CALIFORNIA STATE UNIVERSITY
FULLERTON™

COLLEGE OF ENGINEERING
AND COMPUTER SCIENCE

Advanced Software Process

Part III: The Defined Process

14. The Software Engineering Process Group

Dave Garcia-Gomez
Faculty / Lecturer
Department of Computer Science

Course Roadmap

Part I: Software Process Maturity
- 1. A Software Maturity Framework
- 2. The Principles of Software Process Change
- 3. Software Process Assessment
- 4. The Initial Process

Part II: The Repeatable Process
- 5. Managing Software Organizations
- 6. The Project Plan
- 7. Software Configuration Management (Part I)
- 8. Software Quality Assurance

Part III: Defined Process
- 9. Software Standards
- 10. Software Inspections
- 11. Software Testing
- 12. Software Configuration Management (continued)
- 13. Defining the Software Process
- 14. The Software Engineering Process Group

Part IV: The Managed Process
- 15. Data Gathering and Analysis
- 16. Managing Software Quality

Part V: The Optimizing Process
- 17. Defect Prevention
- 18. Automating the Software Process
- *19. Contracting for Software*
- *20. Conclusion*

The Software Engineering Process Group

- Changing the SW Process
- The Role of the SEPG
- Establishing Standards
- The Process Database
- Technology Insertion Focal Point
- Education and Training
- Process Consultation
- Process Status and Assessment
- Establishing the SEPG

The Software Engineering Process Group

- In approaching the software process it is instructive to examine the way processes are handled in other fields.
- While there are vast differences between software engineering and the typical factory, software process development also requires some specialists to do the work.

Changing the Software Process

- Changing anything as complex as a software process must necessarily involve a host of factors, among which one of the most challenging is the need to change the way the software people do their work.
- Since change is difficult even without tight schedule pressure, it is not surprising that software process change is both painfully slow and haphazard.

Changing the Software Process

- Tasks for software process improvement:
  - Identify the key problems.
  - Establish priorities.
  - Define action plans.
  - Get professional and management agreement.
  - Assign people.
  - Provide training and guidance.
  - Launch implementation.
  - Track progress.
  - Fix the inevitable problems.

Changing the Software Process

- The Software Engineering Process Group(SEPG) is the focal point for the total effort involved in changing the SW process.
- Other people
  - Senior management
  - Line projects
  - SQA
  - Education, finance, and administration
  - Software professionals

The Role of the SEPG

- The SEPG has two basic tasks that are done simultaneously:
  - Initiating and sustaining process change
  - Supporting normal operations
- The SEPG may also serve as the spawning ground for other groups such as technology support, education, cost estimating, standards, and possibly even SQA.
  - Large software groups need professional support in all these areas, and, where it is not available, the SEPG can provide guidance until such functions are established.

The Role of the SEPG

- While projects must not be disrupted with excessive change, the software process should be viewed as continuous learning.
- Process change involves learning new methods and accommodating to the changing nature and scale of the problems encountered.

The Role of the SEPG

- Change is also needed to bring current software practice up to the level of current knowledge.
  - We typically know how to do our work far better than we are currently doing.
- Most software problems are caused not by lack of knowledge but by the lack of the discipline to apply the best known methods.
  - Building the disciplined practices to do every software task with precise correctness requires a painstaking improvement program.

The Role of the SEPG

- Changes are therefore a normal and continuous part of software management, and a key SEPG role is to ensure that these changes are effectively implemented.
- The SEPG should also serve as a consolidating force for the changes that have already been made and should support the projects as they use new methods, standards, and technology.

The SEPG as a Change Agent

- A change agent provides the energy, enthusiasm, and direction needed to overcome resistance and cause change.
- The SEPG fills this role by providing the skilled resources, the creativity, and the management leverage needed to make things happen.
- The decision to make the changes must rest with line management, but the SEPG should provide the technical guidance on what changes are most important.

The SEPG as a Change Agent

- When management approves the action plans, the SEPG takes the lead in launching the required efforts:
  - Providing leadership in getting them staffed
  - Supporting the work with needed information, training, and skills
- The SEPG also tracks action plan progress and informs management of status and major problems.

The SEPG Sustaining Role

- The continuing role of the SEPG can be divided into six categories:
  - Establish process standards.
  - Maintain the process database.
  - Serve as the focal point for technology insertion.
  - Provide key process education.
  - Provide project consultation.
  - Make periodic assessment and status reports.

Establishing Standards

- The SEPG is the focal point for establishing process standards.
- These include the product-related standards and the process-related standards discussed in the previous chapters.
- Since the SEPG staff cannot have sufficient resources or the resident expertise to develop all these standards, it must establish working teams with members drawn from the most involved groups.

Establishing Standards

- The SEPG standards role involves the following tasks:
  - The SEPG recommends the priorities for developing standards.
  - The SEPG should ensure that prior work on the subject is reviewed.
  - The standards development team should include available experts and users.
  - The final standard review and approval is the most important step.

Establishing Standards

- The SEPG standards role involves the following tasks:
  - The SEPG recommends the priorities for developing standards.
  - The SEPG should ensure that prior work on the subject is reviewed.
  - The standards development team should include available experts and users.
  - The final standard review and approval is the most important step.

The Process Database

- The process DB is the permanent repository for the data gathered on the SE process and the resulting products.
- This data provides the reference for improving estimating accuracy, analyzing productivity, and assessing product quality.
- It is used by process specialists, project professionals, the quality staff, and management.

The Process Database

- The types of information retained in the process DB:
  - Size, cost, and schedule data
  - Product metrics
  - Process metrics

The Process Database

- Considerations for an effective process DB:
  - The reason for gathering each piece of data must be stated.
  - To define the data, the exact meaning of each field must be specified, together will all the anticipated options and exceptions.
  - Simple and easy-to-use procedures are required forgathering the data, together with tools, forms, training, and assistance.
  - Means are also required for ensuring that the data is obtained in a timely way.
  - Means are needed to verify data accuracy.
  - Resources and procedures are required for entering the data into the DB.
  - Provision must be made for user access to and analysis of the data.
  - Provisions are required to protect and maintain the data.

Technology Insertion Focal Point

- Technology support for any reasonably large SE organization involves seven activities:
  - A process definition is needed to identify tasks used.
  - A set of requirements is developed for the needed support.
  - These requirements must be approved by the users, the people who will handle installation and support, and management.
  - A search is then made to identify commercially available tools that meet these needs.
  - An overall technology plan is developed.
  - A technology support group is established.
  - Education, training, and consultation must be provided.

Education and Training

- Education could also easily consume all the SEPG resources.
- The SEPG must serve as the focal point for process education and avoid being saddled with all the teaching responsibilities.
  - Ideally a full-time education group maintains a staff of volunteers, instructors, or consultants to do this job.
  - Where an adequately staffed education group is not available, knowledgeable professionals can generally be found to serve as volunteer instructors.

Education and Training

- Example courses:
  - Project management methods
    - How to plan, estimate, and track projects
  - Software design methods
    - The use of design languages, object-oriented design, and prototyping
  - Quality management
    - Methods for making quantitative quality estimates and plans
  - Design and code inspections

Process Consultation

- The key focus of the process group is on improving the practice of SE.
- They do this by working with software practitioners both to provide assistance and to stay current on the project's problems.
- If they do not stay current, they will not be able to relate to the practicing professionals.
- Another reason for SEPG consultation is that few projects can afford their own SEPG group.

Process Consultation

- The SEPG can be most helpful to the projectby consulting on:
  - The process data they should gather
  - The analyses and interpretation of the data gathered
  - Tuning the standard process to unique project needs
  - Assisting with the preparation of quality plans
  - Serving as experienced inspection moderators
  - Advising on the priority areas for technology insertion

Process Status and Assessment

- The SEPG is also responsible for understanding the current state of software practice and alerting management to key problems.
  - Awareness of how completely each project's process is defined
  - Knowledge of how the process is implemented
  - Judgment on when an assessment would be appropriate
  - Leadership in conducting assessments

Process Status and Assessment

- The items required to make senior management reviews effective:
  - Goals for process improvement
  - A comparison of the actual process state to prior plans
  - The status of the process improvement actions
  - Identified problems and recommended corrective actions
  - Recommended responsibilities for handling these actions

Establishing the SEPG

- The questions to address in setting up an SEPG are:
  - How big should the effort be?
  - Where does the staff come from?
  - Who should head it?
  - Where should it report?
  - What are the tasks for initial focus?
  - What are the key risks?
  - How is its effectiveness evaluated?

SEPG Size and Staffing

- While each organization has its own unique needs, a useful initial guide is to aim at full-time assignments to the SEPG of about 2 percent of the software professionals.
- For organizations of about a hundred or more software professionals, the typical range falls between 1 percent and 3 percent, with the prime determinants being the ability to recruit suitable candidates and the financial constraints of the organization.

SEPG Leadership and Reporting

- The SEPG leader must be a knowledgeable manager with a demonstrated ability to make things happen, the respect of the project professionals, and the support of top management.

SEPG Leadership and Reporting

- To select official agents for process change:
  - Agents should be enthusiastic about leading the change process.
  - Agents must be both technically and politically capable of understanding the problems and ensuring that effective solutions are implemented.
  - Agents need the respect of the people they are todeal with.
  - Agents must have management's confidence and support or they will not act with the assurance needed to get wide cooperation and acceptance.

SEPG Priorities and Risks

- The SEPG priorities should roughly follow those given, with initial emphasis on project planning and project management.
- The most important single guideline is for the SEPG to limit its focus to those tasks it can handle reasonably quickly and effectively.

Evaluating the SEPG

- There are many ways to evaluate staff and support groups like the SEPG.
- Some of the more common methods are to use advisory groups or periodically to poll the users and SW professionals for their opinions.
- While it is probably a good idea to do some of these things, perhaps the best approach is to judge the SEPG on how effectively it applies the software process maturity framework to its own work.

Evaluating the SEPG

- Level 2:
  - Does the SEPG have a plan for its work, a tracking system, and means to retain and control its work products?
- Level 3:
  - Have the SEPG professionals established a basic framework for their own work, including standards, procedures, and are view program?
- Level 4:
  - Does the SEPG measure the productivity and quality of its own work?
- Level 5:
  - Do they regularly assess their own activities for improvement opportunities and incorporate them in their working process.

References

Humphrey, Watts S., *Managing the Software Process*, The SEI Series in Software Engineering, Addison-Wesley, 1989. (29th Printing, May 2003) (ISBN 0-201-18095-2)