Tailoring Reuse-Driven Processes In A Process Improvement Context

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There is now a good basis for organizations to undertake process improvement and reuse adoption as integrated initiatives. Based on work with Thomson-CSF in the context of the SEI Software Capability Maturity Model (CMM) and the SPC Reuse Capability Model (RCM), the correspondences, as well as useful distinctions, between these two has become clearer. This experience has shown that reuse adoption, though traditionally managed separately, is complementary to process improvement efforts. In addition, it permits an emphasis on process enhancement that anticipates a CMM level 4 capability.

The RCM was developed in the early 1990's at the Software Productivity Consortium (SPC) as part of a systematic approach to reuse adoption. It is an effective guide primarily to help organizations identify opportunities for improving a reuse-based process. It also provides criteria by which an organization can target a level of reuse capability that matches its particular needs and capabilities. However, the interaction between these two purposes and with the CMM has not been fully understood. Now, our work with Thomson-CSF has established that the critical success factors defined by the RCM can be entirely partitioned according to these two purposes.

Of the 60 factors defined in the RCM assessment model, 43 are concerned with issues of process improvement consistent with CMM concerns. However, these factors are relevant to an organization only if reuse is a specific goal of its software process. The other 17 factors provide the criteria an organization needs to define a tailored reuse-driven process, helping them to target a good level of reuse capability.

Of the 43 process improvement factors, 15 correspond to existing CMM goals but refine them further to address specific reuse-related concerns. These factors concern process definition and integration, measurement, continuous process improvement, training, technology innovation, quality assurance, configuration management, and intergroup coordination.

The other 28 process improvement factors identify criteria that help an organization improve aspects of its reuse practices that are outside the defined scope of the CMM. These factors concern creation and use of assets, definition of commonalities and variabilities, organizational commitment, legal and contractual constraints, and tool support. The CMM, in version 2, is being broadened to include some of these factors, primarily through a new level 4 key process area "Organization Asset Alignment" which directly addresses reuse-related issues.

To provide organizations with detailed guidance on how to achieve effective reuse, the Reuse-driven Software Processes (RSP) methodology was also developed at SPC in the early 1990's. All RSP processes consist of two distinct lifecycle activities of domain engineering and application engineering. The conceptual basis of any RSP process is the

formalization of commonalities and variabilities that characterize a set of similar products to represent a product family and an associated process for deriving instance products to meet diverse and changing customer needs.
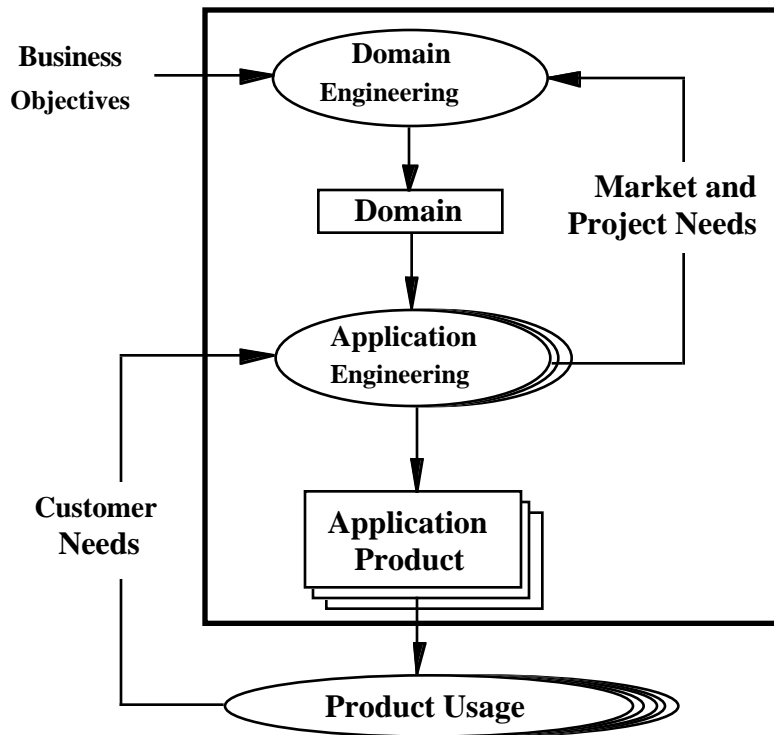
A Reuse-driven Process

A reuse-driven process is a framework for performing domain-specific engineering. The goal of domain-specific engineering is institution of software practices that are optimized to building products of a particular type. This optimization substantially improves productivity and product quality for creating those products but at the cost of limits on the capability to create other types of products. This focusing and standardization of effort is the key to systematic reuse, leading ultimately to a manufacturing discipline.

Although a reuse-driven process can be beneficially adopted by an organization at any level of CMM capability, version 2 of the CMM recognizes that the practices promoted by such a process are essential to quantitatively managed level 4 process maturity. However, the addition of the Organization Asset Alignment key process area at level 4 of the CMM may introduce some confusion. As with any process, the CMM and RCM process improvement factors can motivate improvements in a reuse-driven process. In this, some of the corresponding RCM factors ought to be addressed in attaining CMM levels 2 and 3.

The 17 process definition factors in the RCM concern differences in the types of reuse-based process that an organization may adopt. The RCM, in its implementation model, defines four types of reuse-based process: opportunistic, integrated, leveraged, and anticipating. These types, ordered by increasing cost-risk and benefit, provided a categorization for the diversity of approaches already envisioned by the RSP methodology as a family of processes. These process definition factors do not fit into the proper scope of the CMM because they involve a choice among equally valid alternative process conceptions; no one approach is best for everyone.

RSP had an informal characterization of its associated process family in terms of 4 concerns:

- The nature and degree of management integration between the domain and projects

- Whether project or customer needs, current or anticipated, motivate domain efforts

- The level of product integration established by the domain

- The tradeoff between cultural stability and process optimization

We see now that the 17 process definition factors of the RCM can give precision to this characterization. With our new understanding of the RCM factors, an organization can target a particular type of RSP process based on an analysis of its objectives in terms of just these 17 factors. On this basis, a tailored RSP process can be derived to reflect these four concerns and to accommodate an organization's preferred management and engineering practices.

After instituting use of a tailored RSP process, an organization can then use the RCM process improvement factors, in conjunction with the CMM, to become more effective in its use of the process. Periodic reconsideration of the process definition factors may motivate subsequent changes in an organization's RSP process for improved cost/benefit in their software practices.

References

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