Fraunhofer Center for Experimental Software Engineering
Technical Report

“Five Tips for Applying Quantitative Project Management Practices”

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Abstract.

The Quantitative Project Management (QPM) process area in CMMI for Development (CMMI-DEV) focuses on managing the project quantitatively to achieve a project’s established quality and process performance objectives. QPM includes 2 specific goals and 7 specific practices (not to mention the generic goals and practices) and is generally considered one of the most difficult process areas to implement. Despite being difficult to implement, this area is crucial because it helps to keep projects focused on quantitative thinking and making important project adjustments to achieve the end goal of the project. The context of this experience is a Maturity Level (ML) 5 organization called Keymind, a division of Luminpoint. Keymind, a small 25-person division, provides software development, strategic marketing and user-focused services to both commercial and government customers. Fraunhofer provides process improvement and measurement expertise to Keymind. Based on our successful experience in applying CMMI-DEV, we describe five tips to effectively apply QPM practices that measurably impact business results.
Five Tips for Applying Quantitative Project Management Practices

Tip 1: Start project measurement early using established processes
Keymind’s processes enacted to address QPM practices include setting goals and tracking them in JIRA, an issue-tracking system, monitoring goal performance and quantitatively manage the project across the lifecycle with issue updates recorded in JIRA, as well as addressing all aspects of QPM within specific and periodic meetings at key milestones. One key point we learned is that good measurement takes time. Specifically, it takes time to measure progress against goals (QPPOs) particularly if the project spans many months or years. In addition, good QPM requires some basis for project comparison. Project measurement, goal-setting, and evaluation is accomplished using established process performance baselines (PPB) and process performance models (PPM) or prediction models - these take time to build too! We found it best to set baselines and create models at the organization-level in order to learn about the overall organization performance and to assist within other CMMI requirements for the Organizational Process Performance (OPP) process area. Define your QPM process and start right away!

Tip 2: It's all about the goals (QPPOs)
It is difficult to monitor performance when project goals are not well defined or wrong. For example, a project may set a goal to deliver high quality software. This type of goal is too abstract and not measurable and this makes the implementation of QPM practices extremely difficult, if not practically impossible.

In general, some experience is needed to write a good project goal; thus, it is worthwhile to invest in goal writing training as well as using popular techniques like SMART, GQM, etc. One possible solution is to use well-designed workshops. These can provide training and the creation of artifacts and hence evidence. This solution proved to be effective especially when used together with handling project goals like action items and tracking them in a tool.

Tip 3: Understand the difference between QPM SP 2.1 (Monitor) and 2.2 (Manage)
It is hard to ensure that you have evidence for both monitoring and managing QPM. We found that concrete examples helped the project team to better understand the subtle difference in these concepts and collect the evidence needed. Specifically:

- Monitor: using an objective quantitative measure to assess the performance of the process (e.g., product correctness)
  - [Good]: “Defects in production are as expected.”
  - [Better]: “For release 2.2.0, defects in production shall be fewer than 4.”
- Manage: taking action based on monitoring outcomes. Generally this involves discrete steps including:
DETERMINE ACTION: What process tailoring needs to be done to ensure goal achievement given available predictions (PPMs)?
CHECK GOALS: Adjustment may be necessary
TAKE ACTION: Implement process tailoring to ensure goal achievement
MONITOR AGAIN(!): Ensure reports exist to check performance along the way

Usage of issue tracking tools to assist with monitoring and managing makes capturing results (and gathering evidence) much easier.

**Tip 4: Use measurement experts to assist with QPM**
In the case of small organizations, the dedicated process improvement manager is often one person and sometimes even part-time. Obviously, it is unusual for one person to have all the expertise needed to complete a major change initiative such as the one required to achieve ML 5 which includes process improvement, change management, quantitative measurement techniques, statistical analysis, appraisals, and tool support. In our experience, we found it essential to partner with reliable external expertise that provides a mix of resources, complementing the ones available in our organization, and who is well-aligned with our process improvement strategy and shares the same ideals and values.

**Tip 5: Perform quantitative management in one meeting**
Initially we had measurement events occurring haphazardly throughout the project lifecycle. This made it difficult to implement the QPM practices and caused excessive measurement related meetings that were not thought of as a cohesive process. Over time we realized it was important to collapse important measurement activities into single meetings throughout the lifecycle. Important topics to include in the measurement meeting agenda include:

- Set project goals or review progress against goals
- Compose project processes given decisions based on our prediction model
- Apply project lessons learned using organizational baseline performance and experiences.

**Conclusion**
By synthesizing our experience in achieving and maintaining CMMI Maturity Level 5 in a small organization, we described the following five tips for effectively and smoothly applying QPM practices:

1) Start project measurement early using established processes
2) It’s all about the goals
3) Understand the difference between QPM SP 2.1 (Monitor) and 2.2 (Manage)
4) Use measurement experts to assist with QPM
5) Perform quantitative management in one meeting