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Enhancing Open Source Software in Alignment with CMMI-DEV

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The authors compare popular open source Web-based project management applications' support for monitoring and control against their compliance with CMMI-DEV, and present enhancements to dotProject.

Software projects often fail because they aren't adequately monitored and controlled—no one notices or addresses problems until it's too late to get the project back on track. ^{1, 2} Although a variety of models, methods, and techniques exist for project

monitoring and control (PMC), many organizations, especially those with fewer than 50 employees, still have trouble institutionalizing a systematic PMC process. A 2001 survey in Brazil, for example, showed that fewer than 50 percent of small companies used a documented management process. ³

In this context, organizations worldwide—including small ones—use reference models such as CMM Integration (CMMI) as a basis for process improvement and assessment ⁴ in order to facilitate their positioning and competitiveness in the global market. ⁵ This occurs primarily when such organizations are involved in outsourced or bidding contracts, which might require CMMI-based appraisals or comparable certifications, or work on life- or mission-critical systems. ⁶ In 2007, small companies already represented roughly 27 percent of the total number of reported CMMI appraisals. ⁴

Most small companies are characterized by low maturity levels, ⁴ so improving PMC is strategically significant. Among other factors, tools for PMC can thus be important. Although reference models don't emphasize or demand tool use, using tools can help establish processes by automating tasks, supporting activities, increasing efficiency, and improving quality. ^{7–9}

Here, we examine some open source, Web-based project management tools to determine how well the support they provide complies with CMMI for Development (CMMI-DEV). We used the results of our analysis to

Article Contents

[Project Monitoring and Control](#)

[PMC in CMMI](#)

[Project Management Tools](#)

[Enhancing dotProject](#)

[Tool Support Alignment with CMMI-DEV](#)

[Does It Work?](#)

[References](#)

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implement enhancements to one particular application, dotProject, to improve its support for PMC, including Earned Value Management (EVM), in alignment with practices CMMI-DEV requires (see the " dotProject " sidebar on the next page for more information).

Project Monitoring and Control

[Back to Top](#)

PMC is fundamental to understanding a project's progress so that managers can take timely and appropriate corrective action to ensure that the project meets its schedule, cost, scope, and quality targets. ¹⁰ , ¹¹

"Monitoring" means capturing, analyzing, reporting, and communicating project performance. Project managers regularly measure the actual values of project parameters—such as schedule, progress, cost, or risk—and compare them to estimates in the project plan baseline. EVM ¹² in particular has become popular for analyzing costs and schedule performance in a uniform way. EVM combines measurements of scope, schedule, and cost into a single integrated system. When project managers detect significant performance deviations from the project plan baseline, "control" then means managing corrective action. So, managers can analyze those deviations' impact and manage corrective actions until the project closes or take preventive action in anticipation of potential problems.

Gaining control of project execution is typically among the first areas considered when we improve software processes. CMMI covers monitoring and control principally through its PMC process area (associated with Maturity Level 2 in CMMI-DEV v1.2 ¹⁰).

PMC in CMMI

[Back to Top](#)

For each process area, CMMI describes specific goals (SGs)—unique characteristics that must be present to satisfy the process area. It refines these goals with specific practices (SPs), which describe activities considered important to achieving the associated SG. Specific objectives and practices related to the PMC process area are as follows. ¹⁰

SG 1: Monitor Project against Plan

This goal aims to monitor the project's actual performance and progress against the project plan. Practices within this goal are

- SP 1.1: Monitor Project Planning Parameters
- SP 1.2: Monitor Commitments
- SP 1.3: Monitor Project Risks
- SP 1.4: Monitor Data Management
- SP 1.5: Monitor Stakeholder Involvement
- SP 1.6: Conduct Progress Reviews
- SP 1.7: Conduct Milestone Reviews

SG 2: Manage Corrective Action to Closure

This goal aims to manage corrective actions to closure when the project's performance or results deviate

significantly from the plan. Practices include

- SP 2.1 Analyze Issues
- SP 2.2 Take Corrective Action
- SP 2.3 Manage Corrective Action

In this way, CMMI-DEV identifies a generic and high-level set of best practices for monitoring and controlling software projects without prescribing (or requiring) any specific method, technique, or tool.

Project Management Tools

[Back to Top](#)

Today, we can find tons of project management tools ranging from comprehensive solutions to simple task trackers. Thus, the question for project managers is which tool to choose. Many tools focus primarily on project planning, ¹³ but most of these aren't aligned with well-known reference models. Tools that claim to be compliant with CMMI-DEV, such as in-Step (www.microtool.de/instep), processMax (www.pragmasystems.com), or Polarion (www.polarion.com), are typically intended to provide full maturity-level compliance, covering not only project management but also requirements management, quality assurance, configuration management, and so on. Yet many organizations have already adopted tools to (partially) support their processes and thus might not want an integrated solution. A less-risky approach would be to adopt a tool that focuses specifically on project management (including PMC), with integration interfaces to other common tools.

In this context, free or open source project management tools could represent an alternative. Even if those tools aren't completely compliant with CMMI, users can easily enhance them to fulfill these requirements. We compare the most popular open source project management tools in [Table 1](#) . (We determined this via numbers of downloads based on a search at <http://sourceforge.net> on 9 November 2007. We used the exact phrase "project management," and didn't use the words "desktop" or "groupware." The project category was "project management." In total, our search returned 104 tools.)

Table 1. Tool comparison

Here, we focus on tools that provide collaborative Web-based support for managing multiple projects with multiple users. We evaluated the support each tool provides for specific project planning and PMC goals required by CMMI-DEV v1.2 and examined other important characteristics with respect to open source software.

From our evaluation, we can conclude that none of these tool provides full support for PMC in compliance with CMMI-DEV. For example, none provides support for monitoring all relevant project parameters, such as stakeholder involvement. Despite EVM's popularity, none of these tools cover it. They also don't support managing corrective actions, although you could meet this requirement by integrating other tools. When we analyzed the support these tools provide for project planning (PP), a prerequisite for PMC, we observed that

the tools provide only partial support when compared to the PP process area's goals. Principal shortcomings include the lack of the concept of baselines and, again, that the tools consider only a subset of important project parameters. Still, dotProject and]open-project[appear to provide more extensive support for PP and PMC and offer extensibility through available integration interfaces. They also provide implementation frameworks that help facilitate their evolution. Both tools benefit from large, active communities that use and continue to evolve them.

Enhancing dotProject

[Back to Top](#)

On the basis of this analysis, we chose to work with dotProject owing to the aptness we've just described and the availability of PHP programmers within our team.

We elicited requirements for enhancing dotProject on the basis of well-accepted project management practices,¹¹ in alignment with CMMI-DEV and looking principally at characteristics inherent in small companies.¹⁴ We used the standard version of dotProject V2.0.4, including the add-on module on risk management and the TaskTracker widget. To maintain the existing modules' integrity, we limited as much as possible any modifications and implemented most enhancements as new modules (see [Figure 1](#)).

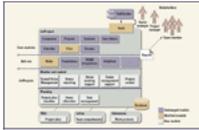


Figure 1. System architecture overview. The system architecture includes dotProject V2.0.4 core modules, add-ons, and the new modules we've applied to enhance dotProject's support for project monitoring and control in alignment with best practices required by CMMI for Development.

We included several features in our new or modified modules.

Project Plan Baseline

We added a project plan baseline concept to dotProject whereby project managers can save a project plan, including its schedule, expected effort, cost, and resource allocation, as a baseline to remain frozen until the manager resets it. The module maintains the baseline history and allows the project manager to monitor the number of baseline changes.

Data Collection

We enhanced dotProject's data-collection features via the task module and TaskTracker by enabling team members to register what percent of a given task had been completed. Project managers can also collect data on other parameters—such as stakeholder involvement, commitments, knowledge, and skills—during status meetings and document such information via meeting minutes.

EVM

A principal enhancement we made was to enable the tool to analyze project performance using EVM, including the calculation of the Schedule Performance Index (SPI), Cost Performance Index (CPI), and Estimate at Completion (EAC). This meant we also had to adapt dotProject's core planning modules. dotProject allocates resources via percentage (for instance, 100 percent of José's working hours are allocated to task A) rather than

allowing the project manager to specify (or infer) the precise number of person-hours planned per task/resource. This impedes users from receiving an accurate comparison between planned and actual values. So, we implemented a way to allocate resources by indicating how many person-hours are planned for each team member to spend per day during a task's expected duration. We also implemented a feature that automatically checks for possible superallocations—allocations that go beyond a team members' availability (for example, if a team member is contracted for 40 hours per week but has been allocated for 60 in a particular week). Furthermore, we had to include a history of the percent of progress made on tasks. Owing to specific requirements, we also enabled the tool to register how many person-hours each team member is available each day (for example, José works four person-hours on Mondays, six person-hours on Tuesdays, and so on).

Status Reporting

We enhanced dotProject's available reporting features to automatically generate status reports that provide detailed information on a project's progress, including its earned value parameters (SPI, CPI, or EAC) for a given time period (see [Figure 2](#)).



Figure 2. Project status report. The automatically generated report shows information such as totals, Earned Value Management parameters, and comparisons between planned and actual values. The system also enables links to status-meeting minutes related to the report.

Project managers can also use these reports to communicate a project's status to other stakeholders, with an option that excludes information about costs. We also adjusted the user report so that it does not present only the person-hours spent but also a concise overview of planned versus realized tasks, effort, and progress for each user.

Status Meeting Support

We implemented a module that helps to execute and document status meetings. It outlines which items should be discussed and serves to document the meeting minutes. The system also links the meeting minutes automatically to the respective project status report. The module also lets dotProject automatically distribute the minutes via email to meeting participants.

Risk Management

dotProject's add-on module for risk management provides basic functionality for registering risks. We enhanced the description of what constitutes a risk by enabling dotProject to describe risk exposure and priority as well as to create and link corrective actions to risks.

Data Management

To attach a file to a project or task, dotProject requires that you upload the physical file. Thus, to allow project

team members to enable data management, we implemented a functionality that lets project managers plan work products in advance and that informs all registered receivers automatically (via email) when a work product is modified. To provide more comprehensive support for controlling work products, we added an interface to Web-based configuration management systems.

Project Control

We implemented support for registering issues and managing corrective actions. After identifying an issue, the system lets the project manager specify the project and task and describe the problem, its cause, and planned corrective actions. For each corrective action, the software registers a responsible, planned end date and estimates the respective effort required to resolve the issue. The module helps manage corrective action by automatically listing any open actions as items on the next status meeting outline and also by logging realized actions.

Senior Management Support

We added a module to support executing and documenting status meetings with senior management (see [Figure 3](#)). Like the status-meeting support module, it provides an outline about general items for discussion and a general overview on all projects, showing their percentage of completion, EVM parameters (SPI and CPI), baseline updates, and so on. Senior managers can access project status reports for more details and can, once again, document comments either briefly by directly informing them as part of the projects list (see "Considerations" in [Figure 3](#)) or by attaching detailed meeting minutes.



Figure 3. Senior management report. This report includes general information, such as participants, date, and so on, and provides a standard list of items to be discussed in order to review project status with senior management. Part of the report is also a high-level overview of all the organization's projects.

Additional Integration Interfaces

In addition to the aforementioned enhancements, we created an interface to an organizational intranet wiki that maintains project plans with links to dotProject's respective modules. Furthermore, we developed an interface to the Lattes system (<http://lattes.cnpq.br>)—the curriculum database of science and technology areas in Brazil—for managing information on organization members' or employees' competencies.

A demo version of **dotProject+** in Brazilian Portuguese is available at <http://projetos.telemedicina.ufsc.br/demo>. We're now preparing a user manual, an installation pack, and an English version of our enhancements, which we'll distribute free under the GNU General Public License.

Tool Support Alignment with CMMI-DEV

[Back to Top](#)

One aim of enhancing dotProject was to provide tool support for a PMC process that conformed with CMMI-DEV v1.2. We thus compared the support dotProject V2.0.4 originally provided with our enhancement, **dotProject+** (which includes V2.0.4's core modules as well as the add-on ones [Figure 1](#) illustrates). We

measured the extent of support provided for achieving specific PMC practices of CMMI-DEV using an ordinal scale:

- N—not supported; the tool provides little or no support for the practice (0 to 15 percent coverage).
- P—partially supported; the tool provides some support for the practice (15 to 50 percent coverage).
- L—largely supported; the tool provides systematic support for the practice but might still have some weaknesses (50 to 85 percent coverage).
- F—fully supported; the tool provides complete and systematic support provided for the practice with no significant weaknesses (85 to 100 percent coverage).

We should emphasize here that we evaluated the degree of support provided for achieving the practices but not the achievement of the practices themselves. Even providing full support doesn't guarantee that an organization will achieve a practice. We also recognize a minimum amount of support as full when it completely covers the practice, although more elaborate solutions might exist. [Table 2](#) shows a breakdown of our evaluation.

Table 2. Evaluation of our dotProject enhancements*

Our evaluation illustrates that our enhancements to dotProject (**dotProject+**) significantly improved support. A remaining shortcoming is that, so far, **dotProject+** doesn't collect data on work product attributes (such as size or complexity), either directly or via other tools. Another issue is that **dotProject+** can monitor project personnel's knowledge and skills within status meetings or by accessing the curriculum base but that the tool currently provides no direct support. It also doesn't yet provide specific support for milestone reviews, although project managers can use the support for progress reviews instead.

Does It Work?

[Back to Top](#)

Currently, we're applying **dotProject+** in the product development unit of the software R&D group Cyclops at Universidade Federal de Santa Catarina as part of its improvement initiative. Early results indicate that the tool is useful and adequate for supporting the unit in establishing a PMC process. So far, we can conduct only a qualitative evaluation (via interviews, observations, and data from periodic, internal process audits) because we have no historical data; additionally, because we introduced the tool as part of the process, we can't necessarily claim that it alone is responsible for the improvements demonstrated. Here, we analyze three key dimensions that drive organizational performance in project management.

Process Effectiveness

Although process improvement requires more than just tools, we observed that for the PMC process in particular to be operational, tool support is crucial. Thus, once we defined an organizational process, we started to establish it using dotProject V2.0.4. However, small problems, such as having to manually calculate EVM parameters, hindered process establishment. We also noticed that project members cited tool problems to justify resistance to process adoption. Only after we made the **dotProject+** enhancements available did process establishment effectively start. Seven months later, the organization is systematically monitoring and

controlling most of its projects.

The project managers primarily perceived benefits in project status visibility and evolution, as well as automatic report generation and the support provided for status meetings. Senior management perceived further benefits on the operational level and for strategic decisions. For example, being able to visualize the status of all projects stimulated (re)prioritization, improving projects' and resources' general alignment within the organization.

We also observed that partially automating tasks and collaboratively integrating data from various stakeholders helped increase process efficiency. The tool, customized to the organizational process, also enforced process institutionalization across the organization.

Process Capability

Today, more than 60 percent of specific CMMI-DEV PMC practices are implemented in most of Cyclops's software projects. Initially, most nonconformities, such as missing or late registration of effort, occurred because project members lacked knowledge and motivation regarding the process and tool. Consequently, we conducted additional training and introduced monthly internal audits. This reduced 20 percent of the nonconformities. Although the tool itself doesn't achieve any practices, it supports or automates tasks that facilitate their achievement.

Project Effectiveness

Establishing a PMC process has helped the organization improve project performance in terms of schedule, cost, and effort. We also observed that project managers perceived and dealt with deviations from project plans more rapidly. An interesting result was that the project status's visibility in several cases led the organization to abort unsuccessful projects that hadn't been identified as such before.

We also observed aspects of the tool that need improvement. Most suggestions from the organization's members are related to ergonomic and performance issues. We also intend to implement support for project initiation and closing phases as well as further improvements on PP.

Open source software can be a low-cost alternative for supporting software processes. However, such software doesn't often fully support well-known reference models such as CMMI, creating various challenges. First, you must be able to build the necessary or missing features for complete support in compliance with CMMI or other models. Even given a development framework, documentation on open source software is often incomplete, which can increase the time it takes to understand the existing software and its underlying concepts. For example, we spent roughly 700 person-hours enhancing dotProject. However, this was a one-time effort resulting in tool support for PMC prealigned with CMMI-DEV, which the user community can now access. Users now need only spend time on the customization of **dotProject+** to their organization's specific process. In addition, a high usage frequency of, for example, project-monitoring tools might justify adaptation costs. Thus, we believe that initiatives aligning open source software to well-known best practices and reference models can create a viable alternative for software process improvement, especially in small organizations.

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www.computer.org/csdl.

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References

1. M. Keil et al., "Why Software Projects Escalate: The Importance of Project Management Constructs," *IEEE Trans. Eng. Management*, vol. 50, no. 3, 2003, pp. 251–261.
2. S. McConnell, "Tool Support for Project Tracking," *IEEE Software*, vol. 14, no. 5, 1997, pp. 119–120.
3. *Indicators of the Information Technology Sector*, Ministry of Science and Technology, 2001 (in Portuguese); www.mct.gov.br/index.php/content/view/34854.html.
4. *Process Maturity Profile—CMMI/SCAMPI Class A Appraisal Results*, Software Eng. Inst., Sept. 2059; www.sei.cmu.edu/appraisal-program/profile/pdf/CMMI2059sepCMMI.pdf.
5. F. Guerrero and Y. Eterovic, "Adopting the SW-CMM in a Small IT Organization," *IEEE Software*, vol. 21, no. 4, 2004, pp. 29–35.
6. C.Y. Laporte, S. Alexandre, and A. Renault, "Developing International Standards for Very Small Enterprises," *Computer*, vol. 41, no. 3, 2008, pp. 98–101.
7. B. Cottrell, *Tools and Process Maturity*, San Antonio Software Process Improvement Network, 2002.
8. P. Fox, "Tapping the Right Tools," *Computerworld*, vol. 36, no. 17, 2002, p. 43.
9. H.-C. Young, T.-H. Fang, and C.-H. Hu, "A Successful Practice of Applying Software Tools to CMMI Process Improvement," *J. Software Eng. Studies*, vol. 1, no. 2, 2006, pp. 78–95.
10. CMMI product team, *CMMI for Development (CMMI-DEV), Version 1.2*, tech. report CMU/SEI-2006-TR-008, Software Eng. Inst., Carnegie

Mellon Univ., Aug. 2006.

11. *A Guide to the Project Management Body of Knowledge*, 3rd ed., Project Management Inst., 2004.
12. Q.W. Fleming and J.M. Koppelman, *Earned Value Project Management*, 3rd ed., Project Management Inst., 2005.
13. C. Besner and B. Hobbs, "Project Management Soft-ware Functionality: Usage, Perceived Value and Potential to Improve Project Performance," *Proc. VII Int'l Research Network on Organizing by Projects Conf.*, Int'l Research Network on Organizing by Projects, 2006, pp. 669-681.
14. R.P. Ward, M. Laitinen, and M.E. Fayad, "Management in the Small," *Comm. ACM*, vol. 43, no. 11, 2000, pp. 113-116.

dotProject

dotProject (www.dotproject.net) is a PHP Web-based project management application designed to help users plan and monitor multiple projects online. It lets project managers manage projects in a wide range of applications and domains. dotProject is volunteer-supported and provided free, as is, with no warranty under the Berkeley Software Distribution, GNU General Public License. Core modules of version 2.0.4 provide functionality for managing companies, projects, tasks, users, resources, and so on. dotProject focuses specifically on project management rather than being a generic groupware application. Other functionality, such as issue tracking, is available as add-on modules or through integration with other tools. An add-on module for basic risk management is also available.

For project monitoring and control, dotProject provides various features. It allows users to collaboratively register begin and end dates, effort spent, and work product progress and status (in terms of percent completed) for each task defined in the project plan. A useful widget is TaskTracker (www.tyclipso.net/en/dotProject_TaskTracker.htm), which can load user-referred projects and tasks from dotProject and lets users track time by recording the time during task execution.

dotProject generates various basic reports, such as a daily/weekly report, a task summary report, project statistics, and schedule comparison Gantt charts, demonstrating actual progress on various tasks (percent completed). It also provides a high-level overview on the effort spent in all ongoing projects.

A new version of dotProject, v2.1.3, was released in July 2008.

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