EXPERT SERIES

The "Expert Series" is a collection of articles, papers and writings by PM Solutions' associates and other industry experts that provides insight into the practice and value of project management.

Measuring and Managing Success

IT Project Metrics

by Karen R.J. White, PMP

"You can't control what you can't measure."
Tom DeMarco, *Controlling Software Projects*

PROJECT MANAGERS ARE THE PRINCIPAL INDIVIDUALS RESPONSIBLE FOR REPORTING TO EXECUTIVES ON THE PERFORMANCE OF A PROJECT. As such, they are continually faced with the question: what aspects of the project should I measure and report? Some say that anything you collect is probably better than nothing; but in fact, measuring the wrong things can lead to bad decisions that undermine morale, reduce productivity, and unintentionally mislead the organization.

For metrics to be of any use they need to be responsive to fundamental questions at the highest level of the organization: Why are we in business? What's our vision? What are we doing now that supports or drives that vision? What should we be doing? Do we exceed our customer's expectations? If we assume that each department in an organization is part of a well functioning whole, then the efforts of all must contribute towards those common goals. Therefore, IT metrics, like any other metric within the organization, must be viewed strategically.

Why collect metrics?

Metrics are important when predicting and controlling the outcome is important. If we are in fact to predict and affect the direction of our projects, we must know *where* to correct, *what* to correct, and *how much* to correct. Without baseline and progressive metrics, predictive and corrective behavior isn't possible. With metrics, it is.

What should be measured?

Both the end-deliverable of the project and the project's actual execution need to be measured. The project needs to be measured as it is run to be sure it is achieving its specific objectives. The project deliverables need to be measured to be sure that they support the business objectives of the requesting department or organization.

There are two kinds of metrics usually found within an IT organization. There are the operational metrics used to measure the effectiveness of the organization as a whole, including use of data center resources and staff. These metrics help ascertain how the operational aspect of the information technology organization is performing. Such metrics include system availability, outage response times, volumes processed, support calls addressed, reports delivered. They are usually gathered as a by-product of performing the work.

Then, there are project metrics. These latter metrics measure the project during its execution and then measure the project's final deliverable.

Project execution metrics determine how well the delivery of new or enhanced capabilities are executed. We will discuss both the executive metrics that are used to monitor and oversee a portfolio of projects, and metrics used to manage the delivery of a project.

Metrics associated with the end-deliverables of a project begin and end with the customer. They look at the effectiveness of the project, its end-deliverables and its contribution to the organization as a whole. These types of metrics find us repeatedly asking ourselves "Given today's business climate, should we still be doing this work, and should we still be doing it the way we are today?" Often these measures start with financial measures such as ROI. Improved quality, faster time to market, and other measures are also important.

The following paragraphs discuss each of these types of metrics in further detail.

Business Metrics

These metrics help focus on the fact that in order for an IT project to be considered successful, IT must not only deliver a quality product, it must deliver a quality product that is *accepted* by its intended audience. The most important aspect of departmental and organizational measurements is to assure that the projects and operations are furthering the goals of the organization, and optimizing performance.

ROI
Meaning: Return on Investment (usually financial)
Measure: How long it will take in increased revenue, or reduced cost to pay back the project investment
Benefit: The projects that pose the best benefit to the organization get performed, and organizational performance is optimized.

Time to Market
Meaning: Streamlining or reducing the time it takes to deliver a product or service to clients
Measure: Current timing of delivery needs to be measured before project execution, and compared to post project delivery performance.
Benefit: Increased market share and reduced costs

Customer Satisfaction
Meaning: Meeting client's needs, expectations, and defined scope
Measure: Document needs, expectations in a clearly defined scope statement. Develop milestones to measure achievement of those objectives.
Benefit: Removes ambiguity of project acceptance and improves overall satisfaction

Table 1 – Business Metrics

Project Metrics

Project metrics address the needs of two audiences:

- Executives charged with project oversight
- Project managers responsible for the successful completion of the project.

It is the responsibility of the project manager to ensure the needs of both these audiences are addressed in the metrics collection program.

Executive/Portfolio Management Metrics

Measurements of this type have a common goal: to increase focus on projects that will support the organization's long/short term strategic business goals. This may be accomplished by decreasing internal costs, providing a technological advantage over competition, improving customer/vendor relationships, etc. Its secondary purpose is to help manage the portfolio by identifying those projects that should *not* be initiated.

Align with Strategic Business Goals	
Meaning: How much impact does this project have on the strategic goals of the organization?	
Measure: Often subjective – can be made more objective through the use of decision making tools used by the upper management staff to quantify and rank objectives and projects	
Benefit: Resources are maximized and the most beneficial projects are performed for the organization.	

Return on Investment	
Meaning: Does the ROI of the project meet the company's established financial goals for an investment?	
Measure: Usually financial, based on projected costs for execution of the project and deployment of the deliverable; should include life-time costs of the final deliverable, including projected operations and maintenance costs.	
Benefit: Allows project to be equally measured against other corporate financial decisions	

Time and Budget to Date	
Meaning: How much of the original budget and schedule has elapsed to date, versus work accomplished?	
Measure: Hours worked and monies spent to date, compared to original estimates in the business case, for work accomplished so far. Are you on track to complete the project in accordance with those original numbers, or are corrections in the plan or a re-statement of the business case, required?	
Benefit: Allows project progress to be measured against original estimations in the business case	

Quality	
Meaning: The metric that will be used to determine acceptability of the end products	
Measure: Varies from project to project – could be expressed as a factor of defects, response time, number of users supported	
Benefit: Removes ambiguity about product acceptance	

Table 2 – Executive/Portfolio Management Metrics

Project Management Metrics

Project management metrics are gathered during the life of the project. Identified during the planning phase of the project, these metrics are key to being able to make "go/no go" decisions at the end of each phase of

the system development life cycle. They are also instrumental in the early detection of potential problems within the project.

Gathering these metrics means establishing a clear definition of success with your client, and a method for measuring that success before the project begins. Business metrics fall into several categories: Scope and deliverables, timeliness, budget and quality. For many organizations, developing solid business metrics often means changing the nature of the relationship with the client.

Project Management Metrics – Planning Phase

Planning metrics are part of an iterative process, based on lessons learned. For example, although estimates are performed during the planning phase, most measurements will be taken during execution and the final numbers known only after project closure.

Schedule Estimate	
Meaning: Estimated amount of elapsed time required to complete the project	
Measure: Number of planned work days based on work effort and required resources	
Benefit: Establishes a baseline to support comparison during later project phases	

Cost/Hours Estimate	
Meaning: Amount of resources (dollars, people, equipment) it will take to produce the project	
Measure: Number of planned work hours and estimated costs based on work effort and required resources	
Benefit: Establishes a baseline to support comparison during later project phases	

Defect Rate	
Meaning: Anticipated amount of re-work (numbers of defects, average time to repair)	
Measure: Based on past experiences, number of defects to be incurred based on size of product	
Benefit: Establishes a baseline to support comparison during later project phases	

Component Size	
Meaning: Anticipated size of products to be delivered	
Measure: Based on past experiences, number of lines of code or function points, plus documentation pages, to be developed	
Benefit: Establishes a baseline to support comparison during later project phases	

Quality	
Meaning: The metric that will be used to determine acceptability of the end products	
Measure: Varies from project to project – could be expressed as a factor of defects, response time, number of users supported	
Benefit: Removes ambiguity about product acceptance	

Table 3 – Planning Phase Metrics

Project Management Metrics – Build Phase

Metrics gathered during the build, or construction, phase of a project allow the project manager and the project team to determine whether the project is proceeding as planned or if action needs to be taken to bring the project back on plan. Regular review of these metrics should be part of the project's oversight and control activities.

Actual Hours	
Meaning: Actual labor hours spent to date on project activities	
Measure: All labor hours, including those of support personnel and contractors	
Benefit: Provides comparison to budget and business case and supports schedule analysis	

Actual Schedule	
Meaning: Schedule performance to date	
Measure: Number of days behind or ahead of schedule	
Benefit: Supports early determination of potential late delivery	

Actual Costs	
Meaning: Actual costs associated spent to date on project activities (labor, hardware, software)	
Measure: True total costs spent to date, including all labor, software and hardware costs	
Benefit: Provides comparison to budget and to business case	

Defect Rate	
Meaning: Number of defects incurred to date	
Measure: Defects that require re-work, usually software bugs but can also include documentation re-writes	
Benefit: Supports comparison to baseline estimate to determine if potential schedule or costs impacts will occur	

Component Size	
Meaning: Size of end products	
Measure: Number of modules; number of KLOC (thousands of lines of code) or function points; number of documentation pages	
Benefit: Supports improvement in estimation (when combined with other metrics, such as # of defects per KLOC)	

Defect per Peer Review	
Meaning: Quality of work produced to date, prior to testing phases	
Measure: Number of defects per peer review	
Benefit: Early measure of quality of product; indication of a training or specification problem	

Staff Productivity	
Meaning: Average staff productivity	
Measure: Number of KLOC or Function Points per staff hour	
Benefit: Use this metric to determine rate of work to be anticipated in remaining software build activities	

Table 4 – Build Phase Metrics

Project Management Metrics – Testing Phase

The metrics gathered during the testing phase are useful when planning implementation activities. Items such as defects per unit of software and response times are early indicators of how the application will perform when implemented in an actual production environment. Frequent metrics analysis during this phase is particularly crucial as issues raised during this phase often become schedule drivers and need to be detected and managed early.

Schedule Estimate	
Meaning: Schedule performance to date	
Measure: Number of days ahead of or behind schedule, and amount of float	
Benefit: Ability to predict actual completion date, and approximate risk	

Cost/Hours Estimate	
Meaning: Amount of resources (dollars, people, equipment) it will take to produce the project	
Measure: Resources/cost spent to date – some earned value?	
Benefit: Predict total cost of the project	

Defect Rate	
Meaning: Determines the quality of the work produced to date	
Measure: Number of defects per some pre-determined unit (lines of code)	
Benefit: Determine rate of future re-work	

Response Time	
Meaning: Ability of the application to handle volume in a timely manner	
Measure: Response time in seconds per hundreds of users	
Benefit: Advance notice of performance problems	

Avg. Time to Repair Defect	
Meaning: Amount of duplicate work due to errors	
Measure: Number of hours and dollars spent correcting the problem	
Benefit: Reduce unnecessary costs and increase work efficiency	

Table 5 –Testing Phase Metrics

Project Management Metrics – Deployment Phase

Systems "deployed" into production are often monitored for an agreed period of time (e.g. one cycle, one month etc.). Metrics gathered during this phase will indicate the need for a slim or robust release 1.1. These metrics are also indicators of overall customer satisfaction with the deployed system.

Defect Rate	
Meaning: Determines the quality of the work produced to date	
Measure: Number of defects per some pre-determined unit (lines of code)	
Benefit: Determines rate of future re-work	

Response Time	
Meaning: Ability of the application to handle volume in a timely manner	
Measure: Response time in seconds per hundreds of users	
Benefit: Advance notice of performance problems	

Quality	
Meaning: The metric that determines acceptability of the end products	
Measure: Varies from project to project – could be expressed as a factor of defects, response time, number of users supported	
Benefit: Removes ambiguity about product acceptance	

Avg. Time to Repair Defect	
Meaning: Amount of duplicate work due to errors	
Measure: Number of hours and dollars spent correcting the problem	
Benefit: Reduce unnecessary costs and increase work efficiency	

Table 6 – Deployment Phase Metrics

Metrics Collection Programs

A Metrics Collection Program does not need to be an elaborate process. The more easily the metrics are produced and reported, the better the quality of the data you will receive. Metrics should be generated as a by-product of the project's work. For instance, a Peer Review report should include a quantification of the number of defects uncovered, by severity. This report could then be used to update an Excel spreadsheet that is used to track defects.

The following graphic depicts a simple Excel chart that can be used to capture and report defect metrics. The project manager can request team members update the chart and include it as part of a periodic status report. The project manager can then easily consolidate and summarize the data for presentation to management.

Often time executives just want to see a summary level of a project's critical metrics, as a reflection of the risks on the project. Chart 2 presents one way of providing such a summary. The second column represents the current status of the metric (red, yellow, green, improving or declining, or same as last report). The third column contains the specific metric. The terms shown in this example refer to the earned value terms of Schedule Variance and Cost Variance.

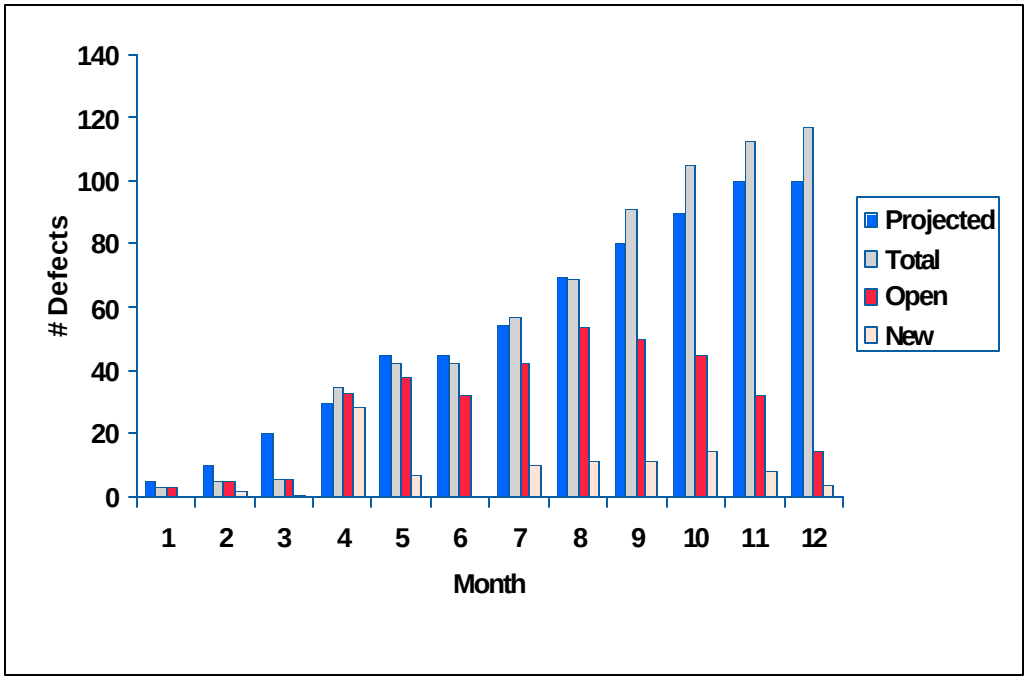
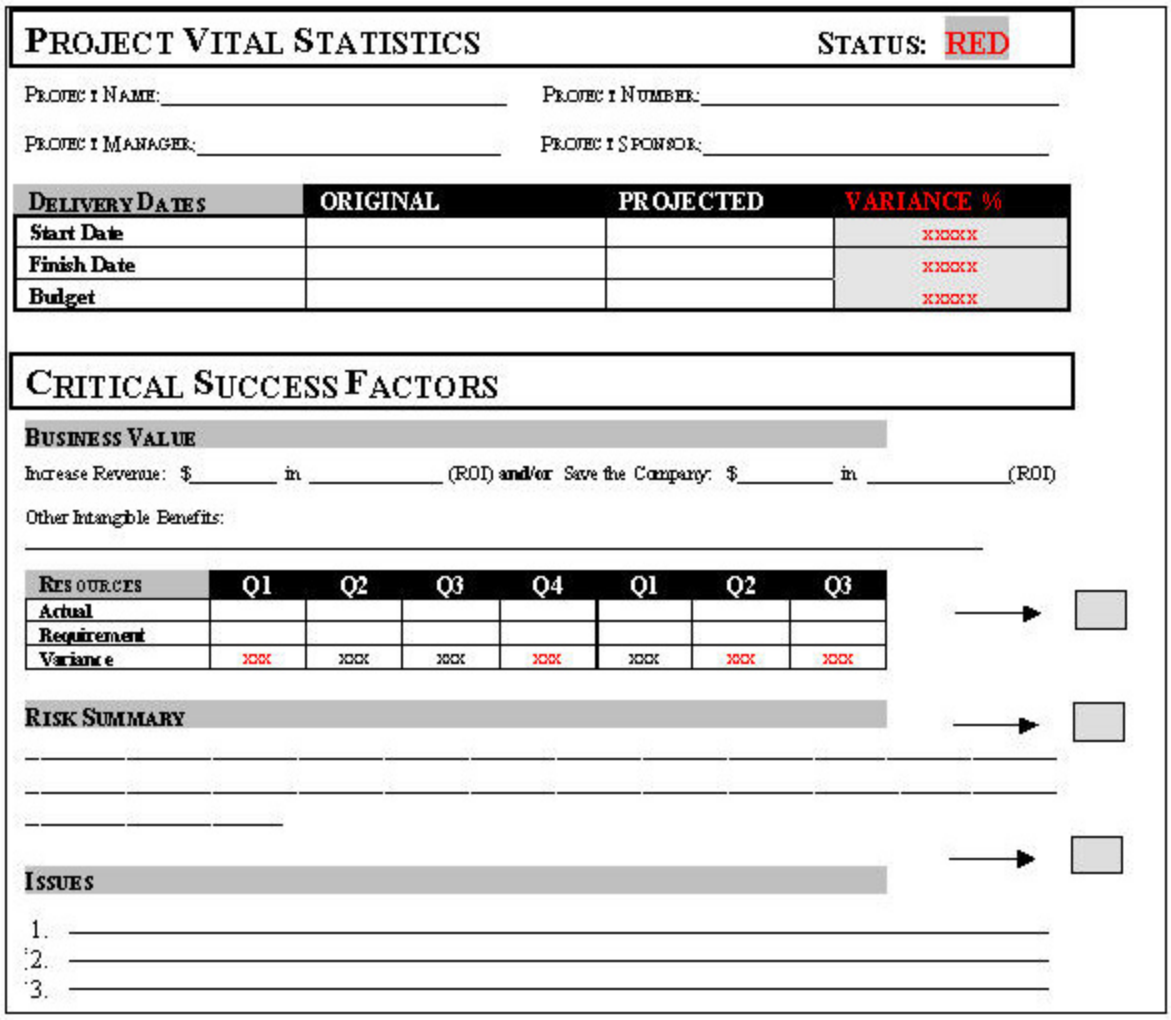


Chart 1 – Defect Report

Risk Area	↑ RYG ↓ ↔	Metric	Issue Summary	Action (required or underway)
Schedule		SV=		
Cost		CV=		
Staff Satisfaction		N/A		
Customer Satisfaction		N/A		
Quality		# of Critical Defects =		

Chart 2 – Summary Project Metrics

Chart 3 depicts another example of a management level report. This report identifies metrics that might be fed into a portfolio status report. The numbers on the side indicate the current risk status of that item as expressed in numeric terms (1 = Green, 10 = Red), as of the reporting period and as determined by the project manager.



PROJECT VITAL STATISTICS STATUS: RED

PROJECT NAME:_____ PROJECT NUMBER:_____

PROJECT MANAGER:_____ PROJECT SPONSOR:_____

DELIVERY DATES	ORIGINAL	PROJECTED	VARIANCE %
Start Date			xxxxx
Finish Date			xxxxx
Budget			xxxxx

CRITICAL SUCCESS FACTORS

BUSINESS VALUE

Increase Revenue: $_____ in _____ (ROI) and/or Save the Company: $_____ in _____(ROI)

Other Intangible Benefits:

_____

RESOURCES	Q1	Q2	Q3	Q4	Q1	Q2	Q3
Actual							
Requirement							
Variance	xxx	xxx	xxx	xxx	xxx	xxx	xxx

RISK SUMMARY

_____

_____

_____

ISSUES

1. _____
2. _____
3. _____

Chart 3 – One Page Project Summary

Tips and tricks for successfully implementing a metrics program

Metrics used properly are essential management tools. Too often, metrics programs are developed in a vacuum or become so detailed that they get in the way of productivity. Design your metrics program for success.

To be successful, metrics programs need to be holistic and developed from the top of the organization, through to deployment. Metrics, though useful, can often bog down an organization, taking too much time to generate, and creating information overload. It is critical to examine precisely what information is needed to spot critical problems.

When launching a metrics program, actively foster a spirit of open, honest communication. In most organizations, the norm is to put on paper what people want to hear, not necessarily the reality of what is happening. Demonstrate the value of honest, reliable, timely information. For some organizations, this is the biggest challenge to implementing a metrics program. Be honest about this challenge in your organization, and respond accordingly.

Keep the metrics simple, and manage by exception. Metrics can be a gimmick that keeps a manager trapped at their desks and away from their staff. Use metrics as a red flag and work through the issues with your team. Generate and review metrics on a regular basis. Let your staff see you using them as a basis for discussion and communication. Regularly ask yourself, are the metrics I'm generating/receiving providing timely, useful information?

Despite your attempt at simplicity, gathering all of the data necessary to measure, manage and control projects often requires the use of automated tools. Carefully evaluate the tools available to you and your needs. When choosing and implementing a tool, start simple and build slowly. Be sure the focus is on the information generated, and not the technology.

Summary

When putting metrics in place, be sure all stakeholders understand what the metrics are used for, and why they are important. Be sure to involve the people generating the metrics, as well as the people using the metrics. When gathered, demonstrate the metrics usefulness in solving problems.

In short:

- Keep it simple
- Involve all the participants
- Keep the atmosphere non-punitive and participatory
- Use and demonstrate metrics effectiveness regularly
- Discontinue or revise what isn't being used

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