

PROJECT MANAGEMENT ESTIMATING TOOL

By

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PROJECT MANAGEMENT ESTIMATING TOOL

Project Overview

Abstract

This project developed a user-friendly spreadsheet cost estimating tool for Public Buildings Service (PBS) project manager use in small construction and leasing projects. It helps users provide their own conceptual and budgetary level estimates for over 50 common tenant improvement tasks in federally owned and leased buildings in Alaska, Washington, Oregon and Idaho.

The Project Management Estimating Tool (PMET) will enable project managers to provide many simple estimates in minutes that currently require multiple days using cost estimator resources. PBS leaders consistently receive complaints from customer agencies regarding the long time PBS takes to provide estimates, and often regarding estimate inaccuracy. The PMET addresses both timeliness and accuracy of small, recurring project estimates, freeing cost estimators to focus on timeliness and accuracy of more complex estimates.

The PMET incorporates a statistical risk methodology to increase estimate accuracy. Each estimating item contains a dataset combination of commercial estimating guide values and actual bid values from recent federal contracts. Based on user-provided answers to seven risk factor questions, the tool tailors estimates to the risks. The improved accuracy of PBS estimates from this tool will also build the estimating skills and confidence of project managers, another PBS goal toward project management maturity.

Keywords And Abbreviations

CA – Construction Analyst
CCB – Change Control Board
FM – Functional Manager
GSA – U.S. General Services Administration
PBS – Public Buildings Service
PM – Project Manager
PMET – Project Management Estimating Tool
PMI – Project Management Institute
PMP – Project Management Plan
WBS – Work Breakdown Structure
PS – Project Sponsor
UAA – University of Alaska Anchorage

Current State

Currently, most PBS project cost estimating is accomplished by contracted cost estimators or federal planner estimators. Project managers fill out electronic cost estimating request forms and copy documentation for the estimates to a shared drive. Each estimate request is then assigned to an estimator and it waits in a first in, first out queue until requests ahead of it are completed. This process involves several process steps and usually several days of waiting, even for simple estimate requests. Quite often, the estimator calls the project manager for a briefing on the request to ensure a correct understanding of the scope.

Future State

The PMET enables project managers to provide timely cost estimate ranges for many simple budgetary estimate needs, or conceptual level estimates for feasibility of more complex estimates. Use of the PMET saves time for both project managers and cost estimators in developing estimates. Project managers now provide many of the simple estimates their own projects require in minutes, saving days of waiting for help from cost estimators. Cost estimators have more time to focus on complex estimates requiring their greater estimating expertise. This improves the overall timeliness of estimates requested by project teams and improves the precision and overall accuracy of estimates using this tool. Use of the PMET also builds the estimating skills and confidence of project managers, furthering a PBS goal toward greater project management maturity.

Need

PBS leaders consistently receive complaints from customer agencies regarding the long time PBS takes to provide estimates. PBS policy allows one month for returning estimates to clients who request them. With equal frequency, PBS leadership receives complaints regarding estimate inaccuracy, for estimates that are either too high or too low. Overly high estimates are a problem because they tie up agency funding that cannot be reprogrammed for other priority needs before they expire. Estimates that understate costs require modifications to increase funding, often requiring national approval and administrative overhead that delays projects. The need was for initiatives to help reduce estimating time and improve accuracy. A secondary need was improving project management maturity by building the estimating expertise and confidence of project managers.

Scope

Project Justification

The current process for generating small estimates is neither an efficient use of project manager time nor cost estimator time for simple cost estimate needs. Project managers have the ability to develop their own estimates for simple and common scopes of work, but many lack the training, experience and confidence to do so. Cost estimators are tied up with many simple estimates, delaying their work on the more complex estimates their experience and skill-sets were intended for. For example, the average 27 estimating requests per month take an average of 4.5 days to return a cost estimate. The PMET will provide timely conceptual or budgetary level estimates for simple projects in minutes and saves resource hours in developing them. Cost estimators will have more time to focus on complex estimates, improving the timeliness of delivering those estimates. Use of the PMET will also improve precision and overall accuracy of estimates by using historical actual data and promote project management maturity as it builds user estimating skills and confidence.

Project Objectives

The following list includes the PMET project objectives:

- Create a project management estimating tool for use by PBS Region 10 project managers, cost estimators and contracting officers for simple and common estimating needs.
- Aid development of single item or single assembly estimates that are the PBS “bread and butter” projects most often requested by clients and needed in projects.
- Develop a searchable tool in a user-friendly spreadsheet format.

- Incorporate PBS and R.S. Means parametric "rules of thumb" for conceptual level estimates.
- Incorporate PBS and R.S. Means estimating data for budgetary level estimates.
- Incorporate PBS historical contract cost data into both conceptual and budgetary level estimates.
- Factor risk (agency, contract type, requirement standards, urgency) & geographic location (Cities in AK, ID, OR & WA) inputs into PMET estimate ranges.
- Include a user guide and a training plan for proper rollout to PBS users.
- Include a plan for annual maintenance updates and improvements based on inflation and variances realized between estimates and actual pricing.

Deliverables

This project included a full Project Management Plan (PMP) that guided PMET development and took this tool from concept through initiation and planning to execution and delivery of a fully operational model for creating simple project estimates. Along that path, it provided the project management team practical experience in cradle-to-grave project management.

The product deliverable (PMET) is a project management estimating tool that incorporates a searchable, user-friendly spreadsheet format and a user guide. This tool has both parametric estimating components for conceptual estimates (-40% < Precision and Range < +75%) and more accurate line-item budgetary level estimates (-10% < Precision and Range < +25%) for common tasks and assemblies at a budgetary cost level.

Other PMET deliverables include a user guide (instructions) and a training outline. The PMET also includes a plan for annual updates and accuracy improvements to keep pace with inflation and continually improve its results as more historical actual pricing is gained and incorporated. This project commenced on September 4, 2015 and was completed on March 24, 2017.

Work Breakdown Structure (WBS)

The high level work breakdown shown in Exhibit (1) illustrates the general flow of the project:

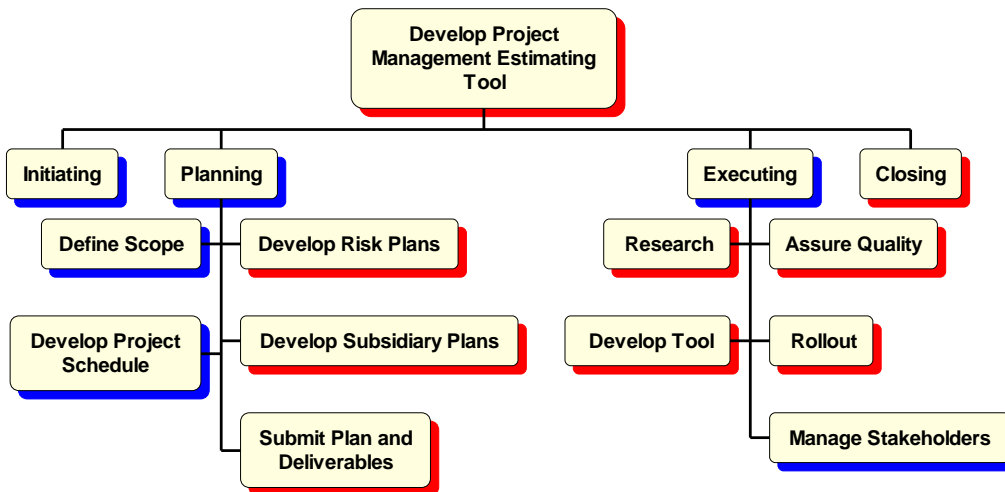


Exhibit (1) – Work Breakdown Structure (WBS)

Research Approach

Research Sources

The research for this project consisted of a general literature search for similar efforts already available in the global project management field, followed by an internal agency search for any other products or parallel efforts underway. Research sources for the product (PMET) include R.S. Means estimating guides for general industry results and PBS contract files for historical data to tailor general industry costs to PBS actual costs.

Research Keywords

The following keywords were used to search for related research outside the agency and within the agency systems:

Cost Estimating Tool	Cost Estimating Guide	Cost Estimating Reference
Project Estimating Tool	Project Estimating Guide	Project Estimating Reference
Construction Estimating Tool	Construction Estimating Guide	Construction Estimating Reference
Lease Estimate Tool	Lease Estimating Guide	Lease Estimating Reference
Small Project Estimating	Small Estimate Guide	Small Estimate Reference

External Research

This project used a general literature search for similar estimating references or guides that may exist to aid estimators in assembling estimates for simple projects. While there were several estimating guides available, there were no similar estimating tools available that would apply to PBS estimating. The R.S. Means guidelines were chosen as the most common estimating aids used in general industry.

Internal Agency Research

Internal research incorporated an internal literature search for similar tools and cost estimates from historical costs within PBS. This was collected from contract files and project manager and cost estimator experience with the simple and most common requests for estimates. Examples of common and simple estimating requests include:

- Build an interior partition wall with a door, creating an office
- Demolish walls and doors
- Install a window or relight
- Install a new electrical outlet
- Add a light fixture in a ceiling
- Carpet floors and paint walls and ceilings

In order to make the PMET truly user-friendly, research was conducted with GSA/ PBS project managers, contracting officers, planner/estimators, and contracted cost estimators. Planner/estimators and contracted cost estimators were grouped in this project as PBS Cost Estimators, since their function and expertise were generally the same.

The interaction with the above population was primarily electronic in nature (survey or email), seeking the most common items they need estimated, rules-of-thumb they use for parametric cost estimates and periodic suggestions for the tool as it develops. The project manager occasionally supplemented electronic communication with phone calls or meetings with individuals or groups.

Initial User Survey Questions

An initial survey was sent to employees in the three user groups introducing the project, explaining the purpose of the tool and then asking the following questions:

1. Which user group are you in? (Project manager, cost estimator, contracting specialist/officer)
2. What is your geographic location? (Anchorage, Auburn, Portland, Seattle, Spokane, Boise)
3. What percentage of estimates that you review/use do you develop yourself? (0-100%, by 10%)
4. What percentage of estimates that you review/use would you develop yourself if you had a user-friendly tool with a current collection of historical estimating factors and line items from around the region? (0-100%, by 10%)
5. What parametric rules-of-thumb do you use in your work? (i.e., \$50/sf for vanilla office TI's)
6. What estimating guide(s) do you use in your work, if you do any estimating yourself? (Check all that apply: RS Means, IDIQ listing, other "menu" listing, parametric list, other)
7. What is the average estimating accuracy of the conceptual or budgetary estimates you work with?

Initial User Survey Results

The complete survey results are available in the appendices, but key results included:

- 48% of the respondents were project managers, 28% were contracting staff and 20% were cost estimators.
- 44% of the respondents were from the regional office in Auburn, Washington.
- 29% of estimates were currently created by respondents, but the forecast number increased to 49% if a user-friendly tool was provided.
- The most commonly used estimating sources were R. S. Means and previous historical estimates (confirmation for focusing on those sources for the PMET).
- There was a broad range of estimating accuracy averages, but the -10%/+25% was the clear favorite and likely the most useful (PMET uses this range for over 50 assembly estimating lines).
- One half of the respondents wait a week or longer to receive their small cost estimate.

Annual Follow-Up User Survey Questions

Annually over the life of the PMET, the cost database numbers will be updated and users will be asked these follow-up knowledge area annual survey questions:

1. What percentage of estimates that you review/use do you develop yourself? (0-100%, by 10%)?
2. In what percentage of any estimates that you develop yourself do you use the Project Management Estimating Tool (PMET)? (0-100%, by 10%)?
3. Do you use the PMET for project estimates in more than one phase of a project? (Yes, No)
4. Has the PMET increased your understanding and confidence in developing your own simple estimates? (Yes, No)
5. Has the PMET helped reduce the time it takes to respond to estimate requests/needs? (Yes, No)
6. Do you have any tips for other users of the PMET to help improve the accuracy of the estimates or in using the risk factors?
7. What suggestions do you have for improvements to the PMET? (Open answer)

Project Management Life Cycle

The PMET life cycle follows a regular product life cycle pattern shown in Exhibit (2). The planning, development, training and launch in this project make up the introduction phase. The growth phase will be as project managers and estimators use the tool in practice and share success stories and ideas for improvement. The maturity phase occurs as the PMET reaches full deployment and widest usage. The decline would normally start as the estimating data decays in accuracy. Therefore, the PMET must have regular maintenance to ensure pricing data is updated to maintain its accuracy and new improvement ideas from users are implemented. Regular (annual) PMET maintenance will be the key to keeping this tool at full maturity usage.

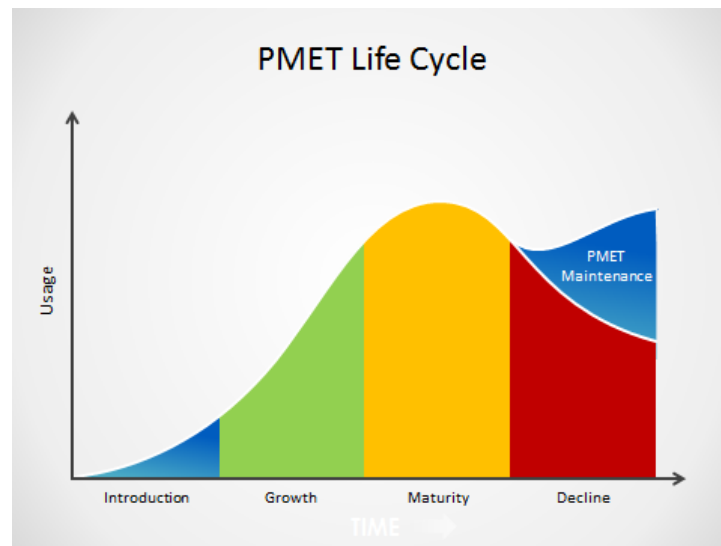


Exhibit (2) – PMET Life Cycle

Critical Success Factors

The PMET is an important enhancement to the PBS project manager's toolkit. It enables project managers to assemble many of the small and simple cost estimates for build-outs in their lease projects or change orders during tenant improvements construction. This reduces the time needed for estimating, yielding shorter estimating task durations and increased productivity for both project managers and cost estimators. Ultimately, the PMET will improve PBS responsiveness to its many clients.

To successfully realize these gains, this project had to meet the following critical success factors:

- The PMET must be user-friendly to encourage its use.
- The PMET must yield accurate estimates, within the normal estimating ranges it was designed for.
- The PMET must have a training plan that allows many different users to use it effectively and develop accurate estimates within the designed estimating ranges.
- The PMET must have a maintenance plan to ensure the parametric and pricing data is updated annually to maintain its accuracy of estimates indefinitely.

Project Results

Staffing Planning and Acquisition

Staffing and acquisition for this project were simplified by use of the project manager as the predominant resource and accessible in-house expertise for technical consultation. There was no planned requirement or need for any acquisition in this project. The project manager was the primary planning resource, with reviews by the Project Sponsor, Project Executive and the Construction Analyst as in-house sources of additional expertise.

Assumptions

Assumptions for this project were:

- The PMET project would have the support of functional managers
- In-house resources had the technical expertise needed to support the project
- In-house resources would be available as needed for technical consultation
- Project managers and cost estimators would be willing to provide input for the potential benefit they would derive from the finished tool

The assumptions were correct with two minor exceptions. The PM needed to refresh on estimating practice technical skills and benefited from some additional study in advanced risk modeling. Also, the cost estimators were instructed to hold on some PM-requested input, due to changes in the PBS national estimating policy.

Constraints

The key constraint in this project initially was time, since many of the deliverables were driven by academic deadlines. Time ended up becoming a flexible constraint. Quality ended up as the key constraint for success, since without the quality that drives estimate accuracy, the PMET would not see much use. Scope was a more flexible constraint and the cost component of this project was the least constrained, since this was an in-house effort and salaries were already covered.

Integration Management

The planning team focused on consistency between all the different project documents created in the planning and initiating phases. This was a focus on a single, cohesive PMP, broken down into logical sub-plans that consistently supported the big picture. Inconsistencies between different portions of the plans would have caused confusion and distracted from the logical flow of the project.

To integrate consistency across all elements of the project plan, the project team first minimized the total number of project documents. The goal was to keep the project file list simple. The PMP is a single Word document with a single Excel document, tabbed to include separate PMP annexes best supported by a spreadsheet format.

The project schedule includes as much of the plan information as practical in MS Project, integrated into its custom cells and views. That includes the data dictionary, requirements traceability, risks associated with each task, estimate and costs summaries.

Any annex to the PMP that could be created from MS Project helped assure consistency with the work breakdown schedule (WBS) and the activity schedule. All data entered in MS Project was maintained there, including any changes. New copies of PMP annexes were created from MS Project as significant

changes were made. The project manager also reviewed all documents for consistency at each submission point.

Project files and documents were subject to change as the project progressed. To minimize confusion about which version of a file or document was the most current, version control identified it with the project, the PM and the date the file or document was last edited and saved. A revision history for this PMP was also maintained to document significant revisions and review checks.

Scope Management

Scope management for this project consisted of identifying the major work required to meet the project's goals, helping the team define, verify, and control what should be (and should not be) included in the project.

The planning team focused on defining the scope with clear boundaries to prevent scope creep during the project. There were many ideas and initiatives in the Public Building Service (PBS) leasing project management group and this project started with the idea of incorporating several of the agency needs. However, anything beyond the PMET and its supporting plans was beyond the scope of this project.

During project execution, there was expected pressure to add more features to this estimating tool that never materialized. The theory was users would see the PMET in development and would have many suggestions for making it larger and adding features that were not part of the initial requirements. Ultimately, user suggestions will serve to grow and improve the product, but development time was limited in the execution of this first version of the PMET.

Change management included identifying and documenting potential changes in scope, determining whether the change was beneficial and necessary, analyzing the scope and impact of the change, estimating the effort and cost of the change, documenting the decision on the change, and managing the change once added to the project. All changes to the project scope required approval of the Project Sponsor and Project Executive. There were three changes in scope for this project.

Scope Change One

The first change was an opportunity to expand and modify the project scope. Indefinite delivery indefinite quantity (IDIQ) contracts are used in larger federal buildings to pre-price common building modifications, similar to those the PMET was intended to help estimate. The research discovered the IDIQ contracts were not being used, since lower pricing was obtained by having the IDIQ contractor bid on the specifics of each project.

The flaw in the pre-pricing for the IDIQ contract vehicle was the bid items were not flexible enough to allow for much variation in the specific project requirements. The bidders put conservative pricing on the items to cover the worst case in the variables, which made the whole menu of pre-priced work items overpriced when compared with specific estimates for specific project requirements. Since significant time and effort is invested in developing and soliciting an IDIQ contract, this time and effort is wasted if this contract vehicle is not used.

The scope expansion for the PMET project was to develop the logic to correct this approach to these IDIQ contracts. That same logic was programmed into the PMET to keep it from overpricing estimates, but it also was intended to address a much broader problem for PBS building maintenance contracting at the

same time. This expansion in scope increased the benefit of this project for a nominal increase in the project scope.

Scope Change Two

The second change involved a reduction in scope resulting from a realized opportunity identified in the PMP. Since the IDIQ contracts seek to pre-price the many small, recurring work items that occur in buildings, the contracts already list common, recurring items identified by project managers, cost estimators and contracting personnel. The scope reduction will eliminate the separate research with PBS PM's and cost estimators and use items listed on IDIQ line item contracts. The PM's and cost estimators will still have opportunity to provide input regarding estimating line items when they review the PMET.

This scope reduction was realized with a double benefit. In researching all of the IDIQ contracts in the region, the PM discovered a trio of IDIQ contracts that had a list of common recurring estimate items with the flawed logic corrected and current contract pricing. The estimating line items from those contracts provided the draft list for the assembly estimates in the PMET and the pricing provided supplied much of the initial pricing data in the tool. Another advantage to this opportunity was the alignment created between the PMET and the most current IDIQ contracts in the region.

Scope Change Three

The third scope change involved another reduction in scope. Since approval of the PMET PMP, the National Office of PBS issued new guidance regarding the estimating process and formats used by the agency. PBS evaluated commercial-off-the-shelf estimating systems over a period of eight years and settled on an enterprise version of the R.S. Means software.

This move reinforced the selection of R.S. Means for the PMET, but an unanticipated outcome of the national rollout was a new requirement that all estimates for clients be reviewed by PBS cost estimators. The rollout of this regional PMET initiative during the larger national rollout would likely confuse users. Therefore, the rollout portion of the PMET project scope was deleted. The testing and evaluation of the PMET remains with the regional cost estimators, until the national system rollout is completed and the PMET rollout may follow as a supporting and natural outflow of the national initiative. This element likely contributed to the lack of pressure to increase the PMET scope, since the majority of future users have neither seen nor utilized the tool during this project.

The rollout of the PMET to project managers may be made part of a future, separate project, since the PMET's potential benefits to the PBS project management community are unchanged. The new R.S. Means system requires a license for every user and the PMET could be used nationally to minimize the number of project managers requiring a license.

Time Management

Time management for this project included defining all the detailed tasks and activities needed to produce the deliverables of this project, creating an integrated schedule for the project, and controlling changes to that project timeline.

The PM developed the schedule, including defining and sequencing each schedule task with its cost estimates and durations. As stated already under integration management, the project schedule included as much of the plan information as practical in MS Project 2013, integrated into its custom cells and

views. That included the data dictionary, requirements traceability, risks associated with each task, estimates and costs summaries.

The Schedule Performance Index and the Cost Performance Index were analyzed at each deliverables milestone to measure how the PM was managing time. A range for each index of 0.9 – 1.1 was considered within normal tolerance thresholds. Below 0.9 required analysis for possible corrective action and below 0.8 triggered an action plan requirement to get the project back on schedule. A measurement above 1.2 would have triggered an analysis of why the project was significantly ahead of schedule and a recommendation to add additional quality to the project to take advantage of the extra time available.

Time management was the most challenging project management element of this project. In addition to the three changes to scope addressed previously, there were two significant schedule changes to this project schedule.

Schedule Change One

The first schedule change occurred when two of the high level risks identified in the Project Management Plan were realized in combination. The first risk was titled, “Project Manager unavailable,” which stated that the project could be delayed if the PM's regular workload interfered with this project work. The second risk was titled, “Tasks take longer,” which stated that the project could be delayed if PMET development tasks took longer than estimated.

The risk mitigation strategy for both risks was to utilize project overtime to crash the late schedule tasks and recover the schedule. This combination of simultaneous risks exceeded the amount of overtime available to crash the delayed tasks.

The PM's primary work projects were at critical points, squeezing available overtime hours and preventing the option to take leave from work to create overtime availability. The PMET development task durations were optimistically underestimated in attempting to fit the tasks into the academic calendar requirements. The PMET project schedule was already compressed from the first scope increase change, so the combination of these realized risks pushed the compressed schedule back past academic milestone constraints. This caused a major delay in the slip of a full academic semester.

Schedule Change Two

The second schedule change came as a result of a new opportunity over the summer to perform additional research into the risk management features of the PMET. This opportunity was made possible by the first schedule change and resulting project delay. The PM took a directed studies course in advanced risk model simulation techniques to incorporate in the tool design. The new insight provided by that course resulted in a better technical mechanism for allocating the estimating risk factors into the estimate calculations within the PMET.

This technical improvement in the PMET, however, came at the cost of another significant delay in the project schedule. The two high level risks that caused the first schedule delay were still in effect, causing a second significant delay. The project schedule had to be reworked and re-baselined again to reflect the reality of seriously constrained resource availability for the project's primary resource. The time delay is illustrated in Exhibit (3) on the project timeline.

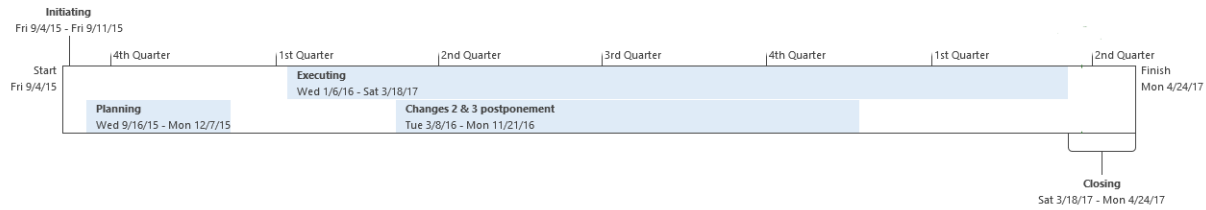


Exhibit (3) – PMET Project Timeline

Cost Management

Cost management for this project included developing cost estimates and budgets and performing ongoing project cost control. The PM estimated costs for each task in the project schedule and built the project budget. Since the project costs were primarily salary costs of the PM, the cost of each task was directly related to the work for the task. Also, the PM’s salary was already fully covered by PBS, so the representative hourly rate of one dollar (\$1) per hour was applied to the work under this project for the main purpose of tracking fiscal measures in the project. This yielded only a representative budget for the project, again for tracking budget performance.

The initial project budget consisted of 436 hours of work, multiplied by a tracking labor rate of \$1 per hour, for a total representative budgeted cost of \$436. The final cost of the project was 420 hours of work, for a net representative actual cost of \$420. However, the scope reduction of 40 hours for PMET rollout reduced the budgeted cost to \$396, so the project execution tasks (250 hours) came in over budget.

Exhibit (4) on the following page shows the cash flow report for the project. Of note are two horizontal portions of the graph when no project work occurred during a holiday break and then during the delays mentioned in time management. There is also a spike in the work during Week 11 of the 1st Quarter 2017, when the cost estimators reviewed the PMET in parallel with other work by the PM.

Exhibit (5) on the following page shows the baseline cost report for the project, which better displays the breakdown of the total project cost. Project execution tasks varied considerably from budget. There were four tasks in execution that took much longer than budgeted: estimating component systems, programming the tool, developing the user and training guide and field testing. These were mitigated somewhat by time savings over budget in gathering and incorporating test feedback and retesting and validating the PMET.

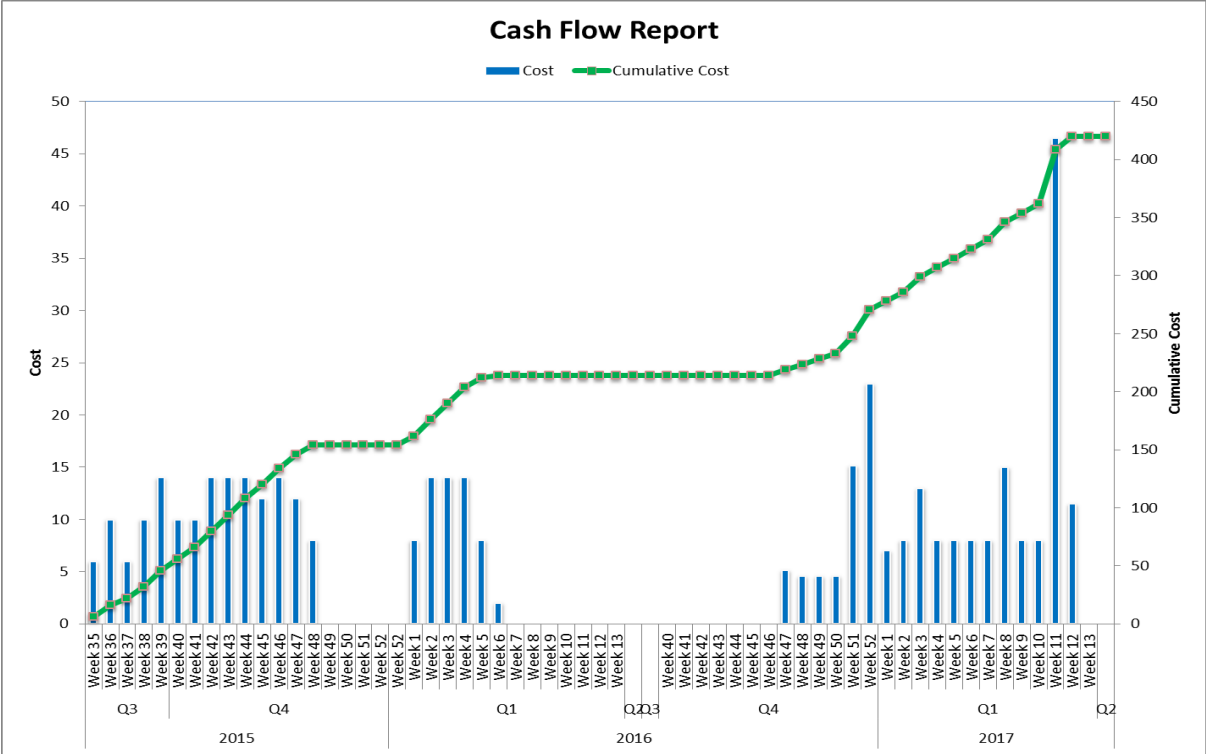


Exhibit (4) – PMET Cash Flow Report

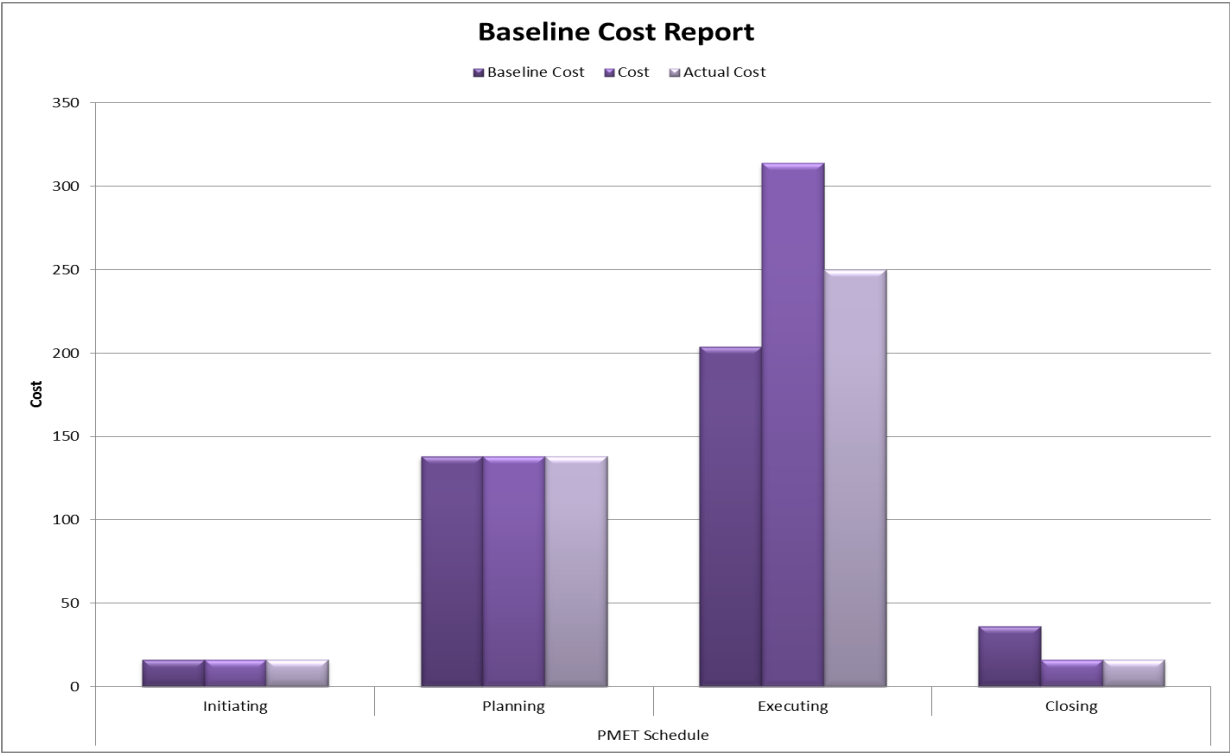


Exhibit (5) – PMET Baseline Cost Report

Quality Management

Quality management builds quality into a project by defining a quality program that includes the test planning, deliverables reviews, and customer reviews of progress against objectives. It also includes planning quality management, performing quality assurance and controlling quality. The PM had overall responsibility for project and product quality, using the in-house expertise of the Project Sponsor, Project Executive, the Construction Analyst and the PBS Cost Estimators for testing and evaluation of the PMET.

The PMET has both parametric estimating components for conceptual estimates (-40% < Precision and Range < +75%) and more accurate line-item budgetary level estimates (-10% < Precision and Range < +25%) for common tasks and assemblies at a budgetary cost level. Estimate ranges generated by the PMET were tested against actual contract costs to ensure these standards were met.

The annually updated R.S. Means estimating guides were another standard incorporated into the PMET. This is the most commonly used estimating guide in the industry. This guide was also used to check the PMET results for accuracy within the specified precision ranges and will be used indefinitely into the future to maintain the accuracy of this tool.

A qualitative standard for the PMET was to be “user-friendly” or easy to understand and use. This will be evaluated through comments given to users during their training and review of the PMET.

Communications Management

The purpose of communication management is to identify planned and typical methods of exchanging information both within the project and to stakeholders and interested parties outside of the project. Communication management entailed identifying what information to communicate, who would receive the information, and how it was disseminated, including in what format and at what frequency. The communication management plan strived to require communication that was essential to success or averted failure.

Given the small size of the team on this project, communication was relatively simple:

- All communication related to project-wide status was directed to the Project Manager, unless otherwise advised.
- The Project Manager maintained an email folder for all e-mail correspondence.
- The Project Manager distributed regular status reports to the academic committee. The status reports usually covered the previous three weeks progress and included tasks completed, tasks in progress with percent completed, upcoming tasks, and copies of the current issues list, assignment list, and report of earned value against the project baseline.

Exhibit (6) shows the communications matrix for the project to show the depth and variety of stakeholders and their involvements in different aspects of the project.

PMET Project Communications Matrix

Name	Roles/ Responsibilities	Contact Phone Office/Cell	Contact E-Mail	Preference	Research Questions	Status Updates	Deliverable Reviews
Guy Cannova	Project Sponsor Supervisory Project Manager	(509) 353-2462 (W) (509) 590-3907 (M)	guy.cannova@gsa.gov	E-Mail	X	X	
Brian Swanson	Project Manager	(907) 271-5028 (W) (907) 841-6710 (M)	brian.swanson@gsa.gov	E-Mail	X	X	X
Paul Witherspoon	Project Executive	(253) 931-7423 (W) (253) 561-2982 (M)	paul.witherspoon@gsa.gov	E-Mail	X	X	
Alray Neumiller	Construction Analyst	(253) 931-7335 (W)	sonny.neumiller@gsa.gov	E-Mail	X	X	
Scott Matson	Leasing Division Branch Chief (Functional Manager)	(253) 931-7527 (W) (253) 347-4897 (M)	scott.matson@gsa.gov	E-Mail	As requested	As requested	
Ann Crawley	Leasing Division Director (Functional Manager)	(206) 220-4383 (W) (206) 992-5097 (M)	ann.crawley@gsa.gov	E-Mail	As requested	As requested	
UAA Academic Advisory Committee	Project Advisor – Roger Hull Committee Members – Dr. Kim and LuAnn Piccard	(907) 786-1923	rkhull@uaa.alaska.edu	E-Mail	X	X	X
Regional Project Managers	Construction & Leasing Project Managers	Multiple	Multiple	E-Mail	X		
Regional Cost Estimators	Agency Points of Contact/PM's	Multiple	Multiple	E-Mail	X		
Regional Contracting Officers	Agency Points of Contact/PM's	Multiple	Multiple	E-Mail	X		
PBS Clients	Agency Points of Contact/PM's	Multiple	Multiple	N/A	N/A	N/A	N/A

Exhibit (6) – PMET Project Communications Matrix

Project status meetings were scheduled every three weeks with project deliverables due the week before. These were generally part of the academic requirement and held after the normal weekday, but they were open to any interested team members. Project status reports were completed and routed.

Risk Management

Risk management documented policies and procedures for identifying and handling uncommon causes of project variation (i.e. risk and opportunities). Risk was the possibility of suffering a negative impact to the project, such as decreased quality, increased cost, delayed completion, or project failure. Risk management also included identification and handling of possible positive impacts to the project, or opportunities. Two major identified risks realized in this project have already been described in time management regarding the project delays.

A second aspect of risk management for this project was in programming a risk impact feature into the PMET. Based on a set of inputs from the user, the tool factors the estimate range up or down to account for a higher or lower risk than average. This was further developed during project execution.

Exhibit (7) shows four cases of different normal distribution factors and the percentages of programmed data they cover. The normal distribution factor shows where the risk factors (entered in the Input Tab) have established the most likely estimate relative to the data in the PMET database. In the first example below, the most likely estimates shown would be equal to or higher than 50% of the estimated and actual costs in the PMET database for each line item. The optimistic and pessimistic estimates are calculated by

subtracting or adding one standard deviation from the most likely estimate. The example range this establishes for each line item includes 68% of the known data in the database, from the 16th percentile to the 84th.

In the last example below, the most likely estimates shown would be equal to or higher than 98% of the estimated and actual costs in the PMET database for each line item. The example range this establishes for each line item includes only 16% of the known data in the database, from the 84th percentile to the 99.9th.

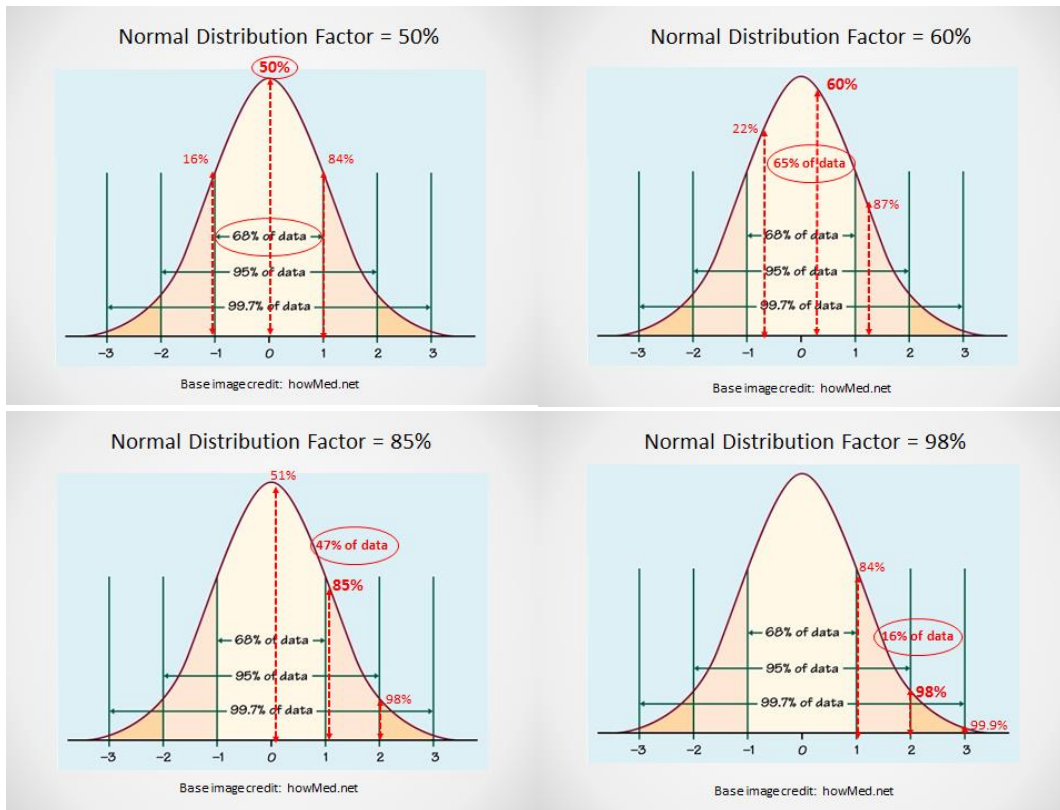


Exhibit (7) – PMET Normal Distribution Factors

The normal distribution factor works the same way in the opposite direction. The key point is the estimates the PMET produces account for common risk variances and will always have an estimate within the known experience of actual costs. The PMET estimating items are common, repeatable tasks, so a good set of historical costs will capture the vast majority of near future estimates. Since the database contains high and low risk actual numbers, the normal distribution factor serves to move tool estimates upward or downward within the range of actual experience. The user inputs for risk factors are the driver for summarizing overall risk of an estimate and finding an appropriate range in the data.

Stakeholder Management

Stakeholder management identified stakeholders, planned the management of stakeholders and managed and controlled stakeholder engagement. Good management of stakeholder's interests provides a good understanding of their needs and interests.

Stakeholders for the PMET project were identified in Exhibit (6). Stakeholder analysis consisted of two processes –each individual stakeholder was characterized according to their level of interest, influence and involvement. The stakeholders were categorized into two groups (Exhibit (8)), based on their level of involvement and need for communications:

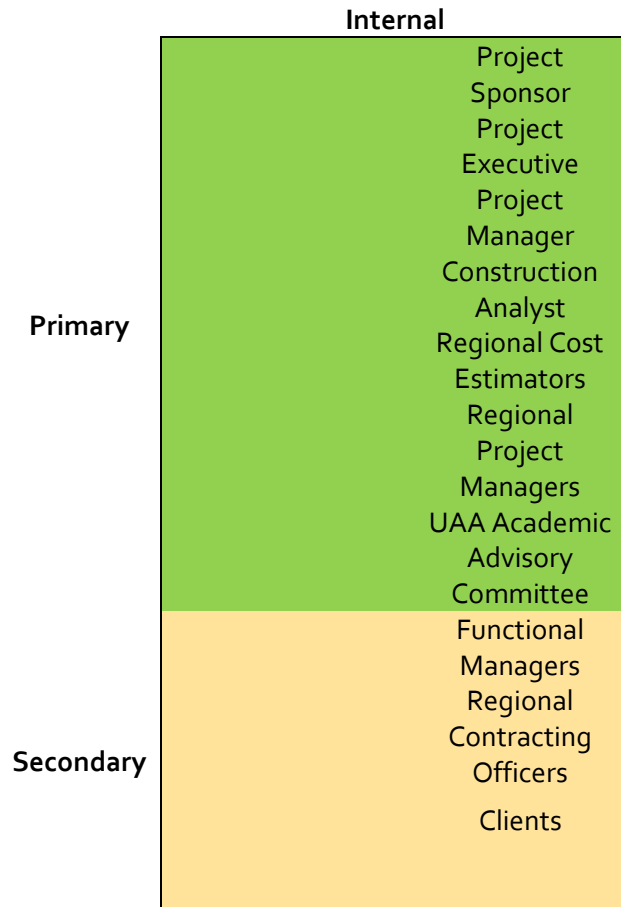


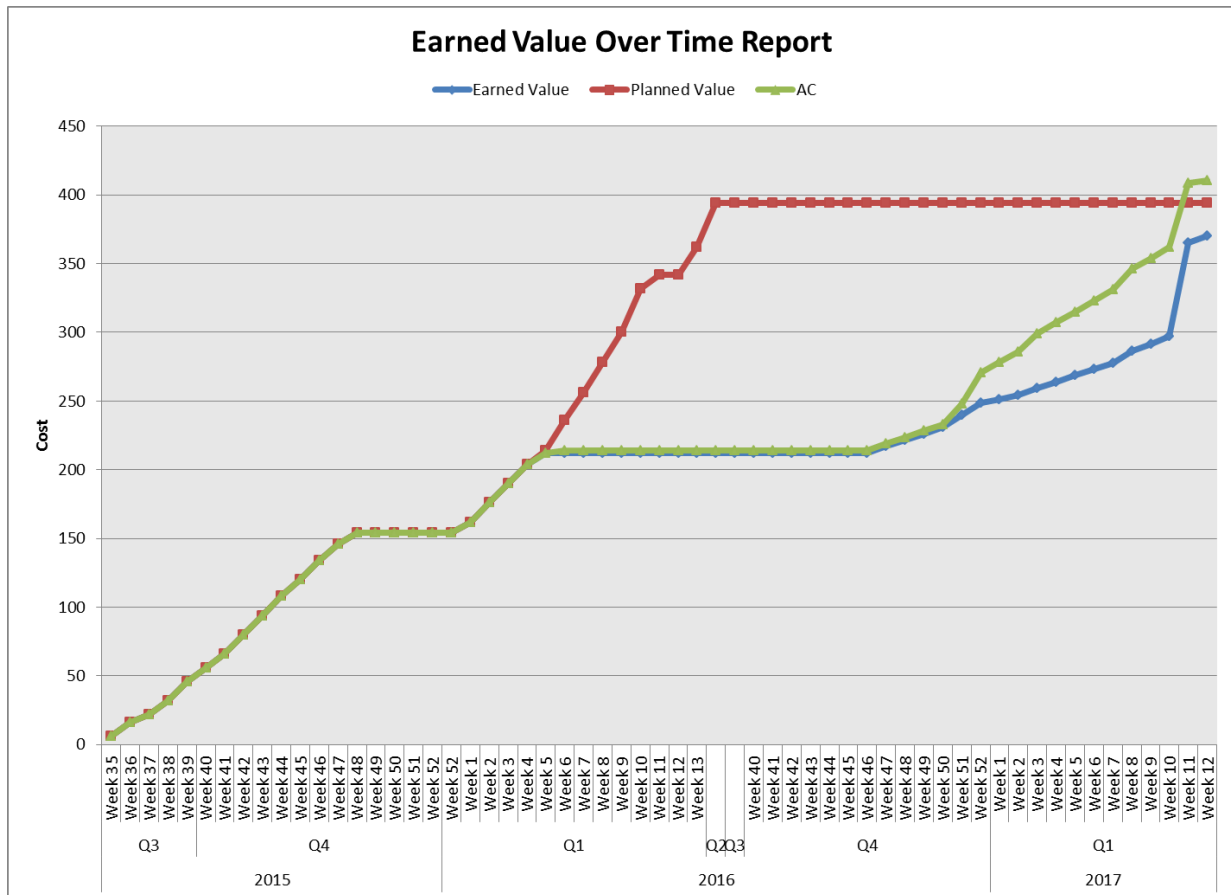
Exhibit (8) – PMET Stakeholders Diagram

Expectations of stakeholders were managed and controlled to keep their positive support throughout the duration of the project. The stakeholders listed above in the primary group were the most interested and involved in either the product or the project. They were the most closely involved stakeholders in research of requirements, project progress, and testing and use of the PMET. The secondary group of stakeholders had a lesser direct need in the project or the product, and due to postponement of the tool rollout, their only involvement was in the user survey.

Performance Measurement (Project Metrics)

As mentioned before under time measurement, the Schedule Performance Index (SPI) and the Cost Performance Index (CPI) were analyzed at each deliverables milestone to measure how the PM was managing time. A range for each index of 0.9 – 1.1 was considered within normal tolerance thresholds. Below 0.9 required analysis for possible corrective action and below 0.8 triggered an action plan requirement to get the project back on schedule. A measurement above 1.2 would have triggered an

analysis of why the project was significantly ahead of schedule and a recommendation to add additional quality to the project to take advantage of the extra time available.



showing an average of 27 estimating requests per month and an average of 4.8 days to complete each lease alteration estimate.

After the PMET is implemented and in use for a year, there will be data to compare to this baseline to see how the tool impacts those numbers. The expectation is the number of requests per month would be reduced by up to 25%. The average time to complete a project estimate should also go down, since there would be fewer requests competing for estimator resources and a greater time share for each project. An offsetting factor that might increase the average time per estimate would be the reduced number of simple, quick estimates and an increased proportion of more complex and time consuming estimates.

Product (PMET) Overview

Tool Construction

The data provided by cost estimators helped to populate a small data set for each parametric item or assembly item in the PMET. That data generally formed a normal distribution. Based on user answers to input questions that identify risk elements, the tool pulls its estimate for that scenario from somewhere along that distribution curve. The higher the risk score, the further to the right on the curve the most likely estimate is pulled from. The estimate range is then calculated plus and minus one standard deviation from that most likely value.

Once the data is populated and the tool tested in actual use, the risk factor calculations can be adjusted to "dial in" the tool results, much like a rifle scope is sighted in using actual shots. There is not much reliance on any single estimate in the data, but each estimate adds validity to the data and helps define the range and standard deviation. Of course, unlike a scoped rifle, this tool will have neither similar accuracy nor precision. However, for the normal range of actual results, it will have a logical basis for refining an estimate range based on risk.

This tool will rarely be as accurate as a tailored estimate from a cost estimator, but it is not intended to provide that level of accuracy. The PMET is intended to help project managers and contracting officers develop an expected range for project plans or negotiation memorandums. Cost estimators may find it useful and a handy reference as a measure of their individual estimates against past actual data, where the estimate scope is general and simple enough.

Each estimator reviewed the items listed and gave each item their best number, based on R.S. Means, actual results and their professional estimating judgment. Each estimator picked a familiar location with the best actual data to support their estimates. The geographic cost index for each location was then backed out of the data to form national average numbers for the databases. Any estimate the tool calculates for that location would multiply that same factor back in. For other locations, those estimates still provide valuable data when multiplied by the geographic index for a different location.

Development Iterations

The parametric estimates tab includes some line items to help in drafting project management plans. The assemblies estimating tab uses line items from PBS standard IDIQ contracts and is intended to help develop small budgetary estimates. This PMET shell is programmed with estimated and actual data for two types of estimating data:

1. A parametric (average) unit price or unit price range for office paint, carpet, move, IT/data and TI's in general.
2. An assembly (average) unit price or unit price range for each of approximately 50 standard IDIQ line items listed on the assembly estimates tab.

PMET data is 2016 national average estimating data (RS Means and/or actual) as a cost to the government (includes standard overhead and profit). Since this tool is not building-specific like IDIQ contracts with building-standard specifications, each line item contains an average price or price range for the most common assembly that would be found in most Class A buildings. For example, in constructing an interior wall, the estimates are for 5/8" gypsum wallboard on either side of 20 gauge metal studs at 16 inches on center. The unit cost for insulation is added to that for interior walls for constructing a standard, insulated, interior wall. The expanded metal security mesh line item is added for constructing a slab-to-slab security wall some PBS clients require.

The PBS experienced cost estimators were the best source of expertise for the accuracy of data in the PMET. Their combined input to the PMET data established a cost estimating database with realistic ranges for each line item.

PMET User Introduction

The first tab in the PMET (Exhibit (10)) provides important introductory information to the user:

GSA Public Buildings Service

Project Management Estimating Tool (PMET) (v 1.0)

This cost estimating tool for Public Buildings Service (PBS) project managers and cost estimators is designed for use for both construction and leasing projects in office space. The PMET enables project managers to provide timely cost estimate ranges for many simple budgetary estimate needs, or conceptual level estimates for feasibility of more complex estimates.

This tool uses parametric estimating components for conceptual estimates (-40% < Precision & Range < +75%) and more accurate line-item budgetary level estimates (-10% < Precision & Range < +25%) for common tasks and assemblies at a budgetary cost level

PMET (1.0) Features:

1. Programmed for use by PBS Region 10 project managers, estimators, planners and contracting staff for simple and common estimating needs.
2. Searchable and built in a user-friendly spreadsheet format.
3. Incorporates PBS parametric "rules of thumb" for conceptual level estimates.
4. Incorporates RS Means estimating data for budgetary level estimates.
5. Incorporates PBS historical contract cost data into both conceptual and budgetary level estimates.
6. Factors risk (contract type, requirement standards, urgency) & geographic location (Cities in AK, ID, OR & WA) inputs into its estimate ranges.

Author: Brian Swanson (March 2017)

PMET User Input

The [Input Factors] tab of the PMET (Exhibit (11)) contains most of the user-supplied data entry points for estimate identification, facility data and risk factors entry. Green cells denote user entry points:

Input Factors			
Project Number	SAK0123	Building Number	AK4678ZZ
Client & City	GSA Anchorage	Usable Square Footage (USF) of Space*	2,500
Geographic Location of Work*	Anchorage, AK	Office Type*	80% open/20% closed
Geographic Location Index:	1.19		
Annual Escalation Rate:	3.24%		
Risk Factors			
Client Tier*	Tier 2	Owned/Leased Facility*	Leased Facility
Client Facility Security Level (FSL)*	FSL 3	Contractor Layering*	Contractor
GSA Risk Experience with Client*	High Risk	Contract Method*	Firm Fixed Price Contract
		Market Competition*	Average Competition
* Required Factor		(Normal Distribution Factor = 60%)	

Exhibit (11) – PMET [Risk Factors] Tab

- Project Number: A PBS alpha-numeric project number to tie this estimate to a project.
- Client & City: A client abbreviation followed by city. (For example: FBI Anchorage).
- Geographic Location of Work: A location pick from the drop down menu with over 50 Region 10 cities to pick from. Cities are listed by state, alphabetically. There is a state average included if a specific city is not listed. (The Geographic Location Index and the Annual Escalation Rate will be displayed for the location selection.)
- Building Number: A PBS 6 or 8-digit alpha-numeric building number.
- Usable Square Footage (USF) of Space: The usable square feet in the space for the scope being estimated.
- Office Type: A ratio of open to closed office space in the project being estimated.
- Client Tier: A client tier level that establishes standards for the quality of finishes and improvements allowed each agency.
- Client Facility Security Level (FSL): A level of physical and electronic security afforded each agency, based on their mission.
- GSA Risk Experience with Client: A high, medium or low risk factor based on GSA's risk experience with the client.
- Owned/Leased Facility: Facility type (owned or leased) that significantly impacts overall pricing level.
- Contractor Layering: Number of contractor organizational layers in the project that add overhead and/or profit.
- Contract Method: Different contract methods have different cost impacts to projects.
- Market Competition: The level of competition (High, Average, Low) in the market for this estimate impacts pricing much like the law of supply and demand.

PMET Parametric Estimate Outputs

The [Parametric Estimates] tab (Exhibit (12)) displays the information entered in the [Input Factors] tab as a reference for the calculated parametric estimate ranges for paint, carpet, move services, IT/data and average tenant improvement costs. These are five common tasks in preparing office space for a new tenant, and both the unit cost for each task and a total estimate range is provided for the square footage entered:

Parametric Estimating Sheet						
5AK0123	GSA Anchorage		Tier 2		High Risk	
AK4678ZZ	Anchorage, AK		FSL 3		Average Competition	
Leased Facility	2,500 USF		80% open/20% closed		Firm Fixed Price Contract	
					Contractor	
Category	Unit Price	Units	Optimistic Estimate	Most Likely Estimate	Pessimistic Estimate	
Paint	\$ 1.39	SF	\$ 3,001	\$ 3,485	\$ 3,968	
Carpet	\$ 7.27	SF	\$ 15,103	\$ 18,168	\$ 21,232	
Move	\$ 2.98	SF	\$ 4,905	\$ 7,456	\$ 10,008	
IT/Data	\$ 8.10	SF	\$ 17,181	\$ 20,243	\$ 23,304	
Tenant Improvements	\$95.32	SF	\$ 187,267	\$ 238,298	\$ 289,329	
(Normal Distribution Factor = 60%)						

Exhibit (12) – PMET [Parametric Estimates] Tab

The normal distribution factor shows where the risk factors (entered in the Input Tab) have established the most likely estimate relative to the data in the PMET database. In the example above, the most likely estimates shown would be equal to or higher than 60% of the estimated and actual costs in the PMET database for each line item. The optimistic and pessimistic estimates are calculated by subtracting or adding one standard deviation from the most likely estimate. The example range this establishes for each line item includes 65% of the known data in the database, from the 22nd percentile to the 87th.

PMET Assembly Estimate Outputs

The [Assembly Estimates] tab (Exhibit (13)) also displays the information entered in the [Input Factors] tab as a reference for its estimated unit costs:

Assembly Estimates Sheet							
5AK0123	GSA Anchorage	Tier 2	High Risk				
AK4678ZZ	Anchorage, AK	FSL 3	Average Competition				
Leased Facility	2,500 USF	80% open/20% closed	Firm Fixed Price Contract				
			Contractor				
Number	(Prices include supervisor)	Units	Cost Per Unit	Quantity	Estimate	Estimate	Estimate
2419.1	Provide wall cutout	SF	\$ 8.05		\$ -	\$ -	\$ -
2419.2	Remove door and frame	EA	\$ 231.62		\$ -	\$ -	\$ -
2419.3	Remove acoustical ceiling panels	SF	\$ 2.44		\$ -	\$ -	\$ -
2419.4	Remove carpet flooring	SF	\$ 1.96	2,500	\$ 3,437	\$ 4,890	\$ 6,344
2419.5	Demolish walls or partitions	SF	\$ 6.38		\$ -	\$ -	\$ -
2419.6	Core drill, any size to 4" depth, for electrical access	EA	\$ 366.91		\$ -	\$ -	\$ -
2419.7	Remove rubber base.	LF	\$ 1.39	200	\$ 232	\$ 279	\$ 326
6200.1	Provide and install wood wall base	LF	\$ 8.95		\$ -	\$ -	\$ -
7210.2	Provide and install acoustical sound attenuation (fiberglass)	SF	\$ 1.35		\$ -	\$ -	\$ -
9140.1	Provide and install expanded metal security mesh in interior wall (min. 10 gauge)	SF	\$ 10.16		\$ -	\$ -	\$ -
9600.1	Provide and install carpet tile	SF	\$ 7.41	2,500	\$ 16,789	\$ 18,516	\$ 20,243
9600.2	Install carpet tiles, labor only	SF	\$ 2.73		\$ -	\$ -	\$ -
9650.1	Provide and install vinyl composition tile (VCT) to match existing.	SF	\$ 9.08		\$ -	\$ -	\$ -
9650.2	Provide and install rubber base. (4")	LF	\$ 7.75	200	\$ 1,143	\$ 1,549	\$ 1,956
16715.5	Provide and install cable (data / phone / CATV)	LF	\$ 3.51		\$ -	\$ -	\$ -
					Optimistic Estimate	Most Likely Estimate	Pessimistic Estimate
	(Normal Distribution Factor = 60%)		Assembly Estimate Totals:		\$ 21,601	\$ 25,235	\$ 28,869

Exhibit (13) – PMET [Assembly Estimates] Tab

After the Input Factors data entry is complete, the [Assembly Estimates] tab displays approximately 50 line items of common tasks found in the PBS Region 10 line item Indefinite Delivery Indefinite Quantity (IDIQ) contracts with factored unit costs for each. These line items allow a greater breakdown of tasks to better fit a project and provide a budgetary level estimate instead of a conceptual or rough order of magnitude estimate.

The normal distribution factor works exactly the same way for each assembly item as it does for the parametric items. It shows where the risk factors (entered in the [Input Factors] tab) have established the most likely estimate relative to the assembly data in the PMET database. In the condensed example above, the unit costs shown would be equal to or higher than 60% of the estimated and actual unit costs in the PMET database for each assembly.

Entering a quantity in the green cell for an assembly will calculate a most likely estimate for that quantity of assembly units. Optimistic and pessimistic estimates form an estimate range, calculated the same way they are for parametric line items.

There is a totals line at the bottom that sums the optimistic, most likely and pessimistic estimate totals for all the line items used.

Contractor overhead and profit are generally reflected in the PMET estimates, but any associated general requirements (project overhead) are not. The PMET is intended to help develop project plan estimates for relatively small tenant improvement projects, or serve as a second opinion reference for simple contractor proposals. As the database fills with good actual contract results, this tool will be used by cost estimators and project managers for small, tenant improvement projects.

Product (PMET) Testing, Rollout and Maintenance

Testing, Training and Rollout

The PMET plan called for an initial testing by cost estimators, followed by user training and rollout of the PMET to intended users. Due to the changes to PBS policy and the regional estimating improvement initiative, the project scope was reduced to remove testing, training and rollout. Those tasks will be covered in a follow-on project, after the new plan for measuring actual contract pricing data against cost estimates is implemented.

Annual Maintenance

The PMET will only be as accurate as the accuracy of the data in its database. Regular PMET maintenance will be the key to keeping this tool at full accuracy, an essential element for its effectiveness and continued use.

As the programmed estimating data decays in accuracy over time, the PMET's estimates will suffer a directly proportional decline. User feedback will identify variances between estimates and actual contract pricing. This plan will ensure the PMET parametric and pricing data is updated annually to maintain its accuracy of estimates indefinitely.

Regular maintenance will also implement new improvement ideas from user feedback, adding new common estimating line items and other helpful suggestions. The PMET must maintain a healthy balance between usefulness and maintenance effort. Additions to the tool need evaluation against the risk that the tool would become too cumbersome and maintenance would require too much time and energy.

Annual User Survey

Issue the annual follow-up survey questions below to users to gather feedback and measure progress from the initial and earlier surveys:

1. What percentage of estimates that you review/use do you develop yourself? (0-100%, by 10%)?
2. In what percentage of any estimates that you develop yourself do you use the Project Management Estimating Tool (PMET)? (0-100%, by 10%)?
3. Do you use the PMET for project estimates in more than one phase of a project? (Yes, No)
4. Has the PMET increased your understanding and confidence in developing your own simple estimates? (Yes, No)
5. Has the PMET helped reduce the time it takes to respond to estimate requests/needs? (Yes, No)
6. Do you have any tips for other users of the PMET to help improve the accuracy of the estimates or in use of the risk factors?
7. What suggestions do you have for improvements to the PMET? (Open answer)

Annual Maintenance Instructions

1. Identify variances between estimates and actual contract pricing from the surveys.
2. Identify new improvement ideas and other helpful suggestions from the surveys.
3. Gather user feedback submitted since the last annual maintenance.
4. Make a new copy of the latest PMET master file and rename it for the next update.
5. Use the latest release of R.S. Means estimating guide to estimate each line item in the PMET.
6. Unhide the three tabs in the PMET that contain the estimating datasets. Right-clicking on any visible tab will call up a menu and allow each hidden tab to be opened.
7. Unprotect each sheet using the [Review] menu in Excel. PMET (version 1.0) is not password protected, but future versions may incorporate stronger protection.
8. Data Lookup Sheet – Update location indices and annual escalation rates from the latest PBS estimating guidance for each location in this table (Exhibit (14)):

State	City	October 1, 2014 Location Index	Annual Escalation Rate, based on average of previous 10 years
Alaska	ALASKA State Average	1.28	3.05%
Alaska	Anchorage, AK	1.19	3.24%
Alaska	Fairbanks, AK	1.20	2.97%
Alaska	Juneau, AK	1.31	3.20%
Alaska	Kenai Peninsula, AK	1.19	3.24%
Alaska	Ketchikan, AK	1.29	3.17%
Alaska	Kodiak, AK	1.34	3.20%
Alaska	Mat-Su Valley, AK	1.15	3.20%
Alaska	Sitka, AK	1.32	3.42%
Idaho	IDAHO State Average	0.92	3.18%
Idaho	Boise, ID	0.92	2.87%
Idaho	Caldwell, ID	0.90	2.86%
Idaho	Coeur D' Alene, ID	0.95	3.32%
Idaho	Idaho Falls, ID	0.93	3.44%
Idaho	Lewislaton, ID	0.93	3.28%
Idaho	Moscow, ID	0.94	3.28%
Idaho	Pocatello, ID	0.90	3.29%
Idaho	Twin Falls, ID	0.91	2.92%
Oregon	OREGON State Average	0.98	3.02%
Oregon	Albany, OR	0.97	2.93%
Oregon	Allamont, OR	0.95	3.02%
Oregon	Astoria, OR	0.96	2.93%
Oregon	Bend, OR	1.00	3.22%
Oregon	Coos Bay, OR	0.96	2.74%
Oregon	Corvallis, OR	0.97	2.93%
Oregon	Eugene, OR	1.01	3.26%
Oregon	Grants Pass, OR	0.97	2.74%
Oregon	Klamath Falls, OR	0.95	2.79%
Oregon	Medford, OR	0.98	2.74%
Oregon	North Bend, OR	0.96	2.97%
Oregon	Pendleton, OR	1.00	2.93%
Oregon	Portland, OR	1.00	2.98%
Oregon	Roseburg, OR	0.95	2.79%
Oregon	Salem, OR	0.99	2.93%
Oregon	Springfield, OR	0.94	2.97%
Oregon	The Dalles, OR	1.01	2.93%
Washington	WASHINGTON State Average	1.03	3.47%
Washington	Bellingham, WA	1.04	3.61%
Washington	Coupeville, WA	1.08	3.55%
Washington	Everett, WA	1.10	3.54%
Washington	Longview, WA	1.00	3.36%
Washington	Olympia, WA	1.07	3.55%
Washington	Pasco (Tri-Cities), WA	1.01	3.19%
Washington	Port Angeles, WA	1.05	3.61%
Washington	Port Orchard, WA	1.06	3.55%
Washington	Seattle, WA	1.11	3.54%
Washington	Spokane, WA	1.00	3.29%
Washington	Tacoma, WA	1.09	3.59%
Washington	Vancouver, WA	1.00	3.09%
Washington	Walla Walla, WA	1.00	3.19%
Washington	Wenatchee, WA	0.99	3.29%
Washington	Yakima, WA	1.00	3.19%

Exhibit (14) – PMET [Data Lookup] Tab - Locations

9. Data Lookup Sheet – Update the following risk factors (Exhibit (15)), based on the latest actual contract pricing data and the realized impact for each risk menu item. Remember that the percentages in the risk factors are not a direct increase of the estimate by that price, but an adjustment of the normal distribution factor that is used to select the most likely cost estimate from the dataset for each line item. Menu items may also be added to reflect newly identified risk elements.

Owned/Leased	0%		
Owned Facility	20%		
Leased Facility	0%		
Tiers	0%		
Tier 5	15%		
Tier 4	10%		
Tier 3	5%		
Tier 2	0%		
Tier 1	-5%		
Facility Security Level	5%		
FSL 4	10%		
FSL 3	5%		
FSL 2	0%		
FSL 1	-5%		
Office Types	0%		
20% open/80% closed	10%		
50% open/50% closed	5%		
80% open/20% closed	0%		
100% open/0% closed	-5%		
		Risks	5%
		High Risk	5%
		Medium Risk	0%
		Low Risk	-5%
		Contractor Layers	0%
		GC/Subs/Sub-Subcontractors	20%
		GC/Subcontractors	10%
		Contractor	0%
		Contract Methods	0%
		8(a) Contract	10%
		Best Value Contract	5%
		Micro-Purchase	5%
		Firm Fixed Price Contract	0%
		Market Competition	0%
		Low To No Competition	5%
		Average Competition	0%
		High Competition	-5%

Exhibit (15) – PMET [Data Lookup] Tab – Input Menus

10. Parametric Data Sheet – Update the dataset pricing for each line item (Exhibit (16)), noting a grey-shaded reference in the line above to where the data came from or a file where it is maintained. If a file is listed, the file must contain the reference info for each individual number. Referencing provides a path to a source for updates, as well as for verification of data. PMET (v. 1.0) formulas currently use data out to and including Column “Z”.

Parametric Data Worksheet - All data is or has been converted to the R.S. Means National Average									
Category	Units	Mean	Std Dev	Low	Median	High			
							C3010 230 0140	74 0240 + 0840	C3010 210
Paint	S.F.	\$ 1.12	\$ 0.19	\$ 0.85	\$ 1.25	\$ 1.27	0.85	1.27	1.25
							C3020 410 Tile & Covering		
Carpet	S.F.	\$ 5.80	\$ 1.23	\$ 4.18	\$ 5.68	\$ 8.05	4.36	4.97	6.35
							4.18	5.36	4.44
							09 68 13 Tile Carpeting		
							6	8.05	6.86
							C3020 430		
							Moving Costs - Avg Ofc & Ofc- Move-IT-Data		
Move	S.F.	\$ 2.25	\$ 1.02	\$ 1.00	\$ 2.25	\$ 3.50	1	2.25	3.5
							Office-Moving-IT-Data		
IT/Data	S.F.	\$ 6.50	\$ 1.22	\$ 5.00	\$ 6.50	\$ 8.00	5	6.5	8
							Collier's Int'l Ofc Build-Out		
Tenant Improvements	S.F.	\$75.00	\$20.41	\$50.00	\$75.00	\$ 100.00	50	75	100

Exhibit (16) – PMET [Parametric Data] Tab

11. Assembly Data Sheet – Update the dataset pricing for each line item (Exhibit (17)), noting the reference in the column header where the data came from or a file where it is maintained. The column header may also contain the name of a cost estimator who supplied the data. If a file is listed, the file must contain the reference info for each individual number. Referencing provides a path to a source for updates, as well as for verification of data. PMET (v. 1.0) formulas currently use data out to and including Column “Z”, but the range could easily be enlarged.

Assembly Data Worksheet - All data is or has been converted to the R.S. Means National Average																
CSI Division Number	CONSTRUCTION ASSEMBLIES (Prices include supervisor)	UNIT	Mean	Std Dev	Low	Median	High	Federal	Auburn	Tacoma Union	McClure FB	FOB Seattle	CostWorks Estimates			
								Center South	Complex	Station	Boise					
2419.1	Provide wall cutout	SF	\$6.39	\$1.52	\$3.76	\$7.22	\$7.34	\$7.18	\$7.27	\$7.34	\$3.76					
2419.2	Remove door and frame	EA	\$191.23	\$14.14	\$179.92	\$186.02	\$219.02	\$183.50	\$186.02	\$187.71	\$179.92	\$219.02				
2419.3	Remove acoustical ceiling panels	SF	\$1.89	\$0.66	\$0.95	\$2.39	\$2.45	\$2.39	\$2.42	\$2.45	\$0.95	\$1.21				
2419.4	Remove carpet flooring	SF	\$1.50	\$0.58	\$0.63	\$1.94	\$1.99	\$1.94	\$1.97	\$1.99	\$0.63	\$0.97				
2419.5	Demolish walls or partitions	SF	\$5.06	\$1.24	\$3.34	\$5.99	\$6.12	\$5.99	\$6.07	\$6.12	\$3.76	\$3.34				
2419.6	Core drill, any size to 4" depth, for electrical access	EA	\$281.99	\$105.05	\$100.10	\$340.79	\$346.25	\$338.47	\$343.12	\$346.25	\$100.10					
2419.7	Remove rubber base.	LF	\$1.11	\$0.23	\$0.71	\$1.24	\$1.26	\$1.23	\$1.25	\$1.26		\$0.71				
6200.1	Provide and install wood wall base	LF	\$7.51	\$0.08	\$7.41	\$7.51	\$7.61				\$7.51			\$7.41	\$7.61	
7210.2	Provide and install acoustical sound attenuation (fiberglass)	SF	\$1.07	\$0.24	\$0.92	\$0.94	\$1.54	\$0.92	\$0.93	\$0.94	\$1.54	\$1.03				
9140.1	Provide and install expanded metal security mesh in interior wall (min. 10 gauge)	SF	\$8.53	\$0.08	\$8.42	\$8.54	\$8.62	\$8.42	\$8.54	\$8.62						
9140.2	Provide and install interior wall. (metal frame, 2 sides GWB)	SF	\$13.48	\$1.22	\$11.38	\$14.10	\$14.33	\$14.01	\$14.20	\$14.33		\$11.38				
9140.3	Repair interior wall (GWB)	SF	\$14.77	\$0.62	\$14.10	\$14.68	\$15.63	\$14.10	\$14.29	\$15.07		\$15.63				
9140.4	Provide and install interior wall framing perpendicular to window mullion. (metal frame, 2	SF	\$15.99	\$0.15	\$15.80	\$16.01	\$16.16	\$15.80	\$16.01	\$16.16						
9140.5	Repair interior wall (GWB)	SF	\$53.14	\$37.51	\$15.63	\$53.14	\$90.64				\$90.64	\$15.63				
9510.1	Provide and install acoustical ceiling panels. (Sway Brace)	SF	\$11.27	\$0.08	\$11.19	\$11.27	\$11.35	\$11.19	\$11.35							
9510.2	Provide and install acoustical ceiling panels. (Lateral Brace)	SF	\$11.42	\$0.08	\$11.34	\$11.42	\$11.50	\$11.34	\$11.50							
9510.3a	Provide and install acoustical ceiling panels (24" x 24")	EA	\$6.69	\$1.33	\$4.39	\$7.42	\$7.54	\$7.37	\$7.47	\$7.54		\$4.39				
9510.3b	Provide and install acoustical ceiling panels (24" x 48")	EA	\$11.93	\$0.08	\$11.83	\$11.93	\$12.03			\$11.93		\$11.83	\$12.03			
9600.1	Provide and install carpet tile	SF	\$6.05	\$0.69	\$4.97	\$6.35	\$6.68	\$6.53	\$6.62	\$6.68		\$6.24	\$4.97	\$6.35	\$5.00	
9600.2	Install carpet tiles, labor only	SF	\$2.06	\$0.94	\$0.70	\$2.78	\$2.85	\$2.78	\$2.82	\$2.85	\$1.16	\$0.70				
9650.1	Provide and install vinyl composition tile (VCT) to match existing.	SF	\$7.31	\$1.28	\$4.85	\$8.05	\$8.23	\$8.05	\$8.16	\$8.23	\$4.85	\$7.28				
9650.2	Provide and install rubber base. (4")	LF	\$6.00	\$2.03	\$3.45	\$7.57	\$7.74	\$7.57	\$7.67	\$7.74	\$3.45	\$3.58				
9720.1	Provide and install vinyl wallcoverings (18 oz)	SF	\$1.88	\$0.00	\$1.88	\$1.88	\$1.88			\$1.88						
9910.1	Paint wall.	SF	\$1.00	\$0.27	\$0.82	\$0.91	\$1.60	\$0.90	\$0.91	\$0.92		\$1.60	\$0.85	\$0.82		
9910.2	Paint trim. (metal or wood, up to 4" width)	LF	\$2.70	\$0.89	\$0.98	\$3.23	\$3.31	\$3.23	\$3.28	\$3.31	\$0.98	\$2.71				
9910.3	Oil or stain wood doors	EA	\$227.91	\$71.02	\$104.95	\$267.47	\$271.75	\$265.65	\$269.29	\$271.75	\$104.95					
10260.1	Provide and install corner guards	LF	\$56.02	\$21.73	\$25.28	\$70.90	\$71.86	\$70.90	\$71.86		\$25.28					
10426.1	Provide and install corridor signage.	EA	\$287.58	\$3.27	\$284.32	\$287.58	\$290.85	\$284.32		\$290.85						
15300.1	Remove and relocate sprinkler heads. (w/in 5' radius)	EA	\$502.03	\$102.12	\$437.76	\$445.79	\$678.80	\$437.76	\$443.76	\$447.82	\$678.80					
15300.2	Provide and install sprinkler heads. (new pipe connected w/in 10' or less to existing)	EA	\$637.50	\$62.59	\$594.21	\$605.11	\$745.58	\$594.21	\$602.36	\$607.86	\$745.58					
15300.3	Remove and relocate pull station (w/in 10' radius) [excludes programming]	EA	\$416.20	\$87.94	\$280.32	\$429.17	\$526.13	\$424.29	\$280.32	\$434.04	\$526.13					
15300.4	Provide and install pull station [excludes programming]	EA	\$362.32	\$116.38	\$160.84	\$427.21	\$434.04	\$424.29	\$430.12	\$434.04	\$160.84					
15300.5	Provide and install smoke detector [excludes programming]	EA	\$593.98	\$74.29	\$544.51	\$554.50	\$722.41	\$544.51	\$551.98	\$557.02	\$722.41					
15300.6	Provide and install horn/strobe [excludes programming]	EA	\$319.70	\$7.96	\$306.68	\$322.32	\$327.48	\$320.12	\$324.51	\$327.48	\$306.68					
15810.2	Provide and install duct work, 18" or less, spiral, wrap insulated.	LF	\$73.06	\$0.68	\$72.18	\$73.17	\$73.84	\$72.18	\$73.17	\$73.84						
16130.1	Relocate monument (w/in 10', in same trench)	EA	\$15.25	\$0.08	\$15.15	\$15.25	\$15.35	\$15.25				\$15.15	\$15.35			
16130.2	Remove outlet. Pull wire to nearest panel, up to 100 LF	EA	\$115.42	\$73.79	\$71.94	\$73.26	\$243.22	\$71.94	\$72.92	\$73.59		\$243.22				
16130.3	Provide and install duplex receptacle (excludes wire, conduit)	EA	\$201.03	\$57.92	\$143.12	\$201.03	\$258.95				\$143.12	\$258.95				
16130.4	Provide and install dedicated receptacle (20 or 30 amp) [excludes wire, conduit]	EA	\$201.03	\$57.92	\$143.12	\$201.03	\$258.95				\$143.12	\$258.95				
16130.5	Provide and install conduit (3/4" EMT)	LF	\$12.85	\$1.09	\$10.74	\$13.39	\$13.70	\$13.39	\$13.57	\$13.70	\$10.74	\$12.86				
16130.6	Provide and install wiring (3 conductor, 12 ga)	LF	\$3.25	\$0.59	\$2.33	\$3.67	\$3.75	\$3.67	\$3.72	\$3.75	\$2.78	\$2.33				
16130.7	Provide and install circuit breaker (20A SP)	EA	\$102.64	\$29.12	\$54.06	\$104.58	\$145.85	\$103.17	\$104.58	\$105.54	\$145.85	\$54.06				
16130.8	Connect furniture whip to electrical source. (excludes wire installation)	EA	\$48.44	\$27.12	\$32.39	\$32.98	\$95.41	\$32.39	\$32.83	\$33.13	\$95.41					
16130.9	Provide and install raceway and boxes for Electrical systems, Walker duct.	LF	\$81.14	\$0.08	\$81.04	\$81.14	\$81.24	\$81.14				\$81.04	\$81.24			
16500.1	Provide and install fluorescent lighting and lamps w/seismic bracing (within 10' radius of existing)	EA	\$443.41	\$111.73	\$222.00	\$485.33	\$521.20	\$521.20	\$508.74		\$479.79	\$485.33	\$222.00			
16500.2	Remove and relocate fluorescent lighting fixture w/seismic bracing (w/in 10' radius of existing)	EA	\$218.72	\$24.87	\$201.93	\$205.63	\$261.70	\$201.93	\$204.70	\$206.57	\$261.70					
16715.1	Remove and relocate data or phone receptacle (w/in 10' in same trench)	LF	\$151.66	\$35.22	\$129.75	\$132.13	\$212.63	\$129.75	\$131.53	\$132.73	\$212.63					
16715.2	Remove data / phone / cable. Pull cable to nearest panel, up to 100 LF	EA	\$123.56	\$10.50	\$117.11	\$118.72	\$144.48	\$117.11	\$118.72	\$119.80	\$144.48	\$117.68				
16715.3	Provide and install data / phone / cable receptacle (excludes wire, conduit)	EA	\$237.21	\$53.20	\$184.01	\$237.21	\$290.41				\$184.01	\$290.41				
16715.4	Provide and install conduit for data / phone / cable	LF	\$14.73	\$2.39	\$10.60	\$16.02	\$16.28	\$15.92	\$16.13	\$16.28	\$10.60					
16715.5	Provide and install cable (data / phone / CATV)	LF	\$2.92	\$0.13	\$2.81	\$2.86	\$3.15	\$2.81	\$2.85	\$2.88	\$3.15					

Exhibit (17) - PMET [Assembly Data] Tab

12. Protect each sheet using the [Review] menu in Excel.
13. Hide the three tabs in the PMET that contain the estimating datasets. Right-clicking on any visible tab will call up a menu and allow each tab to be hidden.
14. Save the new copy of this latest PMET master file.
15. Retest the tool to ensure proper operation of all functions and check results against the recent actual contract pricing data.
16. Redistribute the new updated version to users.

Project Conclusions

PMET Lessons Learned

The project was very successful in furthering the project management expertise of the PM. The lessons learned through the project included discoveries in time, stakeholder and risk management knowledge areas. Summary highlights of those lessons are:

- Research and study stakeholder requirements early in a project, including communication preferences.
- Schedule recurring stakeholder meetings on participant calendars, even if only as a check-in reminder.
- Ask what success looks like for stakeholders and how will project success be measured?
- Based on input from stakeholders, progressively elaborate the project plan and requirements.
- The test of a good project plan is if another project manager could take the plan and successfully execute it.
- When it becomes apparent a risk will occur, take any needed action as early as possible.
- Identified risks may happen in combination; plan for that possibility in risk analysis.
- Task durations should not be influenced by the time available for the project.
- Track project management tasks and resources as a separate path on the WBS and schedule.
- Technical aspects of a project may benefit significantly from additional study by project resources.
- A little quantitative measurement can significantly improve analysis of an otherwise qualitative approach.
- Do not underestimate durations of tasks with technical requirements, unless the assigned resource is technically proficient currently.
- Refreshing knowledge in a technical area before executing tasks with technical requirements may reduce risk of delay inherent in the task.

PMET Project Conclusion

This project was a success. In spite of significant changes to the time and scope portions of the PMP, all PMET original project objectives were achieved:

- The PMET is a project management estimating tool for use by PBS Region 10 project managers, cost estimators and contracting officers for simple and common estimating needs.
- The PMET aids development of single item or single assembly estimates that are the PBS “bread and butter” projects most often requested by clients and needed in projects.
- The PMET is a searchable tool in a user-friendly spreadsheet format.
- The PMET incorporates PBS and R.S. Means parametric "rules of thumb" for conceptual level estimates.
- The PMET incorporates PBS and R.S. Means estimating data for budgetary level estimates.
- The PMET incorporates PBS historical contract cost data into both conceptual and budgetary level estimates.
- The PMET factors seven risks and approximately 50 geographic location inputs into PMET estimate ranges.
- The PMET includes a user guide and a training plan for proper rollout to PBS users.

- The PMET includes a plan for annual maintenance updates and improvements based on inflation and variances realized between estimates and actual pricing.

One of the increases in project duration actually facilitated a more robust risk factoring function than originally envisioned. The directed studies course in advanced risk model simulation techniques contributed to the normal distribution methodology used in the model, a significant improvement for keeping cost estimate risk adjustments within the normal range of actual historical estimates.

PMET Product Conclusion

The PMET is a fully functioning estimating model, meeting every design requirement as previously noted and exceeding one design objective. However, the model is only partially populated with actual historical contract pricing data at this point. Since the model can only be as accurate as the estimating data populated in its database, it is not ready for rollout to intended users yet. There will be an interim time where very current pricing data is gathered on all projects as a new regional policy. Once that data is available, it will be programmed into the model, together with the most current estimating guide data.

Once the PMET is fully populated with current and consistent estimating data, it will be a very time-efficient and accurate tool. With less than 10 minutes of user entry, the PMET will immediately return conceptual parametric and budgetary assembly estimates. It will be programmed with PBS specific data and be highly effective for PBS small project estimates. It will never yield perfect results consistently, but it will always deliver reliable estimates within stated accuracy ranges.

The unique normal distribution methodology ensures any estimate the PMET produces will fall within a known set of actual results. The risk factors further narrow the estimate range to a most likely segment of actual results. After testing results are known, the factors can be adjusted to align the PMET estimates with actual results. An analogy is when rifle scope crosshairs are adjusted to bring shots closer to the bullseye, based on observations of where previous shots hit the target. Once the PMET is “sighted in,” it will be a simple, time-saving and accurate tool for project managers and teams to use.

The PMET could also be used for any similar estimating application with known actual pricing results for simple and commonly used estimating items. Loaded with specific general, residential or oilfield construction info, for example, the PMET would return accurate conceptual and budgetary cost estimates for those tailored industry line items. Line items are easily changed and added and risk factors easily tailored. This would make the PMET an effective and accurate tool for any estimating application with frequently used line items and historical cost data for those items, operating in an environment of commonly experienced risks.

Recommendations for Further Research/Development

Actual Cost Data Collection

PBS Region 10 will issue new policy from their cost estimating improvement initiative, ensuring a capture of every actual contract cost result for comparison with pre-contract estimates. This will provide a wealth of data to be analyzed and programmed into the PMET database. The first recommendation is to gather consistent actual cost data to measure against any PBS estimate.

PMET Testing and Rollout

The second recommendation is to gather the actual cost results when they become available and populate the PMET database with that statistically significant data sample. When that programming is complete, test the tool using the PBS cost estimators and roll the PMET out to project teams. The rollout to all users should be in two phases. The first phase will come immediately after user training for this tool, asking users to use the PMET in parallel with whatever they currently use. Once feedback is received and any additional adjustments made, the PMET will roll into full operational use.

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Appendix A Project Management Estimating Tool (PMET) (1.0)



GSA Public Buildings Service

Project Management Estimating Tool (PMET) (v 1.0)

This cost estimating tool for Public Buildings Service (PBS) project managers and cost estimators is designed for use for both construction and leasing projects in office space. The PMET enables project managers to provide timely cost estimate ranges for many simple budgetary estimate needs, or conceptual level estimates for feasibility of more complex estimates.

This tool uses parametric estimating components for conceptual estimates (-40% < Precision & Range < +75%) and more accurate line-item budgetary level estimates (-10% < Precision & Range < +25%) for common tasks and assemblies at a budgetary cost level

PMET (1.0) Features:

1. Programmed for use by PBS Region 10 project managers, estimators, planners and contracting staff for simple and common estimating needs.
2. Searchable and built in a user-friendly spreadsheet format.
3. Incorporates PBS parametric "rules of thumb" for conceptual level estimates.
4. Incorporates RS Means estimating data for budgetary level estimates.
5. Incorporates PBS historical contract cost data into both conceptual and budgetary level estimates.
6. Factors risk (contract type, requirement standards, urgency) & geographic location (Cities in AK, ID, OR & WA) inputs into its estimate ranges.

Author: Brian Swanson (March 2017)

Appendix A

Project Management Estimating Tool (PMET) (1.0)

Input Factors

Project Number	Building Number	5AK0123
Client & City Geographic		GSA Anchorage
Location of Work*		Anchorage, AK
Geographic Location Index: Annual		1.19
Escalation Rate:		3.24%

Risk Factors

Client Tier*	Tier 2
Client Facility Security Level (FSL)*	FSL 3
GSA Risk Experience with Client*	High Risk

* Required Factor
 Usable Square Footage (USF) of
 Space* Office Type*

Leased Facility	AK4678ZZ
Contractor	2,500
Firm Fixed Price Contract	80% open/20% closed
Average Competition	

Owned/Leased Facility*
 Contractor Layering*
 Contract Method* Market Competition*

(Normal
 Distribution
 Factor = 60%)

Appendix A
Project Management Estimating Tool (PMET) (1.0)

Parametric Estimating Sheet

5AK0123 AK4678ZZ Leased Facility		GSA Anchorage Anchorage, AK 2,500 USF		Tier 2 FSL 3 80% open/20% closed		High Risk Average Competition Firm Fixed Price Contract Contractor	
Category	Unit Price	Units	Optimistic Estimate	Most Likely Estimate	Pessimistic Estimate		
Paint	\$ 1.39	SF	\$ 3,001	\$ 3,485	\$ 3,968		
Carpet	\$ 7.27	SF	\$ 15,103	\$ 18,168	\$ 21,232		
Move	\$ 2.98	SF	\$ 4,905	\$ 7,456	\$ 10,008		
IT/Data	\$ 8.10	SF	\$ 17,181	\$ 20,243	\$ 23,304		
Tenant Improvements (Normal Distribution Factor = 60%)	\$ 95.32	SF	\$ 187,267	\$ 238,298	\$ 289,329		

Appendix A Project Management Estimating Tool (PMET) (1.0)

15300.4	Provide and install pull station [excludes programming]	EA	\$ 465.84		\$ -	\$ -	\$ -
15300.5	Provide and install smoke detector [excludes programming]	EA	\$ 728.58		\$ -	\$ -	\$ -
15300.6	Provide and install horn/strobe [excludes programming]	EA	\$ 382.50		\$ -	\$ -	\$ -
15810.2	Provide and install duct work, 18" or less, spiral, wrap insulated..	LF	\$ 87.07		\$ -	\$ -	\$ -
16130.1	Relocate monument (w/in 10', in same trench)	EA	\$ 18.16		\$ -	\$ -	\$ -
16130.2	Remove outlet. Pull wire to nearest panel, up to 100 LF	EA	\$ 159.45		\$ -	\$ -	\$ -
16130.3	Provide and install duplex receptacle (excludes wire, conduit)	EA	\$ 256.46		\$ -	\$ -	\$ -
16130.4	Provide and install dedicated receptacle (20 or 30 amp) (excludes wire, conduit)	EA	\$ 256.46		\$ -	\$ -	\$ -
16130.5	Provide and install conduit (3/4" EMT)	LF	\$ 15.61		\$ -	\$ -	\$ -
16130.6	Provide and install wiring (3 conductor, 12 ga)	LF	\$ 4.04		\$ -	\$ -	\$ -
16130.7	Provide and install circuit breaker (20A SP)	EA	\$ 130.80		\$ -	\$ -	\$ -
16130.8	Connect furniture whip to electrical source. (excludes wire installation)	EA	\$ 65.76		\$ -	\$ -	\$ -
16130.9	Provide and install raceway and boxes for Electrical systems, Walker duct.	LF	\$ 96.50		\$ -	\$ -	\$ -
16500.1	Provide and install fluorescent lighting and lamps w/seismic bracing. (within 10' radius of existing)	EA	\$ 560.85		\$ -	\$ -	\$ -
16500.2	Remove and relocate fluorescent lighting fixture w/seismic bracing. (w/in 10' radius of existing)	EA	\$ 267.54		\$ -	\$ -	\$ -
16715.1	Remove and relocate data or phone receptacle (w/in 10' in same trench)	LF	\$ 190.92		\$ -	\$ -	\$ -
16715.2	Remove data / phone / cable. Pull cable to nearest panel, up to 100 LF	EA	\$ 150.07		\$ -	\$ -	\$ -
16715.3	Provide and install data / phone / cable receptacle (excludes wire, conduit)	EA	\$ 298.05		\$ -	\$ -	\$ -
16715.4	Provide and install conduit for data / phone / cable	LF	\$ 18.24		\$ -	\$ -	\$ -
16715.5	Provide and install cable (data / phone / CATV)	LF	\$ 3.51		\$ -	\$ -	\$ -

	Optimistic Estimate	Most Likely Estimate	Pessimistic Estimate
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(Normal Distribution Factor = 60%)

Assembly Estimate Totals: \$ - \$ - \$ -

Appendix A

Project Management Estimating Tool (PMET) (1.0)

Project Management Estimating Tool (PMET) Instructions

1. This tool is intended to provide quick conceptual estimates of what common building interior projects should cost. These may be used for initial planning numbers or as a quick price-reasonableness check.
2. Green cells are for user input. All others are calculated and locked to prevent accidental changes.
3. Estimated costs are the price to the government. They include:
 - Bare material costs with no sales tax, plus 10% profit
 - Labor costs reflect union wages, average productivity and installing contractor overhead and profit.
4. General Conditions (when applicable) should be added to these estimates. General Conditions for the installing contractor may range from 0% - 10% of the total cost and 5% - 15% for a general contractor.
5. Input Steps for Estimating - Click on the **Input Factors tab** and enter the following inputs, following the prompts for each cell:
Project Number; Client & City; Geographic Location of Work; Building Number; Usable Square Footage of Space; Office Type; Client Tier; Client Facility Security Level (FSL); GSA Risk Experience with Client; Owned/Leased Facility; Contractor Layering; Contract Method; and Market Competition.
Ensure you choose the correct location factor. Locations list the major cities in the Region and their corresponding geographical cost factors are used to adjust the national average cost data in this tool. If a location is not listed by city name, the state average may be selected or a nearby city that is listed.
6. After all the required inputs are complete, the **Parametric Estimates tab** displays general parametric estimate ranges for paint, carpet, move services, IT/data and average tenant improvement costs for the inputs provided.
7. Also after required inputs are complete, the **Assembly Estimates tab** displays approximately 50 line items of common tasks found in the PBS Region 10 line item Indefinite Delivery Indefinite Quantity (IDIQ) contracts with factored unit costs for each. These line items allow a greater breakdown of tasks to better fit a project and provide a budgetary level estimate instead of a conceptual or rough order of magnitude estimate.
8. Entering a quantity in the green cell for an assembly will calculate a most likely estimate for that quantity of assembly units. Optimistic and pessimistic estimates form an estimate range, calculated the same way they are for parametric line items. Lastly, there is a totals line at the bottom that sums the optimistic, most likely and pessimistic estimate totals for all the line items used.
9. Contractor overhead and profit are generally reflected in the PMET estimates, but any associated general requirements (project overhead) are not. The PMET is intended to help develop project plan estimates for relatively small tenant improvement projects, or serve as a second opinion reference for simple contractor proposals. As the database fills with good actual contract results, this tool may be used by cost estimators and project managers for small, tenant improvement projects.
10. Lastly, this tool is for internal PBS use only. It is only as good as the data it contains and the judgment of the user regarding the risk inputs. If you experience significant differences between PMET estimates and actual results, please forward those results and the matching risk factor data to the Regional or another cost estimator. Likewise, your feedback is also important for estimates that this tool provides very effective results for or line items you would like to see

Appendix B PMET User & Training Guide

Introduction

GSA Public Buildings Service

Project Management Estimating Tool (PMET) (v 1.0)

This cost estimating tool for Public Buildings Service (PBS) project managers and cost estimators is designed for use for both construction and leasing projects in office space. The PMET enables project managers to provide timely cost estimate ranges for many simple budgetary estimate needs, or conceptual level estimates for feasibility of more complex estimates.

This tool uses parametric estimating components for conceptual estimates (-40% < Precision & Range < +75%) and more accurate line-item budgetary level estimates (-10% < Precision & Range < +25%) for common tasks and assemblies at a budgetary cost level

PMET (1.0) Features:

1. Programmed for use by PBS Region 10 project managers, estimators, planners and contracting staff for simple and common estimating needs.
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5. Incorporates PBS historical contract cost data into both conceptual and budgetary level estimates.
6. Factors risk (contract type, requirement standards, urgency) & geographic location (Cities in AK, ID, OR & WA) inputs into its estimate ranges.

Author: Brian Swanson (March 2017)

PMET Concepts

Green cells are for user input. All others are for info or are calculated and locked to prevent accidental changes.

Appendix B PMET User & Training Guide

Estimated costs are the price to the government. They include:

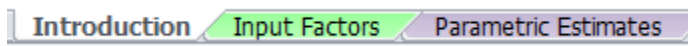
- Bare material costs with no sales tax, plus 10% profit
- Labor costs reflect union wages, average productivity and installing contractor overhead and profit.

General Conditions (when applicable) should be added to these estimates. General Conditions for the installing contractor may range from 0% - 10% of the total cost and 5% – 15% for a general contractor.

Size of project will have a significant impact on cost. Economies of scale can reduce large project costs, but unit costs often run higher for small projects.

Input Steps for Estimating

1. Know and understand the PMET Concepts listed above.
2. Click on the “**Input Factors**” tab and enter the following inputs:



Input Factors			
Project Number	5AK0123	Building Number	AK4678ZZ
Client & City	GSA Anchorage	Usable Square Footage (USF) of Space*	2,500
Geographic Location of Work*	Anchorage, AK	Office Type*	80% open/20% closed
Geographic Location Index:	1.19		
Annual Escalation Rate:	3.24%		
Risk Factors			
Client Tier*	Tier 2	Owned/Leased Facility*	Leased Facility
Client Facility Security Level (FSL)*	FSL 3	Contractor Layering*	Contractor
GSA Risk Experience with Client*	High Risk	Contract Method*	Firm Fixed Price Contract
		Market Competition*	Average Competition
* Required Factor		(Normal Distribution Factor = 60%)	

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3. **Project Number:** Enter a 7-digit alpha-numeric project number to tie this estimate to a project (optional).

Input Factors	
Project Number	1AK2345
Client & City	GSA Anchorage
Geographic Location of Work*	Anchor
Geographic Location Index:	1.
Annual Escalation Rate:	3.2

4. **Client & City:** Enter client abbreviation followed by city. (For example: FBI Anchorage) (optional).

Client & City	GSA Anchorage
Geographic Location of Work*	Anchor
Geographic Location Index:	1.
Annual Escalation Rate:	3.2

5. **Geographic Location of Work*:** Pick a location from the drop down menu with over 50 R10 cities to pick from. Cities are listed by state, alphabetically. Use the state average if the specific city is not listed. (The Geographic Location Index and the Annual Escalation Rate will be displayed for your choice.)

Geographic Location of Work*	Anchorage, AK
Geographic Location Index:	1.
Annual Escalation Rate:	3.2
Risk Factors	

6. **Building Number:** Enter 6 or 8-digit alpha-numeric building number (optional).

Building Number	AK0031ZZ
Usable Square Footage (USF) of Space*	2,500
Office Type*	80% open

7. **Usable Square Footage (USF) of Space*:** Enter usable square feet of space.

Usable Square Footage (USF) of Space*	2,500
Office Type*	80% open/USF

8. **Office Type*:** Select ratio of open to closed office space from the menu. (Select [80% open/20% closed] if office type is unknown)

Office Type*	80% open/20% closed	Office Types
		20% open/80% closed
		50% open/50% closed
		80% open/20% closed
		100% open/0% closed

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9. **Client Tier***: Select client tier level.
(Select [*Tier 2*] if client tier is unknown)

Client Tier*	Tier 2	Tiers
Client Facility Security Level (FSL)*	FSL 2	Tier 5
GSA Risk Experience with Client*	Medium	Tier 4
		Tier 3
		Tier 2
		Tier 1

10. **Client Facility Security Level (FSL)***: Select client FSL.
(Select [*FSL 2*] if client FSL is unknown)

Client Facility Security Level (FSL)*	FSL 2	Facility Security Level
GSA Risk Experience with Client*	Medium	FSL 4
		FSL 3
		FSL 2
		FSL 1

* Required Factor

11. **GSA Risk Experience with Client***: Select a choice for GSA's risk experience with this client. (Select [*Medium*] if client risk experience is unknown)

GSA Risk Experience with Client*	Medium Risk	Risks
		High Risk
		Medium Risk
		Low Risk

* Required Factor

12. **Owned/Leased Facility***: Select facility type (owned or leased) from the pick box.
(Select [*Leased Facility*] if facility type is unknown)

Owned/Leased Facility*	Leased Facility	Owned/Leased
Contractor Layering*	Contractor	Owned Facility
Contract Method*	Firm Fixed Price Contract	Leased Facility
Market Competition*	Average Competition	

13. **Contractor Layering***: Select contractor organization layering from the pick box.
(Select [*Contractor*] if contracting method is unknown)

Contractor Layering*	Contractor	Contractor Layers
Contract Method*	Firm Fixed Price Contract	GC/Subs/Sub-Subcontractors
Market Competition*	Average Competition	GC/Subcontractors
		Contractor

(Normal Distribution Factor = 50%)

14. **Contract Method***: Select contract method from the pick box.
(Select [*Firm Fixed Price Contract*] if contract method is unknown)

Contracting Method*	Firm Fixed Price Contract	Contract Methods
Market Competition*	Average Competition	8(a) Contract
		Best Value Contract
		Micro-Purchase
		Firm Fixed Price Contract

15. **Market Competition***: Select level of competition (High, Average, Low) in the market for this estimate.

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(Select [*Average Competition*] if market competition is unknown)

Market Competition*	Average Competition	Market Competition Select level of competition in the market for this estimate.	Market Competition
			Low To No Competition
			Average Competition
			High Competition

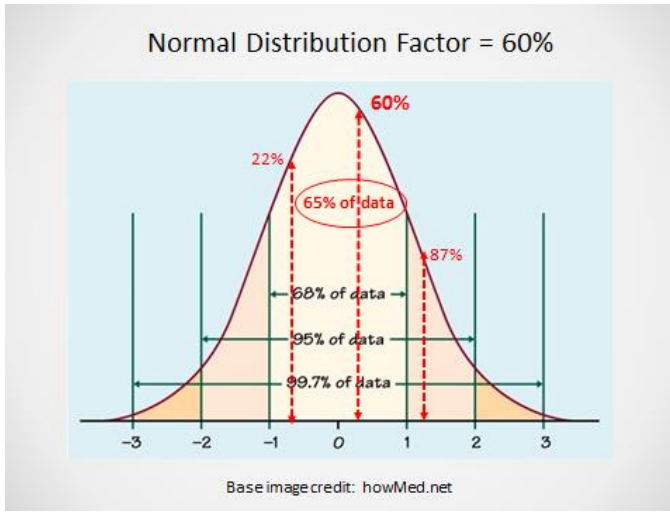
Interpreting Estimate Outputs - Parametric

Parametric Estimating Sheet					
5AK0123 AK4678ZZ Leased Facility	GSA Anchorage Anchorage, AK 2,500 USF	Tier 2 FSL 3 80% open/20% closed	High Risk Average Competition Firm Fixed Price Contract Contractor		
Category	Unit Price	Units	Optimistic Estimate	Most Likely Estimate	Pessimistic Estimate
Paint	\$ 1.39	SF	\$ 3,001	\$ 3,485	\$ 3,968
Carpet	\$ 7.27	SF	\$ 15,103	\$ 18,168	\$ 21,232
Move	\$ 2.98	SF	\$ 4,905	\$ 7,456	\$ 10,008
IT/Data	\$ 8.10	SF	\$ 17,181	\$ 20,243	\$ 23,304
Tenant Improvements	\$95.32	SF	\$ 187,267	\$ 238,298	\$ 289,329
(Normal Distribution Factor = 60%)					

After all the required inputs are complete, the Parametric Estimates tab displays general parametric estimate ranges for paint, carpet, move services, IT/data and average tenant improvement costs for the inputs provided.

The normal distribution factor shows where the risk factors (entered in the Input Tab) have established the most likely estimate relative to the data in the PMET database. In the example above, the most likely estimates shown would be equal to or higher than 60% of the estimated and actual costs in the PMET database for each line item. The optimistic and pessimistic estimates are calculated by subtracting or adding one standard deviation from the most likely estimate. The example range this establishes for each line item includes 65% of the known data in the database, from the 22nd percentile to the 87th.

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Interpreting Estimate Outputs - Assemblies

Assembly Estimates Sheet							
5AK0123 AK4678ZZ Leased Facility		GSA Anchorage Anchorage, AK 2,500 USF		Tier 2 FSL 3 80% open/20% closed		High Risk Average Competition Firm Fixed Price Contract Contractor	
Number	(Prices include supervisor)	Units	Cost Per Unit	Quantity	Estimate	Estimate	Estimate
2419.1	Provide wall cutout	SF	\$ 8.05		\$ -	\$ -	\$ -
2419.2	Remove door and frame	EA	\$ 231.62		\$ -	\$ -	\$ -
2419.3	Remove acoustical ceiling panels	SF	\$ 2.44		\$ -	\$ -	\$ -
2419.4	Remove carpet flooring	SF	\$ 1.96	2,500	\$ 3,437	\$ 4,890	\$ 6,344
2419.5	Demolish walls or partitions	SF	\$ 6.38		\$ -	\$ -	\$ -
2419.6	Core drill, any size to 4" depth, for electrical access	EA	\$ 366.91		\$ -	\$ -	\$ -
2419.7	Remove rubber base.	LF	\$ 1.39	200	\$ 232	\$ 279	\$ 326
6200.1	Provide and install wood wall base	LF	\$ 8.95		\$ -	\$ -	\$ -
7210.2	Provide and install acoustical sound attenuation (fiberglass)	SF	\$ 1.35		\$ -	\$ -	\$ -
9140.1	Provide and install expanded metal security mesh in interior wall (min. 10 gauge)	SF	\$ 10.16		\$ -	\$ -	\$ -
9600.1	Provide and install carpet tile	SF	\$ 7.41	2,500	\$ 16,789	\$ 18,516	\$ 20,243
9600.2	Install carpet tiles, labor only	SF	\$ 2.73		\$ -	\$ -	\$ -
9650.1	Provide and install vinyl composition tile (VCT) to match existing.	SF	\$ 9.08		\$ -	\$ -	\$ -
9650.2	Provide and install rubber base. (4")	LF	\$ 7.75	200	\$ 1,143	\$ 1,549	\$ 1,956
16715.5	Provide and install cable (data / phone / CATV)	LF	\$ 3.51		\$ -	\$ -	\$ -
					Optimistic Estimate	Most Likely Estimate	Pessimistic Estimate
(Normal Distribution Factor = 60%)			Assembly Estimate Totals:		\$ 21,601	\$ 25,235	\$ 28,869

After the Input Factors tab is complete, the Assembly Estimates tab displays approximately 50 line items of common tasks found in the PBS Region 10 line item

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Indefinite Delivery Indefinite Quantity (IDIQ) contracts with factored unit costs for each. These line items allow a greater breakdown of tasks to better fit a project and provide a budgetary level estimate instead of a conceptual or rough order of magnitude estimate.

The normal distribution factor works exactly the same way for each assembly item as it does for the parametric items. It shows where the risk factors (entered in the Input Tab) have established the most likely estimate relative to the assembly data in the PMET database. In the condensed example above, the unit costs shown would be equal to or higher than 60% of the estimated and actual unit costs in the PMET database for each assembly.

Entering a quantity in the green cell for an assembly will calculate a most likely estimate for that quantity of assembly units. Optimistic and pessimistic estimates form an estimate range, calculated the same way they are for parametric line items.

There is a totals line at the bottom that sums the optimistic, most likely and pessimistic estimate totals for all the line items used.

	Optimistic Estimate	Most Likely Estimate	Pessimistic Estimate
Assembly Estimate Totals:	\$ -	\$ -	\$ -

Contractor overhead and profit are generally reflected in the PMET estimates, but any associated general requirements (project overhead) are not. The PMET is intended to help develop project plan estimates for relatively small tenant improvement projects, or serve as a second opinion reference for simple contractor proposals. As the database fills with good actual contract results, this tool may be used by cost estimators and project managers for small, tenant improvement projects.

Lastly, this tool is for internal PBS use only. It is only as good as the data it contains and the judgment of the user regarding the risk inputs. If you experience significant differences between PMET estimates and actual results, please forward those results and the matching risk factor data to the Regional or another cost estimator. Likewise, your feedback is also important for estimates that this tool provides very effective results for or line items you would like to see added. Thank you in advance for your partnership in these areas.

Appendix C PMET Maintenance Plan

Introduction

The PMET will only be as accurate as the accuracy of the data in its database. Regular PMET maintenance will be the key to keeping this tool at full accuracy, an essential element for its effectiveness and continued use.

As the programmed estimating data decays in accuracy over time, the PMET's estimates will suffer a directly proportional decline. User feedback will identify variances between estimates and actual contract pricing. This plan will ensure the PMET parametric and pricing data is updated annually to maintain its accuracy of estimates indefinitely.

Regular maintenance will also implement new improvement ideas from user feedback, adding new common estimating line items and other helpful suggestions. The PMET must maintain a healthy balance between usefulness and maintenance effort. Additions to the tool need evaluation against the risk that the tool would become too cumbersome and maintenance would require too much time and energy.

Steps for Annual Maintenance

1. Make a new copy of the latest PMET master file and rename it for the next update.
2. Query the users for variances between estimates and actual contract pricing.
3. Query the users for new improvement ideas and other helpful suggestions.
4. Gather user feedback submitted since the last annual maintenance.
5. Use the latest release of R.S. Means estimating guide to estimate each line item in the PMET.
6. Unhide the three tabs in the PMET that contain the estimating datasets. Right-clicking on any visible tab will call up a menu and allow each hidden tab to be opened.
7. Unprotect each sheet using the [Review] menu in Excel. PMET (version 1.0) is not password protected, but future versions may incorporate stronger protection.

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8. Data Lookup Sheet – Update location indices and annual escalation rates from the latest PBS estimating guidance for each location in this table:

State	City	October 1, 2014 Location Index	Annual Escalation Rate, based on average of previous 10 years
Alaska	ALASKA State Average	1.28	3.05%
Alaska	Anchorage, AK	1.19	3.24%
Alaska	Fairbanks, AK	1.20	2.97%
Alaska	Juneau, AK	1.31	3.20%
Alaska	Kenai Peninsula, AK	1.19	3.24%
Alaska	Ketchikan, AK	1.29	3.17%
Alaska	Kodiak, AK	1.34	3.20%
Alaska	Mat-Su Valley, AK	1.15	3.20%
Alaska	Sitka, AK	1.32	3.42%
Idaho	IDAHO State Average	0.92	3.18%
Idaho	Boise, ID	0.92	2.87%
Idaho	Caldwell, ID	0.90	2.86%
Idaho	Coeur D' Alene, ID	0.95	3.32%
Idaho	Idaho Falls, ID	0.93	3.44%
Idaho	Lewiston, ID	0.93	3.28%
Idaho	Moscow, ID	0.94	3.28%
Idaho	Pocatello, ID	0.90	3.29%
Idaho	Twin Falls, ID	0.91	2.92%
Oregon	OREGON State Average	0.98	3.02%
Oregon	Albany, OR	0.97	2.93%
Oregon	Altamont, OR	0.95	3.02%
Oregon	Astoria, OR	0.96	2.93%
Oregon	Bend, OR	1.00	3.22%
Oregon	Coos Bay, OR	0.96	2.74%
Oregon	Corvallis, OR	0.97	2.93%
Oregon	Eugene, OR	1.01	3.26%
Oregon	Grants Pass, OR	0.97	2.74%
Oregon	Klamath Falls, OR	0.95	2.79%
Oregon	Medford, OR	0.98	2.74%
Oregon	North Bend, OR	0.96	2.97%
Oregon	Pendleton, OR	1.00	2.93%
Oregon	Portland, OR	1.00	2.98%
Oregon	Roseburg, OR	0.95	2.79%
Oregon	Salem, OR	0.99	2.93%
Oregon	Springfield, OR	0.94	2.97%
Oregon	The Dalles, OR	1.01	2.93%
Washington	WASHINGTON State Average	1.03	3.47%
Washington	Bellingham, WA	1.04	3.61%
Washington	Coupeville, WA	1.08	3.55%
Washington	Everett, WA	1.10	3.54%
Washington	Longview, WA	1.00	3.36%
Washington	Olympia, WA	1.07	3.55%
Washington	Pasco (Tri-Cities), WA	1.01	3.19%
Washington	Port Angeles, WA	1.05	3.61%
Washington	Port Orchard, WA	1.06	3.55%
Washington	Seattle, WA	1.11	3.54%
Washington	Spokane, WA	1.00	3.29%
Washington	Tacoma, WA	1.09	3.59%
Washington	Vancouver, WA	1.00	3.09%
Washington	Walla Walla, WA	1.00	3.19%
Washington	Wenatchee, WA	0.99	3.29%
Washington	Yakima, WA	1.00	3.19%

9. Data Lookup Sheet – Update the following risk factors, based on the latest actual contract pricing data and the realized impact for each risk menu item. Remember that the percentages in the risk factors are not a direct increase of the estimate by that price,

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but an adjustment of the normal distribution factor that is used to select the most likely cost estimate from the dataset for each line item. Menu items may also be added to reflect newly identified risk elements.

Owned/Leased	0%		
Owned Facility	20%		
Leased Facility	0%	Risks	5%
		High Risk	5%
Tiers	0%	Medium Risk	0%
Tier 5	15%	Low Risk	-5%
Tier 4	10%		
Tier 3	5%	Contractor Layers	0%
Tier 2	0%	GC/Subs/Sub-Subcontractors	20%
Tier 1	-5%	GC/Subcontractors	10%
		Contractor	0%
Facility Security Level	5%		
FSL 4	10%	Contract Methods	0%
FSL 3	5%	8(a) Contract	10%
FSL 2	0%	Best Value Contract	5%
FSL 1	-5%	Micro-Purchase	5%
		Firm Fixed Price Contract	0%
Office Types	0%		
20% open/80% closed	10%	Market Competition	0%
50% open/50% closed	5%	Low To No Competition	5%
80% open/20% closed	0%	Average Competition	0%
100% open/0% closed	-5%	High Competition	-5%

10. Parametric Data Sheet – Update the dataset pricing for each line item, noting a grey-shaded reference in the line above to where the data came from or a file where it is maintained. If a file is listed, the file must contain the reference info for each individual number. Referencing provides a path to a source for updates, as well as for verification of data. PMET (v. 1.0) formulas currently use data out to and including Column “Z”.

Parametric Data Worksheet - All data is or has been converted to the R.S. Means National Average																		
Category	Units	Mean	Std Dev	Low	Median	High												
Paint	S.F.	\$ 1.12	\$ 0.19	\$ 0.85	\$ 1.25	\$ 1.27	C3010 230 0140	74 0240+ 0840	C3010 210									
							0.85	1.27	1.25									
Carpet	S.F.	\$ 5.80	\$ 1.23	\$ 4.18	\$ 5.68	\$ 8.05	C3020 410 Tile & Covering			09 68 13 Tile Carpeting			C3020 430					
							4.36	4.97	6.35	4.18	5.36	4.44	5.05	6.44	6	8.05	6.86	7.56
Move	S.F.	\$ 2.25	\$ 1.02	\$ 1.00	\$ 2.25	\$ 3.50	Moving Costs - Avg Ofc & Ofc- Move-IT-Data											
							1	2.25	3.5									
IT/Data	S.F.	\$ 6.50	\$ 1.22	\$ 5.00	\$ 6.50	\$ 8.00	Office-Moving-IT-Data											
							5	6.5	8									
Tenant Improvements	S.F.	\$75.00	\$20.41	\$50.00	\$75.00	\$ 100.00	Collier's Int'l Ofc Build-Out											
							50	75	100									

11. Assembly Data Sheet – Update the dataset pricing for each line item, noting the reference in the column header where the data came from or a file where it is maintained. The column header may also contain the name of a cost estimator who

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supplied the data. If a file is listed, the file must contain the reference info for each individual number. Referencing provides a path to a source for updates, as well as for verification of data. PMET (v. 1.0) formulas currently use data out to and including Column "Z", but the range could easily be enlarged.

Assembly Data Worksheet - All data is or has been converted to the R.S. Means National Average															
CSI Division Number	CONSTRUCTION ASSEMBLIES (Prices include supervisor)	UNIT	Mean	Std Dev	Low	Median	High	Federal	Auburn	Tacoma Union	McClure FB	FOB Seattle	CostWorks Estimates		
								Center South	Complex	Station	Boise				
2419.1	Provide wall cutout	SF	\$6.39	\$1.52	\$3.76	\$7.22	\$7.34	\$7.18	\$7.27	\$7.34	\$3.76				
2419.2	Remove door and frame	EA	\$191.23	\$14.14	\$179.92	\$186.02	\$219.02	\$183.50	\$186.02	\$187.71	\$179.92	\$219.02			
2419.3	Remove acoustical ceiling panels	SF	\$1.89	\$0.66	\$0.95	\$2.39	\$2.45	\$2.39	\$2.42	\$2.45	\$0.95	\$1.21			
2419.4	Remove carpet flooring	SF	\$1.50	\$0.58	\$0.63	\$1.94	\$1.99	\$1.94	\$1.97	\$1.99	\$0.63	\$0.97			
2419.5	Demolish walls or partitions	SF	\$5.06	\$1.24	\$3.34	\$5.99	\$6.12	\$5.99	\$6.07	\$6.12	\$3.76	\$3.34			
2419.6	Core drill, any size to 4" depth, for electrical access	EA	\$283.99	\$105.05	\$100.10	\$340.79	\$346.25	\$338.47	\$343.12	\$346.25	\$100.10				
2419.7	Remove rubber base.	LF	\$1.11	\$0.23	\$0.71	\$1.24	\$1.26	\$1.23	\$1.25	\$1.26		\$0.71			
6200.1	Provide and install wood wall base	LF	\$7.51	\$0.08	\$7.41	\$7.51	\$7.61			\$7.51			\$7.41	\$7.61	
7210.2	Provide and install acoustical sound attenuation (fiberglass)	SF	\$1.07	\$0.24	\$0.92	\$0.94	\$1.54	\$0.92	\$0.93	\$0.94	\$1.54	\$1.03			
9140.1	Provide and install expanded metal security mesh in interior wall (min. 10 gauge)	SF	\$8.53	\$0.08	\$8.42	\$8.54	\$8.62	\$8.42	\$8.54	\$8.62					
9140.2	Provide and install interior wall, (metal frame, 2 sides GWB)	SF	\$13.48	\$1.22	\$11.38	\$14.10	\$14.33	\$14.01	\$14.20	\$14.33		\$11.38			
9140.3	Repair interior wall (GWB)	SF	\$14.77	\$0.62	\$14.10	\$14.68	\$15.63	\$14.10	\$14.29	\$15.07		\$15.63			
9140.4	Provide and install interior wall framing perpendicular to window mullion, (metal frame, 2	SF	\$15.99	\$0.15	\$15.80	\$16.01	\$16.16	\$15.80	\$16.01	\$16.16					
9140.5	Repair interior wall (GWB)	SF	\$53.14	\$37.51	\$15.63	\$53.14	\$90.64				\$90.64	\$15.63			
9510.1	Provide and install acoustical ceiling panels. (Sway Brace)	SF	\$11.27	\$0.08	\$11.19	\$11.27	\$11.35	\$11.19	\$11.35						
9510.2	Provide and install acoustical ceiling panels. (Lateral Brace)	SF	\$11.42	\$0.08	\$11.34	\$11.42	\$11.50	\$11.34	\$11.50						
9510.3a	Provide and install acoustical ceiling panels (24" x 24")	EA	\$6.69	\$1.33	\$4.39	\$7.42	\$7.54	\$7.37	\$7.47	\$7.54		\$4.39			
9510.3b	Provide and install acoustical ceiling panels (24" x 48")	EA	\$11.93	\$0.08	\$11.83	\$11.93	\$12.03			\$11.93			\$11.83	\$12.03	
9600.1	Provide and install carpet tile	SF	\$6.05	\$0.69	\$4.97	\$6.35	\$6.68	\$6.53	\$6.62	\$6.68		\$6.24	\$4.97	\$6.35	\$5.00
9600.2	Install carpet tiles, labor only	SF	\$2.06	\$0.94	\$0.70	\$2.78	\$2.85	\$2.78	\$2.82	\$2.85	\$1.16		\$0.70		
9650.1	Provide and install vinyl composition tile (VCT) to match existing.	SF	\$7.31	\$1.28	\$4.85	\$8.05	\$8.23	\$8.05	\$8.16	\$8.23	\$4.85		\$7.28		
9650.2	Provide and install rubber base. (4")	LF	\$6.00	\$2.03	\$3.45	\$7.57	\$7.74	\$7.57	\$7.67	\$7.74	\$3.45	\$3.58			
9720.1	Provide and install vinyl wallcoverings (18 oz)	SF	\$1.88	\$0.00	\$1.88	\$1.88	\$1.88			\$1.88					
9910.1	Paint wall.	SF	\$1.00	\$0.27	\$0.82	\$0.91	\$1.60	\$0.90	\$0.91	\$0.92		\$1.60	\$0.85	\$0.82	
9910.2	Paint trim, (metal or wood, up to 4" width)	LF	\$2.70	\$0.89	\$0.98	\$3.23	\$3.31	\$3.23	\$3.28	\$3.31	\$0.98	\$2.71			
9910.3	Oil or stain wood doors	EA	\$227.91	\$71.02	\$104.95	\$267.47	\$271.75	\$265.65	\$269.29	\$271.75	\$104.95				
10260.1	Provide and install corner guards	LF	\$56.02	\$21.73	\$25.28	\$70.90	\$71.86	\$70.90	\$71.86		\$25.28				
10426.1	Provide and install corridor signage	EA	\$287.58	\$3.27	\$284.32	\$287.58	\$290.85	\$284.32		\$290.85					
15300.1	Remove and relocate sprinkler heads. (w/in 5' radius)	EA	\$502.03	\$102.12	\$437.76	\$445.79	\$678.80	\$437.76	\$443.76	\$447.82	\$678.80				
15300.2	Provide and install sprinkler heads. (new pipe connected w/in 10' or less to existing)	EA	\$637.50	\$62.59	\$594.21	\$605.11	\$745.58	\$594.21	\$602.36	\$607.86	\$745.58				
15300.3	Remove and relocate pull station (w/in 10' radius) [excludes programming]	EA	\$416.20	\$87.94	\$280.32	\$429.17	\$526.13	\$424.29	\$280.32	\$434.04	\$526.13				
15300.4	Provide and install pull station [excludes programming]	EA	\$362.32	\$116.38	\$160.84	\$427.21	\$434.04	\$424.29	\$430.12	\$434.04	\$160.84				
15300.5	Provide and install smoke detector [excludes programming]	EA	\$593.98	\$74.29	\$544.51	\$554.50	\$722.41	\$544.51	\$551.98	\$557.02	\$722.41				
15300.6	Provide and install horn/strobe [excludes programming]	EA	\$319.70	\$7.96	\$306.68	\$322.32	\$327.48	\$320.12	\$324.51	\$327.48	\$306.68				
15810.2	Provide and install duct work, 18" or less, spiral, wrap insulated.	LF	\$73.06	\$0.68	\$72.18	\$73.17	\$73.84	\$72.18	\$73.17	\$73.84					
16130.1	Relocate monument (w/in 10', in same trench)	EA	\$15.25	\$0.08	\$15.15	\$15.25	\$15.35	\$15.25					\$15.15	\$15.35	
16130.2	Remove outlet. Pull wire to nearest panel, up to 100 LF	EA	\$115.42	\$73.79	\$71.94	\$73.26	\$243.22	\$71.94	\$72.92	\$73.59		\$243.22			
16130.3	Provide and install duplex receptacle (excludes wire, conduit)	EA	\$201.03	\$57.92	\$143.12	\$201.03	\$258.95				\$143.12	\$258.95			
16130.4	Provide and install dedicated receptacle (20 or 30 amp) (excludes wire, conduit)	EA	\$201.03	\$57.92	\$143.12	\$201.03	\$258.95				\$143.12	\$258.95			
16130.5	Provide and install conduit (3/4" EMT)	LF	\$12.85	\$1.09	\$10.74	\$13.39	\$13.70	\$13.39	\$13.57	\$13.70	\$10.74	\$12.86			
16130.6	Provide and install wiring (3 conductor, 12 ga)	LF	\$3.25	\$0.59	\$2.33	\$3.67	\$3.75	\$3.67	\$3.72	\$3.75	\$2.78	\$2.33			
16130.7	Provide and install circuit breaker (20A SP)	EA	\$102.64	\$29.12	\$54.06	\$104.58	\$145.85	\$103.17	\$104.58	\$105.54	\$145.85	\$54.06			
16130.8	Connect furniture whip to electrical source. (excludes wire installation)	EA	\$48.44	\$27.12	\$32.39	\$32.98	\$95.41	\$32.39	\$32.83	\$33.13	\$95.41				
16130.9	Provide and install raceway and boxes for Electrical systems, Walker duct.	LF	\$81.14	\$0.08	\$81.04	\$81.14	\$81.24	\$81.14				\$81.04	\$81.24		
16500.1	Provide and install fluorescent lighting and lamps w/seismic bracing. (within 10' radius of existing)	EA	\$443.41	\$111.73	\$222.00	\$485.33	\$521.20	\$521.20	\$508.74		\$479.79	\$485.33	\$222.00		
16500.2	Remove and relocate fluorescent lighting fixture w/seismic bracing. (w/in 10' radius of existing)	EA	\$218.72	\$24.87	\$201.93	\$205.63	\$261.70	\$201.93	\$204.70	\$206.57	\$261.70				
16715.1	Remove and relocate data or phone receptacle (w/in 10' in same trench)	LF	\$151.66	\$35.22	\$129.75	\$132.13	\$212.63	\$129.75	\$131.53	\$132.73	\$212.63				
16715.2	Remove data / phone / cable. Pull cable to nearest panel, up to 100 LF	EA	\$123.56	\$10.50	\$117.11	\$118.72	\$144.48	\$117.11	\$118.72	\$119.80	\$144.48	\$117.68			
16715.3	Provide and install data / phone / cable receptacle (excludes wire, conduit)	EA	\$237.21	\$53.20	\$184.01	\$237.21	\$290.41				\$184.01	\$290.41			
16715.4	Provide and install conduit for data / phone / cable	LF	\$14.73	\$2.39	\$10.60	\$16.02	\$16.28	\$15.92	\$16.13	\$16.28	\$10.60				
16715.5	Provide and install cable (data / phone / CATV)	LF	\$2.92	\$0.13	\$2.81	\$2.86	\$3.15	\$2.81	\$2.85	\$2.88	\$3.15				

12. Protect each sheet using the [Review] menu in Excel.

13. Hide the three tabs in the PMET that contain the estimating datasets. Right-clicking on any visible tab will call up a menu and allow each tab to be hidden.

Appendix C
PMET Maintenance Plan

14. Save the new copy of this latest PMET master file.
15. Retest the tool to ensure proper operation of all functions and check results against the recent actual contract pricing data.
16. Redistribute the new updated version to users.

Appendix D

Change Management Tracking Log

Project ID #	Issue Date	Name of Submitter	Title of Change Request	Impact and Deliverables Affected	Date of Completion	Notes & Recommendations
01	2/5/16	Brian Swanson	Scope Increase – IDIQ Logic Opportunity	Add new logic for IDIQ contracts to PMP and update schedule.	2/22/2016	Route through CCB for approval.
02	3/1/16	Brian Swanson	Scope Reduction – IDIQ Work Items List Opportunity	Reduce research requirement for estimate line items in PMET	12/31/2016	Route through CCB for approval.
03	3/8/16	Brian Swanson	Schedule Delay – Combined Risks Realized	Defer project completion by seven months to fall academic semester.	3/31/2016	Route through CCB for approval.
04	5/1/16	Brian Swanson	Schedule Change – Specialized Risk Simulation Research Opportunity	Defer project completion by five months to spring academic semester.	9/30/2016	Route through CCB for approval.
05	11/28/16	Brian Swanson	Scope Reduction – Delete Rollout	Edit scope in PMP and update schedule.	12/31/2016	Route through CCB for approval.

Project Management Change Request Form

Change Request Details	
Date:	2/5/2016
Title of Change Request:	Scope Increase – IDIQ Logic Opportunity
Change Request ID #:	01
Name of Person Making the Change Request:	Brian Swanson
Submitter's Title:	Project Manager
Submitter's Phone # and Email:	(907) 271-5028, bswans11@alaska.edu
Description of the Proposed Change:	<p>While researching during project execution, the PM discovered an opportunity to expand and modify the project scope. Indefinite delivery indefinite quantity (IDIQ) contracts are used in the larger federal buildings to pre-price common building modifications, similar to those the PMET is intended to help estimate. The research discovered the IDIQ contracts are not being used, since lower pricing may be obtained by having the IDIQ contractor bid on the specifics of each project.</p> <p>The flaw in the pre-pricing for the IDIQ contract vehicle is the bid items are not flexible enough to allow for much variation in the specific project requirements. The bidder has to put a conservative price on the item to cover the worst case in the variables, which makes the whole menu of pre-priced work items overpriced when compared with specific estimates for specific project requirements. Since significant time and effort is invested in developing and soliciting an IDIQ contract, this effort is wasted if this contract vehicle is not used.</p> <p>The scope expansion for the PMET project is to develop the logic to correct this approach to these IDIQ contracts. That same logic will be programmed into the PMET to keep it from overpricing estimates, but it will address a much broader problem for PBS building maintenance contracting at the same time. This expansion in scope will approximately double the benefit of this project for a nominal increase in the project scope. This change includes a reworked schedule and a new baseline to measure from.</p>
Priority Level:	Medium
Sponsor Approval:	Guy Cannova
Proj. Exec. Approval:	Paul Witherspoon

Appendix D

Project Management Change Request Form

Change Request Details	
Date:	3/1/2016
Title of Change Request:	Scope Reduction – IDIQ Work Items List Opportunity
Change Request ID #:	02
Name of Person Making the Change Request:	Brian Swanson
Submitter's Title:	Project Manager
Submitter's Phone # and Email:	(907) 271-5028, bswans11@alaska.edu
Description of the Proposed Change:	A scope reduction resulted from a realized opportunity identified in the Risk & Opportunity Register. Since the IDIQ contracts seek to pre-price the many small, recurring work items that occur in buildings, the contracts already list common, recurring items identified by project managers, cost estimators and contracting personnel. The scope reduction will eliminate the separate research with PBS PM's and cost estimators and use items listed on IDIQ line item contracts. The PM's and cost estimators will still have opportunity to provide input regarding estimating line items when they review the PMET.
Priority Level:	Medium
Sponsor Approval:	Guy Cannova
Proj. Exec. Approval:	Paul Witherspoon

Project Management Change Request Form

Change Request Details	
Date:	3/8/2016
Title of Change Request:	Schedule Delay – Combined Risks Realized
Change Request ID #:	03
Name of Person Making the Change Request:	Brian Swanson
Submitter's Title:	Project Manager
Submitter's Phone # and Email:	(907) 271-5028, bswans11@alaska.edu
Description of the Proposed Change:	<p>Two of the high level risks identified in the Project Management Plan were realized in combination. The first risk was titled, “Project Manager unavailable,” which stated that the project could be delayed if the PM's regular workload interfered with this project work. The second risk was titled, “Tasks take longer,” which stated that the project could be delayed if PMET development tasks took longer than estimated. The risk mitigation strategy for both risks was to utilize project overtime to crash the late schedule tasks and recover the schedule. This combination of simultaneous risks exceeded the amount of overtime available to crash the delayed tasks.</p> <p>The PM’s primary projects were at critical points, squeezing available overtime hours and preventing the option to take leave from work to create overtime availability. The PMET development task durations were underestimated. The PMET project schedule was already compressed from Change 1, so the combination of these realized risks was enough to push the compressed schedule back past academic milestone constraints. This change includes a reworked schedule that defers project completion by seven months to the fall academic semester..</p>
Priority Level:	High
Sponsor Approval:	Guy Cannova
Proj. Exec. Approval:	Paul Witherspoon

Appendix D



























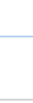
Project Management Change Request Form

Change Request Details	
Date:	5/1/2016
Title of Change Request:	Schedule Postponement – Specialized Risk Simulation Research Opportunity
Change Request ID #:	04
Name of Person Making the Change Request:	Brian Swanson
Submitter's Title:	Project Manager
Submitter's Phone # and Email:	(907) 271-5028, bswans11@alaska.edu
Description of the Proposed Change:	<p>The schedule postponement of Change 2 opens up a new opportunity over the summer to perform additional research into the risk management features of the PMET. The PM will take a directed studies course to learn advanced risk model simulation techniques to be incorporated into the tool design.</p> <p>This change includes a new schedule with a new baseline and reduced work rate that better matches the PM work scheduling to the actual PM resource availability from Change 3. This change defers project completion by five months to the Spring 2017 academic semester.</p>
Priority Level:	Medium
Sponsor Approval:	Guy Cannova
Proj. Exec. Approval:	Paul Witherspoon

Project Management Change Request Form

Change Request Details	
Date:	11/28/2016
Title of Change Request:	Scope Reduction – Delete Rollout
Change Request ID #:	05
Name of Person Making the Change Request:	Brian Swanson
Submitter's Title:	Project Manager
Submitter's Phone # and Email:	(907) 271-5028, bswans11@alaska.edu
Description of the Proposed Change:	<p>Since approval of the PMET Project Management Plan, the National Office of the Public Buildings Service issued new guidance regarding the estimating process and formats used by the agency. The National Office evaluated commercial-off-the-shelf estimating systems over a period of eight years and settled on an enterprise version of the R.S. Means software.</p> <p>This move reinforces the use of R.S. Means for the PMET, but an unanticipated outcome of the national rollout is a new requirement that all estimates for clients be reviewed by PBS cost estimators. The rollout of a regional initiative during the larger national rollout would likely confuse users. Therefore, the rollout portion of the PMET project scope is deleted. The testing and evaluation of the PMET will remain with the regional cost estimators, until the national system rollout is complete.</p> <p>The rollout of the PMET may be made part of a future, separate project, since the PMET's potential benefits to the PBS project management community are unchanged. The new R.S. Means system requires a license for every user and the PMET could be used nationally to minimize the number of project managers requiring a license.</p>
Priority Level:	High
Sponsor Approval:	Guy Cannova
Proj. Exec. Approval:	Paul Witherspoon

PMET Project Schedule

PMET Final Schedule						
ID	Task Name	Work	Duration	Start	Finish	
0	 PMET Schedule	420 hrs	409 days	Fri 9/4/15	Mon 4/24/17	July 1 6/7 8/16
1	 Initiating	16 hrs	5 days	Fri 9/4/15	Fri 9/11/15	 100%
2	 Project Start	0 hrs	0 days	Fri 9/4/15	Fri 9/4/15	 9/4
3	 Develop Project Charter	4 hrs	0.5 days	Fri 9/4/15	Sat 9/5/15	 100%
4	 Develop Preliminary Project Scope Statement	4 hrs	0.5 days	Sat 9/5/15	Sun 9/6/15	 100%
5	 Develop Draft Work Breakdown Structure & Schedule	4 hrs	0.5 days	Sun 9/6/15	Wed 9/9/15	 100%
6	 ID Stakeholders	4 hrs	0.5 days	Thu 9/10/15	Fri 9/11/15	 100%
7	 Milestone: PPM #1 Deliverables	0 hrs	0 days	Fri 9/11/15	Fri 9/11/15	 9/11
8	 Planning	138 hrs	54 days	Wed 9/16/15	Mon 12/7/15	 1
9	 Define Scope	22 hrs	11 days	Wed 9/16/15	Fri 10/2/15	 1
10	 Specify Deliverables and Acceptance Criteria	4 hrs	0.5 days	Wed 9/16/15	Thu 9/17/15	 100%
11	 Define Scope	4 hrs	0.5 days	Fri 9/18/15	Wed 9/23/15	 100%
12	 Document Assumptions	4 hrs	0.5 days	Thu 9/24/15	Fri 9/25/15	 100%
13	 Draft Research Plan & Questions	6 hrs	0.75 days	Sat 9/26/15	Sun 9/27/15	 100%

PMET Project Schedule

PMET Final Schedule						
ID	Task Name	Work	Duration	Start	Finish	
14	Outline PM Plan & Project Final Report	4 hrs	0.5 days	Sun 9/27/15	Wed 9/30/15	8/16 PM
15	Milestone: PPM #2 Deliverables	0 hrs	0 days	Fri 10/2/15	Fri 10/2/15	1
16	Develop Project Schedule	36 hrs	14 days	Thu 10/1/15	Fri 10/23/15	
17	Draft interview questions	4 hrs	0.5 days	Thu 10/1/15	Fri 10/2/15	PM
18	Draft desired estimate line items	4 hrs	0.5 days	Sat 10/3/15	Sat 10/3/15	PM
19	Build Work Breakdown Structure	4 hrs	0.5 days	Sun 10/4/15	Sun 10/4/15	PM
20	Develop Resource Plans	4 hrs	0.5 days	Wed 10/7/15	Thu 10/8/15	PM
21	Prepare Project Budget Estimates	4 hrs	0.5 days	Fri 10/9/15	Wed 10/14/15	PM
22	Define Dependencies and Develop Project Schedule	8 hrs	1 day	Thu 10/15/15	Sat 10/17/15	PM
23	Draft Preliminary PM Plan	8 hrs	1 day	Sun 10/18/15	Thu 10/22/15	PM
24	Milestone: PPM #3 Deliverables	0 hrs	0 days	Fri 10/23/15	Fri 10/23/15	
25	Develop Risk Plans	12 hrs	3 days	Fri 10/23/15	Wed 10/28/15	
26	Develop Risk Management Plan	4 hrs	0.5 days	Fri 10/23/15	Sat 10/24/15	PM
27	Identify Risks	4 hrs	0.5 days	Sat 10/24/15	Sun 10/25/15	PM

Appendix E

PMET Project Schedule

PMET Final Schedule						
ID	Task Name	Work	Duration	Start	Finish	July 1 6/7 8/16
28	Analyze Risks	4 hrs	0.5 days	Sun 10/25/15	Wed 10/28/15	
29	Develop Subsidiary Plans	24 hrs	6 days	Thu 10/29/15	Sun 11/8/15	
30	Develop Integration Management Plan	2 hrs	0.25 days	Thu 10/29/15	Thu 10/29/15	
31	Develop Scope Management Plan	2 hrs	0.25 days	Fri 10/30/15	Fri 10/30/15	
32	Develop Time Management Plan	4 hrs	0.5 days	Sat 10/31/15	Sat 10/31/15	
33	Develop Cost Management Plan	2 hrs	0.25 days	Sun 11/1/15	Sun 11/1/15	
34	Develop Quality Management Plan	4 hrs	0.5 days	Sun 11/1/15	Wed 11/4/15	
35	Develop Human Resource Management Plan	2 hrs	0.25 days	Thu 11/5/15	Thu 11/5/15	
36	Develop Communications Management Plan	3 hrs	0.38 days	Fri 11/6/15	Sat 11/7/15	
37	Develop Procurement Management Plan	2 hrs	0.25 days	Sat 11/7/15	Sat 11/7/15	
38	Develop Stakeholder Management Plan	3 hrs	0.38 days	Sat 11/7/15	Sun 11/8/15	
39	Submit Plan and Deliverables	44 hrs	18 days	Sun 11/8/15	Mon 12/7/15	
40	Finalize Project Management Plan	12 hrs	1.5 days	Sun 11/8/15	Sun 11/15/15	

Appendix E

PMET Project Schedule

41		Milestone: PPM #4 Deliverables	0 hrs	0 days	Fri 11/20/15	Fri 11/20/15		July 1 6/7	8/16
PMET Final Schedule									
ID		Task Name	Work	Duration	Start	Finish			
42		Prepare Final PMP Presentation	20 hrs	2.5 days	Sun 11/15/15	Fri 11/27/15			
43		Milestone: Final PMP Presentation	0 hrs	0 days	Mon 11/30/15	Mon 11/30/15			
44		Prepare Final PMP Deliverables Package	12 hrs	1.5 days	Sat 11/28/15	Thu 12/3/15			
45		Milestone: Submit Final PMP Deliverables	0 hrs	0 days	Mon 12/7/15	Mon 12/7/15			
46		Executing	250 hrs	300 days	Wed 1/6/16	Sat 3/18/17			
47		Research	60 hrs	221 days	Wed 1/6/16	Mon 11/21/16			
48		Gather local estimating guide copies	8 hrs	1 day	Wed 1/6/16	Sat 1/9/16			
49		Finalize estimate line item list	8 hrs	1 day	Sun 1/10/16	Thu 1/14/16			
50		Research historical estimates	12 hrs	1.5 days	Fri 1/15/16	Wed 1/20/16			
51		Research Means estimating guides	12 hrs	1.5 days	Thu 1/21/16	Sun 1/24/16			
52		Resolve differences	8 hrs	1 day	Wed 1/27/16	Sat 1/30/16			

Appendix E

PMET Project Schedule

53		Milestone: PPM #1 Deliverables	0 hrs	0 days	Fri 2/5/16	Fri 2/5/16
54		Conduct Team Orientation	4 hrs	0.5 days	Sat 1/30/16	Mon 2/1/16
55		Survey project managers	4 hrs	0.5 days	Wed 2/3/16	Thu 2/4/16

PMET Final Schedule						
ID	Task Name	Work	Duration	Start	Finish	July 1 6/7
56	Interview estimators	4 hrs	0.5 days	Fri 2/5/16	Sat 2/13/16	8/16
57	Changes 2 & 3 postponement	0 hrs	180 days	Tue 3/8/16	Mon 11/21/16	
58	Develop Tool	147 hrs	74 days	Mon 11/21/16	Sat 3/11/17	
59	Develop spreadsheet	24 hrs	5.25 days	Mon 11/21/16	Wed 12/21/16	
60	Estimate component systems	62 hrs	7.75 days	Wed 12/21/16	Sun 1/22/17	
61	Program tool	42 hrs	5.25 days	Sun 1/22/17	Tue 2/21/17	
62	Develop user guide & training	19 hrs	2.38 days	Wed 2/22/17	Sat 3/11/17	
63	Milestone: PPM #2 Deliverables	0 hrs	0 days	Sat 3/11/17	Sat 3/11/17	
64	Assure Quality	39 hrs	5 days	Sat 3/11/17	Fri 3/17/17	

PMET Project Schedule

65		Develop PMET maintenance plan	4 hrs	0.5 days	Sat 3/11/17	Mon 3/13/17
66		Field test PMET	32 hrs	4 days	Mon 3/13/17	Thu 3/16/17
67		Gather and incorporate test feedback	2 hrs	0.25 days	Thu 3/16/17	Thu 3/16/17
68		Retest and validate PMET	1 hr	0.13 days	Fri 3/17/17	Fri 3/17/17
69		Risk response: Regather and incorporate test feedback	8 hrs	1-day	Fri 3/17/17	Sat 3/18/17

PMET Final Schedule						
ID	Task Name	Work	Duration	Start	Finish	July 1 6/7
70	Risk response: Retest and validate PMET	16 hrs	2 days	Sat 3/18/17	Fri 3/24/17	8/16
71	-Rollout	40 hrs	35 days	Fri 3/24/17	Sat 5/13/17	
72	Announce tool availability	8 hrs	1 day	Fri 3/24/17	Sat 3/25/17	
73	Provide PMET training	8 hrs	1 day	Sat 3/25/17	Sun 4/23/17	
74	Deploy tool to project managers	8 hrs	1 day	Sun 4/23/17	Sun 4/30/17	
75	Monitor and Control PMET Use	8 hrs	1 day	Sun 4/30/17	Sun 5/7/17	
76	Manage Project Acceptance	8 hrs	1 day	Sun 5/7/17	Sat 5/13/17	

PMET Project Schedule

77		Manage Stakeholders	4 hrs	0 days	Fri 3/17/17	Sat 3/18/17
78		Monitor Satisfaction	2 hrs	0.25 days	Fri 3/17/17	Sat 3/18/17
79		Resolve Issues	2 hrs	0.25 days	Sat 3/18/17	Sat 3/18/17
80		Closing	16 hrs	26 days	Sat 3/18/17	Mon 4/24/17
81		Summarize Project Results and Lessons Learned	4 hrs	0.5 days	Sat 3/18/17	Sat 3/18/17
82		Prepare Final PMP Presentation	8 hrs	1 day	Sat 3/18/17	Fri 3/24/17
83		Milestone: PPM #3 Deliverables	0 hrs	0 days	Fri 3/24/17	Fri 3/24/17

PMET Final Schedule						
ID		Task Name	Work	Duration	Start	Finish
84		Review and Recognize Team Performance	2 hrs	0.25 days	Fri 3/24/17	Sat 3/25/17
85		Close Out the Project Records	2 hrs	0.25 days	Sat 3/25/17	Sat 3/25/17
86		Milestone: PPM #4 Deliverables	0 hrs	0 days	Fri 4/14/17	Fri 4/14/17
87		Milestone: Final Project Results Presentation	0 hrs	0 days	Mon 4/24/17	Mon 4/24/17
88		Project Complete	0 hrs	1 day	Mon 4/24/17	Mon 4/24/17

July 1
6/7

8/16

Appendix F
PMET Project Presentation

Project Management Estimating Tool (PMET)

Brian Swanson
PM 686B – Capstone Project
Executing, Controlling & Closing

Presentation Outline

1. Project Overview
2. Project Scope
3. Research Approach
4. Project Results
5. PMET (Product) Overview
6. PMET Testing, Rollout & Maintenance
7. Project Conclusions
8. Project Recommendations



1. Project Overview

- * Develop a **user-friendly spreadsheet cost estimating tool**
- * Use for **small alteration projects** in Public Buildings Service (PBS) owned or leased buildings with commonly used tasks
- * Enable PM's to create **timely and accurate cost estimates**
- * **Conceptual level (-40%/+75%) parametric estimates**
- * **Budgetary level (-10%/+25%) assembly estimates**
- * Includes **user guide & training plan** for PM's
- * Includes **annual maintenance plan** for administrators
- * This project commenced on September 4, 2015 & completed on April 24, 2017.

Current State

- * Most PM's lack cost estimating skills and confidence
- * Most PBS project cost estimating done by cost estimators
- * Project managers fill out cost estimate request forms
- * Each estimate request waits in a queue
- * This process usually involves several days of waiting
- * Estimator usually calls the PM for a briefing on the request

Appendix F PMET Project Presentation

Need

- * Reduced cost estimating time
- * Improved cost estimating accuracy.
- * Increased estimating expertise and confidence of project managers

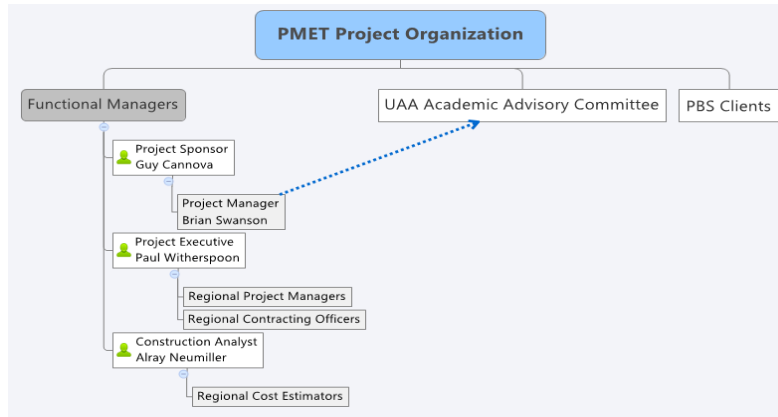


Future State

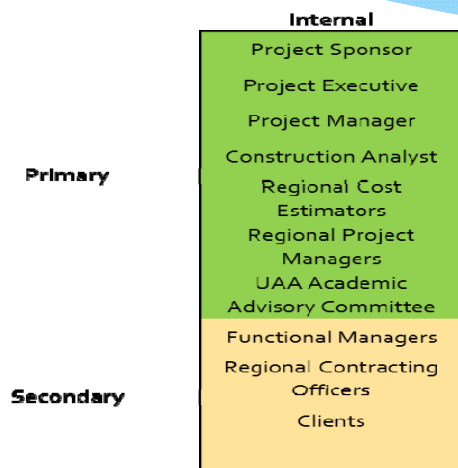
- * The PMET enables PM's to provide many small cost estimates in minutes, saving days of waiting
- * Use of the PMET saves time for cost estimators also
- * Cost estimators have more time to focus on complex estimates
- * Improved overall timeliness of estimates
- * Improved accuracy of estimates using PMET
- * Improved PM estimating skills and confidence

Appendix F PMET Project Presentation

Project Team Organization



Stakeholders



2. Project Scope

- * Develop a **user-friendly spreadsheet cost estimating tool**
- * Use for **small alteration projects** with commonly used tasks
- * Include **Conceptual level (-40%/+75%) parametric estimates**
- * Include **Budgetary level (-10%/+25%) assembly estimates**
- * Develop a **user guide & training plan** for PM's
- * Develop an **annual maintenance plan** for administrators

Business Case

- * **PM's will develop** most simple estimates their own small, routine projects require
- * Use of the PMET will **save time** for PM's and cost estimators
- * **Saves waiting time** in cost estimator queues
- * **Frees cost estimators** for complex estimates
- * **Improves overall timeliness** of estimates for clients
- * **Improves precision and accuracy** of estimates
- * Use of the tool will **build estimating skills and confidence** of PM's (increased PM maturity)

PMET Project Objectives

- * Assist with single item or single assembly estimates that are the **PBS “bread and butter” projects** most often requested by clients.
- * Initial limit of **no more than 100 different estimating line items**. (PMET 1.0 contains 55 line items.)
- * Searchable and built in a **user-friendly spreadsheet format**.
- * Incorporate **PBS and R.S. Means parametric “rules of thumb”** for conceptual level estimates (-40% < Precision and Range < +75%).

Project Objectives (cont.)

- * Incorporate **PBS and R.S. Means estimating data** for budgetary level estimates. (-10% < Precision and Range < +25%)
- * Incorporate **PBS historical contract cost data** into both conceptual and budgetary level estimates.
- * **Factor risk** (agency, contract type, requirement standards, urgency, etc.) & geographic location (Cities in AK, ID, OR & WA) inputs into its estimate ranges.
- * Include a **user guide and a training plan**
- * Include an **annual maintenance update plan**

Appendix F
PMET Project Presentation

Constraints

Constraint	Fixed	Flexible	Accept
Scope		X	
Time	X →		
Cost			X
Quality	X		

Deliverables

- * Project Management Estimating Tool (PMET)
- * PMET user guide & training plan
- * Annual maintenance/update plan
- * All project documentation & final report

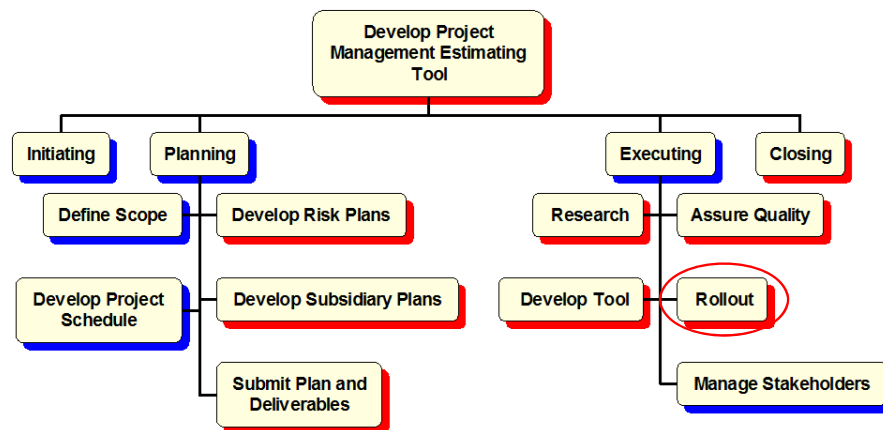


Appendix F
PMET Project Presentation

Outcomes

- * **Time savings** for PM's & cost estimators
- * **Improved focus** on more complex estimates by cost estimators
- * **Improved responsiveness** for small estimates requested by clients or project teams
- * **Improved precision and overall accuracy** of simple estimates
- * **Improved estimating skills and confidence** of PM's
- * **Greater project management maturity**

Work Breakdown Structure



3. Research Approach

- * **General literature search** for similar tools/efforts
- * **Internal agency search** for similar tools/efforts
- * **Survey of future users** for baseline data
- * **Estimating standards** from R.S. Means estimating guide.
- * Actual contract file **historical cost data**
- * **Annual user survey** to measure improvements and glean tool improvement suggestions

Research Results

- * No other similar tools/efforts externally or internally
- * R.S. Means estimating guide had current industry standard estimate data.
- * Actual PBS contract file historical cost data was very limited and difficult to reach and analyze.
- * 25 future users responded to the initial survey



User Survey Results

- * **48% of respondents were PMs**, 28% were contracting staff and 20% were cost estimators.
- * 29% of estimates were currently created by respondents, but **forecast increased to 49%** if a user-friendly tool was provided.
- * The most commonly used estimating sources were **R. S. Means** and previous **historical estimates** (confirmation for focusing on those sources for the PMET).
- * The **-10%/+25% estimating range** was the most useful (PMET uses this range for over 50 assembly estimating lines).
- * One half of the respondents **wait a week or longer** to receive their small cost estimate.

4. PMET Project Results

- * Risk Management
- * Scope Management
- * Time Management
- * Cost Management



Appendix F PMET Project Presentation

Risk/Opportunity Management

ID#	Risk Name	Description of Risk	Likelihood (1-not likely, 3-likely, 5-very likely)	Impact (1-negligible, 3-Marginal, 5-Significant)	Risk Level (L X I) 1-5 = Low, 9 = Mod, 15+ = High (code cells with blue for low yellow for moderate and red for high) See example below
1	Excessive estimate variance	If difference between R.S. Means and historical data is too large, then we might not be able to resolve the differences.	1	3	LOW
2	Project records incomplete	If project records are incomplete, then historical data may not be available.	3	3	MEDIUM
3	Excessive time needed	If project records are not well-organized, then it may take too much time to capture the historical data.	3	3	MEDIUM
4	Pricing variability in market	High pricing variability in the market may occur, causing tool to be outdated.	1	5	LOW
5	PM's don't use tool	PM's may not use the tool when rolled out, causing a waste of resources to develop it.	1	5	LOW
6	Lack of Quality	Lack of quality built into the tool may make it unreliable.	1	3	LOW
7	PBS Regional Org Chart	The project organization crosses five divisions, making it difficult to get everyone in the same tool.	3	3	MEDIUM
8	Project Manager unavailable	If the PM's regular workload interferes with this project work, the project could be delayed.	3	5	HIGH
9	Tasks take longer	PMET development tasks take longer than estimated, there is a risk of delaying the project.	3	5	HIGH
10	Tool yields unrealistic estimates	If tool does not provide accurate estimates, it will sit unused.	3	5	HIGH
11	IDIQ Contract List	Several buildings have IDIQ contract menus with priced remodel items.	5	3	HIGH

(IDIQ Contracts)

Building Name	Item Description	Unit	Mat	Labor	Overhead	Profit	UNIT COST	SUPPORTING RATIONALE
AUBURN COMPLEX (ADMINISTRATION BUILDING, WAREHOUSE 7 (SSA))								
	CONSTRUCTION ASSEMBLIES - AUBURN COMPLEX - EXCLUDES WAREHOUSE 7							2009 data escalated 8 years @ 3.47% = 1.314 and divided by Tacoma geo index of 1.09.
2419.1	Provide wall cutout	SF		\$ 4.77	15%	10%	\$ 6.03	\$ 7.27
2419.2	Remove door and frame	EA		\$ 121.98	15%	10%	\$ 154.30	\$ 186.02
2419.3	Remove acoustical ceiling panels	SF		\$ 1.59	15%	10%	\$ 2.01	\$ 2.42
2419.4	Remove carpet flooring	SF		\$ 1.29	15%	10%	\$ 1.63	\$ 1.97
2419.5	Demolish walls or partitions	SF		\$ 3.98	15%	10%	\$ 5.03	\$ 6.07
2419.6	Core drill, any size to 4' depth, for electrical access	EA		\$ 225.00	15%	10%	\$ 284.63	\$ 343.12
2419.7	Remove rubber base.	LF		\$ 0.82	15%	10%	\$ 1.04	\$ 1.25
7210.2	Provide and install acoustical sound attenuation (fiberglass)	SF	\$ 0.23	\$ 0.38	15%	10%	\$ 0.77	\$ 0.93
9140.1	Provide and install expanded metal security mesh in interior wall (min. 10 gauge)	SF	\$ 4.25	\$ 1.35	15%	10%	\$ 7.08	\$ 8.54
9140.2	Provide and install interior wall. (metal frame, 2 sides GWB)	SF	\$ 1.27	\$ 8.04	15%	10%	\$ 11.78	\$ 14.20
9140.3	Repair interior wall (GWB)	SF	\$ 0.81	\$ 8.56	15%	10%	\$ 11.85	\$ 14.29
9140.4	Provide and install interior wall framing perpendicular to window mullion. (metal frame, 2 sides GWB)	SF	\$ 1.75	\$ 8.75	15%	10%	\$ 13.28	\$ 16.01

Scope Management

Three changes to scope:

- * **Expansion** – Fix IDIQ methodology
- * **Reduction** – Use IDIQ line items
- * **Reduction** – Delete full rollout



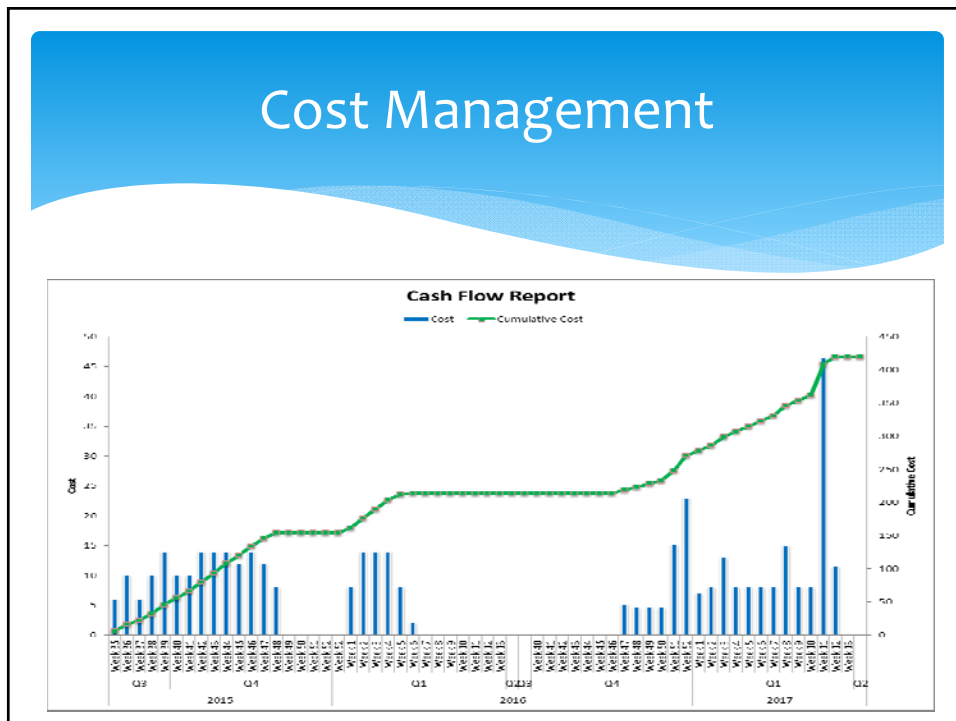
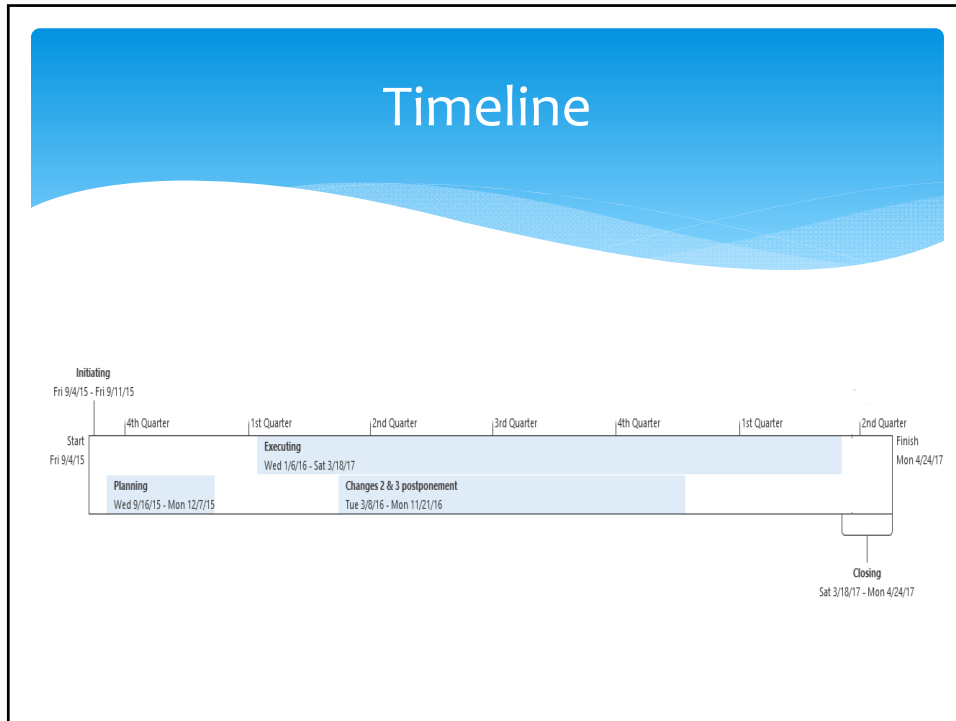
Time Management

Two schedule changes:

- * **Expansion** – Realized risks in combination
- * **Expansion** – Risk research plus above realized risks

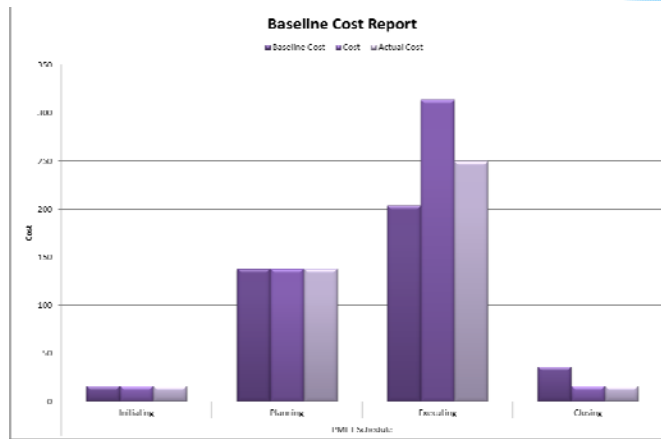


Appendix F PMET Project Presentation

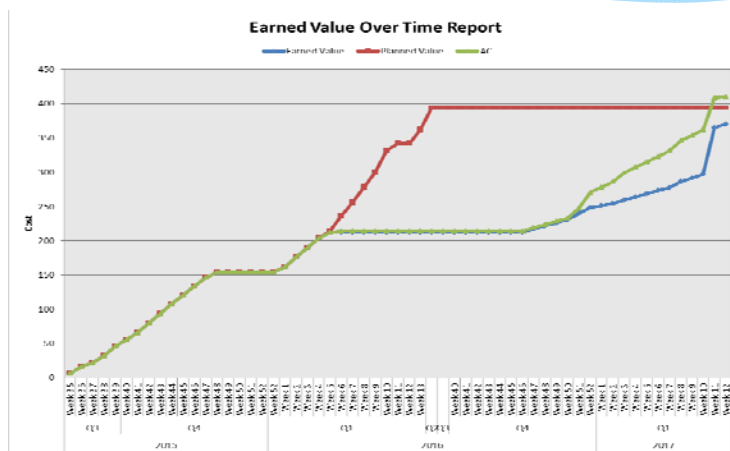


Appendix F PMET Project Presentation

Baseline Cost Report



Project Earned Value



Appendix F

PMET Project Presentation

5. PMET (Product) Overview

- * User Introduction
- * User Input
- * Parametric Estimate Outputs
- * Assembly Estimate Outputs
- * User Instructions
- * Tool Drivers (How the PMET works)



CSA Public Buildings Service

Project Management Estimating Tool (PMET) (v 1.0)

This cost estimating tool for Public Buildings Service (PBS) project managers and cost estimators is designed for use for both construction and leasing projects in office space. The PMET enables project managers to provide timely cost estimate ranges for many simple budgetary estimate needs, or conceptual level estimates for feasibility of more complex estimates.

This tool uses parametric estimating components for conceptual estimates (-40% < Precision & Range < +25%) and more accurate line-item budgetary level estimates (-100% < Precision & Range < +25%) for common tasks and assemblies at a budgetary cost level.

PMET (1.0) Features

1. Programmed for use by PBS Region 10 project managers, estimators, planners and contracting staff for simple and common estimating needs.
2. Searchable and built in a user-friendly spreadsheet format.
3. Incorporates PBS parametric "rules of thumb" for conceptual level estimates.
4. Incorporates PBS historic estimating data for budgetary level estimates.
5. Incorporates PBS historical contract cost data into both conceptual and budgetary level estimates.
6. Features risk (contract type, requirement obscurity, urgency) & geographic location (2/Yes in AK, ID, OR, & WA) inputs into its estimate ranges.

Author: Brian Steenson (March 2017)

Appendix F PMET Project Presentation

Input Factors			
Project Number	5AK0123	Building Number	AK4678ZZ
Client & City	GSA Anchorage	Usable Square Footage (USF) of Space*	2,500
Geographic Location of Work*	Anchorage, AK	Office Type*	80% open/20% closed
Geographic Location Index:	1.19		
Annual Escalation Rate:	3.24%		
Risk Factors			
Client Tier*	Tier 2	Owned/Leased Facility*	Leased Facility
Client Facility Security Level (FSL)*	FSL 3	Contractor Layering*	Contractor
GSA Risk Experience with Client*	High Risk	Contract Method*	Firm Fixed Price Contract
		Market Competition*	Average Competition
* Required Factor		(Normal Distribution Factor = 60%)	

Parametric Estimating Sheet					
5AK0123	GSA Anchorage	Tier 2	High Risk		
AK4678ZZ	Anchorage, AK	FSL 3	Average Competition		
Leased Facility	2,500 USF	80% open/20% closed	Firm Fixed Price Contract Contractor		
Category	Unit Price	Units	Optimistic Estimate	Most Likely Estimate	Pessimistic Estimate
Paint	\$ 1.39	SF	\$ 3,001	\$ 3,485	\$ 3,968
Carpet	\$ 7.27	SF	\$ 15,103	\$ 18,168	\$ 21,232
Move	\$ 2.98	SF	\$ 4,905	\$ 7,456	\$ 10,008
IT/Data	\$ 8.10	SF	\$ 17,181	\$ 20,243	\$ 23,304
Tenant Improvements	\$95.32	SF	\$ 187,267	\$ 238,298	\$ 289,329
(Normal Distribution Factor = 60%)					

Appendix F

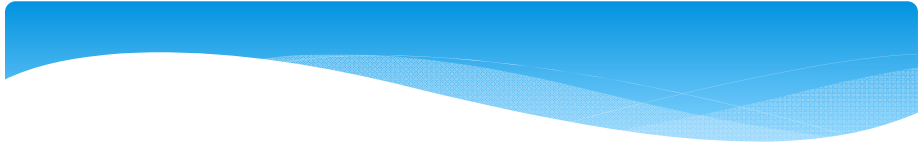
PMET Project Presentation

Assembly Estimates Sheet								
5AK0123 AK4678ZZ Leased Facility	GSA Anchorage Anchorage, AK 2,500 USF	Tier 2 FSL 3 80% open/20% closed	High Risk Average Competition Firm Fixed Price Contract Contractor					
Number	(Prices include supervisor)	Units	Cost Per Unit	Quantity	Estimate	Estimate	Estimate	
2419.1	Provide wall cutout	SF	\$ 8.05		\$ -	\$ -	\$ -	
2419.2	Remove door and frame	EA	\$ 231.62		\$ -	\$ -	\$ -	
2419.3	Remove acoustical ceiling panels	SF	\$ 2.44		\$ -	\$ -	\$ -	
2419.4	Remove carpet flooring	SF	\$ 1.96	2,500	\$ 3,437	\$ 4,890	\$ 6,344	
2419.5	Demolish walls or partitions	SF	\$ 6.38		\$ -	\$ -	\$ -	
2419.6	Core drill, any size to 4" depth, for electrical access	EA	\$ 366.91		\$ -	\$ -	\$ -	
2419.7	Remove rubber base.	LF	\$ 1.39	200	\$ 232	\$ 279	\$ 326	
6200.1	Provide and install wood wall base	LF	\$ 8.95		\$ -	\$ -	\$ -	
7210.2	Provide and install acoustical sound attenuation (fiberless)	SF	\$ 1.35		\$ -	\$ -	\$ -	
9140.1	Provide and install expanded metal security mesh in interior wall (min. 10 gauge)	SF	\$ 10.16		\$ -	\$ -	\$ -	
9600.1	Provide and install carpet tile	SF	\$ 7.41	2,500	\$ 16,789	\$ 18,516	\$ 20,243	
9600.2	Install carpet tiles, labor only	SF	\$ 2.73		\$ -	\$ -	\$ -	
9650.1	Provide and install vinyl composition tile (VCT) to match existing.	SF	\$ 9.08		\$ -	\$ -	\$ -	
9650.2	Provide and install rubber base. (4")	LF	\$ 7.75	200	\$ 1,143	\$ 1,549	\$ 1,956	
16715.5	Provide and install cable (data / phone / CATV)	LF	\$ 3.51		\$ -	\$ -	\$ -	
					Optimistic Estimate	Most Likely Estimate	Pessimistic Estimate	
(Normal Distribution Factor = 60%)					Assembly Estimate Totals:	\$ 21,601	\$ 25,235	\$ 28,869


Project Management Estimating Tool (PMET) Instructions

1. This tool is intended to provide quick conceptual estimates of what common building interior projects should cost. These may be used for initial planning numbers or as a quick price-reasonableness check.
2. Green cells are for user input. All others are calculated and locked to prevent accidental changes.
3. Estimated costs are the price to the government. They include:
 - Bare material costs with no sales tax, plus 10% profit
 - Labor costs reflect union wages, average productivity and installing contractor overhead and profit.
4. General Conditions (when applicable) should be added to these estimates. General Conditions for the installing contractor may range from 0% - 10% of the total cost and 5% - 15% for a general contractor.
5. Input Steps for Estimating - Click on the Input Factors tab and enter the following inputs, following the prompts for each cell:
 - Project Number; Client & City; Geographic Location of Work; Building Number; Usable Square Footage of Space; Office Type; Client Tier; Client Facility Security Level (FSL); GSA Risk; Experience with Client; Owned/Leased Facility; Contractor Layering; Contract Method; and Market Competition.
 - Ensure you choose the correct location factor. Locations list the major cities in the Region and their corresponding geographical cost factors are used to adjust the national average cost data in this tool. If a location is not listed by city name, the state average may be selected or a nearby city that is listed.
6. After all the required inputs are complete, the Parametric Estimates tab displays general parametric estimate ranges for paint, carpet, move services, IT/data and average tenant improvement costs for the inputs provided.
7. Also after required inputs are complete, the Assembly Estimates tab displays approximately 50 line items of common tasks found in the PBS Region 10 line item Indefinite Delivery Indefinite Quantity (IDIQ) contracts with factored unit costs for each. These line items allow a greater breakdown of tasks to better fit a project and provide a budgetary level estimate instead of a conceptual or rough order of magnitude estimate.
8. Entering a quantity in the green cell for an assembly will calculate a most likely estimate for that quantity of assembly units. Optimistic and pessimistic estimates form an estimate range, calculated the same way they are for parametric line items. Lastly, there is a totals line at the bottom that sums the optimistic, most likely and pessimistic estimate totals for all the line items used.
9. Contractor overhead and profit are generally reflected in the PMET estimates, but any associated general requirements (project overhead) are not. The PMET is intended to help develop project plan estimates for relatively small tenant improvement projects, or serve as a second opinion reference for simple contractor proposals. As the database fills with good actual contract results, this tool may be used by cost estimators and project managers for small, tenant improvement projects.
10. Lastly, this tool is for internal PBS use only. It is only as good as the data it contains and the judgment of the user regarding the risk inputs. If you experience significant differences between PMET estimates and actual results, please forward those results and the matching risk factor data to the Regional or another cost estimator. Likewise, your feedback is also important for estimates that this tool provides very effective results for or line items you would like to see added. Thank you in advance for your partnership in these areas.

Appendix F PMET Project Presentation



Data Lookup Worksheet			
Locations			
State	City	October 1, 2014 Location Index	Annual Escalation Rate, based on average of previous 10 years
Alaska	ALASKA State Average	1.28	3.05%
Alaska	Anchorage, AK	1.19	3.24%
Alaska	Fairbanks, AK	1.20	2.97%
Alaska	Juneau, AK	1.31	3.20%
Alaska	Kenai Peninsula, AK	1.19	3.24%
Alaska	Ketchikan, AK	1.29	3.17%
Alaska	Kodiak, AK	1.34	3.20%
Alaska	Mat-Su Valley, AK	1.15	3.20%
Alaska	Sitka, AK	1.32	3.42%
Idaho	IDAHO State Average	0.92	3.18%
Idaho	Boise, ID	0.92	2.87%



Owned/Leased	0%	Risks	5%
Owned Facility	20%	High Risk	5%
Leased Facility	0%	Medium Risk	0%
		Low Risk	-5%
Tiers	0%		
Tier 5	15%	Contractor Layers	0%
Tier 4	10%	GC/Subs/Sub-Subcontractors	20%
Tier 3	5%	GC/Subcontractors	10%
Tier 2	0%	Contractor	0%
Tier 1	-5%		
Facility Security Level	5%	Contract Methods	0%
FSL 4	10%	8(a) Contract	10%
FSL 3	5%	Best Value Contract	5%
FSL 2	0%	Micro-Purchase	5%
FSL 1	-5%	Firm Fixed Price Contract	0%
Office Types	0%		
20% open/80% closed	10%	Market Competition	0%
50% open/50% closed	5%	Low To No Competition	5%
80% open/20% closed	0%	Average Competition	0%
100% open/0% closed	-5%	High Competition	-5%

Appendix F PMET Project Presentation

Parametric Data Worksheet - All data is or has been converted to the R.S. Means National Average

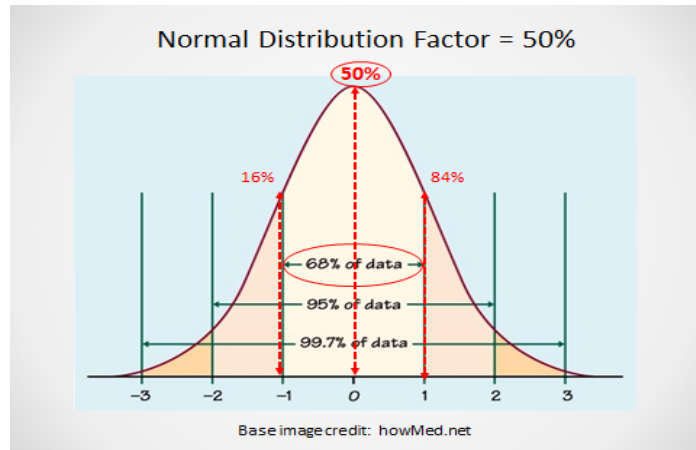
Category	Units	Mean	Std Dev	Low	Median	High													
							C3010 230 0140	74 0240+ 0840	C3010 210										
Paint	S.F.	\$ 1.12	\$ 0.19	\$ 0.85	\$ 1.25	\$ 1.27	0.85	1.27	1.25										
							C3020 410 Tile & Covering			09 68 13 Tile Carpeting			C3020 430						
Carpet	S.F.	\$ 5.80	\$ 1.23	\$ 4.18	\$ 5.68	\$ 8.05	4.36	4.97	6.35	4.18	5.36	4.44	5.05	6.44	6	8.05	6.86	7.56	
							Moving Costs - Avg Ofc & Ofc- Move-IT-Data												
Move	S.F.	\$ 2.25	\$ 1.02	\$ 1.00	\$ 2.25	\$ 3.50	1	2.25	3.5										
							Office-Moving-IT-Data												
IT/Data	S.F.	\$ 6.50	\$ 1.22	\$ 5.00	\$ 6.50	\$ 8.00	5	6.5	8										
							Collier's Intl Ofc Build-Out												
Tenant Improvements	S.F.	\$75.00	\$20.41	\$50.00	\$75.00	\$ 100.00	50	75	100										

Assembly Data Worksheet - All data is or has been converted to the R.S. Means National Average

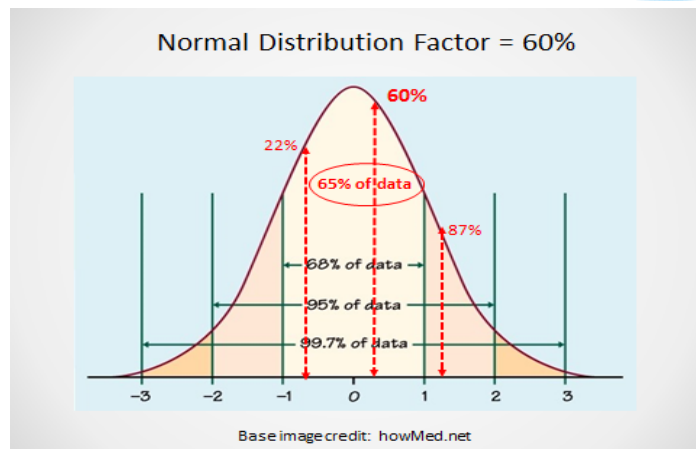
CSI Division Number	CONSTRUCTION ASSEMBLIES (Prices include supervisor)	UNIT	Mean	Std Dev	Low	Median	High	Federal Center South	Auburn Complex	Tacoma Union Station	McDure FB Boise	FOB Seattle	CostWorks Estimates
2419.1	Provide wall cutout	SF	\$6.39	\$1.52	\$3.76	\$7.22	\$7.34	\$7.18	\$7.27	\$7.34	\$3.76		
2419.2	Remove door and frame	EA	\$191.23	\$14.14	\$179.92	\$186.02	\$219.02	\$183.50	\$186.02	\$187.71	\$179.92	\$219.02	
2419.3	Remove acoustical ceiling panels	SF	\$1.89	\$0.66	\$0.95	\$2.39	\$2.45	\$2.39	\$2.42	\$2.45	\$0.95	\$1.21	
2419.4	Remove carpet flooring	SF	\$1.50	\$0.58	\$0.63	\$1.94	\$1.99	\$1.94	\$1.97	\$1.99	\$0.63	\$0.97	
2419.5	Demolish walls or partitions	SF	\$5.06	\$1.24	\$3.34	\$5.99	\$6.12	\$5.99	\$6.07	\$6.12	\$3.76	\$3.34	
2419.6	Core drill, any size to 4" depth, for electrical access	EA	\$281.99	\$105.05	\$100.10	\$340.79	\$346.25	\$338.47	\$343.12	\$346.25	\$100.10		
2419.7	Remove rubber base.	LF	\$1.11	\$0.23	\$0.71	\$1.24	\$1.26	\$1.23	\$1.25	\$1.26		\$0.71	
6200.1	Provide and install wood wall base	LF	\$7.51	\$0.08	\$7.41	\$7.51	\$7.61			\$7.51		\$7.41	\$7.61
7210.2	Provide and install acoustical sound attenuation (fiberglass)	SF	\$1.07	\$0.24	\$0.92	\$0.94	\$1.54	\$0.92	\$0.93	\$0.94	\$1.54	\$1.03	
9140.1	Provide and install expanded metal security mesh in interior wall (min. 10 gauge)	SF	\$8.53	\$0.08	\$8.42	\$8.54	\$8.62	\$8.42	\$8.54	\$8.62			

Appendix F
PMET Project Presentation

PMET Risk Handling



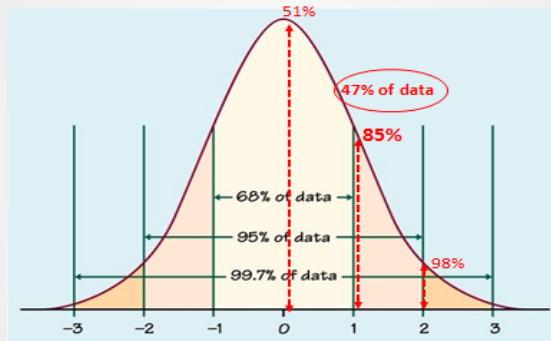
PMET Risk Handling



Appendix F
PMET Project Presentation

PMET Risk Handling

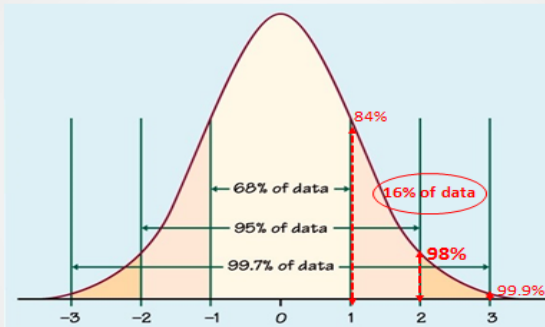
Normal Distribution Factor = 85%



Base image credit: howMed.net

PMET Risk Handling

Normal Distribution Factor = 98%



Base image credit: howMed.net

6. PMET Testing, Rollout & Maintenance

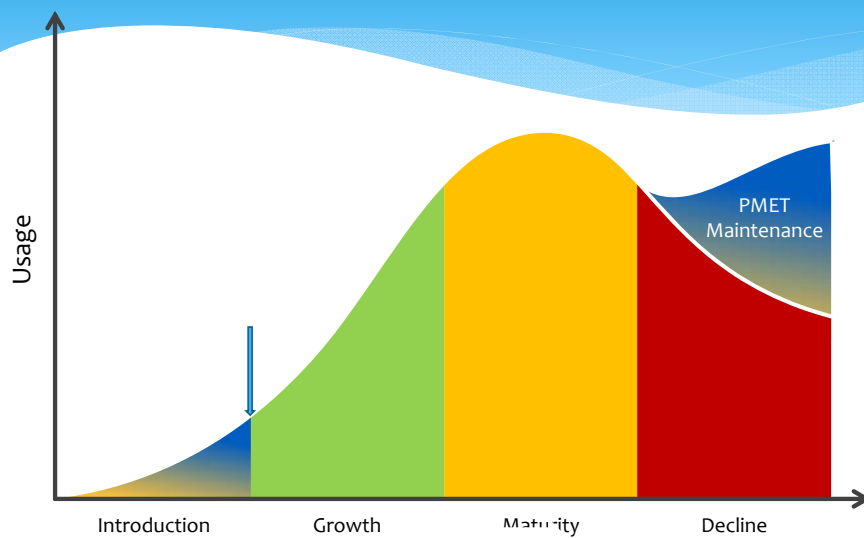
- * PMET Testing
- * PMET Rollout
- * PMET Annual Maintenance
- * Annual User Survey



MAINTENANCE



PMET Life Cycle



7. PMET Project Conclusions

- * The PMET is a fully developed PM estimating tool .
- * The PMET is a searchable tool in a user-friendly spreadsheet.
- * The PMET incorporates PBS and R.S. Means estimating data.
- * The PMET incorporates PBS historical contract cost data.
- * The PMET factors seven risks and approximately 50 geographic location inputs into estimate ranges.
- * The PMET includes a user guide and a training plan.
- * The PMET includes a plan for annual maintenance updates.

Lessons Learned

- * Study stakeholder requirements early.
- * Schedule recurring stakeholder meetings on participant calendars.
- * Progressively elaborate the requirements from stakeholders.
- * Identified risks may happen in combination; plan for that possibility in risk analysis.

Lessons Learned (cont.)

- * Task durations should not be influenced by the time available for the project.
- * Track project management tasks and resources as a separate path on the WBS and schedule.
- * A little quantitative measurement can significantly improve analysis of an otherwise qualitative approach.
- * Do not underestimate durations of tasks with technical requirements.

8. PMET Recommendations

- * Actual Cost Data Collection
- * PMET Testing and Rollout
- * Watch for other future applications for the PMET



References

- * RSMeans Construction Cost Estimating Data
1099 Hingham St, Ste 201
Rockland, MA 02370
<https://www.rsmeans.com>
- * MS Office Clip Art

Questions/Comments?

