Adding Goals for Reuse Practice to Project Plans

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Abstract

This position reports on the Software Technology for Adaptable, Reliable Software (STARS) Reuse Strategy Model (RSM), which is a planning aid for incorporating goals to foster reuse practices into projects. The RSM assesses the extent of change to reuse-based development and the extent of management and technological support for the change as well as identifying goals that further and improve the reuse practice and support. The RSM has seen trial application by the STARS demonstration projects that confirmed its utility as a project planning aid.

Keywords: Strategic Planning, Domain-specific reuse, reuse processes

Workshop Goals: Networking with reuse community to discuss how to influence project planning to better support reuse and to learn what metrics are being used on reuse-based projects.

Working Groups: Reuse management, organization and economics; Useful and collectible metrics;

1 Background

Ms. Margaret (Maggie) J. Davis is the technical lead for reuse on the Boeing STARS project, which was sponsored in part by ARPA under USAF contract F19628-88-D-0028. Ms. Davis has served in a lead capacity on the Boeing STARS project since its award in 1988. She provided management direction for the Boeing STARS Repository during its operation in 1988-1990; designed and coded a prototype Ada code review and understanding tool; developed an initial design for an asset library mechanism (ROAMS) built as a tightly integrated application on a software engineering environment integration framework; lead the design and implementation of a decision-based search capability for ROAMS; had the primary responsibility for authoring the STARS Reuse Strategy Model; and, has been deeply involved in the joint formulation and articulation of the STARS Conceptual Framework for Reuse Processes (CFRP) [1].

2 Position

In the course of planning the preparation phase of the ARPA Software Technology for Adaptable, Reliable Systems (STARS) demonstrations of megaprogramming, it became clear that the project teams needed more than documentation describing processes supporting or describing what is involved in domain-specific, reuse-based software development. In particular, they needed assistance in identifying project goals and metrics that were specific to reuse. Thus, it was decided that STARS efforts directed at contributing to evolution of a community-wide reuse maturity model would be diverted to meeting these immediate needs of the STARS demonstration teams.

Since the overall goals for the STARS demonstrations include (1) showing how reuse can be practiced and (2) assisting the organizations involved in transitioning to domain-specific, reuse-based software-intensive systems development, it was decided that the support from the reuse technology area to the STARS demonstration teams would be in the form of a project planning aid that supported assessment of current reuse practice, identification of goals for improving the current practice, and identification of metrics to measure progress against selected goals. This project planning aid is known as the STARS Reuse Strategy Model (RSM) [2] since it assists in the formulation of the reuse strategy to be followed on a project.

Unlike usual project goals that measure success in terms of delivering artifacts that meet specific standards of quality and functionality, goals identified by the RSM measure progress with respect to the management and engineering processes used and the managerial and technological context in which the project is carried out. Goals and metrics formulated relative to processes are similar to measures of success often used by continuous quality improvement initiatives. Goals and metrics formulated for the managerial and technological contexts of projects are similar to measurements on the progress of technology transition or institutionalization. Since there are organizations implementing continuous quality improvement within their business processes and introducing reuse as a new technology at the same time, the RSM should be applicable beyond the scope of STARS. That is, the RSM can be used to assess and track the extent of technological change (what reuse processes are practiced) and of supporting infrastructure for the new technology (context).

To add some simplifying structure to assessing reuse practice, the RSM identifies 32 individual indicators organized into five groups or dimensions. Each dimension focuses on some separable aspect or issue relative to reuse processes used and the context in which they are executed. Because it was not always possible to formulate each indicator to be completely independent of every other one, notes and heuristics for evaluating the interdependencies are provided.

The five dimensions used in the RSM are:

- Domain Stability (5 indicators),
- Organization Readiness (9 indicators),
- Experience with Domain-specific Knowledge (6 indicators),
- Usage of Technology for Reuse Processes (8 indicators), and
- Business Climate & Reuse Management (5 indicators).

Figure 1 depicts each dimension and its indicators as a separate column. There is no significance to the ordering of columns, nor the indicators within columns, nor is there any significance to the ordering of indicators across rows. The indicators used resulted from analysis of previous work on reuse maturity [3, 4], work in progress on reuse capability and adoption [5], and work in progress on articulating the STARS vision of reuse [1].

The basic steps of the procedure for assessment and goal identification are to:

- rate each indicator relative to a fixed, given scale;
- use the rating of each indicator as an index into a table of appropriate goals for improving that rating;
- use the transition question to determine if there is effort already being applied towards those goals;
- use the same table to identify measures of progress for each goal; and,
- use heuristics to check for consistency and to identify redundancy among the set of goals identified.

It is assumed that once assessment and goal identification has been completed, the set of goals will be evaluated relative to external constraints and transitions already in progress, will be arranged from high to low priority, and a subset of the highest priority goals will actually levied against the project. The assessment and goal formulation may be done by either a project management team or by a management team providing coordinated reuse strategies for multiple projects.

The RSM document supports the assessment and goal identification process by supplying a uniform set of tables that for each indicator provide:

- an assessment question and partially ordered scale for answering the question;
- a matrix of transition questions versus the scale values;
- a matrix of goals and progress measures versus the scale values; and,
- a set of notes or heuristics that help select the most appropriate answer to the assessment question or evaluate goals.

One of the indicator tables is shown in Figure 2. The assessment question is listed just above the matrix. The scale of possible answers is shown on the left side of the matrix as a letter paired with short descriptive text. Goals for improving the rating sit in the same row or in the rows below the rating value. A transition question that determines if the effort is already underway for meeting a particular goal lie in the same row as well as progress metrics appropriate to the specific goal. Finally, heuristics on assessing the indicator or on evaluating the goals identified appear as a set of notes below the matrix.

Since there is not a general consensus as to what reuse practices are consistently an improvement over another, the assessment scales are ordered by degree of sophistication of the practice. And, the reader is warned that greater sophistication is not necessarily better in the notes for each indicator whose assessment scale is known to be partially ordered.

Each of the STARS demonstration teams did a trial application of the RSM. The general conclusion from the teams was that the RSM helped them identify management and infrastructure issues and goals that they had not discovered in their top-down decomposition of strategic business objectives. They believed that doing the RSM assessment was useful if it was used for nothing more than raising issues that need to be addressed by reuse-based development projects. Further, at least two of the projects intend to use the RSM to measure their state of reuse practice going into and at completion of their demonstrations.

References

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3 Biography

Maggie Davis is Reuse Technology Area Lead for the Boeing STARS program, participating in joint STARS activities and leading the Boeing-specific reuse technology development. Other Boeing applied research projects Maggie has participated in include applying object-oriented and knowledge-based techniques to the problem of system integration testing, using graphical user interfaces to support timing and sizing analyses, and authoring a guidebook for the Air Force on software specification techniques. Prior to her Boeing career, Maggie worked as a scientific and systems programmer for a wholly-owned subsidiary of Shell Oil, Inc. that was developing thin-film, photovoltaic energy devices and for the marketing division of E.I. Dupont, Fibers. Maggie holds a M.S. in Computer Science from the University of Delaware.

1. Domain Stability	2. Organization Readiness	3. Experience with Domain-specific Knowledge	4. Usage of Technology for Reuse Processes	5. Business Climate & Reuse Management
1.1 Domain Age	2.1 Motivation for Reuse	3.1 Experience with building of systems that use this domain	4.1 Domain Modeling Technology Used	5.1 Costing/ Pricing
1.2 Volatility	2.2 Scope of Planning for Reuse	3.2 Experience with domain model	4.2 Asset Development Technology Used	5.2 Legal
1.3 Domain Model(s) Existence	2.3 Identification of Reuse Opportunities	3.3 Experience with reference or standard architecture	4.3 Asset Management Technology Used	5.3 Contractual
1.4 Standard or Reference Architecture Existence	2.4 Management Commitment to Reuse	3.4 Experience with set of domain components	4.4 Asset Qualification Technology Used	5.4 Domain Management
1.5 Supported off-the-shelf components available	2.5 Level of Reuse Advocacy	3.5 Effectiveness of domain asset set	4.5 Asset Classification/ Cataloging Technology Used	5.5 Domain Support
	2.6 Development Process Capability Maturity (SEI)	3.6 Effectiveness of domain asset classifications	4.6 Asset Identification/ Retrieval Technology Used	
	2.7 Reuse Accountability/ Effectiveness Measurement		4.7 Asset Tailoring/ Integration Technology Used	
	2.8 Training for Reuse		4.8 Integration of Tools with Processes	
	2.9 Reuse Learning			

Figure 1: RSM Indicators by Dimension

1. Domain Stability	**2. Organization Readiness**	**3. Experience with Domain-specific Knowledge**	**4. Usage of Technology for Reuse Processes**	**5. Business Climate & Reuse Management**
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Figure 2: Example Indicator Table