Milestone
Planning and Research Inc.

A PRIMMS PROJECT MANAGEMENT TUTORIAL

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Quality Gates: A PRIMMS® Tutorial

Tutorials 13: Quality Gates

Objectives

Understanding what Quality Gates are and why they are important to project managers

Identifying sufficiency criteria for a Quality Gate

Building a Quality Gate table

Reporting Quality Gate status

Conducting a Quality Gate Review

Data Files

Decision Problems.ppt

Project Beta.mpp

MS Word Quality Gate Paper by Aaron, Bratta and Smith 1993.

Powerpoint Phase Gate Table Example and Template

MS Project Sample Technology Project Schedule

Powerpoint Slip Chart Example and Template

Introduction

As a project manager, you must plan and control scope, schedule, cost and quality in an integrated fashion. Project managers frequently have difficulty in planning and controlling quality and its integration with the scope and schedule. Yet, quality can be the most crucial element to managing a project because quality usually affects all other dimensions of project performance. If quality is not properly planned and executed, the necessary corrective actions and preventative actions required for overall good project management cannot be performed.

But managing quality is by no means the only reason to be concerned with Quality Gates. Today's technology projects can be so complex that literally hundreds of thousands of objects need to be considered and worked as part of a project's scope. Yet, the processing capacity of the human brain is limited to dealing with 7±2 bits of information at a single point in time. Consequently project managers can get caught between the highly detailed issues of technologists and the high level informational requirements of senior managers who just want the big picture. Quality Gates (or Milestone Q-Gates™ as my company refers to them) provide the appropriate level of detail that allow the project manager, the project team and senior management to communicate at the right level without becoming overwhelmed.

This tutorial helps project managers develop their skills in managing quality and its integration with scope, schedule and cost by using a tool commonly referred to as Quality Gates. Over the years the concept of "Gates" have taken a number of different names such stage gates, phase gates and toll gates to name a few. They do not necessarily refer to the same concepts as Quality Gates since these other terms originated to describe financial checkpoints to kill or not kill product development projects. The Quality Gate concept originated at AT&T Bell Research Labs to help control the software development of large digital telecommunications switches. I learned the concept from Dr. Paul Smith (an alumnus from Bell Labs) while we were both doing work at Tellabs in Lisle Illinois in 1992.

Understanding Quality Gates

Of the four project management constraints (scope, time, cost and quality), the management of the quality constraint has remained the most elusive for practitioners to plan and control. In many cases, *project quality* becomes an issue only during the latter phases of a project. In those cases quality tends to focus primarily upon the functionality or acceptability of products in testing, working models, or delivered end products. Thus, the quality constraint often holds little relevance until the project manager or team has something tangible that approximates the final deliverable to be submitted to the customer.

Along these lines quality inspections and testing on projects tend to focus in the later phases of a project and primarily upon the final project deliverables or end products that are delivered to the ultimate customer or project sponsor. Check sheets and punch lists are the typical inspection-oriented tools used by the project team during the later phases to document observed defects, nonconformities of the final deliverable to contract specifications or failures to meet customer requirements on specific dimensions.

Final inspection is an important quality tool, but the reliance on a "quality by final inspection approach" holds many pitfalls when applied to projects. Its major shortcomings are that inspection usually occurs too late and seldom includes the examination of the earlier, interim deliverables. It is this lack of rigor in the earlier project phases that lead to larger issues downstream. As a result, we often hear a project manager complain that he or she had been meeting the original schedule and budget objectives early on, but the project fell apart in testing and required substantial *rework* resulting in project inefficiencies, schedule delays and cost overruns.

Experience indicates that similar problems occur when project teams fail to secure sufficient closure to milestones and allow projects to prematurely move forward into subsequent phases of their life cycles. The resulting loss of focus and efficiency can result in chaos as project team members try to do everything at once (e.g. trying to design while testing). This situation is shown diagrammatically as Tutorial decision problems.ppt.

Definition: A Quality Gate is a collection of completion criteria and sufficiency standards representing satisfactory execution of a phase of a project plan. Quality Gates enable a project manager to structure projects in a way that allows the integrated reporting and control of schedule and scope progress against both quality criteria and completion criteria through the entire life cycle. It is the use of Quality Gates that enables project managers to ground their projects in reality during the execution phases of projects and provide clear, unambiguous warnings that the project is not as far along as stakeholders may think.

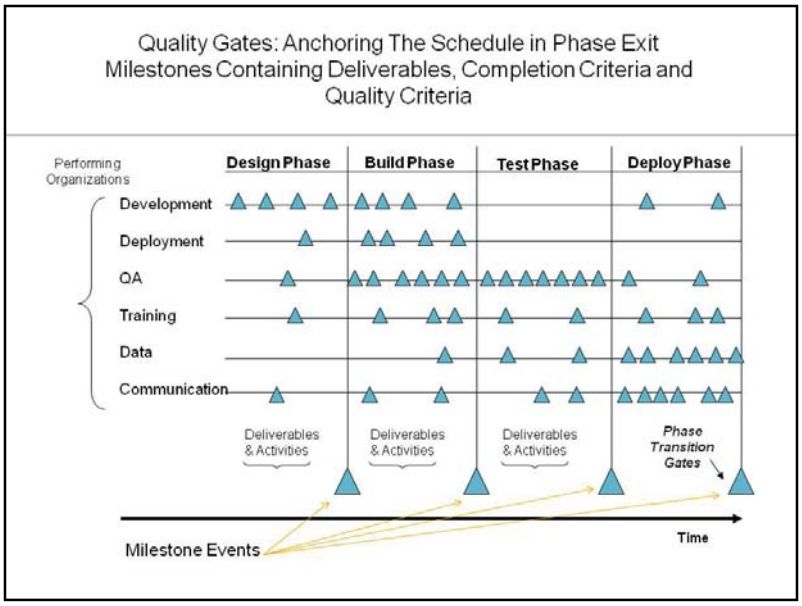
Quality Gates act as "forcing functions" that protect projects by ensuring that project team members finish first things first and don't get too far ahead of themselves during the execution phases. In addition, without the use of Quality Gates project teams run the risk of performing work out of sequence and trying to complete all the work at once which causes project execution efficiency to plummet putting the project in jeopardy. Reference: Read the PMI Quality Gate PMI Whitepaper by Aaron, Bratta and Smith 1993.

Identifying Sufficiency Criteria

The essence of Quality Gates is to anchor milestones in sufficiency criteria. Shown below (Figure 1-1) is a conceptual view of super-milestones and sub-milestones on a project across the time dimension. It is assumed that the life cycle for this example project follows a Waterfall approach containing multiple phases and various organizational functions (tracks of work) that thread through the life cycle simultaneously. The triangles shown reflect milestones. The phase exit points are super-milestones (large triangles) that slice vertically through the diagram and function as Quality Gates. These points represent criterion-based, cross functional events that are deemed complete only when the sub-milestones (smaller triangles) are completed by the various teams (functions) performing the work.

Upon attainment of sufficiency, each sub-milestone contributes to the readiness for exiting a phase. In this regard the sub-milestones (i.e. the criteria) within the figure can be considered "phase exit criteria". The phases are super-milestones (the Quality Gates) reflecting the summation of the individual criteria across the sub-milestones. In practice, the whole is equal to the sum of its parts. Project managers cannot claim credit for a super-milestone (i.e. a Phase exit Quality gate) until sufficiency across all sub-milestones has been reached.

Figure 1-1



Now we advance our discussion from the abstract to a specific example. Shown in Figure 1-2 is an example of a Quality Gate table containing the names of the sub-milestones and their sufficiency criteria needed for exiting a project phase (a super-milestone QR7) on a development project (Alpha Project) in the telecommunications industry.

Notice that the discussion of status at this level of detail offers adequate granularity to conduct meaningful discussions with the most detail-oriented technologists as well as with the more high level minded senior managers who wish to aggregate information and avoid too much detail. Having this common level of communication between all stakeholders is vitally important for keeping projects on track.

Figure 1-2

ALPHA PROJECT
QUALITY GATE QR7 STATUS REPORT

Milestones for Implementation Phase	Dept. Head	Total Sufficiency Criteria	Criteria	Total Criteria Met	Baselined Schedule	Forecasted Complete
Capital Expense Authorization Approved - OPS	VAC	1	Yes	1	1/03/93	1/05/93
Development Lab Facilities Available	TG	3	Yes	2	1/15/93	3/25/93
Prototype Hardware Available	TG	2	100%	0	2/01/93	3/20/93
SIT Test Plans Approved	DPS	20	95%	13	2/15/93	4/01/93
95% Pass Rate on Hardware Tests	TG	1	100%	1	3/01/93	3/01/93
Customer Letter of Intent Received	SS	1	Yes	1	3/15/93	1/02/93
Drawings and BOM's Released to Operations	TG	40	95%	38	3/15/93	2/16/93
Controlled Introduction Plan Reviewed & Issued	KC	2	Yes	2	4/01/93	1/02/93
Draft Source Materials to Technical Writing	JAM	8	100%	2	4/15/93	4/15/93
Code Inspections Complete	TG JAM	60	95%	30	5/30/93	5/30/93
	Total	138		90		

Notice in the naming of the sub-milestones in this table the presence of both completion criteria and quality criteria. For instance, the sub-milestone *"Prototype Hardware Available"* references a completion criterion. Sufficiency is reached for this milestone once the corresponding activities on the project plan have been completed. On the other hand, the sub-milestone *"95% Pass rate on Hardware Tests"* references a quality criterion. It is only reached once a sufficient quality level has been met. This requires the meeting of a qualitative standard by the project team and requires more than just checking off a box on a project schedule.

A way to help interpret the sufficiency table for QR7 shown in Figure 1-1 is to keep in mind that in order for the project manager to claim achievement of this entire Phase, the project team must sufficiently complete all of the associated sub-milestones in the phase by reaching a level of readiness as specified by the criteria.

Let's go through the table in Figure 1-2. It contains a total of 10 sub-milestones that have been identified as being necessary for exiting Phase QR7. Each criterion has an identified owner (shown by the initials of a department head); and has an associated number of sufficiency criteria (standards) required for its completion. Collectively the sub-milestones and their completion standards indicate the minimal state of readiness necessary for the project manager to claim completion of the cross-functional, super-milestone QR7. The table also contains space to insert the planned and forecasted dates of sufficiency completion for each sub-milestone.

Building a Quality Gate Table

Building upon the concepts discussed thus far we will construct a Quality Gate table containing the sufficiency criteria needed for successfully exiting a project phase. In real life the project manager, in collaboration with the project team, constructs a separate Quality Gate table for each execution phase of the project. Each table contains the criteria that must be met for successfully exiting a phase of the project. Typically, the team constructs all of these tables (one for each phase) during the Planning phase of the project. Then, the team refines the criteria as the project progresses during the Execution phases. As a phase in a project nears its target completion date, the use of exit criteria becomes all the more important for objective evaluation during a phase exit review meeting with all project stakeholders present.

The steps necessary for building a Quality Gate table are summarized on the next page. In brief these steps are:

- Creating the table template—this will be a blank table that will be used to construct the Quality Gate tables for each phase exit milestone.
- Identifying the phases of the project and preparing to populate the Quality Gate tables with sufficiency criteria for each phase exit milestone.
- Identifying the critical benchmarks for each phase—this refers to capturing the key sub-milestones in each track of work that must be accomplished for claiming completion of the phase —a super-milestone on the project.
- Refining the benchmarks (part 1) by identifying the key deliverables and their required states of completion that point in the project.
- Refining benchmarks (part 2): identifying quality criteria other qualitative criteria that suggests the required state of readiness across the various tracks of work on the project.
- Counting the total benchmark criteria
- Identifying planned dates for reaching sufficiency on each benchmark.
- Documenting forecasted and actual dates of achieving sufficiency on each criterion in the table .

Let's go through these steps using sample projects on the following pages.

FIGURE 1-3: Building the Quality Gate Table]

Steps	Project Manager Actions
Creating the Table Template	Using a tool such as Excel or Powerpoint, construct the table template that can be used to structure Quality Gate sufficiency criteria for each phase of the project. Each table (one for each phase) will be populated with the appropriate sufficiency criteria necessary for exiting that phase. Each phase will have its own unique criteria. Each table will contain the specific sub-milestones and their readiness criteria needed for phase exit. There will be seven total columns in each table as shown in Figure 1-2.
Identifying the Phases of the Project and preparing to Populate Quality Gate tables phase by phase	There will be a Quality Gate table constructed for each execution phase in your project schedule. The default phase names for many projects follows the *waterfall* which includes Requirements, Design, Build, Test and Deploy phases (in that order). If the project WBS is phase oriented the project manager can identify any phase by rolling up the plan to the highest level of the WBS. See Figure 1-5
Identifying the critical Benchmarks of each phase	Start with the earliest phase and progress to the latest phase of the project. Break out the WBS and the schedule for the first phase in question. Try to identify the key activity completion events that constitute the essence of that phase. List those events in the far left-hand column of the Quality Gate table. These activities become the benchmarks upon completion.
Refining the benchmarks (part 1): Identifying the key deliverables and completion criteria for key sub-milestones.	For the phase in question, identify tangible deliverables (e.g. documents, decisions, and walkthroughs) that result when the activities identified in the plan are completed and validated. The completion of important, tangible deliverables marks progress unambiguously and often makes excellent sufficiency criteria).
Refining the benchmarks (part 2): Identifying Quality Criteria	For the phase in question go back through the list of important deliverables for the phase and determine quality criteria (such as test pass rates) that signify appropriate states of targeted readiness for the project at that point in the project life cycle. Then populate the criteria column of the table with attributes of sufficiency using such terms as percentages, yes's and no's.
Counting the total benchmark criteria	For the phase in question count the total number of completion criteria and quality criteria that are needed for each sub-milestone. Enter this count into the column total. Then review the updated project schedule (i.e. updated with actual completion dates) and count the number of criteria that have already been met to date. Enter these counts into the "Total Criteria Met" column of the table.
Identifying planned dates for reaching sufficiency for each benchmark	Go through the project baseline schedule and identify the target completion dates for each milestone listed in the Quality Gate table. Populate the Quality Gate table with these planned baseline dates. Note: the latest planned milestone date identified becomes the target phase exit date.
Identifying forecasted dates for reaching sufficiency for each benchmark	Perform a critical path analysis of the updated project plan. Identify new early finish dates that are calculated for each of the milestones in the Quality Gate table. Evaluate these new dates good judgment and enter forecast dates into the "Forecast" column. Take note of any forecasted schedule slippage.
Repeat the above process for each phase of the project.	There should be one Quality Gate table completed for each phase of the project.

Creating the Table Template

Figure 1-4 is a suitable format for a Quality Gate Quality Gate table. This table can be created using common tools such as Excel or Powerpoint.

[FIGURE 1-4: Constructing the Table Template]

Benchmark	Resp.	Total	Done	Criteria	Value	Baseline Schedule	Forecast Schedule	Actual Schedule

Let's review the columns of our template. Notice that the far left column contains the title "Benchmark" instead of "Milestone". We have changed the title merely to add clarity. That said, the definitions of our columns are as follows:

Benchmark-This column contains the Work Products and Activities for the Phase (gate) to be considered complete.

Responsible-The organization responsible for leading and bringing the activity to closure

Total -The total number of work products to be delivered for completion of the task

Done -A measure of the work products completed at a given point in time

Criteria- The completion criteria to close out the work product. This can be stated in numbers, percentages or Yes (all)

Value- A measure of the work activity completed against the criteria at a given point in time

Baseline Schedule- Initial scheduled date for completing the benchmark (Note: the latest scheduled benchmark date is the scheduled phase exit date).

Forecasted Schedule- Current estimated completion date for the work product

Actual Schedule - Actual completion date for the work product.

Identifying the Phases of the Project and Preparing to Populate the Quality Gate Tables Phase by Phase

Figure 1-5

	Task Name	Duration	Start	Finish	% Complete	Predecessors
1	Project Beta --------Application Development Project	209.88 days	1/1/2009	10/21/2009	0%	
2	Requirements Phase	20 days	1/1/2009	1/28/2009	0%	
4	Design Phase and Prototype Phase	61.88 days	1/29/2009	4/24/2009	0%	3
57	Final Construction Phase	20 days	4/24/2009	5/22/2009	0%	54
59	Test Phase	40 days	5/22/2009	7/17/2009	0%	57
61	Preparation Phase	6.88 days	7/20/2009	7/28/2009	0%	59
64	Go Live	1 day	7/28/2009	7/29/2009	0%	61
66	Support and Maintenance	60 days	7/29/2009	10/21/2009	0%	64

Figure 1-5 shows the high level WBS of Project Beta, an application development project, using a combination waterfall and iterative development methodology. The view shown in the figure is a roll up of the complete schedule. Each line item reflects a phase of the project requiring a Quality Gate table. In practice we would build a Quality Gate table for the Requirements phase first, and then proceed to the Design and Prototype phase, etc. until all phase tables were completed.

Identifying the Critical Benchmarks for Each Phase

Here we examine the Design phase of Beta project to illustrate how the project manager identifies benchmarks for a Quality Gate table in a project phase. Refer to Figure 1-6 below.

This figure breaks out the project schedule to a lower level for the Design and Prototyping Phase. We look for those critical activities and deliverables that signify the “essence” of the phase. By this we mean those items that must be completed in order for the project to legitimately move into the next phase.

We notice that five *design* elements exist. These are:

Establish Product Design

Design Application Logic

Design Database

Design user Interface

Select Infrastructure components

We also observe that *Unit Test Plans* and *Product Initial Prototype* are important. Collectively the designs, unit test plans and prototype become the critical benchmarks that should be entered into our Quality Gate table for this phase.

Figure 1-6

Task Name	Duration
Project Beta -------Application Development Project	**209.88 days**
Requirements Phase	**20 days**
Design Phase and Prototype Phase	**61.88 days**
Initiate design	**6 days**
Establish business requirement	1 day
Identify stakeholders	0.5 days
Identify key resources and skills	0.5 days
Assess business risks and feasibility	1 day
Establish the business case	5 days
Approval to proceed	0 days
Establish product design	**13 days**
Design application logic	**6 days**
Design database	**8 days**
Design User Interface	**4 days**
Select infrastructure components	**5 days**
Architecture Design Review	0 days
Prepare test plan	**11 days**
Develop unit test plan	**5 days**
Develop integration test plan	**5 days**
Completed product design	0 days
Product initial prototype	12 days
Increment prototype function	10 days
Final Construction Phase	**20 days**
Test Phase	**40 days**
Preparation Phase	**6.88 days**
Go Live	**1 day**
Support and Maintenance	**60 days**

Refining the Benchmarks (part 1): Identifying the Key Deliverables and Completion Criteria for Activities

Having identified the three critical deliverables required for the Design phase exit, we populate these items as Benchmarks into our Quality Gate Table as shown in Figure 1-7. Notice how the wording of the terms imply closure of these deliverables by including terms such as “signed off” and “complete”. As stated these Benchmarks constitute the completion criteria in the Total and Criteria columns of the table.

Figure 1-7

Quality Gate Table for Project Beta-Design and Prototyping Phase
04/25/09

Benchmark	Resp.	Total	Done	Criteria	Value	Baseline Schedule	Forecast Schedule	Actual Schedule
Prototype Demonstration Signed off	Dev	1	1	Yes	Yes	4/24/2009		4/24/2009
Design documentation complete	Dev	5	5	100%	100%	4/2/2009		4/15/2009
Unit Test Plans Complete	SIT	25	23	100%	92%	4/15/2009	5/1/2009	
Total Benchmarks = 3		31	29	--	--	--	--	--

Refining the Benchmarks (part 2): Identifying Quality Criteria

Next, we review our Benchmarks and add needed quality criteria. Refer to Figure 1-8. During his analysis the project manager realizes that all major design issues should be closed before the Design phase should be considered complete. So, accordingly, the project manager adds the quality Benchmark *Severity 1 and 2 Design Issues Closed* to the table as shown below. In this case 36 of the total 47 design issues are closed (77%). However, all 47 design issues need to be closed for phase exit.

Figure 1-8

Quality Gate Table for Project Beta-Design and Prototyping Phase
04/25/09

Benchmark	Resp.	Total	Done	Criteria	Value	Baseline Schedule	Forecast Schedule	Actual Schedule
Prototype Demonstration Signed off	Dev	1	1	Yes	Yes	4/24/2009		4/24/2009
Design documentation complete	Dev	5	5	100%	100%	4/2/2009		4/15/2009
Unit Test Plans Complete	SIT	25	23	100%	92%	4/15/2009	5/1/2009	
Severity 1 and 2 design Issues Closed	Dev	47	36	100%	77%	4/24/2009	5/5/2009	
Total Benchmarks = 4		78	65	--	--	--	--	--

Counting the total Benchmark Criteria

As a next step we sum up the criteria totals and develop an exit criteria status metric for each benchmark within the project phase by counting the total number of benchmarks required for phase completion and comparing that number with the actual number achieved to date.

Identifying Planned Dates of reaching Sufficiency for each Benchmark each phase

By examining Figure 1-8 above closely we see that the latest planned finish date for our benchmarks in the table is 4/24/09. This date then becomes the official Baseline phase target phase exit date on our project plan. Refer to Milestone #2 on the chart shown on the following page (Figure 1-9). You will notice that this date becomes the official target completion date for the milestone. This date takes on significance because it is anchored in sufficiency criteria suggesting that its completion will indicate achievement for the project unambiguously.

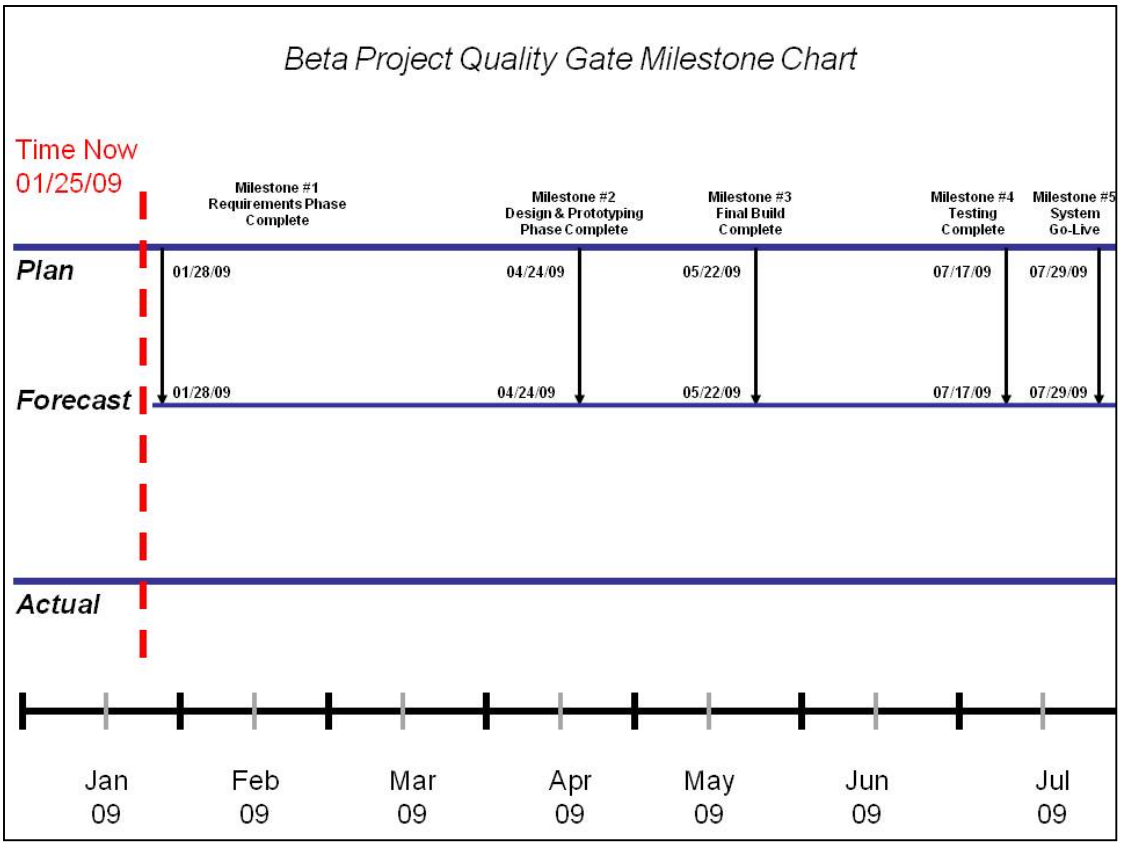
Repeating the process for each phase of the project.

This same series of steps must be performed for each phase exit milestone on the project . The phase exit dates are then summarized on the Milestone Chart (slip chart) as shown in Figure 1-9 shown on the following page.

Reporting Quality Gate Status

Figure 1-9

This is a tool called a Milestone Chart or a "slip chart" that provides a visual status for completion of criteria for Quality Gates (i.e. phase exit milestones) as well as a forecast (i.e. a current plan). In our example project there are five milestones (M1 through M5) that must reach sufficiency. Milestone M1, Requirements Phase Complete, is scheduled to meet sufficiency on 01/28/09. As shown in the figure below based upon



performance to date milestone M1 is forecasted to meet sufficiency on schedule, hence the vertical line from plan to forecast. In addition the remaining milestones are also forecasted to meet sufficiency on their planned target dates. From this status report management should conclude that as of time now (01/25/09) this project is on schedule.

In Tutorial 19 we will use the slip chart as a tool to control the project by giving early slippage warnings that the project is in jeopardy of meeting milestone sufficiency on the planned dates.

Conducting a Quality Gate Review

Once the project enters the execution phases, the project manager attempts to focus the team on completing near term milestones. On a daily to weekly basis the project manager monitors performance by the team and enters performance information on the project scheduling tool (refer to figure 1-10 below). As the project approaches an upcoming phase exit date, the project manager schedules a meeting with all stakeholders to attend a Phase exit review meeting where the Quality Gate table is discussed and populated and the Milestone Slip Chart is modified to provide official schedule status of the project.

In order for this process to work there must be correspondence between the project schedule, the Quality Gate Table and the Slip Chart.

Milestone Slip Chart that is posted publicly after each Phase exit Readiness Review.

The chart shows that the forecast is either anticipating on time completion of future milestones or anticipated slippage.

It is the process of collecting this information from stakeholders that causes corrective action and preventative actions to occur.

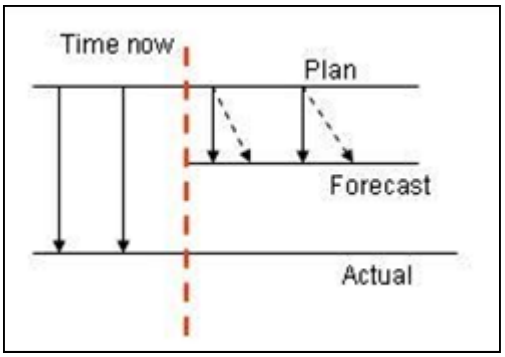


Figure 1-10

Quality Gate Table that is updated at Phase Exit Readiness Reviews

Quality Gate Table for Project Beta-Design and Prototyping Phase
04/25/09

Benchmark	Resp.	Total	Done	Criteria	Value	Baseline Schedule	Forecast Schedule	Actual Schedule
Prototype Demonstration Signed off	Dev	1	1	Yes	Yes	4/24/2009		4/24/2009
Design documentation complete	Dev	5	5	100%	100%	4/2/2009		4/15/2009
Unit Test Plans Complete	SIT	25	23	100%	92%	4/15/2009	5/1/2009	
Severity 1 and 2 design Issues Closed	Dev	47	36	100%	77%	4/24/2009	5/3/2009	
Total Benchmarks = 4		78	65	--	--	--	--	--

	Task Name	Duration	Baseline Start	Baseline Finish	% Complete	Actual Start	Actual Finish
1	Project Beta ------Application Development Project	209.88 days	1/1/2009	10/21/2009	0%	NA	NA
2	+ Requirements Phase	20 days	1/1/2009	1/28/2009	0%	NA	NA
4	Design Phase and Prototype Phase	61.88 days	1/29/2009	4/24/2009	0%	NA	NA
5	+ Initiate design	6 days	1/29/2009	2/5/2009	0%	NA	NA
12	+ Establish product design	13 days	2/5/2009	2/24/2009	0%	NA	NA
20	+ Design application logic	6 days	1/29/2009	2/5/2009	0%	NA	NA
25	+ Design database	8 days	1/29/2009	2/9/2009	0%	NA	NA
29	+ Design User Interface	4 days	1/29/2009	2/3/2009	0%	NA	NA
33	+ Select infrastructure components	5 days	2/25/2009	3/3/2009	0%	NA	NA
38	Architecture Design Review	0 days	3/25/2009	3/25/2009	0%	NA	NA
39	+ Prepare test plan	11 days	2/25/2009	3/11/2009	0%	NA	NA
45	+ Develop unit test plan	5 days	3/12/2009	3/18/2009	0%	NA	NA
50	+ Develop integration test plan	5 days	3/19/2009	3/25/2009	0%	NA	NA
54	Completed product design	0 days	4/24/2009	4/24/2009	0%	NA	NA
55	Product initial prototype	12 days	3/26/2009	4/10/2009	0%	NA	NA
56	Increment prototype function	10 days	4/13/2009	4/24/2009	0%	NA	NA
57	+ Final Construction Phase	20 days	4/24/2009	5/22/2009	0%	NA	NA
59	+ Test Phase	40 days	5/22/2009	7/17/2009	0%	NA	NA
61	+ Preparation Phase	6.88 days	7/20/2009	7/28/2009	0%	NA	NA
64	+ Go Live	1 day	7/28/2009	7/29/2009	0%	NA	NA
66	+ Support and Maintenance	60 days	7/29/2009	10/21/2009	0%	NA	NA

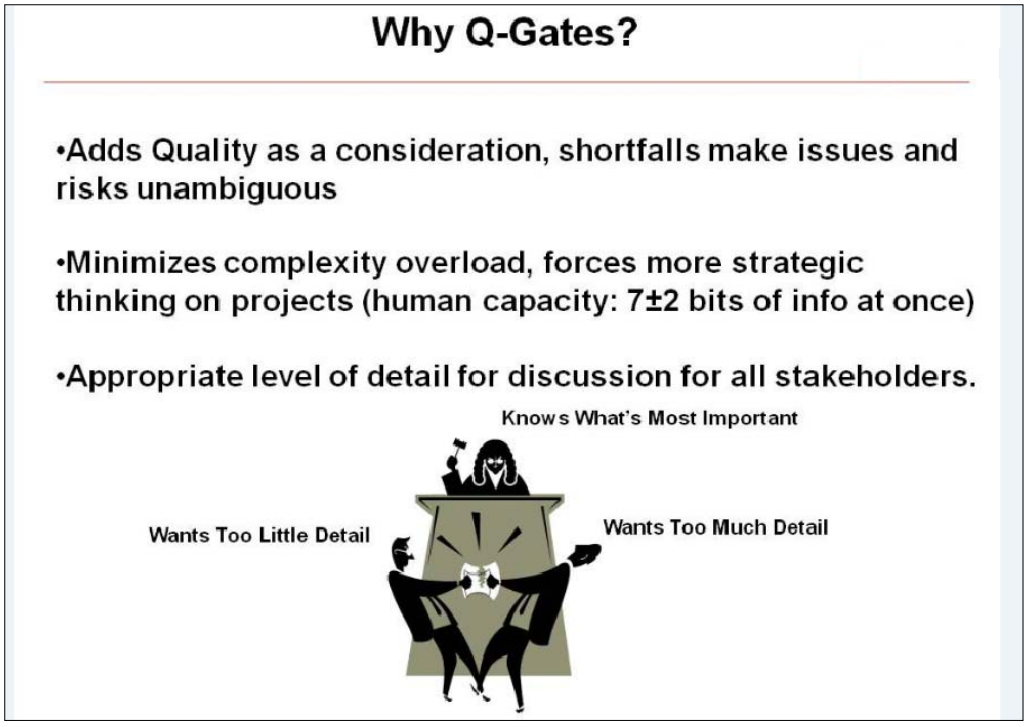
Project Schedule that is updated with actuals daily and weekly.

Quality Gates Are Not Substitute for Leadership

When used improperly Quality Gates can instill fear in project managers leading to their hesitation to ever label anything complete. This can be very non productive, and it is not the intent of the tool. If project managers feel that they might be criticized for calling work finished when it is not, they may needlessly choose to keep criteria incomplete which can result in team members wasting their time.

Quality Gates should not be used as an excuse to stop projects or to make managers and team members overly risk averse about calling items finished. Project managers are first and foremost leaders charged with pushing the project forward. Quality Gates enable the manager to apply checks and balances which keep a project healthy. When performance starts falling behind plan, the use of Quality Gates immediately brings the team toward identifying and focusing upon the issues preventing the attainment of sufficiency. And that is the art of project management on today's technology projects.

As described in the chart shown below Quality Gates help project managers lead projects by ensuring that all stakeholders remain focused upon what is most important-even when the project is highly complex.



Using Quality Gates in PRIMMS®

The PRIMMS Multi-Project Management System is an SaaS product that supports the use of Quality Gates. The following pages are extracted from the PRIMMS Users' Guide and are relevant to the successful use of Quality Gates on that tool.

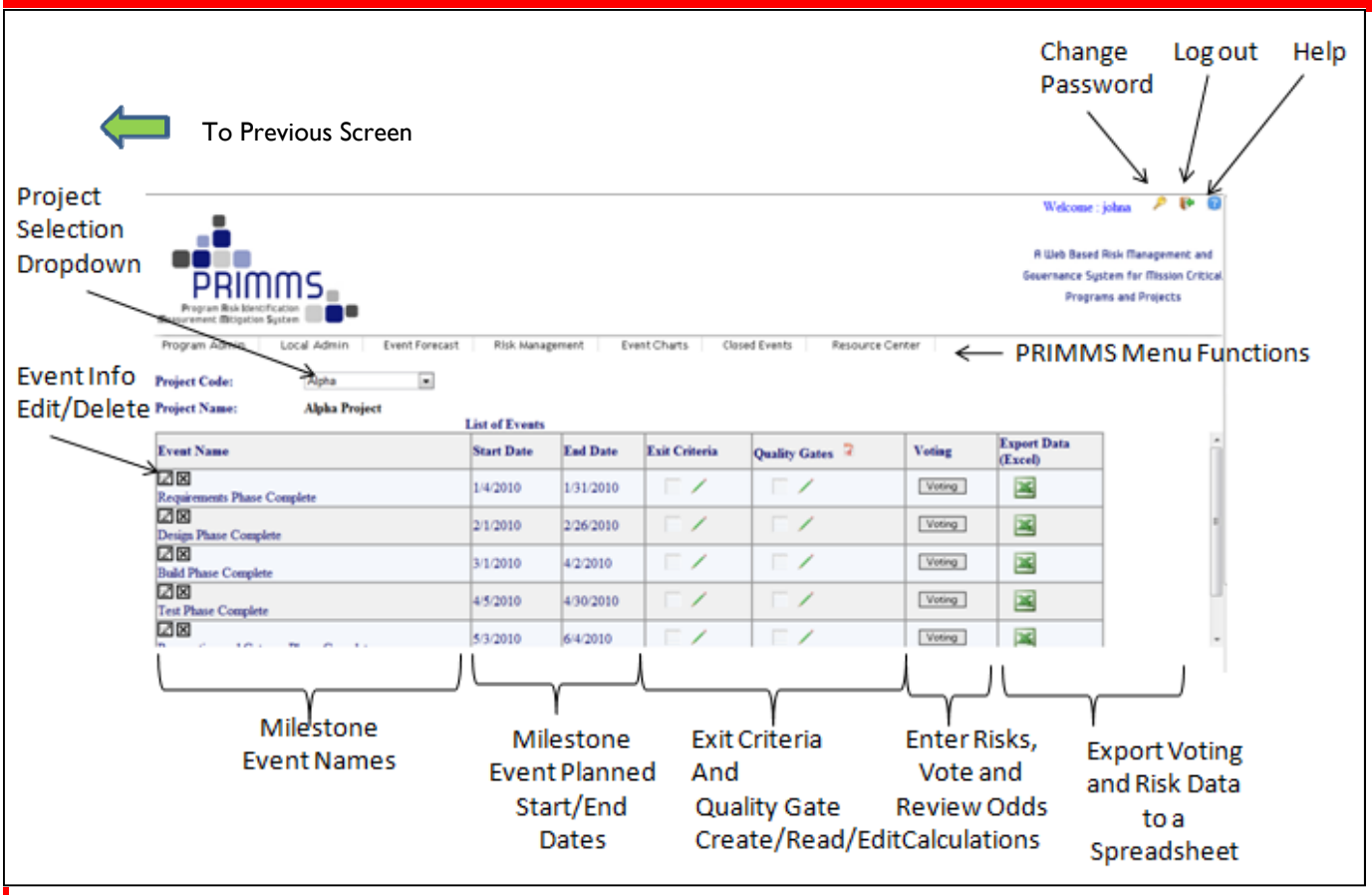


Figure 7—Event Screen and Its Functions-Local Admin

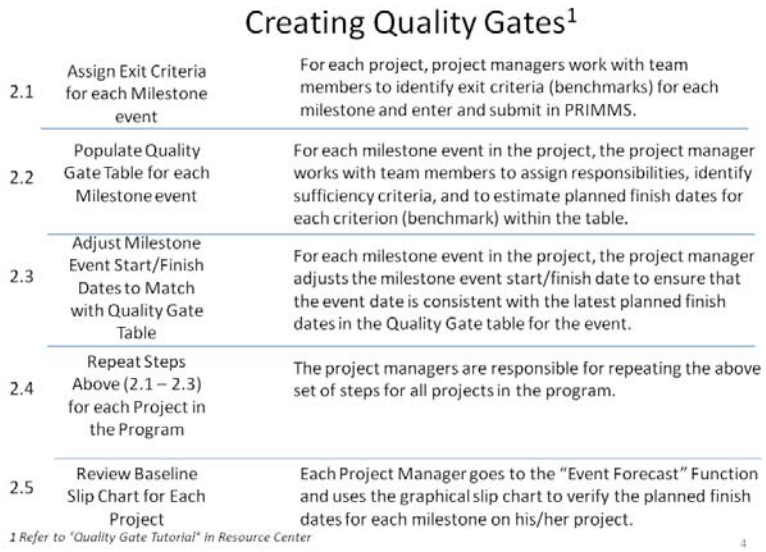
During the planning phase of the project each milestone is given a set of sufficiency criteria required for phase exit. This practice, described in the 1993 PMI paper presented by Aaron, Bratta and Smith, enables each project manager to manage and update status for both milestone (event) schedule adherence and quality attainment during the project execution phases. .

By clicking on the Risk Management menu button, the user can review the pool of risk statements identified by project participants for the current week. The user can also review the entire list of project risk statements to date and their mapping to higher level consolidated risk constructs which feed the PRIMMS Risk Register.

If the project team elects to use voting functionality any team member can click on the Voting button for any milestone during project execution and enter risks. Project participants can enter risks and vote on the likelihood of achieving sufficiency on the target end date. Risks can be entered at any time. Voting occurs once per week per participant

Following the Risk Management menu button also takes the user to the PRIMMS Risk Register. Project managers, with Local Admin privileges, can update the register with status and can log narratives describing risk management activities. Other users can read the risk register. The PRIMMS Risk Register contains buttons that give the user access to the Bubble chart and Escalation chart that provide summarized, graphical views of risks and their disposition.

Creating Quality Gates



Creating Quality Gates[1]

2.1	Assign Exit Criteria for each Milestone event	For each project, project managers work with team members to identify exit criteria (benchmarks) for each milestone and enter and submit in PRIMMS.
2.2	Populate Quality Gate Table for each Milestone event	For each milestone event in the project, the project manager works with team members to assign responsibilities, identify sufficiency criteria, and to estimate planned finish dates for each criterion (benchmark) within the table.
2.3	Adjust Milestone Event Start/Finish Dates to Match with Quality Gate Table	For each milestone event in the project, the project manager adjusts the milestone event start/finish date to ensure that the event date is consistent with the latest planned finish dates in the Quality Gate table for the event.
2.4	Repeat Steps Above (2.1 – 2.3) for each Project in the Program	The project managers are responsible for repeating the above set of steps for all projects in the program.
2.5	Review Baseline Slip Chart for Each Project	Each Project Manager goes to the "Event Forecast" Function and uses the graphical slip chart to verify the planned finish dates for each milestone on his/her project.

1 Refer to "Quality Gate Tutorial" in Resource Center

With PRIMMS each milestone event is anchored in sufficiency (exit) criteria that maps to a Quality Gate table. The Quality Gate Table identifies the completion and quality criteria required for reaching sufficiency for that milestone event. This allows the project manager and team to plan and status the milestone for both schedule and quality accomplishment simultaneously throughout the execution phases of the project. An important job of the project manager is to ensure that Quality Gate criteria and expectations for completion are well communicated to the team and to all project stakeholders.

The relationships of screens and reports used for entering sufficiency criteria and Quality Gate planning/statusing are shown in Figures 8A and 8B respectively on the following page. The reader can consult the Quality Gate tutorial in PRIMMS for the theory and practice of using Quality Gates.

After planning is completed and execution is underway, the project manager updates the Quality Gate table for status weekly (or more often if desired). This enables any project participant to review the table to examine the project manager's view of current status and of the forecast. Based upon all available information, each project participant can enter risks into the weekly pool and vote on the percentage of sufficiency criteria believed to be actually completed by the milestone target end date.

The voting process (if used) can be performed by all participants and applied to all incomplete (non-closed) milestones. The parimutuel voting process generates odds for the participants' perceived probability of meeting sufficiency criteria for that milestone. The results of voting provides a calculated estimate of expected project slippage as well as a time series index of milestone risk. The visualized results of these calculations are displayed as forecasted slippage (Figure 8D) as well as time series inflections (Figure 8E).

Figure 8A Exit Criteria for Requirements Complete Milestone

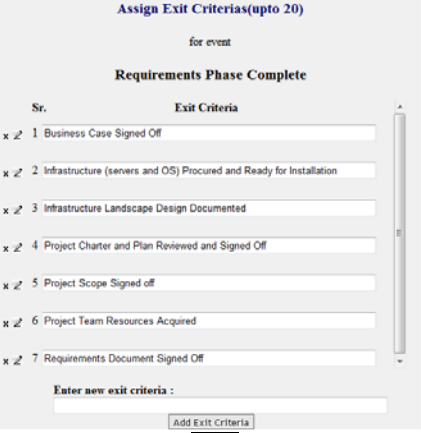


Figure 8B Quality Gate Table for Requirements Complete Milestone

Quality Gate Table for event - **Requirements Phase Complete**

Event's end date: 1/31/2010 **Today: 1/2/2010**

Sr. No.	Exit Criteria	Resp.	Total	Done	Criteria	Percentage %	Planned Date	Forecast Date	Actual Date
1	Business Case Signed Off	Bill	1	1	Yes	0	1/8/2010	1/8/2010	
2	Infrastructure (servers and OS) Procured and Ready for Installation	Louis	3	1	Ready	33	1/15/2010	1/15/2009	
3	Infrastructure Landscape Design Documented	Sarah	1	0	Yes	0	1/13/2010	1/13/2010	
4	Project Charter and Plan Reviewed and Signed Off	John	4	2	100%	50	1/22/2010	1/22/2010	
5	Project Scope Signed off	Diane	1	0	Yes	0	1/31/2010	1/31/2010	
6	Project Team Resources Acquired	John	12	8	90%	75	1/31/2010	1/31/2010	
7	Requirements Document Signed Off	Bill	1	0	Yes	0	1/31/2010	1/31/2010	

Figure 8C Pool of Risks for the Week

Risk Description

Contract for Vendor Consulting Resources Has Not Been Approved yet.

Scope is not contained.

Sr. Management has not bought in to this project. A lack of sponsorship exists.

Voting?

PRIMMS Voting Calculations

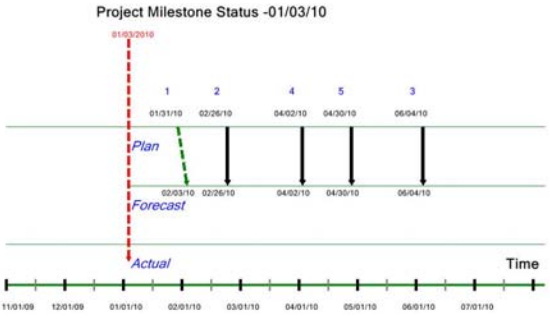


Figure 8D Milestone Slip Chart (Milestone 1 refers to Status of Requirements Complete Milestone)

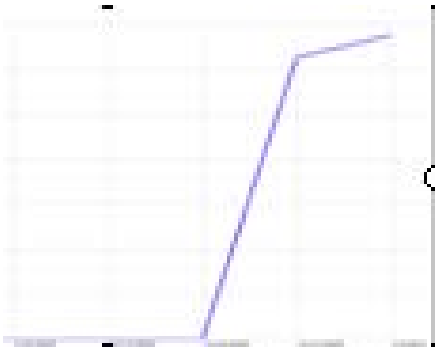


Figure 8E Milestone Risk Index for Requirements Phase Complete

After populating a Quality Gate table with baseline plan information, it is possible that the estimated finish dates for the exit criteria will differ from the high level Milestone End Dates. To reconcile the potential inconsistency, the project manager can either change the finish dates for the individual criteria in the Quality Gate tables or change the overall, high level milestone dates. Whichever approach you choose will depend upon whether you choose a top down or bottom yp planning approach.

Changes in overall

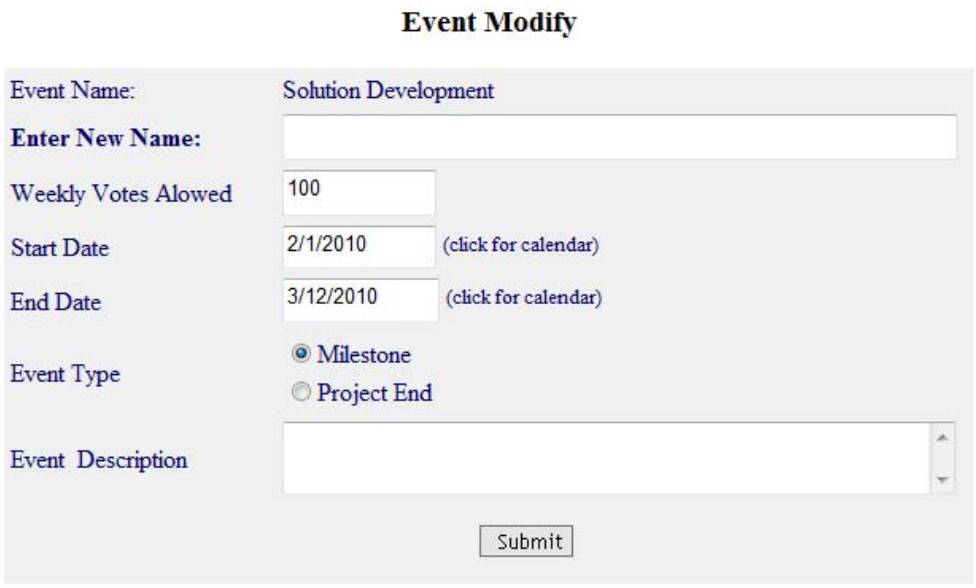


Figure 9-Event Modify Screen

Once the Quality Gate tables are populated for all project milestones ,and the milestone high level exit dates are made consistent with the planned exit dates, the project is ready to move into the execution phases.

It is important to note that the project manager may also be using scheduling tools such as MS project for planning. At this point your baseline schedule should be created, and all of your plans should be in sync.

Risk Management- Statusing, Risk Identification and Voting

Weekly Voting and Daily-Weekly Risk Identification for Each Project and Event

3.1	Project Manager Updates Quality Gate Tables with Current Status	By the end of each week Project Manager assesses performance and finish status updates of Quality Gate Tables[1]
3.2	Project Stakeholders Review Quality Gate Status, Odds tables, and risk management information.	Using their own unique login ID's project stakeholders go into the system and review available information regarding project and event performance from prior week. This includes looking at Q-Gate tables, Odds tables, the risk commentary from other stakeholders, the risk register, the multi-line graph, the bubble chart and the escalation chart.
3.3	Stakeholders Enter Risks and Votes (first for the week)	For each project and event under their purview, stakeholders go to the voting section of PRIMMS and enter their own risks and place their votes
3.4	Stakeholders Enter Additional Risks for the week.	For each project and event under their purview, stakeholders go to the voting section of PRIMMS and enter can enter additional risks.
3.5	Pool of risks and metrics for the week emailed to stakeholders.	At the end of each week the Program Manager (or Project Managers) use auto-email function to send the pool of risks and metrics to all stakeholders.

1 Refer to "Quality Gate Tutorial" in Resource Center

Once the project is planned and the objectives are well communicated, the project enters the execution phases of the life cycle. Throughout these phases the following occurs on a weekly basis:

- On a daily to weekly basis the project manager assesses project performance and makes weekly updates of the Quality Gate tables. This includes updating sufficiency criteria, actual finish dates and forecast finish dates for all milestones.
- Project team members and other stakeholders review status updates, review available risk information and consider risks that could jeopardize the achievement of project milestones.
- For each milestone project team members enter risks (daily to weekly) and vote (weekly) on the amount of sufficiency criteria that will actually be met by the target milestone completion date.
- Team members can continue to enter risks throughout the week as desired.
- At the end of each week the project manager uses the auto-email function to send an email containing the list of the project risks and metrics to all project participants.

Depending upon the project situation on a daily to weekly basis the project manager collaborates with the responsible owners of the sufficiency criteria for each milestone in order to understand achievement for the day or week, to understand obstacles and risks and to focus the team on the work at hand. The PRIMMS Quality Gate table exemplified in Figure 10 below facilitates this process. As illustrated in Figure 10 below status information is updated for both Criteria as well as actual and forecast

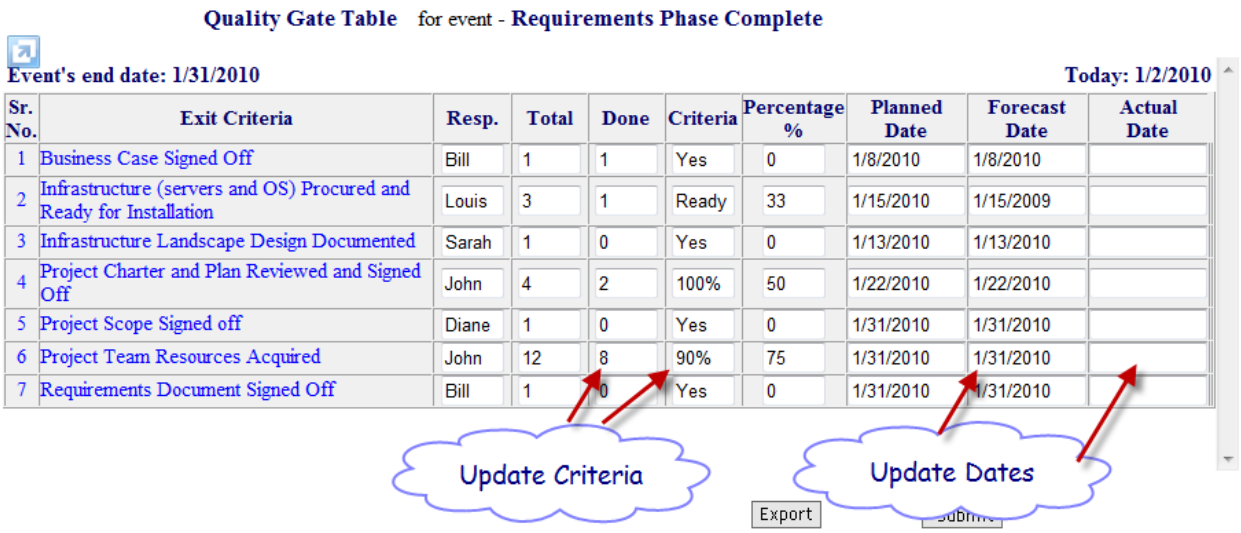


Figure 10-Example of Updating Quality Gate Table for a Milestone Event

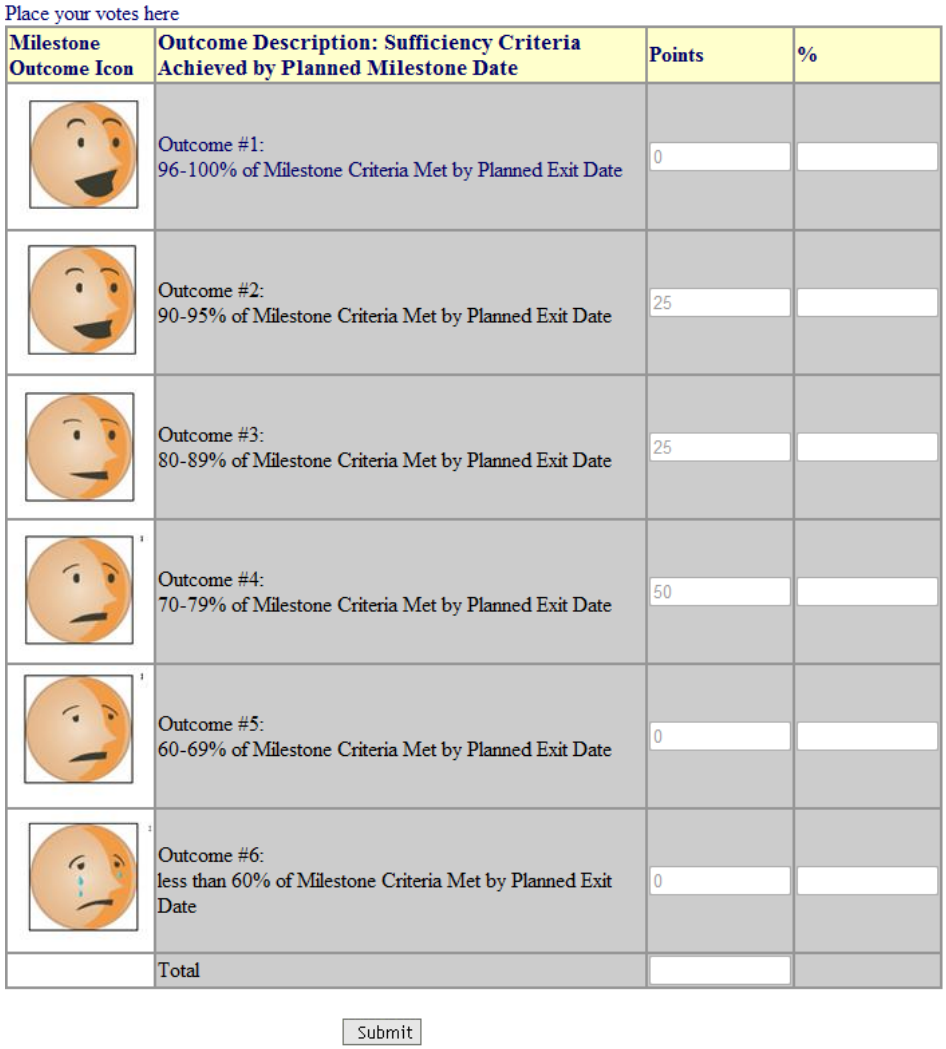
Weekly voting by participants is an important element of the PRIMMS risk management methodology. This step allows risk observations to be recorded into the system, and it provides participants the opportunity to express their perceptions as to overall project health in terms of likelihood of meeting target schedule objectives through voting. Both are essential elements to an effective project risk management process.

The weekly risk identification and voting step begins when a participant logs into the PRIMMS tool and goes to the appropriate project event screen. Refer to Figure 7. On this screen the participant clicks on an appropriate "Vote" button for a milestone event which leads to the Voting screen containing multiple views. The "Vote Now" view allows the participant to enter risks (see Figure 11 A) and to Vote (see Figure 11B on the following page).

In order to vote the participant enters one or more risk statements by answering the first risk question as shown in Figure 11A and hitting "Add" for each risk identified. The participant must also answers the second risk question (the senior management question). Then the participant scrolls down and votes by distributing the available 100 points to each of the six possible outcomes based on his/her perception of project progress to date. Then the participant hits the "submit" button at the bottom of the screen. Note: a participant can submit risks anytime during the week after voting by entering and adding risks and then hitting the submit button.

Figure 11A-Entering Risk Information (Daily to Weekly)

Figure 11B-Voting on Milestone Outcomes (Weekly)



Figures 11A and 11B illustrate the mechanics of risk identification and voting. But before voting project participants can view the complete pool of risks for the week identified by other participants. This is most easily accomplished by going to the events screen and clicking on the risk management button. This takes the participant to the Risk Categorization screen allowing access to the "Risk Descriptions for the Week" button. By clicking on that button, the participant views the risk descriptions for the entire pool of risks for the week. An example of this view is shown in Figure 12 below.

Print

Risk description(s) for this week for project- **Alpha Project**

Risk Description	Info for Mgmt	Event
Contract for Vendor Consulting Resources Has Not Been Approved yet.	We need to sign-off on Business Case, and Vendor Contract	Requirements Phase Complete
Scope is not contained.	Murphy's Law has been passed in the Congress and is expected to affect all best layed out plans.	Requirements Phase Complete
Sr. Management has not bought in to this project. A lack of sponsorship exists.		Requirements Phase Complete

Figure 12-Example of Risk Description Pool for the Week

Before voting the participant can also examine other sources of risk information within the PRIMMS tool including:

- The risk register
- The Milestone slip chart
- The odds tabulations
- The risk index line chart (a time series graph)

Directions to access these screens and reports are covered in the next section of this User's Guide.

Risk Elimination, Mitigation and Preventative/Corrective Actions

Risk Elimination and Mitigation; Preventative Action and Corrective Action

4.1	Project Managers Look at Multi-line graph for inflection points (up or down) and examine the new pool of risks for the week	By the end of voting for each week each Project Manager assesses the pool of identified risks for the week and examines multi-line graph risk metric for each event to determine if risk changed for the event.
4.2	Project Managers Review and Update Quality Gate Tables, Review and Update Slip Chart and Assess Schedule Pressure on Milestones.	By the end of voting for each week each Project Manager updates status on Q-Gate tables & goes to the Event Forecast function to review and update the milestone slip chart to determine the schedule risk of each event related to his/her project.
4.3	Project Managers Assign Risk Statements to Risk Domains (i.e. consolidation)	Throughout the week each Project Manager uses the Risk Management function to examine the pool of risk statements (i.e. the Voice of the Team) for his/her project and assigns each risk statement to a risk domain. As required new risk domains are added or modified.
4.4	Project Managers Update Q-Gate Status Update Risk Register and Risk Logs. Manage Risks Appropriately	Throughout the week each Project Manager uses the Risk Management function and Risk Register to assign risk ownership responsibilities, to review risk mitigation and elimination steps and to review risk status.
4.5	Project Managers Examine Bubble Charts and Escalation Charts and Present to Sponsors as Appropriate	Throughout the week each Project Manager uses the Risk Management function and Bubble Chart/Escalation Chart to assess overall risk and to work with risk owners toward the elimination of risks.

Each project manager has the responsibility to maintain adherence to the scope, schedule cost and quality objectives for the project. During the execution phases schedule and quality issue rise to the surface on a daily basis. So, one of the most important tasks is to identify and deal with schedule-quality risks and problems.

As we have described previously the Quality Gate structure sets the orientation of the team toward a milestone due date. Also, because each milestone is anchored in sufficiency criteria, the team is working toward achieving both schedule and quality objectives simultaneously. Note: the assumption here is that, from a day-to-day perspective, cost and scope objectives are considered fixed and under change control. Remember, we are discussing the Execution phases of the project.

It is expected that each project manager will be working with team members on a daily basis for purposes of communication, coordination and issue resolution. Consequently, each project manager will be reviewing and updating the Quality Gate tables with the team at least several times a week. However, it is easy for a project manager to become insulated and blindsided by unforeseen, hidden issues and problems. For that reason the risk management tools of PRIMMS are very important to enable each project manager to keep abreast of and stay ahead of such problems.

PRIMMS is a tool that facilitates the risk management process. Effective risk management also requires leadership skill as demonstrated by a willingness on the part of each project manager to confront tough issues as they emerge. It also requires the development of management savvy as demonstrated by an ability to direct a team through adversity.

Systematic risk identification is a recurring the first step when using the PRIMMS tool. Risks are defined as any anticipated mismatch between a project plan and actual execution which jeopardizes attainment of a milestone objective. Therefore, risks can be either anticipated future problems that could materialize or actual problems at hand that have materialized and jeopardize meeting project objectives. Risks are "wake-up calls" to the project manager.

Risks are identified through the daily to weekly recording of risk observations by project participants as discussed previously. Each risk statement recorded by a participant is pulled into the PRIMMS Risk Categorization table. Refer to Figure 13A on the following page. Using this table the project manager consolidates and maps each risk statement into a risk domain. This is a data reduction step that enables the project manager to map and consolidate any duplicate statements reflecting the views of multiple individuals into a smaller group of relevant, mutually exclusive risks. It also allows the project manager to view each risk domain as a multifaceted, multidimensional construct that is best described by multiple viewpoints.

The PRIMMS database pulls risk domains into the Risk Register enabling the project manager to prioritize and assign risk management responsibilities to team members and other stakeholders. Refer to Figure 13B.The project manager also uses the Risk Register to update status of each domain through the risk disposition dropdown. The project manager can also use the log functionality to keep a time stamped narrative of risk management activities and actions.

Columns in the Risk Register include:

- Risk Category— A description of each identified risk domain or an actual problem at hand
- Risk Severity— A dropdown scale of 1 to 4 identifying the severity of each risk domain should it materialize
- Risk Likelihood— A dropdown scale of 1 to 4 identifying the probability of each risk domain
- Risk Impact Cost—The expected economic loss should the risk materialize. Optional column
- Owner—Two columns, the organizational level and name of the person responsible for the elimination or mitigation of the risk.
- Running Talley— The number of mentions (risk statements) made that relate to the risk domain

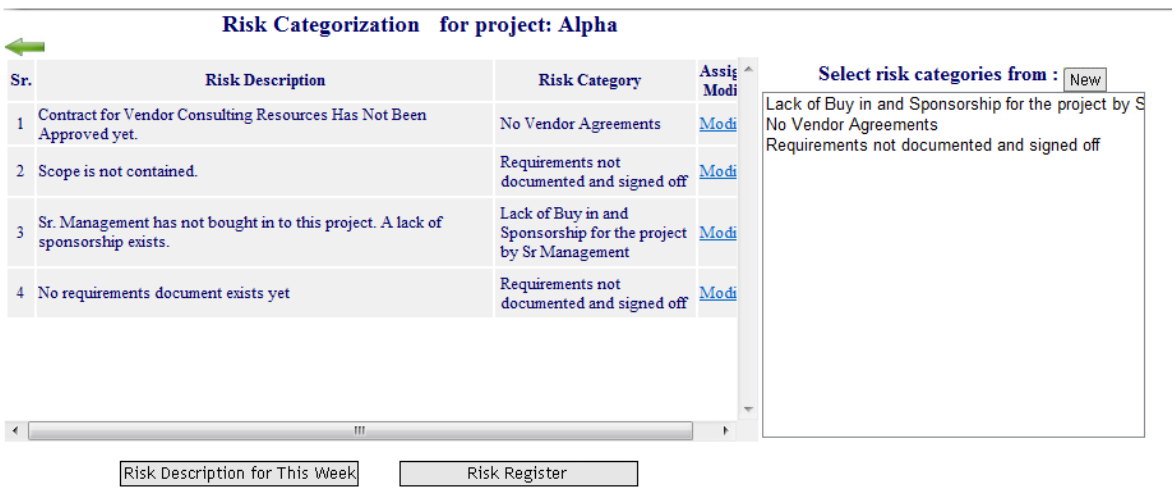


Figure 13A-Example of Risk Categorization Table

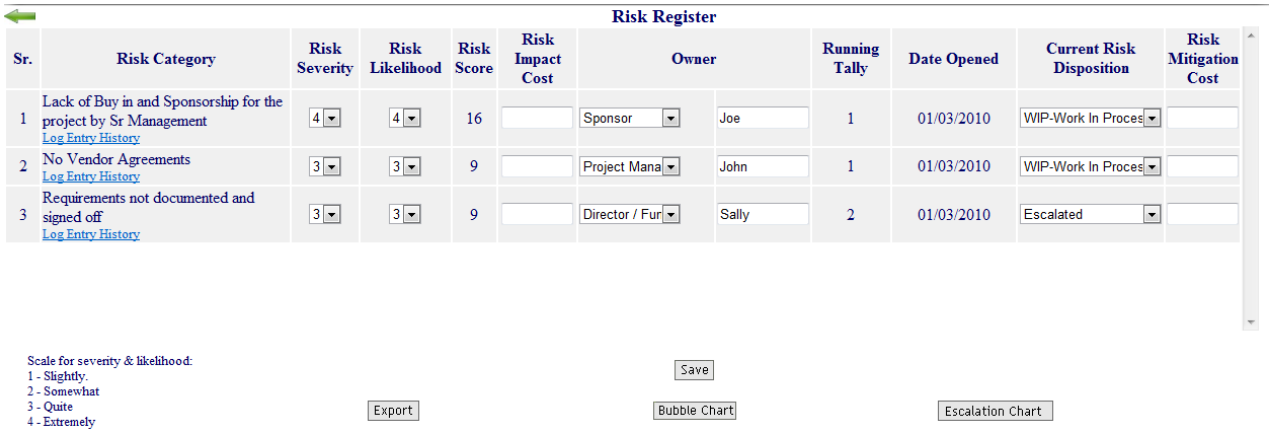
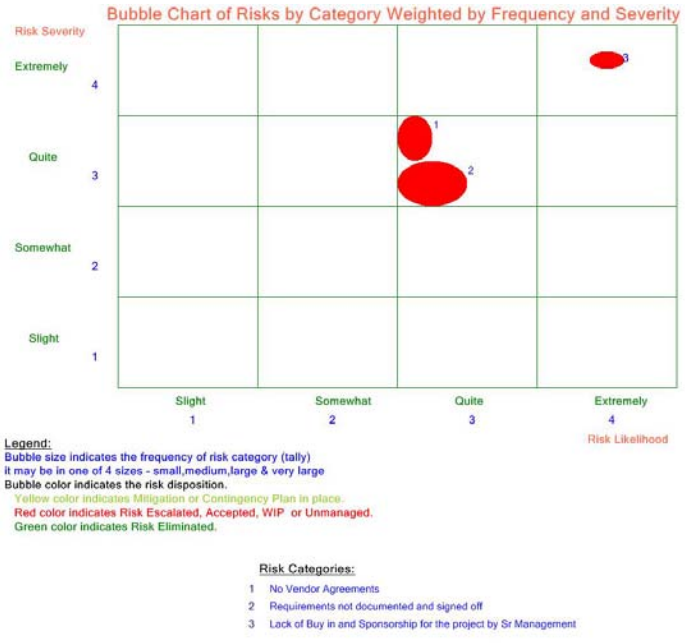


Figure 13B-Example of Risk Register Screen

Figure 13C-Example of Bubble Chart Showing Risk Severity By Risk Likelihood



- Date Opened— The date that the risk domain was created
- Current Risk Disposition— A dropdown of risk statuses
- Risk Mitigation Cost— The expected cost to eliminate or mitigate the risk. An optional column

The Risk Register is a day-to-day management tool that the project manager uses in collaboration with team members to track and manage anticipated or actual problems that jeopardize attainment of project milestones. Only participants with Local Admin privileges can make changes to the above columns. All users have read access. Each mitigation reflects a decision (hypothesis) and an action (test) that is part of a larger OODA cycle. See Figure 14 below.

The Risk Register feeds the Risk Bubble chart (Figure 13C) which is an analytical tool that visually maps risks by severity and likelihood. The size of each bubble is determined by the tally on the Risk Register. So, a larger bubble has more mentions by participants than a smaller bubble. The color of each bubble reflects its disposition in terms of being eliminated, mitigated, in process, unmanaged, etc. Of particular interest to the project manager are those risks (bubbles) located in the upper right quadrant signifying high severity and high likelihood.

The Risk Register also feeds the Risk Escalation chart, shown in the governance section of this guide).

The objective of providing all of these tools is to help each project manager to become aware of all project risks and problems, to help evaluate and prioritize these problems and to help maintain a sustained focus on these problems until resolved or properly mitigated. The principle behind the PRIMMS methodology is Boyd's OODA loop consisting of Observe-Orient-Decide-Act that occur in weekly cycles on the project. Refer to Figure 14 below.

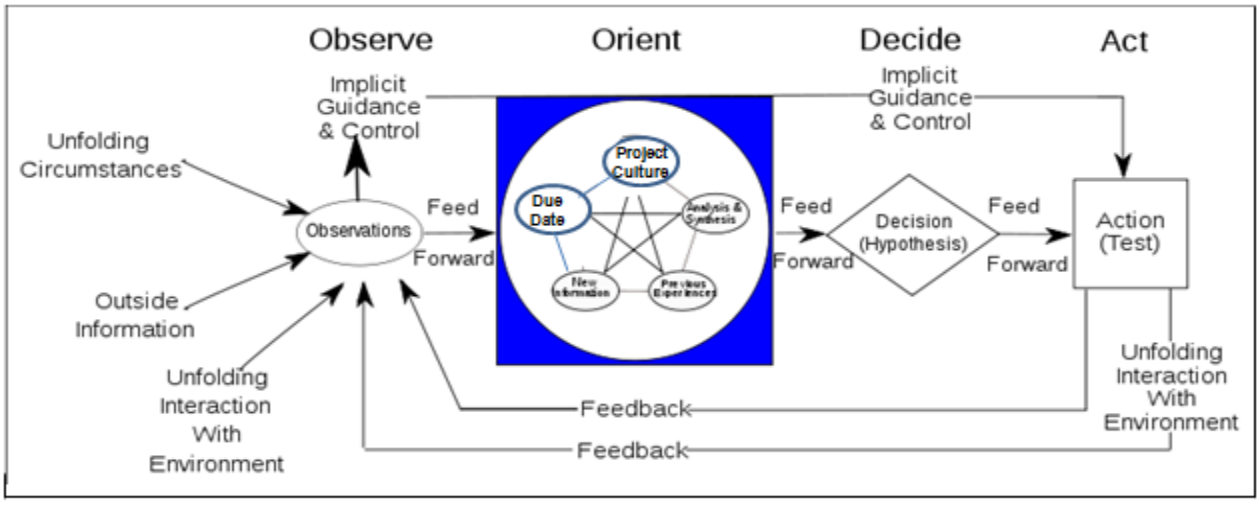


Figure 14-Modified OODA Loop for Project Managers

Program and Project Governance

Program and Project Governance

5.1	Program Manager, Project Managers and Governance Committee Review Presence of an Overall Project Management Process	Program and project governance organization reviews overall Program and Project Management Processes are in place.
5.2	Program Manager, Project Managers and Governance Committee Review Quality Gates Tables and Milestone Slip Chart for each Project	Program and project governance organization reviews Quality gate tables and slip chart with special attention given to the forecast for meeting sufficiency criteria for upcoming milestones (phase exits) due for completion.
5.3	Program Manager, Project Managers and Governance Committee Review Bubble Chart for each Project	Program and project governance organization reviews Bubble Chart with special attention given to the disposition of risks falling in the quadrant of high severity and high probability.
5.4	Program Manager, Project Managers and Governance Committee Review Escalation Chart for each Project	Program and project governance organization reviews Escalation Chart with special attention given to the hand off of risks to higher organization levels and their disposition.
5.5	Program Manager, Project Managers and Governance Committee Review Multi-line Graph for Each Project	Program and project governance organization reviews Multi-line graph with special attention given to the overall average value and recent inflection points.

Governance refers to the existence of an oversight body that works on behalf of the program/project owner that :

- Ensures good project management practices are in place
- Acts as a resource for problem escalation
- Authorizes appropriate changes

Typically the governance body is a committee of senior stakeholders to whom the program and project managers are ultimately responsible and accountable. During the execution phases of a project the governance body is especially interested in knowing that sufficient project management controls are in place. Pages 24-27 are reprints from Module 4 of the project management workshop located in the Resource center of PRIMMS. Module 4 discusses project controls by using a simulation example.

The PRIMMS tool helps the project manager establish and maintain the project management exception process. PRIMMS enables the project manager to stay ahead of critical exceptions to plan (issues, risks, problems) that can jeopardize the successful attainment of milestone objectives.