

# **Project Planning, Tracking & Oversight Tutorial Abstract**

## **Learning Objectives:**

At the completion of this tutorial, the student will have a basic understanding of how to plan and track a software project using a “living” software development plan.

## **Summary**

Join us for an interactive discussion on how to plan and track a software project using a “living” software development plan. We will explore the contents of a plan and ways to use those contents to manage and control a software development effort in the context of a Repeatable or Defined level software engineering organization. This is not some theoretical project-planning tutorial, at the end of the session we expect that you will have learned something that you can apply back at work on Monday.

## **Level and Orientation of the Audience**

This tutorial is for novice to intermediate level software professionals who wish to better understand how to plan and track real-world software projects. It is assumed that those attending this tutorial have had some exposure to project management and have a working knowledge of at least one software life-cycle model. Knowledge of US 12207 is a plus.

## **Project Planning, Tracking & Oversight Tutorial Bios**

Gregory J. Scott is a software manager at UNITED DEFENSE LP. with over thirty years of experience in the computer industry. He has managed software projects in Initial, Repeatable and Defined level organizations and has been the founding member of the Software Engineering Process Group (SEPG) in four organizations. Mr. Scott has participated in numerous Software Process Assessments (SPAs), Software Capability Evaluations (SPEs) and CMM-Base Appraisals for Internal Process Improvement (CBA-IPI) and holds a certificate as an ISO 9000-3 (TickIT) Lead Auditor.

Charles M. Fitzgerald is currently working as a Requirements Manager for a UNITED DEFENSE LP. software project. He has nearly twenty years experience in computer-based human productivity improvement tools and has co-authored a paper on world-class software engineering organizations. Mr. Fitzgerald is an independent consultant specializing in personal performance enhancement planning for potential world-class athletes.

Ann F. Hennon is on contract to UNITED DEFENSE LP. GSD's SEPG as a software process engineer. She has over ten years experience as a Continuous Improvement and Quality Management (CIQM) consultant to Silicon Valley's leading companies.

# Project Planning, Tracking & Oversight Tutorial

Gregory J. Scott  
Ann F. Hennon  
Charles Fitzgerald

SEPG 98 March 12, 1998

Slide 1

## Logistics

- Restrooms
- Emergency Exits
- Break Times
- Break Areas
- Lunch Area
- Pagers and Cell Phones - Silent/OFF

SEPG 98 March 12, 1998

Slide 2

## Who Are We?

- Gregory Scott, United Defense, San Jose, CA, gregory\_scott@udlp.com
- Ann Hennon, KAJON Systems, Inc., Campbell, CA kajon@ix.netcom.com
- Charles Fitzgerald, Performance Enhancement, Santa Cruz, CA cfitz@got.net

SEPG 98 March 12, 1998

Slide 3

## Agenda

- Introductions
- Requirements
- Size Estimation
- Cost and Schedule Estimation
- Risk and Critical Resources
- Tracking and Oversight

SEPG 98 March 12, 1998

Slide 4

## What is PT&O

- **Planning**
  - Requirements Analysis
  - Project Estimation and Planning
- **Tracking**
  - Comparison of Plan to Actual
- **Oversight**
  - Audit
  - Verification and Validation

SEPG 98 March 12, 1998

Slide 5

## Objectives

- **Basic understanding of how to plan a software project or the software component of system development.**
- **Basic understanding of how to track a software project or the software component of system development.**
- **Use of a “living” Software Development Plan**

SEPG 98 March 12, 1998

Slide 6

# Requirements Analysis

- What Are Requirements?
- Where Do We Get Requirements?
- What Do We Do With Them?
- What influences the type of requirements you collect?
- Who are Users?

SEPG 98 March 12, 1998

Slide 7

# Example of Ambiguity

- Create a means for protecting a small group of human beings from the hostile elements of their environment.
- Missing Requirements
- Ambiguous Words
- Introduced Elements

SEPG 98 March 12, 1998

Slide 8

# Relative Cost to Fix An Error

*Exploring Requirements, Quality Before Design Gause & Weinberg*

- | • Phase in which found | • Cost Ratio |
|------------------------|--------------|
| – Requirements         | – 1          |
| – Design               | – 3-6        |
| – Coding               | – 10         |
| – Development testing  | – 15-40      |
| – Acceptance testing   | – 30-70      |
| – Operation            | – 40-1000    |

SEPG 98 March 12, 1998

Slide 9

# Requirements Ambiguity

- Requirements Ambiguity Exercise
- Ann: Customer
- Charly: Consultant
- Greg: Recorder
- You: Engineering Teams

SEPG 98 March 12, 1998

Slide 10

## Requirements Ambiguity Exercise

- Estimate the cost to design and build “A transportation system”
- After each question the team will be given time to reach a cost consensus and report it to the recorder.
- Each teams submits a final bid on the transportation system and costs to design, develop and manufacture.

SEPG 98 March 12, 1998

Slide 11

## Domain Influences

- What influenced your transportation system selection?
- What influenced your costs?
- Did the make up of your team influence you decisions.
- Would the team have made different decisions if it contained other members?

SEPG 98 March 12, 1998

Slide 12

# Requirements Exploration and Management

SEPG 98 March 12, 1998

Slide 13

## Requirements Exploration

- Brainstorming
- Requirements Mapping
- Force Field Analysis
- Communications - vocabulary exploration
- Expectations
- Constraints
- Attributes

SEPG 98 March 12, 1998

Slide 14

## Requirements Management

- Software people involved with requirement definition
- Set of Allocated Requirements
- Stable requirements
- A process for changes to requirements
- Control, Track, Manage changes
- Impact analysis

SEPG 98 March 12, 1998

Slide 15

## User Requirements

- Price
- Time to market
- Physical characteristics
  - Size, weight, color, shape
- Usability
- Intimidation factor
  - VCR programming myth

SEPG 98 March 12, 1998

Slide 16

## User Identification Exercise

- Primary Users
- Secondary Users
- Support Users
- Favored Users
- Disfavored Users
- Top 5 Users

SEPG 98 March 12, 1998

Slide 17

## Requirements Identification Exercise

- Define Basics Requirements
- Define secondary requirements
- Define unstated requirements
- Define support requirements
- Are all your user requirements stated?

SEPG 98 March 12, 1998

Slide 18

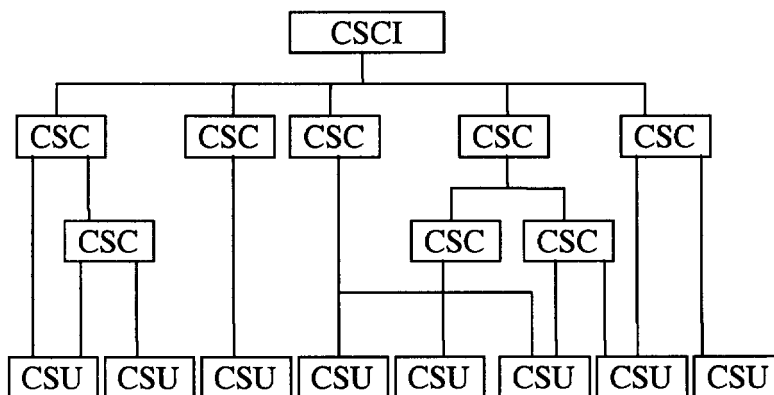
# Software Size Estimation

- How do you do size estimation?
- What are the techniques?
- What are the methods?

SEPG 98 March 12, 1998

Slide 19

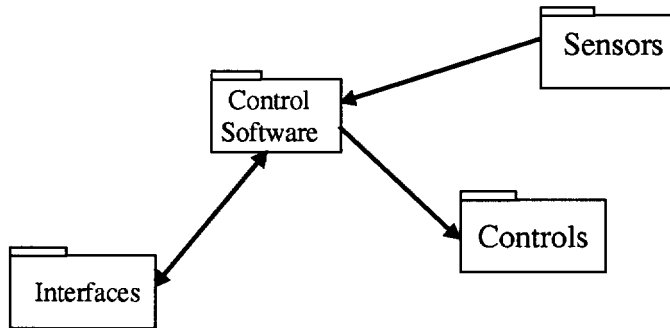
# Real Time Structured Analysis



SEPG 98 March 12, 1998

Slide 20

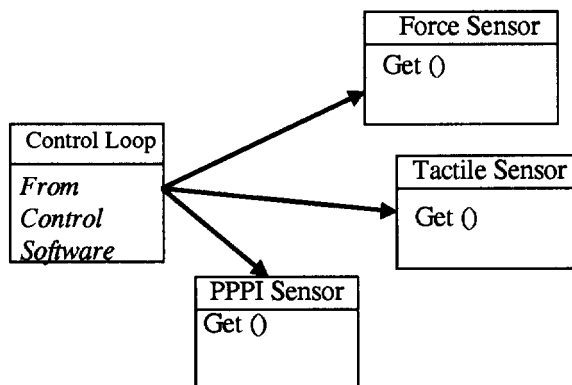
# Object Oriented Design 1



SEPG 98 March 12, 1998

Slide 21

# Object Oriented Design 2



SEPG 98 March 12, 1998

Slide 22

## Size Estimation Exercise

- Estimate the size of your team's project.
- Once you have the size at the lowest level
  - Sum up the sizes
  - Partition the project into manageable chunks
  - Check to see if the chunks are about the same size

SEPG 98 March 12, 1998

Slide 23

## Estimation Models

SEPG 98 March 12, 1998

Slide 24

# Types of Models

- **Constructive Cost Models**
  - COCOMO/REVIC
- **SEER**
- **Homebrew**

SEPG 98 March 12, 1998

Slide 25

# Model Distributions

- **10% Requirements**
- **18% Architecture Design**
- **22% Detail Design**
- **16% Code Generation and Test**
- **18% Software Integration and Test**
- **16% System Integration and Test**

SEPG 98 March 12, 1998

Slide 26

## Hours per 100 SLOC

- 14 Requirements Analysis
- 27 Architecture Design
- 34 Detail Design
- 26 Code Generation and Test
- 31 Software Integration and Test
- 26 System Integration and Test
- 159 Total

SEPG 98 March 12, 1998

Slide 27

## Hours per KSLOC

- 124 Requirements Analysis
- 238 Architecture Design
- 300 Detailed Design
- 227 Code Generation and Test
- 269 Software Integration and Test
- 227 System Integration and Test
- 1,385 Total

SEPG 98 March 12, 1998

Slide 28

## Hours per 10 KSLOC

- 1,083 Requirements Analysis
- 2,075 Architecture Design
- 2,617 Detailed Design
- 1,985 Code Generation and Test
- 2,346 Software Integration and Test
- 1,985 System Integration and Test
- 12,091 Total

SEPG 98 March 12, 1998

Slide 29

## Labor Estimation Exercise

- Estimate the labor needed for you project based upon your size estimates.
- Use the REVIC outputs
- These estimated do not include SQA, SCM, SPI
- Perform a sanity check based on some projected productivity rate.

SEPG 98 March 12, 1998

Slide 30

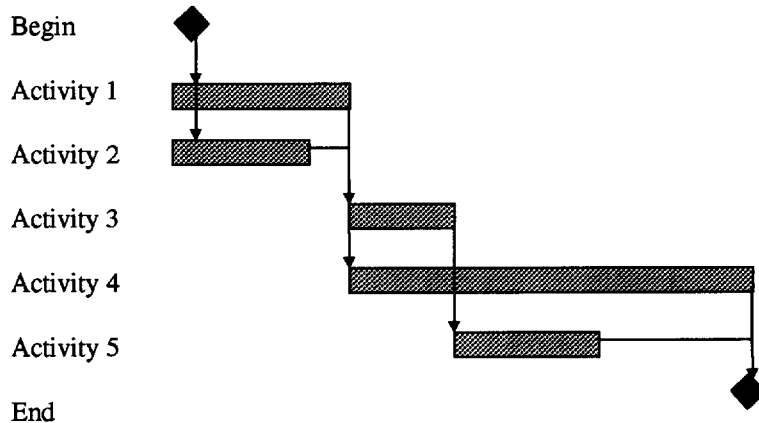
# Schedule Estimation

- 7 hour work day
- No Overtime
- Schedule Compression Costs
- Schedule Expansion Costs

SEPG 98 March 12, 1998

Slide 31

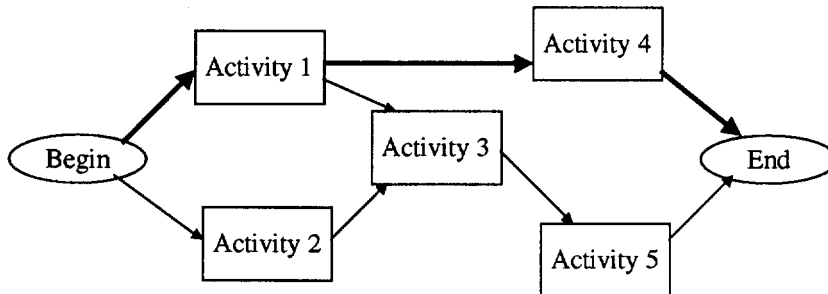
# Gantt Charts



SEPG 98 March 12, 1998

Slide 32

## PERT Charts



SEPG 98 March 12, 1998

Slide 33

## Scheduling Exercise

- Use PERT or Gantt
- Layout schedule for project
- Remember Holidays

SEPG 98 March 12, 1998

Slide 34

## Cost Estimation

- Start with labor hours from model
- Determine Skill Mix and Labor Rates
- Add SCM, SQA, and SPI
- Infrastructure
  - Development Environment
  - Test Environment
- Need Other Resources?

SEPG 98 March 12, 1998

Slide 35

## Risks

Risk	Prob.	Weight	Score	Mitigation
Turnover	10	9	90	Work with HR People CMM <sup>sm</sup>
Interface Instability	9	2	18	Defer until late in Design
Office Products	5	5	25	Work with IS
Test Facility	3	10	30	Build Test structures

SEPG 98 March 12, 1998

Slide 36

## Critical Resources

- What are your critical resources?
- Facilities?
- Do you have critical computer resources?
- Do you require special facilities?
- Do you require special skills?

SEPG 98 March 12, 1998

Slide 37

## Test

- What do you test against?
- How do you perform Software Qualification Testing?
- Build a test plan
- Build test descriptions
- Maintain test data and test reports

SEPG 98 March 12, 1998

Slide 38

# SCM

- What levels of SCM do you need?
  - Development SCM
  - Product SCM
  - Multiple Baselines
- What type of SCM library do you need?
- Software configuration control board
- Engineering review board

SEPG 98 March 12, 1998

Slide 39

# SQA

- Write a Software Quality Assurance Plan
- Process Audit Schedule
- Product Audit Schedule
- Interface with SCM
- Problem Resolution Process

SEPG 98 March 12, 1998

Slide 40

# SPI

- Software Engineering Process Group
- Software Process Improvement Group
  - Project Representatives
  - SQA
  - SCM
  - Test
- Lessons Learned

SEPG 98 March 12, 1998

Slide 41

# Tracking and Oversight

SEPG 98 March 12, 1998

Slide 42

## Infrastructure

- Track over time
- Look for new needs
- Dispose of unneeded items
- Just in time resources
- Acquire office space in a timely manner
- Critical Facilities

SEPG 98 March 12, 1998

Slide 43

## Policies and Procedures

- Repeatable Level of Process Maturity
- Defined Level of Process Maturity
- Company Operating Procedures
- ISO 9000
- ISO 12207

SEPG 98 March 12, 1998

Slide 44

# Software Development Plan

- Project
- Software Engineering
- Test
- SCM, SQA, SPI
- Tailored Processes
- Activities
- Metrics

SEPG 98 March 12, 1998

Slide 45

# Budget

- Consistent with process
  - SCM
  - SQA
  - SPI
- Consistent with size and scope of project
  - Can you accomplish all the work?
  - Can you document the work?

SEPG 98 March 12, 1998

Slide 46

## Staffing and Skill Mix

- Do you have the staff in house?
- Can you hire fast enough?
- Can you hire the right people?
- Can you hire the right skills?
- Can you train to get the right skills?
- Can you retain the people and skills you need?

SEPG 98 March 12, 1998

Slide 47

## Responsibilities

- Responsibilities defined?
- Responsibilities explicitly assigned?
- Completion criteria identified?
- Entrance criteria identified?

SEPG 98 March 12, 1998

Slide 48

# Training Plan

- Must be tied to schedule
- Organization training
  - Process
  - Project requirements
- Project specific training
  - Domain specific
  - Personnel development

SEPG 98 March 12, 1998

Slide 49

# Domain Training

- Must be tied to schedule
- Office environment
  - Win95
  - Office 97
  - Microsoft Access 7.0
- Project specific training

SEPG 98 March 12, 1998

Slide 50

# Requirements Tracking

- Requirements Manager
- Requirements Tracking Tools
- Product Specification
- Requirements Volatility
- Requirements Traceability
- Test to Requirements

SEPG 98 March 12, 1998

Slide 51

# Size Tracking

- Estimated Sizes
  - Code
  - Documentation
  - Critical Resources
- Actual Sizes Tracked Against Estimates
- Replan
- Manage Size

SEPG 98 March 12, 1998

Slide 52

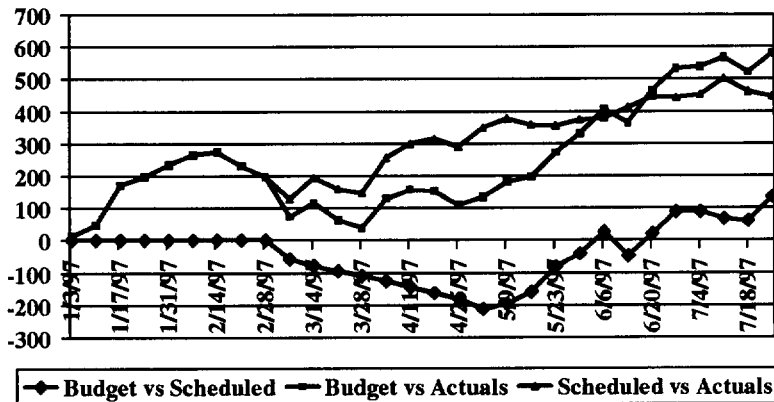
# Cost Tracking

- Labor Costs
- Infrastructure Costs
- Management Costs
- Support Costs
- Track Estimates Against Actuals

SEPG 98 March 12, 1998

Slide 53

# Labor Cost Tracking



SEPG 98 March 12, 1998

Slide 54

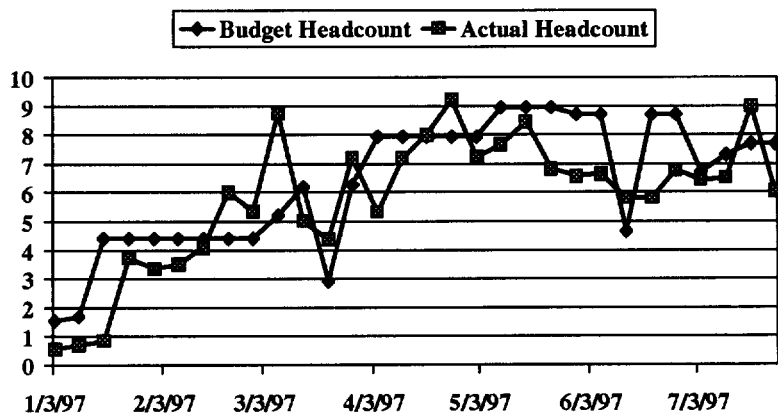
# Schedule Tracking

- Milestones
- Decompose to 3-5 day inch stones
- Track prediction against actual

SEPG 98 March 12, 1998

Slide 55

# Headcount Tracking



SEPG 98 March 12, 1998

Slide 56

## Risk Tracking

Risk	Prob.	Weight	Score	Mitigation
Turnover	10	9	90	Work with HR People CMM <sup>sm</sup>
Interface Instability	9	2	18	Defer until late in Design
Office Products	5	5	25	Work with IS
Test Facility	3	10	30	Build Test structures

SEPG 98 March 12, 1998

Slide 57

## Critical Resource Tracking

- Are these still critical resources?
- Drop those overtaken by events.
- New critical resources?

SEPG 98 March 12, 1998

Slide 58

## Tracking and Oversight Measurement

- Time spent on tracking and oversight
  - Engineering Project Management System
  - MS Project
  - MS Excel
- Money spent on tracking and oversight
  - Management tools
  - Plan updates

SEPG 98 March 12, 1998

Slide 59

## Tracking and Oversight Verification

- SQA functions
- Process audits
- Product audits
- Internal verification and validation
- Documentation supporting activities

SEPG 98 March 12, 1998

Slide 60

## Internal Reviews

- Team level Reviews
  - weekly
  - activities completed and planned
- Project level reviews
  - Monthly
  - progress reporting
- Functional level reviews
  - Monthly
  - Staffing and Skill needs

SEPG 98 March 12, 1998

Slide 61

## Project Reviews

- Monthly
- Scheduled activities completed
- Scheduled activities planned
- Staffing and Budget
- Risks
- Inter-group coordination
- Project training

SEPG 98 March 12, 1998

Slide 62

## Functional Reviews

- Monthly
- Staffing
- Skill mix
- Training plan
- Project progress
- Risks

SEPG 98 March 12, 1998

Slide 63

## Joint Technical Reviews

- Major Milestones and As Needed
  - Requirements Review
  - Architecture Review
  - Design Review
  - Qualification Testing
- Technical Progress
- Approval to continue

SEPG 98 March 12, 1998

Slide 64

# Peer Reviews

- Software work products
  - requirements documentation
  - design documentation
  - test plans and descriptions
  - code
- Formal inspections
- Review of product not person

SEPG 98 March 12, 1998

Slide 65

# That's All Folks

## Thank You!

SEPG 98 March 12, 1998

Slide 66