

Going Beyond the Numbers— The Usefulness of Qualitative Data on Software Development Projects

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Topics

- 1 Quantitative Approach
- 2 Qualitative Approach
- 3 Qualitative Analysis Process
- 4 Qualitative Analysis Examples
- 5 Lessons Learned/ Experiences
- 6 Applications
- 7 Contact Information, References

Topics Covered

- What is a quantitative approach
- What is qualitative approach to analysis and why would you want to do it?
- The qualitative analysis process
- Examples using qualitative analysis
 - Analyzing process assessment documents for trends
 - Understanding effort fluctuations
- Lessons learned
- Where to go for more information

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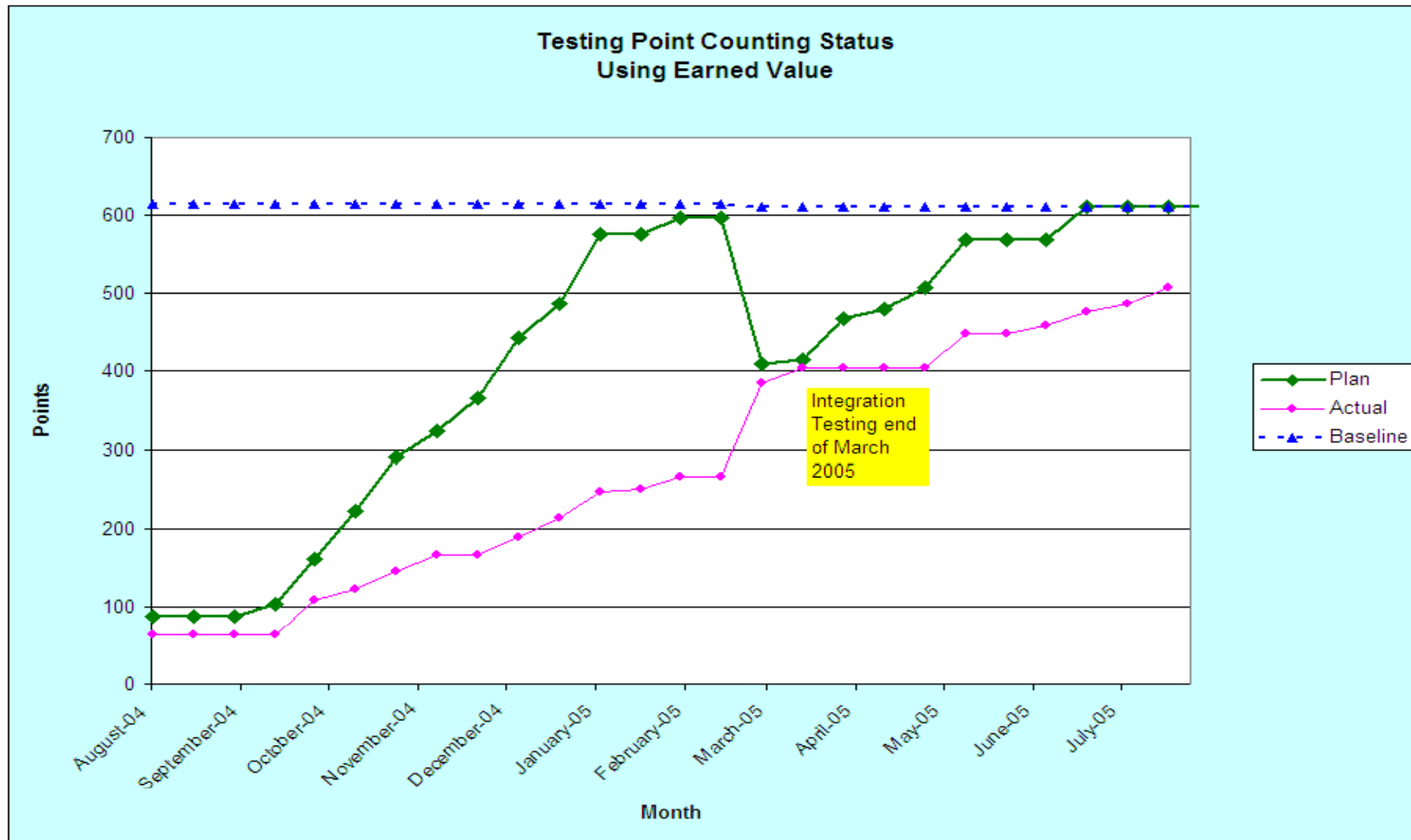
Quantitative Approach

- “Management by Metrics”
- Traditional measures:
 - Cost
 - Schedule
 - Size/SLOC
- Quantitative data:
 - Help to spot trends over time
 - Give an overview of *what* happened
 - Don’t provide the *why*

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Quantitative Approach



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Quantitative Approach

- What we're used to seeing
- Gives a lot of information
 - Easily allows the user to see how the project did compared to plan and baseline.
- But leaves some things out
 - Doesn't say why the curve looks like it does.
- For example, it makes a difference to know that the dip around March 05 was caused by a replan

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Qualitative Approach

Definitions:

- **Qualitative data**
 - Data in the form of text and pictures, not numbers
- **Qualitative analysis**
 - Analysis of qualitative data in order to discover trends, patterns, and generalizations
- **Rich data**
 - Includes a lot of explanatory and context information

1 Quantitative Approach

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Qualitative Approach

- Provides the *why* by incorporating
 - Rich description
 - Context
 - Intangible, unquantifiable details
 - Special cases
 - The unexpected
- What it gives you:
 - Provides a complementary view to quantitative metrics
 - Opportunity to clarify and explain findings
 - Better incorporation of the human element
 - Can lead to improvements for training, management, and a program's culture

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Qualitative Data

- Remember that any text can be qualitative data
- Some useful data comes *naturally* from the development process:
 - Status reports and presentations
 - Defect logs
 - Project schedules
 - Memos
- Other types of data can be collected for specific purposes:
 - Interviews
 - Surveys
 - Debriefs

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Qualitative Analysis Process

- Highly iterative and flexible
 - But still rigorous
- Labor intensive
 - But engaging and interesting
- Basic steps:
 - Deciding on categories of interest
 - “Coding” textual snippets into categories
 - Finding patterns across categories and sources (aided by visualization)
 - Iterating

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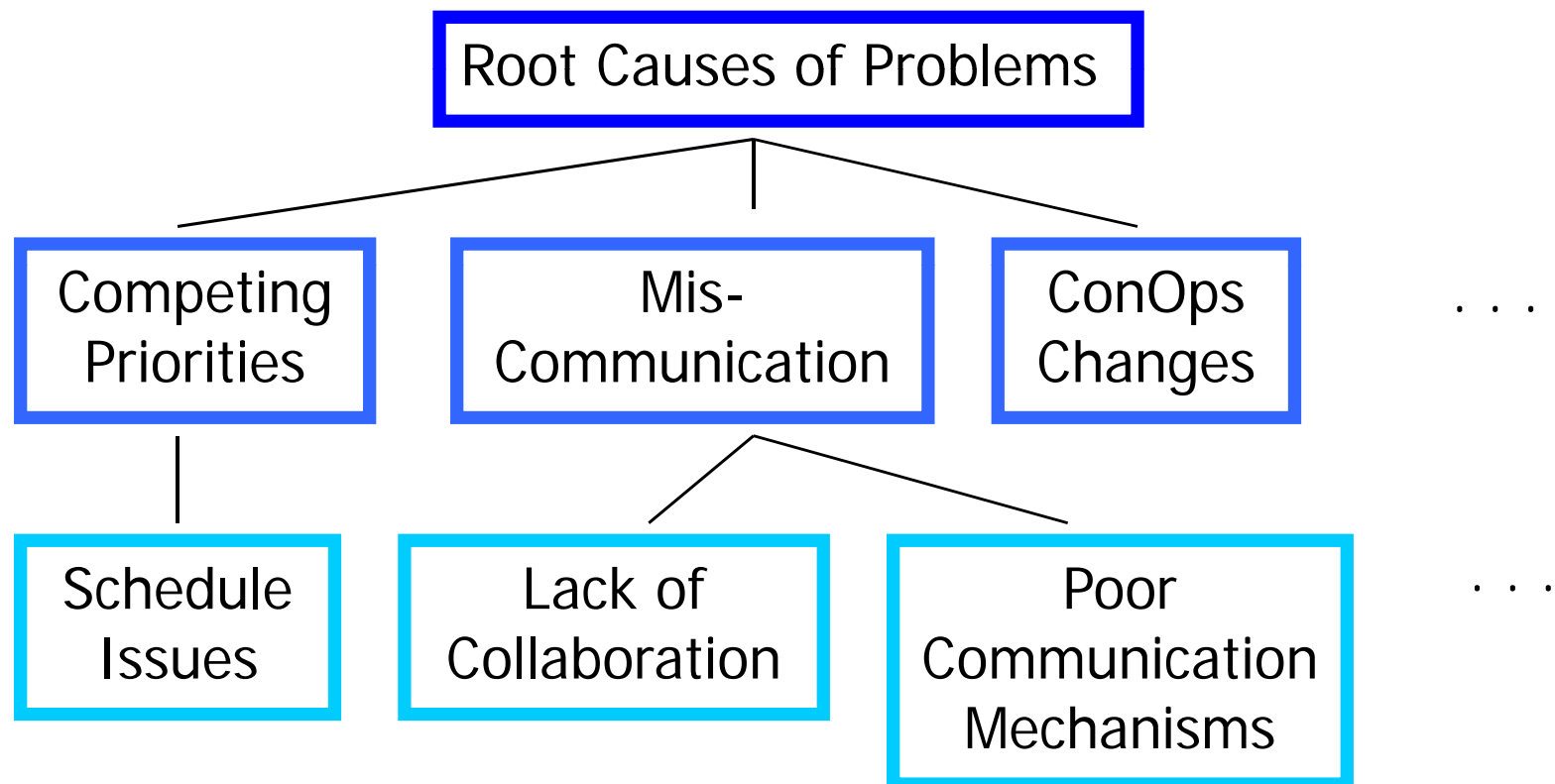
Qualitative Analysis: Process Assessment Example

- Analyzed assessment findings conducted on large government system acquisition programs
- Dataset covered:
 - 44 Programs
 - 1774 findings (positive and neutrals only)
- Goal of analysis:
 - Understand what are the recurring issues that contribute to project success / failure
 - Use these findings to identify areas of improvement, e.g.:
 - ❖ Better training
 - ❖ Areas where tool support needed

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Process Assessment Example: Step 1: Deciding on categories

- Categories can be hierarchical
- Start with the obvious and iterate/refine



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Qualitative Analysis Process: Step 2: Coding

- The mechanics of coding
- Low tech
 - Document markup (colored highlighters / post-its / etc...)
 - Photocopies, scissors, and envelopes
- Medium tech
 - MS Word comments
 - Excel spreadsheets
- High tech – qualitative analysis software
 - NVivo
 - Atlas TI

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Process Assessment Example: Step 2: Coding

From a program assessment:

Schedule risk

Program manager's comments:

- Timely completion of key program documentation may impact the full fielding decision. The management office has developed an aggressive integrated product team approach to completing these documents that will result in completion prior to the targeted 2nd qtr review.
- Service staffing provided through matrix support agreement remains below optimal levels. Of critical concern is the lack of [a key stakeholder's] functional analyst.

Collaboration

Qualitative Analysis Process: Step 3: Finding Patterns

Visualizations:

- A tool for analysis
- Can be a step towards quantification
- Useful as pointers to
 - interesting parts of the data
 - potential relationships
 - issues to study further
- Maps – boxes and lines; show causal, temporal, or other relationships between concepts
- Matrices – uses two axes to show relationship between two concepts coded into discrete categories
- Other types of visualizations limited only by imagination

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Qualitative Analysis Process: Step 3: Finding Patterns

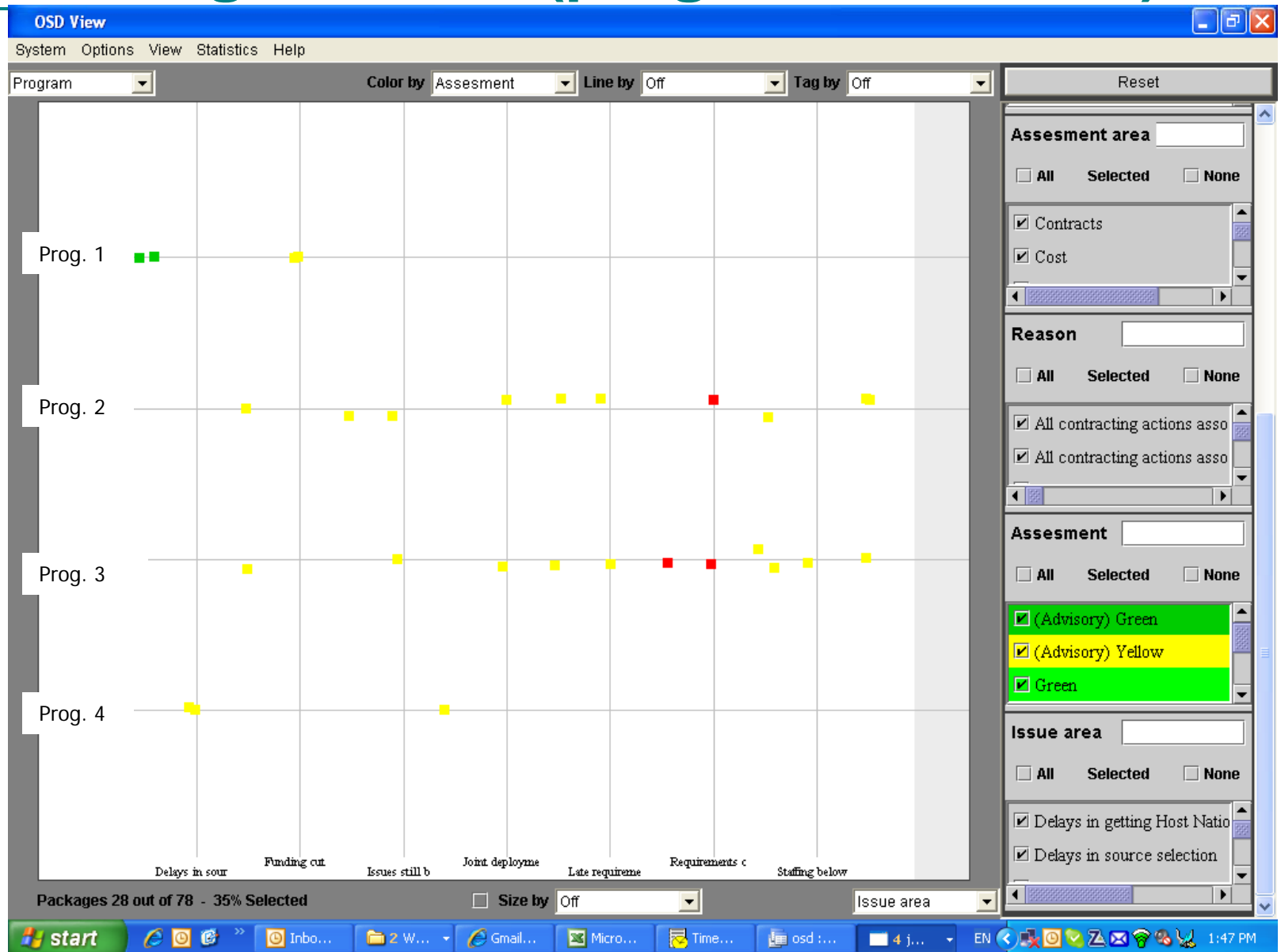
Example analyses:

- Programs x issue area
 - Which programs have the most issues in different areas?
 - What types of issues are consistently most / least severe?
- Date x assessment area (same program)
 - Which assessments changed over time?
 - How did issues evolve?
 - What were the reasons for those changes?

Qualitative Analysis Process: Finding Patterns (programs x issues)

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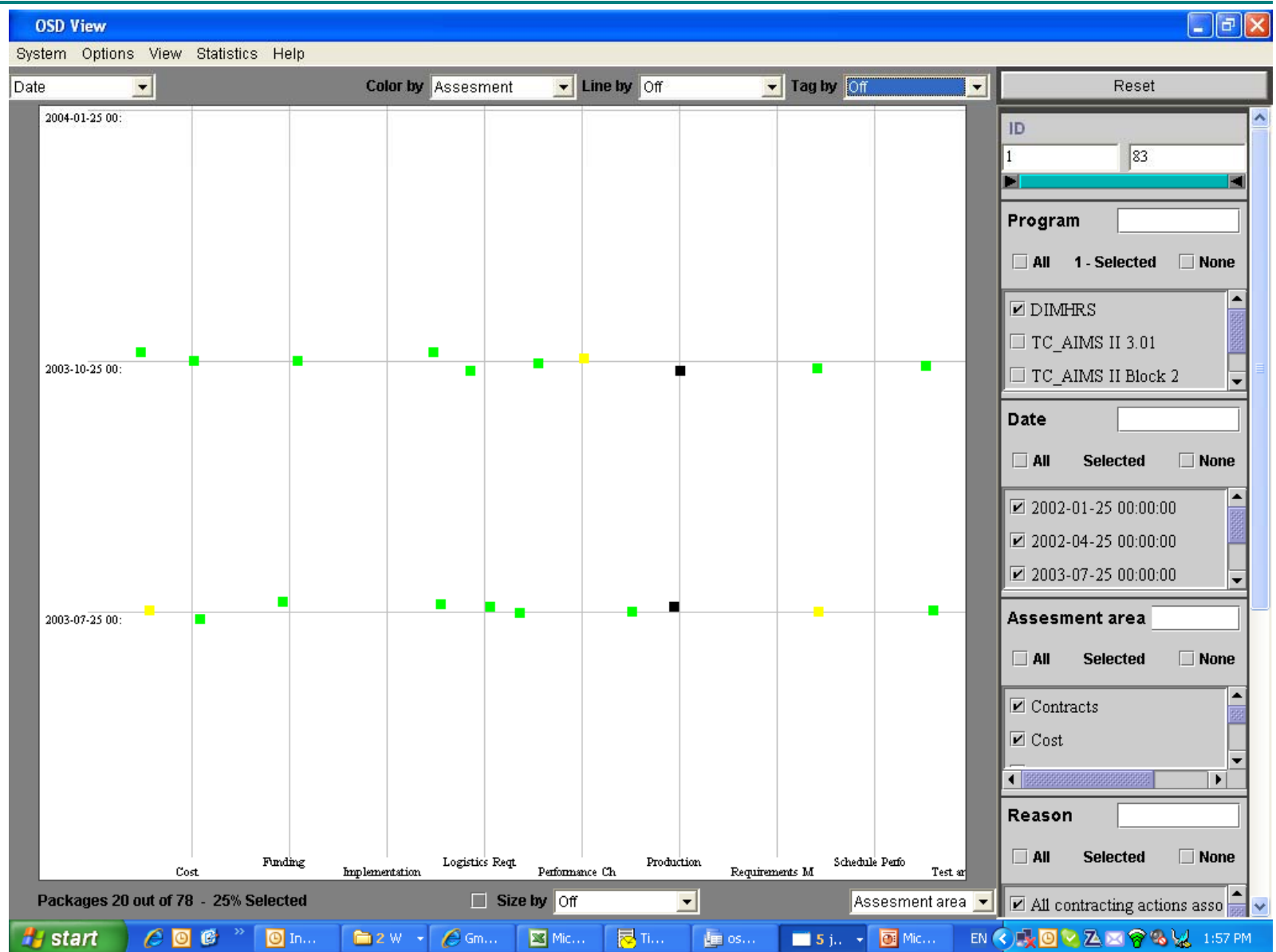
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Qualitative Analysis Process: Finding Patterns (date x assessment)

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Qualitative Analysis Process: Throughout: Iteration

Not a “waterfall” process – Need to keep revisiting steps as:

- Coding helps the analyst understand missing categories
- Looking for patterns raises new questions that require new categories
- Always keep the big picture in view
 - Importance of understanding context
 - Holistic approach to analysis

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Qualitative Analysis: Project Timeline Example

Background:

- 15-month development effort
- About 12 people
- Initial effort estimates made, but effort reporting was very coarse-grained

Goal of analysis:

- Get a finer-grained understanding of effort level

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Qualitative Analysis: Project Timeline Example

- Data sources:
 - Weekly status reports
 - Monthly FTE reports
 - Build delivery documents
 - Interview with team lead
- Approach:
 - Use existing data to create a project timeline visualization
 - Use timeline as a basis for team lead interview

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Project Timeline Example: Step 1: Deciding on Categories

- Initial categories for coding:
 - Build delivered
 - Build deadline
 - Replan
 - Redesign
 - Factors affecting effort level

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Project Timeline Example: Step 2: Coding

Build delivered

From some weekly status reports:

- Build 2 was declared complete; 122 fps are missing from Build 2; after this week Build 2 will no longer be tracked separately

Factors affecting effort level

- Development team has been putting in extra hours in 2007 to partially make up the time lost to vacations. Additional resources were brought in to support code reviews and operational hardware assembly.

- they have removed classes because they are no longer needed

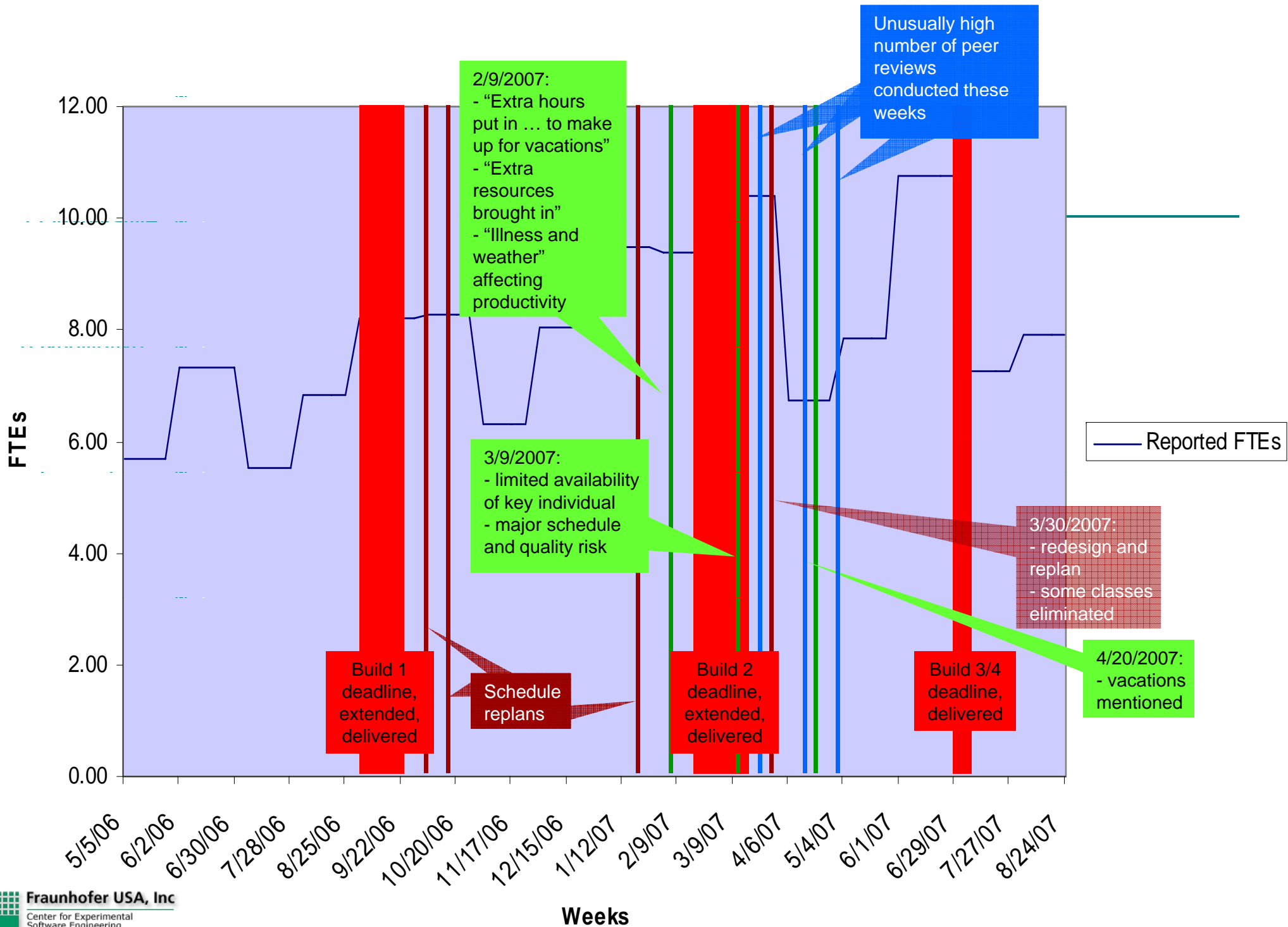
Redesign

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Project Timeline Example: Step 3: Looking for patterns

- Coding organized in a spreadsheet
- Basic chart drawn from monthly FTE reporting
- Other “events” drawn on top
- Resulting visualization...



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Project Timeline Example: Iteration

- Next step: Interview with team lead
 - For each event on timeline,
 - ❖ Is the date correct?
 - ❖ Is it described correctly?
 - ❖ What was the impact of this event on the project's progress?
 - ❖ Was there anything unusual or unexpected about this event?
 - Are there other similar events we've missed?
 - How did the headcount change over time?
 - How did effort ebb and flow over the course of the project?
 - When were the most stressful times during the project?

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Project Timeline Example: Steps 1 and 2 (second iteration)

- Coding the interview data
- Initial categories:
 - Low-effort periods
 - High-effort periods
 - Long hours
 - Stress
 - Personnel issues
 - Effort reporting

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Project Timeline Example: Step 3 (second iteration)

- Look for consistencies and inconsistencies between our analysis of status reports and the team lead's responses
- Infer finer-grained information about effort level
- Goal: test accuracy of initial effort estimates

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Lessons Learned/Experiences

- Data is on hand
- Tricky to come up with categories, but you don't have to get it right the first time
- Get more info out of it than you expect to
- Be ready for (and open to) surprises

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Lessons Learned/Experiences: Coding

- Create an initial list of categories and evolve
 - If an existing coding scheme can be adapted, consider using it
- Develop categories that are:
 - Focused
 - Objective (where possible)
 - Context independent (where possible)
 - Explicitly defined
 - Easy to record

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Other applications of qualitative analysis

- Root causes of problems
- Success factors
- Process improvement
- Interrelationship of “measures”
- Explanation of anomalies in quantitative data
- Post hoc analysis of “surprises”
- Reality check on quantitative measures

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Questions



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