PS&J SOFTWARE SIX SIGMA

Measured Managed and Controlled Project Performance

Software Appraisals

Software appraisals include a range of activities performed to find and remove defects in software early in the development life cycle prior to the start of testing. They are various types of appraisals including personal reviews (also called bench checks), walkthroughs, and inspections. Personal reviews are an efficient technique for cleaning up relatively simple logical errors in a product prior to submitting it for inspection. Walkthroughs are appropriate during the early stages of the development of higher level products like requirements or system architecture. Inspections are best used for finding inconsistencies, misunderstandings, and errors in products like requirements, designs, code, and test cases. Appraisals can be one of the most effective tools for producing high quality software on time and on budget.

Over the years there has been a lot of data published indicating that appraisals are one of the most effective methods to lower cost and cycle time while simultaneously improving product quality. Appraisals work because they find defects early, when the removal cost is lowest.

The cost of appraisals has two components: the time to review the product and the time to fix the defects found in review.   The cost of running tests has a lot more components: compiling and linking the product that will be tested, executing the test case, isolating defects, and fixing the defects.

When performing an appraisal, the time required to review the product is independent of the number of defects found. The time required to fix the defects is at worst the same as the time need to fix them when they are found in test. It can be a lot less if a defect is found and corrected in a spec before the spec is actually used to generate products. The cost of testing increases linearly with the number of defects in the product under test, because the compile-link-test-isolate-fix cycle is typically repeated for each defect. Unless the required time is very small, it is likely that appraisals will have a significant cost advantage over testing.

Well-managed appraisals remove defects at a very predictable rate and cost. Testing is notoriously unpredictable. It can take anything from five minutes to a week to find a defect that requires only a minute to fix. Eliminating the time spent isolating defects and re-running tests to verify the fixes is what gives appraisals their cost advantage. As more defects are found via appraisals and less in test, there is a major reduction in the variability of test time resulting in more predictable schedules and costs.

Finally, removing defects with appraisals is much less prone to injecting secondary errors than removing them in test. When a defect is fixed in test, it is frequently in a high-pressure situation where there is an intense focus is on getting the test case to pass. This can make it easy to implement a fix that is inconsistent with another element of the design and inject a defect somewhere else. The later this happens in the development life cycle, the more likely the secondary defect is to escape into the finished product. The focus in an appraisal is typically much broader and the probability of injecting a secondary defect is usually an order of magnitude lower.

However, many organizations don't perform appraisals at all, and many more don't perform them effectively. Without adequate training and good team leadership, appraisal teams are prone to waste time, and tend to find a preponderance of minor defects. Without measurements and pro-active

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management, even the best appraisal process will not function close to its optimum performance levels. The net result is higher costs and lower yields than necessary. Unfortunately this situation is closer to the norm than the exception. Conversely, with good training, good team leadership, and with measurement driven management of the inspection process, it is possible to remove nearly all of a system's defects prior to the start of integration & test at a much lower cost than for a code & test life cycle.

If your organization is not performing appraisals, introducing them will bring a quick improvement in development cost, product quality, and schedule performance. There will also be soft benefits such as cross-training, knowledge transfer, and enhanced standards compliance.

If your organization is already doing appraisals, but you find yourself curtailing them to make schedule, or your development staff complains about them and says all the major defects are really found in test, then your need to stop and fix a broken process. It is almost certain that your appraisal process is ineffective and could very well be a waste of effort.

If your organization does not measure the effectiveness of its appraisal process, and use the measurements to manage the appraisal process to target performance levels, then it is almost certain that your process is not performing anywhere near its optimum level. There are many factors that degrade appraisal process performance. Do you know what they are? Are you managing them to optimum targets? If not, you won't get the performance you could.

Leading Inspections

Inspections can be one of the most effective means for early low cost defect removal. They can also be relatively ineffective, finding relatively simple defects at a comparatively high cost. Once the staff has been trained, inspection process performance depends primarily on the skills of the team leader. The team leader is responsible for planning the inspection, identifying the right team members, setting the entry and exit criteria, running the inspection meeting, and following up on the fixes. The team leader needs to:

- thoroughly understand what's possible and what's not in the context of an inspection;
- manage the inspection team for maximum effectiveness;
- to recognize process and personality problems and take immediate corrective actions.

The team leader sets a professional tone for the inspection process – something that can make it or break it. It takes a little courage and a lot of skill. Not everyone can do it. It takes a special combination of training, experience, and personality to make a good team lead. However, without trained team leaders, inspections are likely to be ill-prepared, ineffectual, and costly.

Defect Prevention

A formal software defect prevention process is the logical complement to software appraisals. In organizations that have effective defect prevention processes, defects found in the appraisals, testing,

and operations are recorded and analyzed using Six Sigma techniques. The results of the analysis are use to select and prioritize categories of defects for early detection or outright prevention. The typical prevention mechanisms are changes to the standards covering requirements, design, coding, and testing. These standards changes are used to "mistake-proof" (poka-yoke) the development process in order to prevent reoccurrence of the target defect types. Typical mechanisms for early detection are changes to inspection checklists, the inspection process, and the testing process.

Defect prevention is a team activity. It can be very effective at reducing cost and improving quality. It can also greatly improve the yield of the appraisal processes. When an organization institutes a defect prevention process, it puts the responsibility of analyzing and acting on defect data squarely in the lap of its development teams. This promotes an understanding the costs of the team's defects and challenges the team to prevent the defects in the first place, by taking ownership of product quality. It drives home the economics of high quality design and the value of the inspection process. It motivates collection of high quality measurements. And it creates an efficient closed-loop system where feedback is continually used to optimize the design and inspection processes.

Using a formal Defect Prevention process to eliminate common defects can dramatically improve productivity and product quality. In particular, there is a huge payback to preventing requirement errors. Most organizations have ample opportunity for quick improvement in this area.

Inspections and Defect Prevention form a highly synergistic pair of processes. Inspections provide the defect data necessary to drive the defect prevention process. Using the inspection data regularly for defect prevention activities motivate the developer to record complete and accurate defect data. Effective defect prevention lowers the cost of inspections (by eliminating or minimizing the need to inspect for whole classes of defects) and testing (by reducing the number of defects found during test) To get the full benefit of this synergy, PS&J recommends introducing defect prevention three to six month after introducing inspections.

Using PS&J

PS&J Software Six Sigma team members have extensive experience with introducing, managing, and optimizing software inspections and defect prevention activities. They can help you get effective inspection and defect prevention processes up and running with a minimum of cost and risk by

- Helping you to estimate costs and benefits and to set realistic process performance goals

- Helping you to develop a deployment plan

- Providing you with the necessary training

- Providing you with automated data collection and analysis capability process management

- Providing you with mentoring and advice as you move forward

- Helping you to manage the deployment to make your ROI goals

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We can also help you assess the effectiveness of an existing process and, if necessary show you how to improve its performance relative to cost and quality.

Our approach emphasizes setting quantitative process performance goals, measurement, and pro-active process management to meet those goals. Details are available in our publication "Optimizing Inspections Through the Application of Statistical Quality Management Techniques".