Metrics for Your CMM Journey: A Second, Third and Fourth Perspective on Measuring Software Projects and Process Improvement

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Change Is the Only Constant…

- Process Improvement means change
  - Level 1, Level 2, Level 3
  - Organizations don't change evenly
    - Because people don't change evenly
- Measurement evolves over time
  - What's important changes over time

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Goal-Question-Metric

- Use GQM to define your measurements
  - Goal: What do you want to accomplish?
  - Question: What questions do you have to answer to know if you've met the goal?
  - Metric: What measurement will answer the question, so that you know if you've met your goal?

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Measurement Is Observation

- Measure what makes sense
- Measure what you want more of
  - DeMarco's principle: Effort moves to what is measured
- Measure in the aggregate
  - Never measure a single person
- Display information in the simplest way possible, but no simpler

Level 2: Repeatable Projects

Area	Goals
Requirements Management	• Baseline Requirements • Consistency between requirements and project
Project Planning	• Estimates used for planning and tracking • Commitments planned and agreed to
Project Tracking and Oversight	• Actual results are monitored • If problems arise, take actions to address problems • People who do the work plan the work
Software Quality Assurance	• SQA activities are planned • Objective adherence to applicable standards… • SQA results are sent to relevant staff • Senior management resolves issues when necessary
Software Configuration Management	• SCM is planned • Work products are identified, controlled, available • Changes are controlled • Publicize software baseline information

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Realities of Level 2 Organizations

- They come from Level 1 organizations
  - "Tell us what you want"
  - "Give us enough resources"
  - "Don't change anything"
- Start trying to control the the uncontrolled inputs

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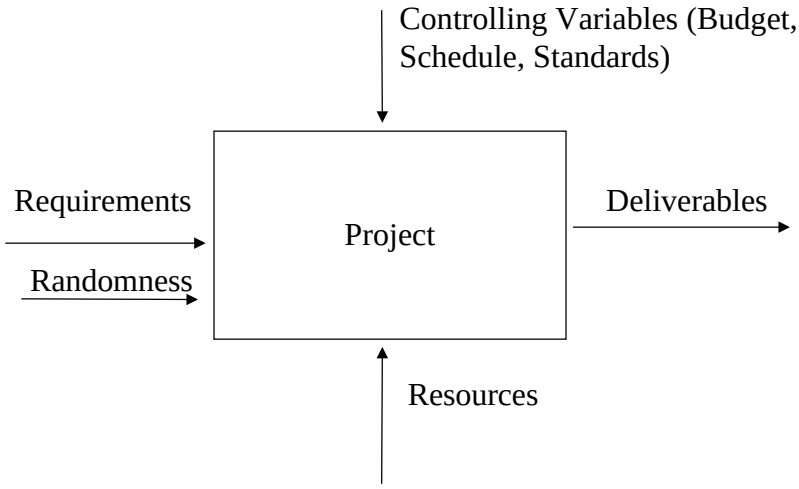
Level 2 Cybernetic Model



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Level 2 Possible Metrics

- The system is a "black box". Measure what's visible
  - Requirements
    - Do we know what we have to do?
    - Can we manage the requirements changes and how often do they occur?
  - Budget, Schedule, Standards:
    - "When will it be done?"
    - Do we meet the budget, the schedule, the standards?
  - Resources: Do we have the resources we need, when we need them?
  - Deliverables: Do we deliver what we agreed to?
- Prioritize your measurement effort as well as your process improvement effort

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Exercise

- Work with 2 other people
  - One person: You're a manager in a Level 2 organization
  - Second person: You're a senior manager in a Level 2 organization
  - Third person: You're an observer
- Manager: Answer these questions
  - What do you do when someone is sick with the flu?
  - When do you think you could recognize a schedule slip?
  - How do you measure productivity?
  - What do you tell your senior manager?

Level 3: Defined Projects

KPA	Goal
Organization Process Focus	• Coordinate and plan process development and improvement activities • Compare software processes strengths and weaknesses
Organization Process Definition	• Develop and maintain a standard software process • Collect, review, and make available information about the organization's process
Training program	• Plan training activities so people know how to do their work • Provide training for software engineering and management
Integrated Software Management	• Each project tailors the organization's standard process • Use the defined process to plan and manage the project
Software Product Engineering	• Define and consistently perform software engineering tasks • Work products are consistent
Intergroup Coordination	• All affected groups agree and commit to requirements • Engineering groups identify, track, and resolve issues
Peer Reviews	• Plan peer reviews • Identify and remove defects in software work products

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Realities of Level 3 Organizations

- Manager's role changed
  - Know the desired state
  - Observe the current state
  - Compare the desired state with the current state and act on the system to bring the current state closer to the desired state
  - A manager is not a controller
- Chaos is a result of moving to Level 3

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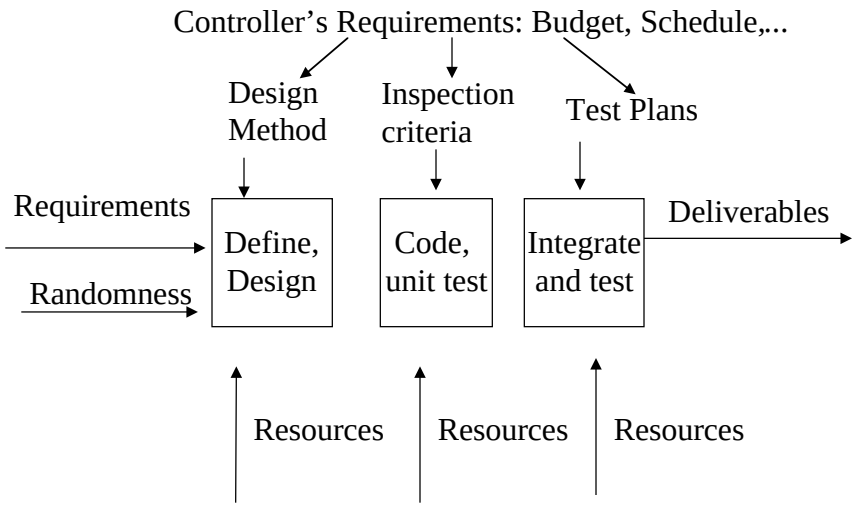
Level 3 Cybernetic Model



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Level 3 Possible Metrics

- Product Development is more open, so more possibilities for measurements
- In addition to the previous questions, can ask predictive questions
  - What activities produce the most defects?
  - Where are defects detected and how much do they cost?
  - When will we know if we can meet the projected schedule?

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Exercise

- Go back to your groups, please change places
  - One person: You're a manager in a Level 3 organization
  - Second person: You're a senior manager in a Level 3 organization
  - Third person: You're an observer
- Manager: Answer these questions
  - What do you do when someone is sick with the flu?
  - When do you think you could recognize a schedule slip?
  - How do you measure productivity?
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Level 4: Managed Projects

KPA	Goal
Quantitative Process management	• Plan quantitative process management activities • Quantitatively control the project's process performance • Be able to quantify the performance of the project's defined software process
Software Quality Management	• Plan project's software quality management activities • Define and prioritize measurable goals for software product quality • Quantify and manage progress toward the quantitative quality goals

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Realities of Level 4 Organizations

- These are only suspicions, because I haven't personally met any level 4 organizations
- Managers, technical leads, and technical staff learn to observe current state, compare it to the desired state, and take actions
- Planned iterations
- Decreased project randomness
- People still in chaos

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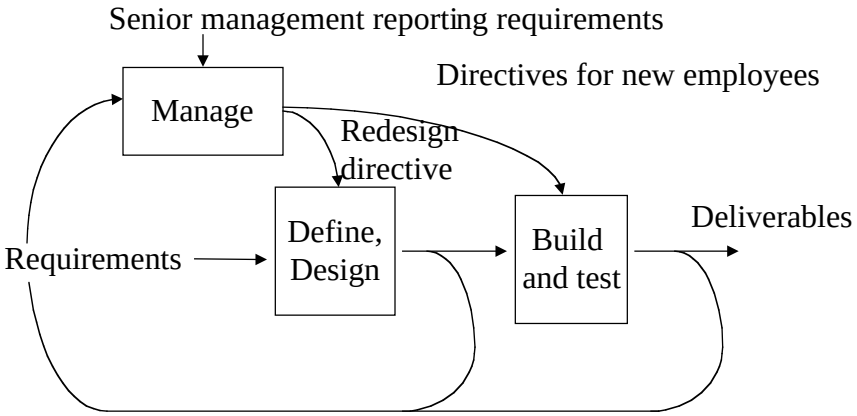
Level 4 Cybernetic Model



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Level 4 Possible Metrics

- Productivity
  - Productivity = size/effort
  - Process productivity, not staff
  - Size is difficult to measure
    - Function points
    - Team size
- Defect distribution
- How resources are allocated
- Likelihood planned and actuals match

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Exercise

- Go back to your groups, please change places
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  - Second person: You're a senior manager in a Level 4 organization
  - Third person: You're an observer
- Manager: Answer these questions
  - What do you do when someone is sick with the flu?
  - When do you think you could recognize a schedule slip?
  - How do you measure productivity?
  - What do you tell your senior manager?

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Choose What You Need to Measure

- What are your requirements?
  - Define the problem, the difference between the current state and the desired state
  - What results are you looking for?
- Choose the questions you want to answer
- Measure to answer the questions

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What to Do Tomorrow

- Define and choose the goals you most want to achieve
- Ask the relevant questions
- Decide what to measure
- Gather the measurements on a weekly basis, wherever possible
- Display the measurements publicly

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Resources

- References
  - Fenton N., and S. Pfleeger, Software Metrics, A Rigorous and Practical Approach, 2nd edition, PWS Publishing, Boston, 1997.
  - Weinberg, Gerald M., Quality Software Management, vol. 2 First Order Measurement, Dorset House, New York, 1991.
  - Edward Tufte's books, Envisiong Information and others, are an incredible resource for figuring out *how* to display the information
- Some web sites
  - http://www.psmsc.com
  - http://www.spmn.com
    - See the project control panel

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Questions?

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