD	GS13	1LT.	GS15	CAPT	2LT.	COL	LT.COL	MAJ	GS12
GS13	-1.79805	-4.44951	-1.90465	-1.37724	-1.96185	-1.56340	-1.12148	-0.95481	-0.56340
1LT.	-4.44951	-6.48298	-4.82169	-4.48723	-4.62666	-4.37524	-4.11812	-3.95145	-3.37524
GS15	-1.90465	-4.82169	-2.89927	-2.43837	-2.88113	-2.52515	-2.14251	-1.97584	-1.52515
CAPT	-1.37724	-4.48723	-2.43837	-2.29208	-2.81182	-2.43221	-2.01739	-1.85073	-1.43221
2LT.	-1.96185	-4.62666	-2.88113	-2.81182	-3.74295	-3.41787	-3.07482	-2.90815	-2.41787
COL	-1.56340	-4.37524	-2.52515	-2.43221	-3.41787	-3.24149	-2.87573	-2.70906	-2.24149
LT.COL	-1.12148	-4.11812	-2.14251	-2.01739	-3.07482	-2.87573	-2.64666	-2.48000	-2.04239
MAJ	-0.95481	-3.95145	-1.97584	-1.85073	-2.90815	-2.70906	-2.48000	-2.64666	-2.20906
GS12	-0.56340	-3.37524	-1.52515	-1.43221	-2.41787	-2.24149	-2.04239	-2.20906	-3.24149

Positive values show pairs of means that are significantly different.

Oneway Analysis of COST VARIANCE R/I By Rank/Grade

Means Comparisons

Dif=Mean[i]-Mean[j]	MAJ	LT.COL	GS13	GS12	CAPT	GS15	COL	2LT.	1LT.
MAJ	0.00000	0.76190	0.89011	0.92857	1.30357	1.62857	1.67857	1.76190	2.42857
LT.COL	-0.76190	0.00000	0.12821	0.16667	0.54167	0.86667	0.91667	1.00000	1.66667
GS13	-0.89011	-0.12821	0.00000	0.03846	0.41346	0.73846	0.78846	0.87179	1.53846
GS12	-0.92857	-0.16667	-0.03846	0.00000	0.37500	0.70000	0.75000	0.83333	1.50000
CAPT	-1.30357	-0.54167	-0.41346	-0.37500	0.00000	0.32500	0.37500	0.45833	1.12500
GS15	-1.62857	-0.86667	-0.73846	-0.70000	-0.32500	0.00000	0.05000	0.13333	0.80000
COL	-1.67857	-0.91667	-0.78846	-0.75000	-0.37500	-0.05000	0.00000	0.08333	0.75000
2LT.	-1.76190	-1.00000	-0.87179	-0.83333	-0.45833	-0.13333	-0.08333	0.00000	0.66667
1LT.	-2.42857	-1.66667	-1.53846	-1.50000	-1.12500	-0.80000	-0.75000	-0.66667	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q^*
3.26851

Abs(Dif)-LSD	MAJ	LT.COL	GS13	GS12	CAPT	GS15	COL	2LT.	1LT.
MAJ	-2.64644	-1.99260	-1.43097	-2.17466	-1.25884	-1.27046	-1.42466	-1.65464	-2.86431
LT.COL	-1.99260	-2.85848	-2.31537	-3.02922	-2.13220	-2.13134	-2.27922	-2.50091	-3.68107
GS13	-1.43097	-2.31537	-1.94196	-2.79240	-1.81133	-1.86695	-2.04240	-2.29941	-3.59948
GS12	-2.17466	-3.02922	-2.79240	-3.50091	-2.65688	-2.62126	-2.75091	-2.94809	-4.03543
CAPT	-1.25884	-2.13220	-1.81133	-2.65688	-2.47552	-2.49753	-2.65688	-2.89354	-4.12637
GS15	-1.27046	-2.13134	-1.86695	-2.62126	-2.49753	-3.13131	-3.27126	-3.48240	-4.62359
COL	-1.42466	-2.27922	-2.04240	-2.75091	-2.65688	-3.27126	-3.50091	-3.69809	-4.78543
2LT.	-1.65464	-2.50091	-2.29941	-2.94809	-2.89354	-3.48240	-3.69809	-4.04251	-5.05030
1LT.	-2.86431	-3.68107	-3.59948	-4.03543	-4.12637	-4.62359	-4.78543	-5.05030	-7.00183

Positive values show pairs of means that are significantly different.

Oneway Analysis of COST VARIANCE R/U By Rank/Grade

Means Comparisons

Dif=Mean[i]-Mean[j]	MAJ	GS12	LT.COL	GS13	CAPT	COL	GS15	2LT.	1LT.
MAJ	0.00000	0.42857	0.59524	0.96703	1.42857	1.42857	1.62857	1.76190	2.42857
GS12	-0.42857	0.00000	0.16667	0.53846	1.00000	1.00000	1.20000	1.33333	2.00000
LT.COL	-0.59524	-0.16667	0.00000	0.37179	0.83333	0.83333	1.03333	1.16667	1.83333
GS13	-0.96703	-0.53846	-0.37179	0.00000	0.46154	0.46154	0.66154	0.79487	1.46154
CAPT	-1.42857	-1.00000	-0.83333	-0.46154	0.00000	0.00000	0.20000	0.33333	1.00000
COL	-1.42857	-1.00000	-0.83333	-0.46154	0.00000	0.00000	0.20000	0.33333	1.00000
GS15	-1.62857	-1.20000	-1.03333	-0.66154	-0.20000	-0.20000	0.00000	0.13333	0.80000
2LT.	-1.76190	-1.33333	-1.16667	-0.79487	-0.33333	-0.33333	-0.13333	0.00000	0.66667
1LT.	-2.42857	-2.00000	-1.83333	-1.46154	-1.00000	-1.00000	-0.80000	-0.66667	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q^*
3.26851

Abs(Dif)-LSD	MAJ	GS12	LT.COL	GS13	CAPT	COL	GS15	2LT.	1LT.
MAJ	-2.65843	-2.68871	-2.17174	-1.36456	-1.14544	-1.68871	-1.28359	-1.67011	-2.88829
GS12	-2.68871	-3.51677	-3.04369	-2.30523	-2.04561	-2.51677	-2.13630	-2.46521	-3.56051
LT.COL	-2.17174	-3.04369	-2.87143	-2.08285	-1.85265	-2.37703	-1.97825	-2.35011	-3.53862
GS13	-1.36456	-2.30523	-2.08285	-1.95075	-1.77333	-2.38215	-1.95567	-2.39070	-3.69967
CAPT	-1.14544	-2.04561	-1.85265	-1.77333	-2.48673	-3.04561	-2.63531	-3.03372	-4.27516
COL	-1.68871	-2.51677	-2.37703	-2.38215	-3.04561	-3.51677	-3.13630	-3.46521	-4.56051
GS15	-1.28359	-2.13630	-1.97825	-1.95567	-2.63531	-3.13630	-3.14550	-3.49877	-4.64816
2LT.	-1.67011	-2.46521	-2.35011	-2.39070	-3.03372	-3.46521	-3.49877	-4.06082	-5.07620
1LT.	-2.88829	-3.56051	-3.53862	-3.69967	-4.27516	-4.56051	-4.64816	-5.07620	-7.03354

Positive values show pairs of means that are significantly different.

Oneway Analysis of CPI R/I By Rank/Grade

Means Comparisons

Dif=Mean[i]-Mean[j]	GS13	GS12	2LT.	GS15	1LT.	CAPT	MAJ	LT.COL	COL
GS13	0.00000	0.17308	0.58974	0.72308	0.92308	0.92308	1.08974	2.08974	2.17308
GS12	-0.17308	0.00000	0.41667	0.55000	0.75000	0.75000	0.91667	1.91667	2.00000
2LT.	-0.58974	-0.41667	0.00000	0.13333	0.33333	0.33333	0.50000	1.50000	1.58333
GS15	-0.72308	-0.55000	-0.13333	0.00000	0.20000	0.20000	0.36667	1.36667	1.45000
1LT.	-0.92308	-0.75000	-0.33333	-0.20000	0.00000	0.00000	0.16667	1.16667	1.25000
CAPT	-0.92308	-0.75000	-0.33333	-0.20000	0.00000	0.00000	0.16667	1.16667	1.25000
MAJ	-1.08974	-0.91667	-0.50000	-0.36667	-0.16667	-0.16667	0.00000	1.00000	1.08333
LT.COL	-2.08974	-1.91667	-1.50000	-1.36667	-1.16667	-1.16667	-1.00000	0.00000	0.08333
COL	-2.17308	-2.00000	-1.58333	-1.45000	-1.25000	-1.25000	-1.08333	-0.08333	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
3.27268

Abs(Dif)-LSD	GS13	GS12	2LT.	GS15	1LT.	CAPT	MAJ	LT.COL	COL
GS13	-2.02027	-2.77194	-2.70934	-1.98740	-4.42205	-1.39143	-1.45237	-0.45237	-0.77194
GS12	-2.77194	-3.64209	-3.51724	-2.90519	-5.00865	-2.40414	-2.40809	-1.40809	-1.64209
2LT.	-2.70934	-3.51724	-4.20552	-3.62820	-5.61417	-3.15370	-3.14209	-2.14209	-2.35057
GS15	-1.98740	-2.90519	-3.62820	-3.25758	-5.44230	-2.73635	-2.75223	-1.75223	-2.00519
1LT.	-4.42205	-5.00865	-5.61417	-5.44230	-7.28418	-5.46313	-5.39672	-4.39672	-4.50865
CAPT	-1.39143	-2.40414	-3.15370	-2.73635	-5.46313	-2.57535	-2.61502	-1.61502	-1.90414
MAJ	-1.45237	-2.40809	-3.14209	-2.75223	-5.39672	-2.61502	-2.97375	-1.97375	-2.24142
LT.COL	-0.45237	-1.40809	-2.14209	-1.75223	-4.39672	-1.61502	-1.97375	-2.97375	-3.24142
COL	-0.77194	-1.64209	-2.35057	-2.00519	-4.50865	-1.90414	-2.24142	-3.24142	-3.64209

Positive values show pairs of means that are significantly different.

Oneway Analysis of CPI R/U By Rank/Grade

Means Comparisons

Dif=Mean[i]-Mean[j]	GS13	GS12	2LT.	CAPT	1LT.	GS15	MAJ	LT.COL	COL
GS13	0.00000	0.40385	0.48718	1.02885	1.15385	1.15385	1.32051	2.32051	2.40385
GS12	-0.40385	0.00000	0.08333	0.62500	0.75000	0.75000	0.91667	1.91667	2.00000
2LT.	-0.48718	-0.08333	0.00000	0.54167	0.66667	0.66667	0.83333	1.83333	1.91667
CAPT	-1.02885	-0.62500	-0.54167	0.00000	0.12500	0.12500	0.29167	1.29167	1.37500
1LT.	-1.15385	-0.75000	-0.66667	-0.12500	0.00000	0.00000	0.16667	1.16667	1.25000
GS15	-1.15385	-0.75000	-0.66667	-0.12500	0.00000	0.00000	0.16667	1.16667	1.25000
MAJ	-1.32051	-0.91667	-0.83333	-0.29167	-0.16667	-0.16667	0.00000	1.00000	1.08333
LT.COL	-2.32051	-1.91667	-1.83333	-1.29167	-1.16667	-1.16667	-1.00000	0.00000	0.08333
COL	-2.40385	-2.00000	-1.91667	-1.37500	-1.25000	-1.25000	-1.08333	-0.08333	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
3.27268

Abs(Dif)-LSD	GS13	GS12	2LT.	CAPT	1LT.	GS15	MAJ	LT.COL	COL
GS13	-1.90608	-2.37472	-2.62544	-1.15484	-3.88917	-1.40343	-1.07792	-0.07792	-0.37472
GS12	-2.37472	-3.43623	-3.62822	-2.35087	-4.68316	-2.50990	-2.22017	-1.22017	-1.43623
2LT.	-2.62544	-3.62822	-3.96782	-2.74828	-4.94468	-2.88226	-2.60290	-1.60290	-1.79489
CAPT	-1.15484	-2.35087	-2.74828	-2.42978	-5.02935	-2.64538	-2.33280	-1.33280	-1.60087
1LT.	-3.88917	-4.68316	-4.94468	-5.02935	-6.87247	-5.32339	-5.08227	-4.08227	-4.18316
GS15	-1.40343	-2.50990	-2.88226	-2.64538	-5.32339	-3.07346	-2.77595	-1.77595	-2.00990
MAJ	-1.07792	-2.22017	-2.60290	-2.33280	-5.08227	-2.77595	-2.80567	-1.80567	-2.05350
LT.COL	-0.07792	-1.22017	-1.60290	-1.33280	-4.08227	-1.77595	-1.80567	-2.80567	-3.05350
COL	-0.37472	-1.43623	-1.79489	-1.60087	-4.18316	-2.00990	-2.05350	-3.05350	-3.43623

Positive values show pairs of means that are significantly different.

Oneway Analysis of ACTIVITY DEVIATION R/I By Rank/Grade

Means Comparisons

Dif=Mean[i]-Mean[j]	1LT.	2LT.	CAPT	GS15	LT.COL	COL	MAJ	GS13	GS12
1LT.	0.00000	0.00000	0.00000	0.00000	0.33333	0.66667	1.16667	1.23077	1.25000
2LT.	0.00000	0.00000	0.00000	0.00000	0.33333	0.66667	1.16667	1.23077	1.25000
CAPT	0.00000	0.00000	0.00000	0.00000	0.33333	0.66667	1.16667	1.23077	1.25000
GS15	0.00000	0.00000	0.00000	0.00000	0.33333	0.66667	1.16667	1.23077	1.25000
LT.COL	-0.33333	-0.33333	-0.33333	-0.33333	0.00000	0.33333	0.83333	0.89744	0.91667
COL	-0.66667	-0.66667	-0.66667	-0.66667	-0.33333	0.00000	0.50000	0.56410	0.58333
MAJ	-1.16667	-1.16667	-1.16667	-1.16667	-0.83333	-0.50000	0.00000	0.06410	0.08333
GS13	-1.23077	-1.23077	-1.23077	-1.23077	-0.89744	-0.56410	-0.06410	0.00000	0.01923
GS12	-1.25000	-1.25000	-1.25000	-1.25000	-0.91667	-0.58333	-0.08333	-0.01923	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
3.27706

Abs(Dif)-LSD	1LT.	2LT.	CAPT	GS15	LT.COL	COL	MAJ	GS13	GS12
1LT.	-6.79116	-5.54496	-5.09337	-5.26041	-4.85350	-4.87829	-4.02017	-3.75258	-4.11888
2LT.	-5.54496	-3.92088	-3.25102	-3.50694	-3.06225	-3.25421	-2.22891	-1.84502	-2.41764
CAPT	-5.09337	-3.25102	-2.40104	-2.73760	-2.26008	-2.58435	-1.42675	-0.92708	-1.69066
GS15	-5.26041	-3.50694	-2.73760	-3.03710	-2.57447	-2.84027	-1.74113	-1.29625	-1.97133
LT.COL	-4.85350	-3.06225	-2.26008	-2.57447	-2.77248	-3.06225	-1.93915	-1.47262	-2.18306
COL	-4.87829	-3.25421	-2.58435	-2.84027	-3.06225	-3.92088	-2.89558	-2.51169	-3.08431
MAJ	-4.02017	-2.22891	-1.42675	-1.74113	-1.93915	-2.89558	-2.77248	-2.30595	-3.01639
GS13	-3.75258	-1.84502	-0.92708	-1.29625	-1.47262	-2.51169	-2.30595	-1.88353	-2.72646
GS12	-4.11888	-2.41764	-1.69066	-1.97133	-2.18306	-3.08431	-3.01639	-2.72646	-3.39558

Positive values show pairs of means that are significantly different.

Oneway Analysis of ACTIVITY DEVIATION R/U By Rank/Grade

Means Comparisons

Dif=Mean[i]-Mean[j]	1LT.	CAPT	GS15	2LT.	LT.COL	COL	MAJ	GS13	GS12
1LT.	0.00000	0.00000	0.00000	0.33333	0.33333	0.66667	1.16667	1.38462	2.00000
CAPT	0.00000	0.00000	0.00000	0.33333	0.33333	0.66667	1.16667	1.38462	2.00000
GS15	0.00000	0.00000	0.00000	0.33333	0.33333	0.66667	1.16667	1.38462	2.00000
2LT.	-0.33333	-0.33333	-0.33333	0.00000	0.00000	0.33333	0.83333	1.05128	1.66667
LT.COL	-0.33333	-0.33333	-0.33333	0.00000	0.00000	0.33333	0.83333	1.05128	1.66667
COL	-0.66667	-0.66667	-0.66667	-0.33333	-0.33333	0.00000	0.50000	0.71795	1.33333
MAJ	-1.16667	-1.16667	-1.16667	-0.83333	-0.83333	-0.50000	0.00000	0.21795	0.83333
GS13	-1.38462	-1.38462	-1.38462	-1.05128	-1.05128	-0.71795	-0.21795	0.00000	0.61538
GS12	-2.00000	-2.00000	-2.00000	-1.66667	-1.66667	-1.33333	-0.83333	-0.61538	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
3.27706

Abs(Dif)-LSD	1LT.	CAPT	GS15	2LT.	LT.COL	COL	MAJ	GS13	GS12
1LT.	-7.49356	-5.62017	-5.80448	-5.78513	-5.38996	-5.45180	-4.55663	-4.11415	-3.92418
CAPT	-5.62017	-2.64937	-3.02075	-3.25393	-2.52832	-2.92060	-1.69498	-0.99642	-1.24480
GS15	-5.80448	-3.02075	-3.35122	-3.53632	-2.87522	-3.20299	-2.04188	-1.40377	-1.55451
2LT.	-5.78513	-3.25393	-3.53632	-4.32641	-3.74678	-3.99307	-2.91344	-2.34263	-2.38032
LT.COL	-5.38996	-2.52832	-2.87522	-3.74678	-3.05923	-3.41344	-2.22590	-1.56390	-1.75366
COL	-5.45180	-2.92060	-3.20299	-3.99307	-3.41344	-4.32641	-3.24678	-2.67596	-2.71365
MAJ	-4.55663	-1.69498	-2.04188	-2.91344	-2.22590	-3.24678	-3.05923	-2.39724	-2.58699
GS13	-4.11415	-0.99642	-1.40377	-2.34263	-1.56390	-2.67596	-2.39724	-2.07834	-2.41429
GS12	-3.92418	-1.24480	-1.55451	-2.38032	-1.75366	-2.71365	-2.58699	-2.41429	-3.74678

Positive values show pairs of means that are significantly different.

Oneway Analysis of RESOURCE OFFSET R/I By Rank/Grade

Means Comparisons

Dif=Mean[i]-Mean[j]	1LT.	2LT.	LT.COL	GS15	CAPT	GS13	MAJ	COL	GS12
1LT.	0.00000	0.00000	0.50000	0.60000	1.00000	1.38462	1.50000	1.50000	2.25000
2LT.	0.00000	0.00000	0.50000	0.60000	1.00000	1.38462	1.50000	1.50000	2.25000
LT.COL	-0.50000	-0.50000	0.00000	0.10000	0.50000	0.88462	1.00000	1.00000	1.75000
GS15	-0.60000	-0.60000	-0.10000	0.00000	0.40000	0.78462	0.90000	0.90000	1.65000
CAPT	-1.00000	-1.00000	-0.50000	-0.40000	0.00000	0.38462	0.50000	0.50000	1.25000
GS13	-1.38462	-1.38462	-0.88462	-0.78462	-0.38462	0.00000	0.11538	0.11538	0.86538
MAJ	-1.50000	-1.50000	-1.00000	-0.90000	-0.50000	-0.11538	0.00000	0.00000	0.75000
COL	-1.50000	-1.50000	-1.00000	-0.90000	-0.50000	-0.11538	0.00000	0.00000	0.75000
GS12	-2.25000	-2.25000	-1.75000	-1.65000	-1.25000	-0.86538	-0.75000	-0.75000	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
3.28168

Abs(Dif)-LSD	1LT.	2LT.	LT.COL	GS15	CAPT	GS13	MAJ	COL	GS12
1LT.	-6.91280	-5.64428	-4.77974	-4.75463	-4.18460	-3.68800	-3.77974	-4.48666	-3.21505
2LT.	-5.64428	-3.99111	-2.95640	-2.96976	-2.30925	-1.74627	-1.95640	-2.96220	-1.48334
LT.COL	-4.77974	-2.95640	-2.82214	-2.85989	-2.13987	-1.52789	-1.82214	-2.99111	-1.40525
GS15	-4.75463	-2.96976	-2.85989	-3.09150	-2.38664	-1.78767	-2.05989	-3.18967	-1.62903
CAPT	-4.18460	-2.30925	-2.13987	-2.38664	-2.44405	-1.81189	-2.13987	-3.36437	-1.74333
GS13	-3.68800	-1.74627	-1.52789	-1.78767	-1.81189	-1.91727	-2.29712	-3.59739	-1.92949
MAJ	-3.77974	-1.95640	-1.82214	-2.05989	-2.13987	-2.29712	-2.82214	-3.99111	-2.40525
COL	-4.48666	-2.96220	-2.99111	-3.18967	-3.36437	-3.59739	-3.99111	-4.88809	-3.48321
GS12	-3.21505	-1.48334	-1.40525	-1.62903	-1.74333	-1.92949	-2.40525	-3.48321	-3.45640

Positive values show pairs of means that are significantly different.

Oneway Analysis of RESOURCE OFFSET R/U By Rank/Grade

Means Comparisons

Dif=Mean[i]-Mean[j]	1LT.	2LT.	LT.COL	GS15	CAPT	COL	MAJ	GS13	GS12
1LT.	0.00000	0.00000	0.50000	0.60000	1.12500	1.50000	1.50000	1.69231	2.25000
2LT.	0.00000	0.00000	0.50000	0.60000	1.12500	1.50000	1.50000	1.69231	2.25000
LT.COL	-0.50000	-0.50000	0.00000	0.10000	0.62500	1.00000	1.00000	1.19231	1.75000
GS15	-0.60000	-0.60000	-0.10000	0.00000	0.52500	0.90000	0.90000	1.09231	1.65000
CAPT	-1.12500	-1.12500	-0.62500	-0.52500	0.00000	0.37500	0.37500	0.56731	1.12500
COL	-1.50000	-1.50000	-1.00000	-0.90000	-0.37500	0.00000	0.00000	0.19231	0.75000
MAJ	-1.50000	-1.50000	-1.00000	-0.90000	-0.37500	0.00000	0.00000	0.19231	0.75000
GS13	-1.69231	-1.69231	-1.19231	-1.09231	-0.56731	-0.19231	-0.19231	0.00000	0.55769
GS12	-2.25000	-2.25000	-1.75000	-1.65000	-1.12500	-0.75000	-0.75000	-0.55769	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
3.28168

Abs(Dif)-LSD	1LT.	2LT.	LT.COL	GS15	CAPT	COL	MAJ	GS13	GS12
1LT.	-6.85533	-5.59736	-4.73585	-4.71012	-4.01650	-4.43689	-3.73585	-3.33813	-3.16962
2LT.	-5.59736	-3.95793	-2.92767	-2.94008	-2.15674	-2.92510	-1.92767	-1.41255	-1.45230
LT.COL	-4.73585	-2.92767	-2.79868	-2.83528	-1.99292	-2.95793	-1.79868	-1.20014	-1.37902
GS15	-4.71012	-2.94008	-2.83528	-3.06580	-2.23847	-3.15567	-2.03528	-1.45859	-1.60177
CAPT	-4.01650	-2.15674	-1.99292	-2.23847	-2.42373	-3.45725	-2.24292	-1.61094	-1.84345
COL	-4.43689	-2.92510	-2.95793	-3.15567	-3.45725	-4.84745	-3.95793	-3.48960	-3.44802
MAJ	-3.73585	-1.92767	-1.79868	-2.03528	-2.24292	-3.95793	-2.79868	-2.20014	-2.37902
GS13	-3.33813	-1.41255	-1.20014	-1.45859	-1.61094	-3.48960	-2.20014	-1.90133	-2.21395
GS12	-3.16962	-1.45230	-1.37902	-1.60177	-1.84345	-3.44802	-2.37902	-2.21395	-3.42767

Positive values show pairs of means that are significantly different.

Appendix E: Differences of Means Tests for Gender Variable

Oneway Analysis of COST S/I By Sex

Means Comparisons

Dif=Mean[i]-Mean[j]	0	1
0	0.00000	1.01190
1	-1.01190	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.00669

Abs(Dif)-LSD	0	1
0	-0.59664	0.11694
1	0.11694	-1.11621

Positive values show pairs of means that are significantly different.

Oneway Analysis of COST S/U By Sex

Means Comparisons

Dif=Mean[i]-Mean[j]	0	1
0	0.000000	0.939394
1	-0.93939	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.00763

Abs(Dif)-LSD	0	1
0	-0.71939	-0.17719
1	-0.17719	-1.40570

Positive values show pairs of means that are significantly different.

Oneway Analysis of SCHEDULE S/I By Sex

Means Comparisons

Dif=Mean[i]-Mean[j]	1	0
1	0.000000	0.404762
0	-0.40476	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.00669

Abs(Dif)-LSD	1	0
1	-0.8149	-0.24861
0	-0.24861	-0.43558

Positive values show pairs of means that are significantly different.

Oneway Analysis of SCHEDULE S/U By Sex

Means Comparisons

Dif=Mean[i]-Mean[j]	1	0
1	0.000000	0.028139
0	-0.02814	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.00763

Abs(Dif)-LSD	1	0
1	-0.93863	-0.71744
0	-0.71744	-0.48036

Positive values show pairs of means that are significantly different.

Oneway Analysis of PERFORMANCE S/I By Sex

Means Comparisons

Dif=Mean[i]-Mean[j]	1	0
1	0.000000	0.345238
0	-0.34524	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.00669

Abs(Dif)-LSD	1	0
1	-0.75103	-0.25692
0	-0.25692	-0.40144

Positive values show pairs of means that are significantly different.

Oneway Analysis of PERFORMANCE S/U By Sex

Means Comparisons

Dif=Mean[i]-Mean[j]	1	0
1	0.000000	0.305195
0	-0.30519	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.00763

Abs(Dif)-LSD	1	0
1	-0.94372	-0.44443
0	-0.44443	-0.48297

Positive values show pairs of means that are significantly different.

Oneway Analysis of EARNED VALUE S/I By Sex

Means Comparisons

Dif=Mean[i]-Mean[j]	0	1
0	0.000000	0.523810
1	-0.52381	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.00669

Abs(Dif)-LSD	0	1
0	-0.72356	-0.56154
1	-0.56154	-1.35367

Positive values show pairs of means that are significantly different.

Oneway Analysis of EARNED VALUE S/U By Sex

Means Comparisons

Dif=Mean[i]-Mean[j]	0	1
0	0.000000	0.034632
1	-0.03463	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.00763

Abs(Dif)-LSD	0	1
0	-0.84069	-1.27023
1	-1.27023	-1.64273

Positive values show pairs of means that are significantly different.

Oneway Analysis of STABILITY S/I By Sex

Means Comparisons

Dif=Mean[i]-Mean[j]	0	1
0	0.00000	1.03680
1	-1.03680	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.00763

Abs(Dif)-LSD	0	1
0	-0.64094	0.04198
1	0.04198	-1.25240

Positive values show pairs of means that are significantly different.

Oneway Analysis of STABILITY S/U By Sex

Means Comparisons

Dif=Mean[i]-Mean[j]	0	1
0	0.000000	0.989177
1	-0.98918	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.00763

Abs(Dif)-LSD	0	1
0	-0.71093	-0.11428
1	-0.11428	-1.38917

Positive values show pairs of means that are significantly different.

Oneway Analysis of COST R/I By Sex

Means Comparisons

Dif=Mean[i]-Mean[j]	1	0
1	0.00000	1.03571
0	-1.03571	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.00669

Abs(Dif)-LSD	1	0
1	-0.98269	0.247810
0	0.247810	-0.52527

Positive values show pairs of means that are significantly different.

Oneway Analysis of COST R/U By Sex

Means Comparisons

Dif=Mean[i]-Mean[j]	1	0
1	0.00000	1.08333
0	-1.08333	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.00669

Abs(Dif)-LSD	1	0
1	-1.04277	0.24726
0	0.24726	-0.55738

Positive values show pairs of means that are significantly different.

Oneway Analysis of SCHEDULE R/I By Sex

Means Comparisons

Dif=Mean[i]-Mean[j]	0	1
0	0.000000	0.523810
1	-0.52381	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.00669

Abs(Dif)-LSD	0	1
0	-0.52873	-0.26928
1	-0.26928	-0.98916

Positive values show pairs of means that are significantly different.

Oneway Analysis of SCHEDULE R/U By Sex

Means Comparisons

Dif=Mean[i]-Mean[j]	0	1
0	0.000000	0.130952
1	-0.13095	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.00669

Abs(Dif)-LSD	0	1
0	-0.58715	-0.74977
1	-0.74977	-1.09845

Positive values show pairs of means that are significantly different.

Oneway Analysis of PERFORMANCE R/I By Sex

Means Comparisons

Dif=Mean[i]-Mean[j]	0	1
0	0.000000	0.547619
1	-0.54762	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.00669

Abs(Dif)-LSD	0	1
0	-0.54452	-0.26915
1	-0.26915	-1.01870

Positive values show pairs of means that are significantly different.

Oneway Analysis of PERFORMANCE R/U By Sex

Means Comparisons

Dif=Mean[i]-Mean[j]	0	1
0	0.000000	0.714286
1	-0.71429	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.00669

Abs(Dif)-LSD	0	1
0	-0.53138	-0.08278
1	-0.08278	-0.99412

Positive values show pairs of means that are significantly different.

Oneway Analysis of EARNED VALUE R/I By Sex

Means Comparisons

Dif=Mean[i]-Mean[j]	1	0
1	0.000000	0.166667
0	-0.16667	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.00669

Abs(Dif)-LSD	1	0
1	-0.98822	-0.62568
0	-0.62568	-0.52823

Positive values show pairs of means that are significantly different.

Oneway Analysis of EARNED VALUE R/U By Sex

Means Comparisons

Dif=Mean[i]-Mean[j]	0	1
0	0.000000	0.011905
1	-0.0119	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.00669

Abs(Dif)-LSD	0	1
0	-0.61889	-0.91643
1	-0.91643	-1.15783

Positive values show pairs of means that are significantly different.

Oneway Analysis of STABILITY R/I By Sex

Means Comparisons

Dif=Mean[i]-Mean[j]	1	0
1	0.000000	0.083333
0	-0.08333	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.00669

Abs(Dif)-LSD	1	0
1	-1.19557	-0.87526
0	-0.87526	-0.63906

Positive values show pairs of means that are significantly different.

Oneway Analysis of STABILITY R/U By Sex

Means Comparisons

Dif=Mean[i]-Mean[j]	1	0
1	0.000000	0.345238
0	-0.34524	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.00669

Abs(Dif)-LSD	1	0
1	-1.20785	-0.62319
0	-0.62319	-0.64562

Positive values show pairs of means that are significantly different.

Oneway Analysis of SCHEDULE VARIANCE S/I By Sex

Means Comparisons

Dif=Mean[i]-Mean[j]	0	1
0	0.000000	0.239024
1	-0.23902	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.00962

Abs(Dif)-LSD	0	1
0	-0.65188	-0.80195
1	-0.80195	-1.31996

Positive values show pairs of means that are significantly different.

Oneway Analysis of SCHEDULE VARIANCE S/U By Sex

Means Comparisons

Dif=Mean[i]-Mean[j]	0	1
0	0.000000	0.297561
1	-0.29756	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.00962

Abs(Dif)-LSD	0	1
0	-0.73182	-0.87107
1	-0.87107	-1.48183

Positive values show pairs of means that are significantly different.

Oneway Analysis of SPI S/I By Sex

Means Comparisons

Dif=Mean[i]-Mean[j]	0	1
0	0.000000	0.924119
1	-0.92412	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.01067

Abs(Dif)-LSD	0	1
0	-0.72143	-0.27826
1	-0.27826	-1.53980

Positive values show pairs of means that are significantly different.

Oneway Analysis of SPI S/U By Sex

Means Comparisons

Dif=Mean[i]-Mean[j]	0	1
0	0.000000	0.967480
1	-0.96748	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.01067

Abs(Dif)-LSD	0	1
0	-0.78376	-0.33878
1	-0.33878	-1.67283

Positive values show pairs of means that are significantly different.

Oneway Analysis of COST VARIANCE S/I By Sex

Means Comparisons

Dif=Mean[i]-Mean[j]	0	1
0	0.000000	0.349593
1	-0.34959	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.01067

Abs(Dif)-LSD	0	1
0	-0.66266	-0.75483
1	-0.75483	-1.41436

Positive values show pairs of means that are significantly different.

Oneway Analysis of COST VARIANCE S/U By Sex

Means Comparisons

Dif=Mean[i]-Mean[j]	0	1
0	0.000000	0.046070
1	-0.04607	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.01067

Abs(Dif)-LSD	0	1
0	-0.77345	-1.24301
1	-1.24301	-1.65083

Positive values show pairs of means that are significantly different.

Oneway Analysis of CPI S/I By Sex

Means Comparisons

Dif=Mean[i]-Mean[j]	0	1
0	0.000000	0.921409
1	-0.92141	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.01067

Abs(Dif)-LSD	0	1
0	-0.73008	-0.29539
1	-0.29539	-1.55827

Positive values show pairs of means that are significantly different.

Oneway Analysis of CPI S/U By Sex

Means Comparisons

Dif=Mean[i]-Mean[j]	0	1
0	0.000000	0.777778
1	-0.77778	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.01067

Abs(Dif)-LSD	0	1
0	-0.81471	-0.58008
1	-0.58008	-1.73890

Positive values show pairs of means that are significantly different.

Oneway Analysis of ACTIVITY DEVIATION S/I By Sex

Means Comparisons

Dif=Mean[i]-Mean[j]	0	1
0	0.00000	1.45366
1	-1.45366	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.00962

Abs(Dif)-LSD	0	1
0	-0.72717	0.29246
1	0.29246	-1.47241

Positive values show pairs of means that are significantly different.

Oneway Analysis of ACTIVITY DEVIATION S/U By Sex

Means Comparisons

Dif=Mean[i]-Mean[j]	0	1
0	0.000000	0.941463
1	-0.94146	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.00962

Abs(Dif)-LSD	0	1
0	-0.80109	-0.33777
1	-0.33777	-1.62208

Positive values show pairs of means that are significantly different.

Oneway Analysis of RESOURCE OFFSET S/I By Sex

Means Comparisons

Dif=Mean[i]-Mean[j]	0	1
0	0.000000	0.925000
1	-0.925	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.01178

Abs(Dif)-LSD	0	1
0	-0.69682	-0.22470
1	-0.22470	-1.46903

Positive values show pairs of means that are significantly different.

Oneway Analysis of RESOURCE OFFSET S/U By Sex

Means Comparisons

Dif=Mean[i]-Mean[j]	0	1
0	0.000000	0.811111
1	-0.81111	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.01178

Abs(Dif)-LSD	0	1
0	-0.74610	-0.41989
1	-0.41989	-1.57292

Positive values show pairs of means that are significantly different.

Oneway Analysis of SCHEDULE VARIANCE R/I By Sex

Means Comparisons

Dif=Mean[i]-Mean[j]	0	1
0	0.000000	0.129545
1	-0.12955	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.00962

Abs(Dif)-LSD	0	1
0	-0.61407	-0.80541
1	-0.80541	-1.17098

Positive values show pairs of means that are significantly different.

Oneway Analysis of SCHEDULE VARIANCE R/U By Sex

Means Comparisons

Dif=Mean[i]-Mean[j]	0	1
0	0.000000	0.154545
1	-0.15455	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.00962

Abs(Dif)-LSD	0	1
0	-0.61950	-0.78867
1	-0.78867	-1.18133

Positive values show pairs of means that are significantly different.

Oneway Analysis of SPI R/I By Sex

Means Comparisons

Dif=Mean[i]-Mean[j]	1	0
1	0.000000	0.317016
0	-0.31702	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.01067

Abs(Dif)-LSD	1	0
1	-1.21007	-0.65181
0	-0.65181	-0.64265

Positive values show pairs of means that are significantly different.

Oneway Analysis of SPI R/U By Sex

Means Comparisons

Dif=Mean[i]-Mean[j]	1	0
1	0.000000	0.473193
0	-0.47319	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.01067

Abs(Dif)-LSD	1	0
1	-1.21563	-0.50009
0	-0.50009	-0.64560

Positive values show pairs of means that are significantly different.

Oneway Analysis of COST VARIANCE R/I By Sex

Means Comparisons

Dif=Mean[i]-Mean[j]	0	1
0	0.000000	0.500000
1	-0.5	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.00962

Abs(Dif)-LSD	0	1
0	-0.67328	-0.52511
1	-0.52511	-1.28390

Positive values show pairs of means that are significantly different.

Oneway Analysis of COST VARIANCE R/U By Sex

Means Comparisons

Dif=Mean[i]-Mean[j]	0	1
0	0.000000	0.665909
1	-0.66591	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.00962

Abs(Dif)-LSD	0	1
0	-0.67537	-0.36238
1	-0.36238	-1.28788

Positive values show pairs of means that are significantly different.

Oneway Analysis of CPI R/I By Sex

Means Comparisons

Dif=Mean[i]-Mean[j]	1	0
1	0.000000	0.247086
0	-0.24709	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.01067

Abs(Dif)-LSD	1	0
1	-1.40636	-0.87890
0	-0.87890	-0.74690

Positive values show pairs of means that are significantly different.

Oneway Analysis of CPI R/U By Sex

Means Comparisons

Dif=Mean[i]-Mean[j]	1	0
1	0.000000	0.027972
0	-0.02797	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.01067

Abs(Dif)-LSD	1	0
1	-1.38196	-1.07848
0	-1.07848	-0.73394

Positive values show pairs of means that are significantly different.

Oneway Analysis of ACTIVITY DEVIATION R/I By Sex

Means Comparisons

Dif=Mean[i]-Mean[j]	1	0
1	0.000000	0.021531
0	-0.02153	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.01178

Abs(Dif)-LSD	1	0
1	-1.25812	-0.98868
0	-0.98868	-0.67690

Positive values show pairs of means that are significantly different.

Oneway Analysis of ACTIVITY DEVIATION R/U By Sex

Means Comparisons

Dif=Mean[i]-Mean[j]	1	0
1	0.000000	0.531100
0	-0.5311	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.01178

Abs(Dif)-LSD	1	0
1	-1.39405	-0.58826
0	-0.58826	-0.75004

Positive values show pairs of means that are significantly different.

Oneway Analysis of RESOURCE OFFSET R/I By Sex

Means Comparisons

Dif=Mean[i]-Mean[j]	1	0
1	0.000000	0.135135
0	-0.13514	0.000000

Alpha=

0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.01293

Abs(Dif)-LSD	1	0
1	-1.28014	-0.89587
0	-0.89587	-0.69800

Positive values show pairs of means that are significantly different.

Oneway Analysis of RESOURCE OFFSET R/U By Sex

Means Comparisons

Dif=Mean[i]-Mean[j]	0	1
0	0.000000	0.083538
1	-0.08354	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.01293

Abs(Dif)-LSD	0	1
0	-0.70321	-0.95517
1	-0.95517	-1.28970

Positive values show pairs of means that are significantly different.

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Appendix F: Differences of Means Tests for APDP Levels of Managers Variable

Oneway Analysis of COST S/I By APDP

Means Comparisons

Dif=Mean[i]-Mean[j]	1	3	2
1	0.000000	0.460829	0.991071
3	-0.46083	0.000000	0.530242
2	-0.99107	-0.53024	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.41398

Abs(Dif)-LSD	1	3	2
1	-1.81241	-0.95807	-0.54547
3	-0.95807	-0.86124	-0.51351
2	-0.54547	-0.51351	-1.19880

Positive values show pairs of means that are significantly different.

Oneway Analysis of COST S/U By APDP

Means Comparisons

Dif=Mean[i]-Mean[j]	1	3	2
1	0.00000	0.30000	1.18750
3	-0.30000	0.00000	0.88750
2	-1.18750	-0.88750	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.41542

Abs(Dif)-LSD	1	3	2
1	-2.11943	-1.36435	-0.60933
3	-1.36435	-1.02378	-0.33997
2	-0.60933	-0.33997	-1.40187

Positive values show pairs of means that are significantly different.

Oneway Analysis of SCHEDULE S/I By APDP

Means Comparisons

Dif=Mean[i]-Mean[j]	1	2	3
1	0.000000	0.366071	0.525346
2	-0.36607	0.000000	0.159274
3	-0.52535	-0.15927	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.41398

Abs(Dif)-LSD	1	2	3
1	-1.29489	-0.73173	-0.48840
2	-0.73173	-0.85649	-0.58645
3	-0.48840	-0.58645	-0.61532

Positive values show pairs of means that are significantly different.

Oneway Analysis of SCHEDULE S/U By APDP

Means Comparisons

Dif=Mean[i]-Mean[j]	1	2	3
1	0.000000	0.017857	0.442857
2	-0.01786	0.000000	0.425000
3	-0.44286	-0.425	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.41542

Abs(Dif)-LSD	1	2	3
1	-1.40139	-1.17023	-0.65763
2	-1.17023	-0.92693	-0.38662
3	-0.65763	-0.38662	-0.67693

Positive values show pairs of means that are significantly different.

Oneway Analysis of PERFORMANCE S/I By APDP

Means Comparisons

Dif=Mean[i]-Mean[j]	3	2	1
3	0.00000	0.57661	1.02304
2	-0.57661	0.00000	0.44643
1	-1.02304	-0.44643	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.41398

Abs(Dif)-LSD	3	2	1
3	-0.52326	-0.05753	0.16097
2	-0.05753	-0.72834	-0.48712
1	0.16097	-0.48712	-1.10115

Positive values show pairs of means that are significantly different.

Oneway Analysis of PERFORMANCE S/U By APDP

Means Comparisons

Dif=Mean[i]-Mean[j]	3	1	2
3	0.000000	0.495238	0.504167
1	-0.49524	0.000000	0.008929
2	-0.50417	-0.00893	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.41542

Abs(Dif)-LSD	3	1	2
3	-0.68044	-0.61094	-0.31165
1	-0.61094	-1.40864	-1.18530
2	-0.31165	-1.18530	-0.93173

Positive values show pairs of means that are significantly different.

Oneway Analysis of EARNED VALUE S/I By APDP

Means Comparisons

Dif=Mean[i]-Mean[j]	3	1	2
3	0.00000	0.95853	1.19960
1	-0.95853	0.00000	0.24107
2	-1.19960	-0.24107	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.41398

Abs(Dif)-LSD	3	1	2
3	-0.96950	-0.63874	0.02464
1	-0.63874	-2.04024	-1.48863
2	0.02464	-1.48863	-1.34949

Positive values show pairs of means that are significantly different.

Oneway Analysis of EARNED VALUE S/U By APDP

Means Comparisons

Dif=Mean[i]-Mean[j]	3	1	2
3	0.000000	0.395238	0.529167
1	-0.39524	0.000000	0.133929
2	-0.52917	-0.13393	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.41542

Abs(Dif)-LSD	3	1	2
3	-1.19840	-1.55298	-0.90766
1	-1.55298	-2.48091	-1.96937
2	-0.90766	-1.96937	-1.64097

Positive values show pairs of means that are significantly different.

Oneway Analysis of STABILITY S/I By APDP

Means Comparisons

Dif=Mean[i]-Mean[j]	3	1	2
3	0.00000	0.60000	1.41250
1	-0.60000	0.00000	0.81250
2	-1.41250	-0.81250	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.41542

Abs(Dif)-LSD	3	1	2
3	-0.87151	-0.81680	0.36760
1	-0.81680	-1.80419	-0.71708
2	0.36760	-0.71708	-1.19336

Positive values show pairs of means that are significantly different.

Oneway Analysis of STABILITY S/U By APDP

Means Comparisons

Dif=Mean[i]-Mean[j]	3	1	2
3	0.00000	0.32381	1.21667
1	-0.32381	0.00000	0.89286
2	-1.21667	-0.89286	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.41542

Abs(Dif)-LSD	3	1	2
3	-0.99522	-1.29410	0.02344
1	-1.29410	-2.06029	-0.85384
2	0.02344	-0.85384	-1.36276

Positive values show pairs of means that are significantly different.

Oneway Analysis of COST R/I By APDP

Means Comparisons

Dif=Mean[i]-Mean[j]	2	3	1
2	0.000000	0.179435	0.437500
3	-0.17944	0.000000	0.258065
1	-0.4375	-0.25806	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.41398

Abs(Dif)-LSD	2	3	1
2	-1.09450	-0.77351	-0.96536
3	-0.77351	-0.78631	-1.03739
1	-0.96536	-1.03739	-1.65473

Positive values show pairs of means that are significantly different.

Oneway Analysis of COST R/U By APDP

Means Comparisons

Dif=Mean[i]-Mean[j]	3	2	1
3	0.000000	0.020161	0.502304
2	-0.02016	0.000000	0.482143
1	-0.5023	-0.48214	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.41398

Abs(Dif)-LSD	3	2	1
3	-0.83112	-0.98709	-0.86697
2	-0.98709	-1.15687	-1.00066
1	-0.86697	-1.00066	-1.74902

Positive values show pairs of means that are significantly different.

Oneway Analysis of SCHEDULE R/I By APDP

Means Comparisons

Dif=Mean[i]-Mean[j]	3	2	1
3	0.00000	0.91331	1.65438
2	-0.91331	0.00000	0.74107
1	-1.65438	-0.74107	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.41398

Abs(Dif)-LSD	3	2	1
3	-0.65709	0.11697	0.57182
2	0.11697	-0.91463	-0.43125
1	0.57182	-0.43125	-1.38279

Positive values show pairs of means that are significantly different.

Oneway Analysis of SCHEDULE R/U By APDP

Means Comparisons

Dif=Mean[i]-Mean[j]	3	2	1
3	0.00000	1.00605	1.62212
2	-1.00605	0.00000	0.61607
1	-1.62212	-0.61607	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.41398

Abs(Dif)-LSD	3	2	1
3	-0.73353	0.11707	0.41363
2	0.11707	-1.02103	-0.69262
1	0.41363	-0.69262	-1.54365

Positive values show pairs of means that are significantly different.

Oneway Analysis of PERFORMANCE R/I By APDP

Means Comparisons

Dif=Mean[i]-Mean[j]	1	2	3
1	0.000000	0.642857	0.917051
2	-0.64286	0.000000	0.274194
3	-0.91705	-0.27419	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.41398

Abs(Dif)-LSD	1	2	3
1	-1.59857	-0.71239	-0.33444
2	-0.71239	-1.05735	-0.64641
3	-0.33444	-0.64641	-0.75962

Positive values show pairs of means that are significantly different.

Oneway Analysis of PERFORMANCE R/U By APDP

Means Comparisons

Dif=Mean[i]-Mean[j]	1	2	3
1	0.00000	1.00893	1.24885
2	-1.00893	0.00000	0.23992
3	-1.24885	-0.23992	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.41398

Abs(Dif)-LSD	1	2	3
1	-1.53767	-0.29469	0.04504
2	-0.29469	-1.01707	-0.64561
3	0.04504	-0.64561	-0.73069

Positive values show pairs of means that are significantly different.

Oneway Analysis of EARNED VALUE R/I By APDP

Means Comparisons

Dif=Mean[i]-Mean[j]	1	3	2
1	0.000000	0.364055	0.616071
3	-0.36406	0.000000	0.252016
2	-0.61607	-0.25202	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.41398

Abs(Dif)-LSD	1	3	2
1	-1.55452	-0.85295	-0.70184
3	-0.85295	-0.73870	-0.64322
2	-0.70184	-0.64322	-1.02822

Positive values show pairs of means that are significantly different.

Oneway Analysis of EARNED VALUE R/U By APDP

Means Comparisons

Dif=Mean[i]-Mean[j]	1	3	2
1	0.000000	0.161290	0.500000
3	-0.16129	0.000000	0.338710
2	-0.5	-0.33871	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.41398

Abs(Dif)-LSD	1	3	2
1	-1.82653	-1.26867	-1.04852
3	-1.26867	-0.86795	-0.71318
2	-1.04852	-0.71318	-1.20814

Positive values show pairs of means that are significantly different.

Oneway Analysis of STABILITY R/I By APDP

Means Comparisons

Dif=Mean[i]-Mean[j]	2	1	3
2	0.000000	0.142857	0.225806
1	-0.14286	0.000000	0.082949
3	-0.22581	-0.08295	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.41398

Abs(Dif)-LSD	2	1	3
2	-1.25501	-1.46573	-0.86689
1	-1.46573	-1.89739	-1.40248
3	-0.86689	-1.40248	-0.90162

Positive values show pairs of means that are significantly different.

Oneway Analysis of STABILITY R/U By APDP

Means Comparisons

Dif=Mean[i]-Mean[j]	2	1	3
2	0.000000	0.348214	0.352823
1	-0.34821	0.000000	0.004608
3	-0.35282	-0.00461	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.41398

Abs(Dif)-LSD	2	1	3
2	-1.26902	-1.27834	-0.75207
1	-1.27834	-1.91858	-1.49741
3	-0.75207	-1.49741	-0.91169

Positive values show pairs of means that are significantly different.

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Oneway Analysis of SCHEDULE VARIANCE S/U By APDP

Means Comparisons

Dif=Mean[i]-Mean[j]	3	1	2
3	0.000000	0.103448	0.170115
1	-0.10345	0.000000	0.066667
2	-0.17011	-0.06667	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.41849

Abs(Dif)-LSD	3	1	2
3	-1.05969	-1.59584	-1.11324
1	-1.59584	-2.15690	-1.78039
2	-1.11324	-1.78039	-1.47344

Positive values show pairs of means that are significantly different.

Oneway Analysis of SPI S/I By APDP

Means Comparisons

Dif=Mean[i]-Mean[j]	3	1	2
3	0.000000	0.211823	0.211823
1	-0.21182	0.000000	0.000000
2	-0.21182	0.000000	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.42012

Abs(Dif)-LSD	3	1	2
3	-1.06685	-1.49894	-1.11026
1	-1.49894	-2.17147	-1.88055
2	-1.11026	-1.88055	-1.53546

Positive values show pairs of means that are significantly different.

Oneway Analysis of SPI S/U By APDP

Means Comparisons

Dif=Mean[i]-Mean[j]	1	3	2
1	0.000000	0.162562	0.571429
3	-0.16256	0.000000	0.408867
2	-0.57143	-0.40887	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.42012

Abs(Dif)-LSD	1	3	2
1	-2.34401	-1.68414	-1.45854
3	-1.68414	-1.15162	-1.01827
2	-1.45854	-1.01827	-1.65746

Positive values show pairs of means that are significantly different.

Oneway Analysis of COST VARIANCE S/I By APDP

Means Comparisons

Dif=Mean[i]-Mean[j]	1	3	2
1	0.00000	0.13793	1.07143
3	-0.13793	0.00000	0.93350
2	-1.07143	-0.93350	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.42012

Abs(Dif)-LSD	1	3	2
1	-1.87155	-1.33655	-0.54938
3	-1.33655	-0.91950	-0.20598
2	-0.54938	-0.20598	-1.32338

Positive values show pairs of means that are significantly different.

Oneway Analysis of COST VARIANCE S/U By APDP

Means Comparisons

Dif=Mean[i]-Mean[j]	1	3	2
1	0.00000	0.33990	1.42857
3	-0.33990	0.00000	1.08867
2	-1.42857	-1.08867	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.42012

Abs(Dif)-LSD	1	3	2
1	-2.16402	-1.36500	-0.44553
3	-1.36500	-1.06319	-0.22888
2	-0.44553	-0.22888	-1.53020

Positive values show pairs of means that are significantly different.

Oneway Analysis of CPI S/I By APDP

Means Comparisons

Dif=Mean[i]-Mean[j]	1	3	2
1	0.000000	0.049261	0.714286
3	-0.04926	0.000000	0.665025
2	-0.71429	-0.66502	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.42012

Abs(Dif)-LSD	1	3	2
1	-2.16297	-1.65481	-1.15890
3	-1.65481	-1.06268	-0.65188
2	-1.15890	-0.65188	-1.52945

Positive values show pairs of means that are significantly different.

Oneway Analysis of CPI S/U By APDP

Means Comparisons

Dif=Mean[i]-Mean[j]	1	3	2
1	0.00000	0.32512	1.35714
3	-0.32512	0.00000	1.03202
2	-1.35714	-1.03202	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.42012

Abs(Dif)-LSD	1	3	2
1	-2.33653	-1.51569	-0.66635
3	-1.51569	-1.14795	-0.39056
2	-0.66635	-0.39056	-1.65218

Positive values show pairs of means that are significantly different.

Oneway Analysis of ACTIVITY DEVIATION S/I By APDP

Means Comparisons

Dif=Mean[i]-Mean[j]	3	2	1
3	0.000000	0.087356	0.192118
2	-0.08736	0.000000	0.104762
1	-0.19212	-0.10476	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.41849

Abs(Dif)-LSD	3	2	1
3	-1.11628	-1.26453	-1.59792
2	-1.26453	-1.55213	-1.84093
1	-1.59792	-1.84093	-2.27208

Positive values show pairs of means that are significantly different.

Oneway Analysis of ACTIVITY DEVIATION S/U By APDP

Means Comparisons

Dif=Mean[i]-Mean[j]	1	3	2
1	0.000000	0.113300	0.219048
3	-0.1133	0.000000	0.105747
2	-0.21905	-0.10575	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.41849

Abs(Dif)-LSD	1	3	2
1	-2.40767	-1.78355	-1.84276
3	-1.78355	-1.18290	-1.32681
2	-1.84276	-1.32681	-1.64475

Positive values show pairs of means that are significantly different.

Oneway Analysis of RESOURCE OFFSET S/I By APDP

Means Comparisons

Dif=Mean[i]-Mean[j]	1	3	2
1	0.000000	0.507937	0.819048
3	-0.50794	0.000000	0.311111
2	-0.81905	-0.31111	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.42183

Abs(Dif)-LSD	1	3	2
1	-2.05418	-1.12204	-0.94005
3	-1.12204	-1.04594	-0.92646
2	-0.94005	-0.92646	-1.40327

Positive values show pairs of means that are significantly different.

Oneway Analysis of RESOURCE OFFSET S/U By APDP

Means Comparisons

Dif=Mean[i]-Mean[j]	1	3	2
1	0.000000	0.481481	0.600000
3	-0.48148	0.000000	0.118519
2	-0.6	-0.11852	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.42183

Abs(Dif)-LSD	1	3	2
1	-2.19572	-1.26081	-1.28031
3	-1.26081	-1.11801	-1.20433
2	-1.28031	-1.20433	-1.49996

Positive values show pairs of means that are significantly different.

Oneway Analysis of SCHEDULE VARIANCE R/I By APDP

Means Comparisons

Dif=Mean[i]-Mean[j]	1	3	2
1	0.00000	0.10000	1.00000
3	-0.10000	0.00000	0.90000
2	-1.00000	-0.90000	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.41849

Abs(Dif)-LSD	1	3	2
1	-1.83280	-1.31968	-0.53343
3	-1.31968	-0.81965	-0.10387
2	-0.53343	-0.10387	-1.15917

Positive values show pairs of means that are significantly different.

Oneway Analysis of SCHEDULE VARIANCE R/U By APDP

Means Comparisons

Dif=Mean[i]-Mean[j]	1	3	2
1	0.00000	0.06667	1.00000
3	-0.06667	0.00000	0.93333
2	-1.00000	-0.93333	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.41849

Abs(Dif)-LSD	1	3	2
1	-1.84569	-1.36300	-0.54421
3	-1.36300	-0.82542	-0.07759
2	-0.54421	-0.07759	-1.16731

Positive values show pairs of means that are significantly different.

Oneway Analysis of SPI R/I By APDP

Means Comparisons

Dif=Mean[i]-Mean[j]	1	3	2
1	0.000000	0.000000	0.071429
3	0.000000	0.000000	0.071429
2	-0.07143	-0.07143	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q^*
2.42012

Abs(Dif)-LSD	1	3	2
1	-2.00139	-1.55027	-1.62005
3	-1.55027	-0.89505	-1.05057
2	-1.62005	-1.05057	-1.31021

Positive values show pairs of means that are significantly different.

Oneway Analysis of SPI R/U By APDP

Means Comparisons

Dif=Mean[i]-Mean[j]	3	1	2
3	0.000000	0.066667	0.066667
1	-0.06667	0.000000	0.000000
2	-0.06667	0.000000	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q^*
2.42012

Abs(Dif)-LSD	3	1	2
3	-0.90400	-1.49910	-1.06655
1	-1.49910	-2.02140	-1.70839
2	-1.06655	-1.70839	-1.32332

Positive values show pairs of means that are significantly different.

Oneway Analysis of COST VARIANCE R/I By APDP

Means Comparisons

Dif=Mean[i]-Mean[j]	2	3	1
2	0.000000	0.000000	0.066667
3	0.000000	0.000000	0.066667
1	-0.06667	-0.06667	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.41849

Abs(Dif)-LSD	2	3	1
2	-1.34977	-1.16894	-1.71891
3	-1.16894	-0.95443	-1.58646
1	-1.71891	-1.58646	-2.13418

Positive values show pairs of means that are significantly different.

Oneway Analysis of COST VARIANCE R/U By APDP

Means Comparisons

Dif=Mean[i]-Mean[j]	2	3	1
2	0.000000	0.033333	0.133333
3	-0.03333	0.000000	0.100000
1	-0.13333	-0.1	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.41849

Abs(Dif)-LSD	2	3	1
2	-1.36354	-1.14753	-1.67047
3	-1.14753	-0.96417	-1.56999
1	-1.67047	-1.56999	-2.15595

Positive values show pairs of means that are significantly different.

Oneway Analysis of CPI R/I By APDP

Means Comparisons

Dif=Mean[i]-Mean[j]	2	1	3
2	0.00000	1.09524	1.19524
1	-1.09524	0.00000	0.10000
3	-1.19524	-0.10000	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.42012

Abs(Dif)-LSD	2	1	3
2	-1.43474	-0.75700	-0.03340
1	-0.75700	-2.19160	-1.59760
3	-0.03340	-1.59760	-0.98011

Positive values show pairs of means that are significantly different.

Oneway Analysis of CPI R/U By APDP

Means Comparisons

Dif=Mean[i]-Mean[j]	2	1	3
2	0.00000	1.07143	1.30476
1	-1.07143	0.00000	0.23333
3	-1.30476	-0.23333	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.42012

Abs(Dif)-LSD	2	1	3
2	-1.38850	-0.72111	0.11573
1	-0.72111	-2.12096	-1.40956
3	0.11573	-1.40956	-0.94852

Positive values show pairs of means that are significantly different.

Oneway Analysis of ACTIVITY DEVIATION R/I By APDP

Means Comparisons

Dif=Mean[i]-Mean[j]	3	1	2
3	0.000000	0.149425	0.411330
1	-0.14943	0.000000	0.261905
2	-0.41133	-0.2619	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.42183

Abs(Dif)-LSD	3	1	2
3	-0.93540	-1.44808	-0.74786
1	-1.44808	-2.05647	-1.47613
2	-0.74786	-1.47613	-1.34628

Positive values show pairs of means that are significantly different.

Oneway Analysis of ACTIVITY DEVIATION R/U By APDP

Means Comparisons

Dif=Mean[i]-Mean[j]	3	1	2
3	0.000000	0.178161	0.344828
1	-0.17816	0.000000	0.166667
2	-0.34483	-0.16667	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*

q*
2.42183

Abs(Dif)-LSD	3	1	2
3	-1.05003	-1.61512	-0.95642
1	-1.61512	-2.30849	-1.78436
2	-0.95642	-1.78436	-1.51126

Positive values show pairs of means that are significantly different.

Oneway Analysis of RESOURCE OFFSET R/I By APDP

Means Comparisons

Dif=Mean[i]-Mean[j]	3	1	2
3	0.000000	0.035714	0.464286
1	-0.03571	0.000000	0.428571
2	-0.46429	-0.42857	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.42362

Abs(Dif)-LSD	3	1	2
3	-0.96749	-1.59281	-0.72064
1	-1.59281	-2.09001	-1.33781
2	-0.72064	-1.33781	-1.36823

Positive values show pairs of means that are significantly different.

Oneway Analysis of RESOURCE OFFSET R/U By APDP

Means Comparisons

Dif=Mean[i]-Mean[j]	1	3	2
1	0.000000	0.035714	0.642857
3	-0.03571	0.000000	0.607143
2	-0.64286	-0.60714	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.42362

Abs(Dif)-LSD	1	3	2
1	-2.08778	-1.59107	-1.12164
3	-1.59107	-0.96645	-0.57652
2	-1.12164	-0.57652	-1.36677

Positive values show pairs of means that are significantly different.
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Appendix G: Differences of Means Tests for ACAT Level of the Program Variable

Oneway Analysis of COST S/I By ACAT Level

Means Comparisons

Dif=Mean[i]-Mean[j]	2	1	3
2	0.000000	0.150000	0.733333
1	-0.15	0.000000	0.583333
3	-0.73333	-0.58333	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.42362

Abs(Dif)-LSD	2	1	3
2	-1.21073	-0.89852	-0.33443
1	-0.89852	-0.85612	-0.29624
3	-0.33443	-0.29624	-0.90242

Positive values show pairs of means that are significantly different.

Oneway Analysis of COST S/U By ACAT Level

Means Comparisons

Dif=Mean[i]-Mean[j]	2	1	3
2	0.000000	0.368421	0.611111
1	-0.36842	0.000000	0.242690
3	-0.61111	-0.24269	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.42548

Abs(Dif)-LSD	2	1	3
2	-1.70490	-1.12096	-0.89247
1	-1.12096	-1.23687	-1.01124
3	-0.89247	-1.01124	-1.27076

Positive values show pairs of means that are significantly different.

Oneway Analysis of SCHEDULE S/I By ACAT Level

Means Comparisons

Dif=Mean[i]-Mean[j]	1	2	3
1	0.000000	0.150000	0.738889
2	-0.15	0.000000	0.588889
3	-0.73889	-0.58889	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.42362

Abs(Dif)-LSD	1	2	3
1	-0.74419	-0.76144	-0.02569
2	-0.76144	-1.05244	-0.33928
3	-0.02569	-0.33928	-0.78444

Positive values show pairs of means that are significantly different.

Oneway Analysis of SCHEDULE S/U By ACAT Level

Means Comparisons

Dif=Mean[i]-Mean[j]	2	1	3
2	0.000000	0.047368	0.433333
1	-0.04737	0.000000	0.385965
3	-0.43333	-0.38596	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.42548

Abs(Dif)-LSD	2	1	3
2	-1.19997	-1.00091	-0.62494
1	-1.00091	-0.87055	-0.49659
3	-0.62494	-0.49659	-0.89440

Positive values show pairs of means that are significantly different.

Oneway Analysis of PERFORMANCE S/I By ACAT Level

Means Comparisons

Dif=Mean[i]-Mean[j]	2	1	3
2	0.000000	0.100000	0.822222
1	-0.1	0.000000	0.722222
3	-0.82222	-0.72222	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.42362

Abs(Dif)-LSD	2	1	3
2	-0.86274	-0.64715	0.061358
1	-0.64715	-0.61005	0.095457
3	0.061358	0.095457	-0.64305

Positive values show pairs of means that are significantly different.

Oneway Analysis of PERFORMANCE S/U By ACAT Level

Means Comparisons

Dif=Mean[i]-Mean[j]	1	2	3
1	0.000000	0.305263	0.383041
2	-0.30526	0.000000	0.077778
3	-0.38304	-0.07778	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.42548

Abs(Dif)-LSD	1	2	3
1	-0.87982	-0.75418	-0.50892
2	-0.75418	-1.21275	-0.99177
3	-0.50892	-0.99177	-0.90393

Positive values show pairs of means that are significantly different.

Oneway Analysis of EARNED VALUE S/I By ACAT Level

Means Comparisons

Dif=Mean[i]-Mean[j]	1	2	3
1	0.000000	0.150000	0.194444
2	-0.15	0.000000	0.044444
3	-0.19444	-0.04444	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.42362

Abs(Dif)-LSD	1	2	3
1	-1.14018	-1.24643	-0.97698
2	-1.24643	-1.61246	-1.37762
3	-0.97698	-1.37762	-1.20186

Positive values show pairs of means that are significantly different.

Oneway Analysis of EARNED VALUE S/U By ACAT Level

Means Comparisons

Dif=Mean[i]-Mean[j]	1	2	3
1	0.000000	0.268421	0.757310
2	-0.26842	0.000000	0.488889
3	-0.75731	-0.48889	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.42548

Abs(Dif)-LSD	1	2	3
1	-1.38146	-1.39508	-0.64321
2	-1.39508	-1.90421	-1.19047
3	-0.64321	-1.19047	-1.41931

Positive values show pairs of means that are significantly different.

Oneway Analysis of STABILITY S/I By ACAT Level

Means Comparisons

Dif=Mean[i]-Mean[j]	2	3	1
2	0.00000	1.08889	1.30526
3	-1.08889	0.00000	0.21637
1	-1.30526	-0.21637	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.42548

Abs(Dif)-LSD	2	3	1
2	-1.52674	-0.25756	-0.02848
3	-0.25756	-1.13796	-0.90651
1	-0.02848	-0.90651	-1.10761

Positive values show pairs of means that are significantly different.

Oneway Analysis of STABILITY S/U By ACAT Level

Means Comparisons

Dif=Mean[i]-Mean[j]	2	3	1
2	0.00000	0.67778	1.16316
3	-0.67778	0.00000	0.48538
1	-1.16316	-0.48538	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.42548

Abs(Dif)-LSD	2	3	1
2	-1.61631	-0.74767	-0.24883
3	-0.74767	-1.20472	-0.70339
1	-0.24883	-0.70339	-1.17259

Positive values show pairs of means that are significantly different.

Oneway Analysis of COST R/I By ACAT Level

Means Comparisons

Dif=Mean[i]-Mean[j]	1	3	2
1	0.000000	0.016667	0.550000
3	-0.01667	0.000000	0.533333
2	-0.55	-0.53333	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.42362

Abs(Dif)-LSD	1	3	2
1	-0.98381	-0.99411	-0.65492
3	-0.99411	-1.03703	-0.69370
2	-0.65492	-0.69370	-1.39132

Positive values show pairs of means that are significantly different.

Oneway Analysis of COST R/U By ACAT Level

Means Comparisons

Dif=Mean[i]-Mean[j]	3	2	1
3	0.000000	0.233333	0.533333
2	-0.23333	0.000000	0.300000
1	-0.53333	-0.3	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.42362

Abs(Dif)-LSD	3	2	1
3	-1.09783	-1.06564	-0.53670
2	-1.06564	-1.47290	-0.97557
1	-0.53670	-0.97557	-1.04150

Positive values show pairs of means that are significantly different.

Oneway Analysis of SCHEDULE R/I By ACAT Level

Means Comparisons

Dif=Mean[i]-Mean[j]	2	1	3
2	0.000000	0.350000	0.433333
1	-0.35	0.000000	0.083333
3	-0.43333	-0.08333	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.42362

Abs(Dif)-LSD	2	1	3
2	-1.29914	-0.77509	-0.71240
1	-0.77509	-0.91863	-0.86047
3	-0.71240	-0.86047	-0.96832

Positive values show pairs of means that are significantly different.

Oneway Analysis of SCHEDULE R/U By ACAT Level

Means Comparisons

Dif=Mean[i]-Mean[j]	2	3	1
2	0.000000	0.544444	0.550000
3	-0.54444	0.000000	0.005556
1	-0.55	-0.00556	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.42362

Abs(Dif)-LSD	2	3	1
2	-1.39268	-0.68378	-0.65609
3	-0.68378	-1.03804	-1.00620
1	-0.65609	-1.00620	-0.98477

Positive values show pairs of means that are significantly different.

Oneway Analysis of PERFORMANCE R/I By ACAT Level

Means Comparisons

Dif=Mean[i]-Mean[j]	3	1	2
3	0.000000	0.100000	0.600000
1	-0.1	0.000000	0.500000
2	-0.6	-0.5	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.42362

Abs(Dif)-LSD	3	1	2
3	-0.94980	-0.82575	-0.52382
1	-0.82575	-0.90106	-0.60357
2	-0.52382	-0.60357	-1.27429

Positive values show pairs of means that are significantly different.

Oneway Analysis of PERFORMANCE R/U By ACAT Level

Means Comparisons

Dif=Mean[i]-Mean[j]	1	3	2
1	0.000000	0.194444	0.750000
3	-0.19444	0.000000	0.555556
2	-0.75	-0.55556	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.42362

Abs(Dif)-LSD	1	3	2
1	-0.91539	-0.74603	-0.37112
3	-0.74603	-0.96491	-0.58614
2	-0.37112	-0.58614	-1.29456

Positive values show pairs of means that are significantly different.

Oneway Analysis of EARNED VALUE R/I By ACAT Level

Means Comparisons

Dif=Mean[i]-Mean[j]	2	3	1
2	0.000000	0.444444	0.700000
3	-0.44444	0.000000	0.255556
1	-0.7	-0.25556	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.42362

Abs(Dif)-LSD	2	3	1
2	-1.29909	-0.70124	-0.42504
3	-0.70124	-0.96828	-0.68821
1	-0.42504	-0.68821	-0.91859

Positive values show pairs of means that are significantly different.

Oneway Analysis of EARNED VALUE R/U By ACAT Level

Means Comparisons

Dif=Mean[i]-Mean[j]	2	3	1
2	0.000000	0.188889	0.200000
3	-0.18889	0.000000	0.011111
1	-0.2	-0.01111	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.42362

Abs(Dif)-LSD	2	3	1
2	-1.58868	-1.21219	-1.17584
3	-1.21219	-1.18413	-1.14304
1	-1.17584	-1.14304	-1.12336

Positive values show pairs of means that are significantly different.

Oneway Analysis of STABILITY R/I By ACAT Level

Means Comparisons

Dif=Mean[i]-Mean[j]	1	2	3
1	0.000000	0.450000	0.705556
2	-0.45	0.000000	0.255556
3	-0.70556	-0.25556	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.42362

Abs(Dif)-LSD	1	2	3
1	-1.07841	-0.87077	-0.40240
2	-0.87077	-1.52510	-1.08945
3	-0.40240	-1.08945	-1.13674

Positive values show pairs of means that are significantly different.

Oneway Analysis of STABILITY R/U By ACAT Level

Means Comparisons

Dif=Mean[i]-Mean[j]	1	2	3
1	0.000000	0.750000	0.805556
2	-0.75	0.000000	0.055556
3	-0.80556	-0.05556	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.42362

Abs(Dif)-LSD	1	2	3
1	-1.08805	-0.58258	-0.31231
2	-0.58258	-1.53873	-1.30148
3	-0.31231	-1.30148	-1.14690

Positive values show pairs of means that are significantly different.

Oneway Analysis of SCHEDULE VARIANCE S/I By ACAT Level

Means Comparisons

Dif=Mean[i]-Mean[j]	2	3	1
2	0.000000	0.387500	0.647368
3	-0.3875	0.000000	0.259868
1	-0.64737	-0.25987	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.42949

Abs(Dif)-LSD	2	3	1
2	-1.62962	-1.08142	-0.77625
3	-1.08142	-1.28833	-0.97656
1	-0.77625	-0.97656	-1.18225

Positive values show pairs of means that are significantly different.

Oneway Analysis of SCHEDULE VARIANCE S/U By ACAT Level

Means Comparisons

Dif=Mean[i]-Mean[j]	2	3	1
2	0.000000	0.525000	0.557895
3	-0.525	0.000000	0.032895
1	-0.55789	-0.03289	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.42949

Abs(Dif)-LSD	2	3	1
2	-1.85689	-1.14878	-1.06427
3	-1.14878	-1.46800	-1.37597
1	-1.06427	-1.37597	-1.34713

Positive values show pairs of means that are significantly different.

Oneway Analysis of SPI S/I By ACAT Level

Means Comparisons

Dif=Mean[i]-Mean[j]	2	1	3
2	0.00000	0.64737	1.13750
1	-0.64737	0.00000	0.49013
3	-1.13750	-0.49013	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.42949

Abs(Dif)-LSD	2	1	3
2	-1.76619	-0.89556	-0.45453
1	-0.89556	-1.28133	-0.84992
3	-0.45453	-0.84992	-1.39630

Positive values show pairs of means that are significantly different.

Oneway Analysis of SPI S/U By ACAT Level

Means Comparisons

Dif=Mean[i]-Mean[j]	2	1	3
2	0.00000	0.51579	1.20000
1	-0.51579	0.00000	0.68421
3	-1.20000	-0.68421	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.42949

Abs(Dif)-LSD	2	1	3
2	-1.96735	-1.20287	-0.57335
1	-1.20287	-1.42727	-0.80846
3	-0.57335	-0.80846	-1.55533

Positive values show pairs of means that are significantly different.

Oneway Analysis of COST VARIANCE S/I By ACAT Level

Means Comparisons

Dif=Mean[i]-Mean[j]	2	3	1
2	0.000000	0.862500	0.931579
3	-0.8625	0.000000	0.069079
1	-0.93158	-0.06908	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.42949

Abs(Dif)-LSD	2	3	1
2	-1.59452	-0.57478	-0.46138
3	-0.57478	-1.26058	-1.14072
1	-0.46138	-1.14072	-1.15679

Positive values show pairs of means that are significantly different.

Oneway Analysis of COST VARIANCE S/U By ACAT Level

Means Comparisons

Dif=Mean[i]-Mean[j]	2	3	1
2	0.000000	0.550000	0.852632
3	-0.55	0.000000	0.302632
1	-0.85263	-0.30263	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.42949

Abs(Dif)-LSD	2	3	1
2	-1.92286	-1.18324	-0.82716
3	-1.18324	-1.52015	-1.15628
1	-0.82716	-1.15628	-1.39499

Positive values show pairs of means that are significantly different.

Oneway Analysis of CPI S/I By ACAT Level

Means Comparisons

Dif=Mean[i]-Mean[j]	2	1	3
2	0.00000	1.14211	1.55000
1	-1.14211	0.00000	0.40789
3	-1.55000	-0.40789	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.42949

Abs(Dif)-LSD	2	1	3
2	-1.70664	-0.34879	0.01166
1	-0.34879	-1.23813	-0.88697
3	0.01166	-0.88697	-1.34922

Positive values show pairs of means that are significantly different.

Oneway Analysis of CPI S/U By ACAT Level

Means Comparisons

Dif=Mean[i]-Mean[j]	2	1	3
2	0.00000	1.05789	1.40000
1	-1.05789	0.00000	0.34211
3	-1.40000	-0.34211	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.42949

Abs(Dif)-LSD	2	1	3
2	-1.97961	-0.67147	-0.38439
1	-0.67147	-1.43616	-1.15986
3	-0.38439	-1.15986	-1.56502

Positive values show pairs of means that are significantly different.

Oneway Analysis of ACTIVITY DEVIATION S/I By ACAT Level

Means Comparisons

Dif=Mean[i]-Mean[j]	2	3	1
2	0.000000	0.312500	0.894737
3	-0.3125	0.000000	0.582237
1	-0.89474	-0.58224	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.42949

Abs(Dif)-LSD	2	3	1
2	-1.93510	-1.43177	-0.79574
3	-1.43177	-1.52983	-0.88596
1	-0.79574	-0.88596	-1.40387

Positive values show pairs of means that are significantly different.

Oneway Analysis of ACTIVITY DEVIATION S/U By ACAT Level

Means Comparisons

Dif=Mean[i]-Mean[j]	2	3	1
2	0.000000	0.312500	0.763158
3	-0.3125	0.000000	0.450658
1	-0.76316	-0.45066	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.42949

Abs(Dif)-LSD	2	3	1
2	-1.98807	-1.47953	-0.97360
3	-1.47953	-1.57171	-1.05774
1	-0.97360	-1.05774	-1.44230

Positive values show pairs of means that are significantly different.

Oneway Analysis of RESOURCE OFFSET S/I By ACAT Level

Means Comparisons

Dif=Mean[i]-Mean[j]	2	3	1
2	0.000000	0.250000	0.578947
3	-0.25	0.000000	0.328947
1	-0.57895	-0.32895	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.43165

Abs(Dif)-LSD	2	3	1
2	-1.89146	-1.42183	-1.04467
3	-1.42183	-1.41859	-1.03250
1	-1.04467	-1.03250	-1.30179

Positive values show pairs of means that are significantly different.

Oneway Analysis of RESOURCE OFFSET S/U By ACAT Level

Means Comparisons

Dif=Mean[i]-Mean[j]	2	3	1
2	0.000000	0.562500	0.736842
3	-0.5625	0.000000	0.174342
1	-0.73684	-0.17434	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.43165

Abs(Dif)-LSD	2	3	1
2	-1.97428	-1.18253	-0.95787
3	-1.18253	-1.48071	-1.24672
1	-0.95787	-1.24672	-1.35879

Positive values show pairs of means that are significantly different.

–

Oneway Analysis of SCHEDULE VARIANCE R/I By ACAT Level

Means Comparisons

Dif=Mean[i]-Mean[j]	2	1	3
2	0.000000	0.878947	0.888235
1	-0.87895	0.000000	0.009288
3	-0.88824	-0.00929	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.42744

Abs(Dif)-LSD	2	1	3
2	-1.43226	-0.37226	-0.38810
1	-0.37226	-1.03907	-1.05991
3	-0.38810	-1.05991	-1.09850

Positive values show pairs of means that are significantly different.

Oneway Analysis of SCHEDULE VARIANCE R/U By ACAT Level

Means Comparisons

Dif=Mean[i]-Mean[j]	2	3	1
2	0.00000	0.98824	1.03158
3	-0.98824	0.00000	0.04334
1	-1.03158	-0.04334	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.42744

Abs(Dif)-LSD	2	3	1
2	-1.41387	-0.27171	-0.20356
3	-0.27171	-1.08439	-1.01212
1	-0.20356	-1.01212	-1.02573

Positive values show pairs of means that are significantly different.

Oneway Analysis of SPI R/I By ACAT Level

Means Comparisons

Dif=Mean[i]-Mean[j]	2	3	1
2	0.000000	0.387500	0.594737
3	-0.3875	0.000000	0.207237
1	-0.59474	-0.20724	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.42949

Abs(Dif)-LSD	2	3	1
2	-1.45506	-0.92408	-0.67639
3	-0.92408	-1.15033	-0.89675
1	-0.67639	-0.89675	-1.05561

Positive values show pairs of means that are significantly different.

Oneway Analysis of SPI R/U By ACAT Level

Means Comparisons

Dif=Mean[i]-Mean[j]	3	2	1
3	0.000000	0.025000	0.467105
2	-0.025	0.000000	0.442105
1	-0.46711	-0.44211	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.42949

Abs(Dif)-LSD	3	2	1
3	-1.19047	-1.33235	-0.67541
2	-1.33235	-1.50584	-0.87338
1	-0.67541	-0.87338	-1.09245

Positive values show pairs of means that are significantly different.

Oneway Analysis of COST VARIANCE R/I By ACAT Level

Means Comparisons

Dif=Mean[i]-Mean[j]	2	1	3
2	0.000000	0.489474	0.523529
1	-0.48947	0.000000	0.034056
3	-0.52353	-0.03406	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.42744

Abs(Dif)-LSD	2	1	3
2	-1.53282	-0.84958	-0.84242
1	-0.84958	-1.11203	-1.11021
3	-0.84242	-1.11021	-1.17562

Positive values show pairs of means that are significantly different.

Oneway Analysis of COST VARIANCE R/U By ACAT Level

Means Comparisons

Dif=Mean[i]-Mean[j]	2	1	3
2	0.000000	0.736842	0.882353
1	-0.73684	0.000000	0.145511
3	-0.88235	-0.14551	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.42744

Abs(Dif)-LSD	2	1	3
2	-1.58314	-0.64617	-0.52843
1	-0.64617	-1.14853	-1.03632
3	-0.52843	-1.03632	-1.21421

Positive values show pairs of means that are significantly different.

Oneway Analysis of CPI R/I By ACAT Level

Means Comparisons

Dif=Mean[i]-Mean[j]	3	1	2
3	0.00000	0.41776	1.11250
1	-0.41776	0.00000	0.69474
2	-1.11250	-0.69474	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.42949

Abs(Dif)-LSD	3	1	2
3	-1.31760	-0.84676	-0.38980
1	-0.84676	-1.20911	-0.76123
2	-0.38980	-0.76123	-1.66665

Positive values show pairs of means that are significantly different.

Oneway Analysis of CPI R/U By ACAT Level

Means Comparisons

Dif=Mean[i]-Mean[j]	3	1	2
3	0.00000	0.50987	1.36250
1	-0.50987	0.00000	0.85263
2	-1.36250	-0.85263	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.42949

Abs(Dif)-LSD	3	1	2
3	-1.30190	-0.73958	-0.12189
1	-0.73958	-1.19470	-0.58598
2	-0.12189	-0.58598	-1.64678

Positive values show pairs of means that are significantly different.

Oneway Analysis of ACTIVITY DEVIATION R/I By ACAT Level

Means Comparisons

Dif=Mean[i]-Mean[j]	1	2	3
1	0.000000	0.277778	0.590278
2	-0.27778	0.000000	0.312500
3	-0.59028	-0.3125	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.43165

Abs(Dif)-LSD	1	2	3
1	-1.08930	-1.01110	-0.53254
2	-1.01110	-1.46145	-1.00483
3	-0.53254	-1.00483	-1.15538

Positive values show pairs of means that are significantly different.

Oneway Analysis of ACTIVITY DEVIATION R/U By ACAT Level

Means Comparisons

Dif=Mean[i]-Mean[j]	1	2	3
1	0.00000	0.42222	1.03472
2	-0.42222	0.00000	0.61250
3	-1.03472	-0.61250	0.00000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.43165

Abs(Dif)-LSD	1	2	3
1	-1.23478	-1.03879	-0.23806
2	-1.03879	-1.65663	-0.88077
3	-0.23806	-0.88077	-1.30968

Positive values show pairs of means that are significantly different.

Oneway Analysis of RESOURCE OFFSET R/I By ACAT Level

Means Comparisons

Dif=Mean[i]-Mean[j]	2	3	1
2	0.000000	0.048611	0.277778
3	-0.04861	0.000000	0.229167
1	-0.27778	-0.22917	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.43392

Abs(Dif)-LSD	2	3	1
2	-1.72416	-1.47534	-1.21539
3	-1.47534	-1.29312	-1.02752
1	-1.21539	-1.02752	-1.21916

Positive values show pairs of means that are significantly different.

Oneway Analysis of RESOURCE OFFSET R/U By ACAT Level

Means Comparisons

Dif=Mean[i]-Mean[j]	3	2	1
3	0.000000	0.062500	0.395833
2	-0.0625	0.000000	0.333333
1	-0.39583	-0.33333	0.000000

Alpha=
0.05

Comparisons for all pairs using Tukey-Kramer HSD

q*
2.43392

Abs(Dif)-LSD	3	2	1
3	-1.31168	-1.48333	-0.87889
2	-1.48333	-1.74890	-1.18126
1	-0.87889	-1.18126	-1.23666

Positive values show pairs of means that are significantly different.

BIBLIOGRAPHY

Culp, Gordon and Smith, Anne "Managing People For Project Success" Van Nostrand Reinhold, New York, 1992, p.180-200

Stuckenbruck, C. Linn, Ph.D. "The Implementation of Project Management: The professional's Handbook" Addison-Wesley Publishing Company, Los Angeles, 1989 p. 125

Artley, Will and Ellison, DJ and Kennedy, Bill, "Establishing and Maintaining a Performance-Based Management Program" Article from the web site www.orau.gov/pbm September, 2000

Dreger, J. Brian, "Project Management, Effective Scheduling" Van Nostrand Reinhold, New York, 1992, p.18-19

Haupt, Eleanor, "Basic Earned Value Management for Program Managers" Excerpt from the web site http://www.acq.osd.mil/pm , 1999

Dooley, David, "Social Research Methods" Prentice Hall, New Jersey, November 1999, p.125

Alreck, Pamela L and Settle, Robert B, "The Survey Research Handbook" McGraw Hill, 1995

Tuman, G.J., "Project Management Handbook" Van Nostrand Reinhold Co., New York, 1983, p.495-532

Chang, A.S. and Ibbs, C.W., "Development of Performance Measures for Design Projects" Project Management Journal, December 1999, p.42

Christensen, David S, "Management Control Systems Theory and Cost/Schedule Control Systems Criteria" National Estimator (Fall), 1989

Department of Defense, "Defense Acquisition Management Policies and Procedures" DOD Instruction 5000.2, Washington DC, 1991

Blanchard, Fred, "Net Present Value: An Old Tool Finding Use in Assessing Public Sector Capital Expenditures" Project Management Journal, March 1995

Barlow, Michael J ACS, Project Management, and Major Thomas A. Klingelhoets, USAF, "Earned Value Supports Enterprise-Wide Project Management" Arnold Engineering and Development Center. Excerpt from the web site http://www.acq.osd.mil/pm/inhouse/index.html, July 1998

Kaplan, Robert and Norton, David P. "The Balanced Scorecard: Translating Strategy into Action" HBS Press, 1996

Arveson, Paul, "What is the Balanced Scorecard?" Excerpt from the web site www.balancescorecard.org/basics/bsc1.html, 1998

EVMS Work Team, "Industry Standard Guidelines For Earned Value Management Systems" Excerpt from the web site : http://www.acq.osd.mil/pm/newpolicy/indus/evms_gde.htm , August 1996

Tassey, Gregory "Lessons Learned About The Methodology of Economic Impact Studies: The NIST Experience" Excerpt from the web site http://www.nist.gov/director/planning/epp-paper.htm, April, 1998

Sall, John and Lehman, Ann and Creighton, Lee, "A Guide to Statistics and Data Analysis Using JMP and JMP IN Software" SAS Institute Inc., 2001

Swartz, Stephen M. "The Effects of Variability and Disruption on Project Stability, Duration, and Net Present Value." Ph.D. Dissertation. Michigan State University, East Lansing MI, 1999.

Vita

Yigit Sen, 1st Lieutenant, Turkish Air Force, was born in Ankara, Turkey. He graduated from Kuleli Military High School in Istanbul, Turkey in June 1992. He entered Turkish Air force Academy in Istanbul, Turkey where he graduated with a Bachelor of Science degree in Industrial Engineering in August 1996. He completed the supply officer training course in July 1998.

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14. ABSTRACT

This research investigates the manager's perceptions of the importance of stability to overall project outcomes. The assessment is based on the importance and usefulness of both the general attributes of management for the activities in a specific program, and the specific measures being employed by the managers. The classical measures of Cost, Schedule, Performance were assessed as well as Earned Value and proposed measures of Stability. In this research, the scope is limited to the management of relatively complex, large-scale projects involving the design, development and delivery of military aircraft and support systems. In order to obtain data for the research, a survey method was employed. The population being sampled for the survey included the managers at various levels in the programs managed by System Program Offices (SPOs) such as C-17, F-16 and F-22.

Results indicated that the newer measures of Stability and Earned Value were well-received and had both importance and usefulness to the managers. Perceptions differed between programs depending on their size; and between managers depending on their level of authority. This was pronounced with regard to the newly introduced *Stability* concept.

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