

Effective Metrics for Pragmatic Project Managers

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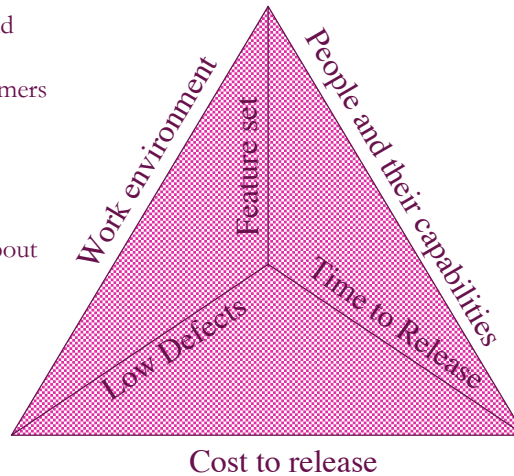
What Do You Want to Know About Your Projects?

- Where are we?
 - Is the project on time?
 - On budget?
 - Are we managing the critical path? (Do we know the critical path?)
 - Do we need more or fewer resources (people and other resources)?
 - Are we making progress? Are we tracking to the plan? (Do we have a plan?)
 - How good are our work products?
- How well are we working?
 - Do people know what they have to do?
 - How is morale?
 - Has the team reached the state of team flow?
- How effective are we?
 - Productivity measures (read Putnam and Myers' Five Core Metrics: The Intelligence Behind Successful Software Management)

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Project Constraints and Requirements

- Every project has constraints and requirements
- Internal constraints: Your customers don't care about these. You do.
 - Cost to market
 - People and their capabilities
 - Work environment
- What do your customers care about the most?
 - Time to market
 - Feature set
 - Defect levels



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Pragmatic Measurements

- View all six sides of the pyramid
 - Time to release
 - Feature set
 - Defect levels
 - People and their contribution to the project
 - Work environment
 - Cost
- You (your management) care differently about each of these, depending on your context

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To Measure Project Completion ...

- Project completion is a function of:
 - How accurate your initial estimation was
 - How much progress you've made (how many features completed and how good they are)
 - Schedule progress

Project Completion Measurements

- Earned value (Measuring what's been accomplished and comparing the accomplishments to the time used, rather than only measuring the time used for the project)
- Progress towards release criteria
- Estimates vs. actuals for major and appropriate minor milestones
 - The dates the project achieved the milestones vs. the planned dates
- Estimation Quality Factor
 - The histogram of the completion date over time: how good your estimation is

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About Earned Value

- Earned value makes sense for products that can be created in self-contained pieces
 - You can create a piece, and measure how long and how much it cost you to create it
- Earned value makes no sense for products whose parts are interdependent
 - If each part is interdependent, how can you tell when a part is done?
 - If you can't tell when a part is complete, you can't measure earned value
- Software projects are composed of interdependent parts
 - Projects that have a software component are composed of interdependent parts
- Projects with tangible deliverables are great candidates for measuring earned value

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Schedule Metrics: Estimation

- How do you estimate now?
 - Range of dates (1/15-3/1)
 - “about” (About Mar 1)
 - Spiral in on a date (Q1, February, 2/14-2/21, 2/18)
- If you choose a date, you can use DeMarco's Estimation Quality Factor, a measurement of how good your estimation was during the project
- EQF is good for:
 - An early warning sign to see if events outside your project are consuming people when they should be on your project
 - A check against the initial estimations for your next project
 - If you have a chance of completing this project sometime in the next millennium

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Calculating Where You Are vs. Where the Schedule Says You Are

- Simple earned value discussion:
 - How much time have you spent?
 - How much money have you spent?
 - How much of the self-contained, tangible deliverables do you have?
 - If you've spent more time and money than you have deliverables to show than you will overrun the budget and/or schedule
- Inch-pebbles for software projects
 - Software projects suffer from the “90% complete” problem
 - It takes the first 90% of the time to complete 90% of the project. It takes the next 90% of the project to complete the other 90%.
 - If you can freeze or baseline requirements, you can avoid the 90% problem
 - Inch-pebbles help you create good estimates

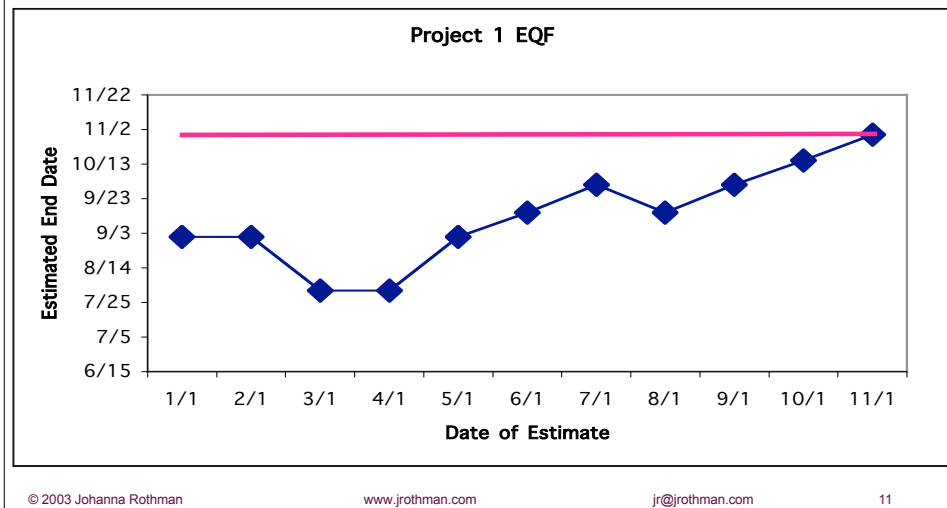
When You're Not on Track

- Ask your staff why
- Ask your staff to log their time for a week and let you know
- Are you holding things up?

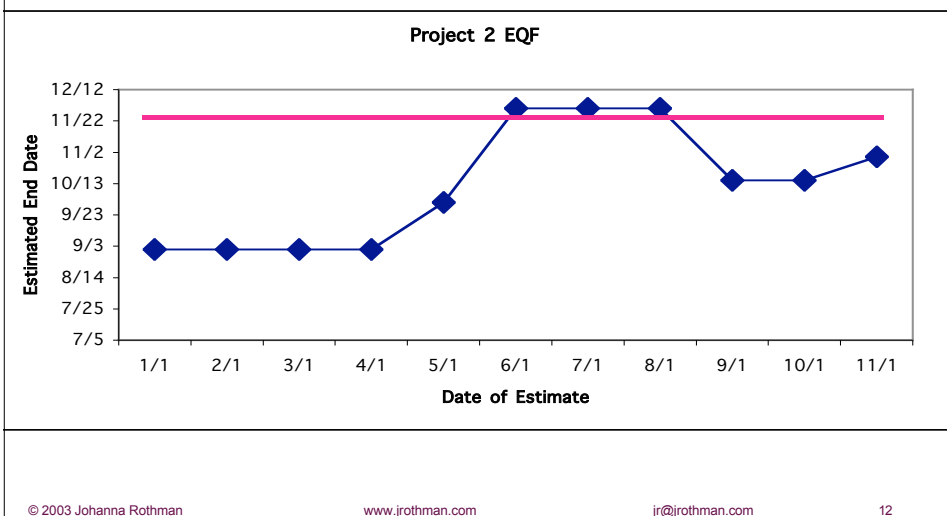
- You have numerous possible actions when your project is not on track. However, you need to collect some data first, and then determine which actions to take.

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Examples of EQF From 3 Projects



Project 2 EQF



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Context Switching Is a Huge Potential Drain

- Multiple parallel projects waste time
- If you want to get the work done faster, assign people full time without any other interruptions

Source: Quality Software Management, vol.1, Systems Thinking, Gerald M. Weinberg, Dorset House, New York, 1992.

Number of tasks	% Time on each task
1	100
2	40
3	20
4	10
5	5
More than 5	Random

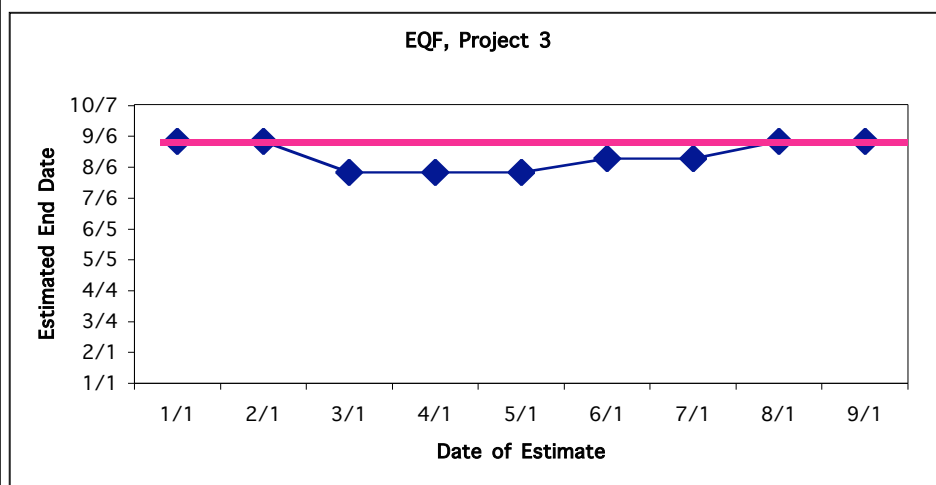
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Project 3 EQF



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Measurements You Can Start Early in the Project

- Do the requirements freeze? Ever?
 - How many requirements change over time?
 - Measure the number of requirements you have, the number of major/minor changes per week over the course of the project
- Do you have the people you need to complete the project?
 - Are they dedicated to the project, or are they working on other things, such as fixing problems from previous releases or other projects?
 - Measure the number of people assigned week by week. Show when you needed the people

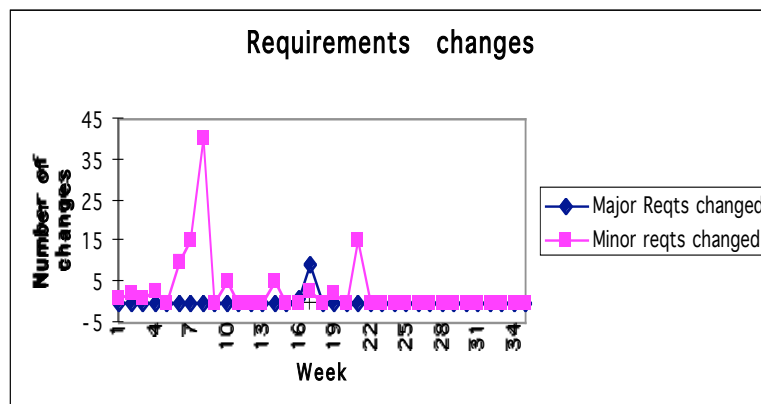
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Example of Requirements Changes Chart



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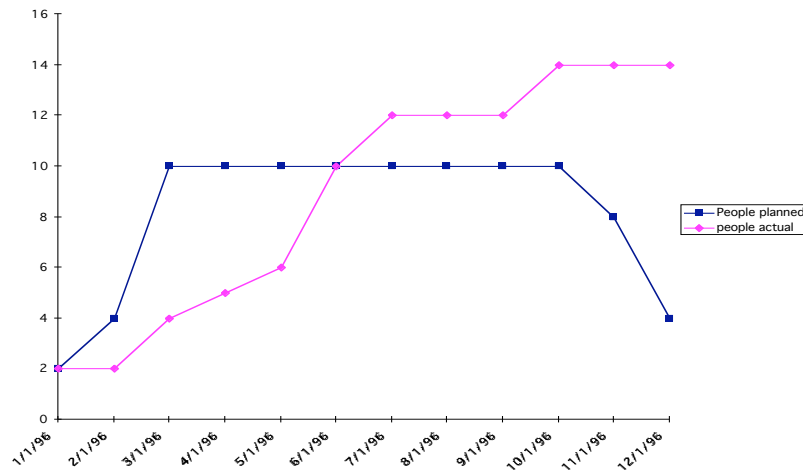
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Example of Staff-Days Chart



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Middle of the Project Trends

- Defect trends
 - Defect find and close rates: Are you fixing defects as quickly as you find them?
 - Cost to fix a defect: How much does it cost you (at which time in the project) to fix a defect?
 - Fault Feedback Ratio: How many defects reappear?
- What is product performance, and is it good enough?
 - Do you know how to measure product performance?
- If reliability or performance are important to you, start measuring them now
 - Compare scenarios by build

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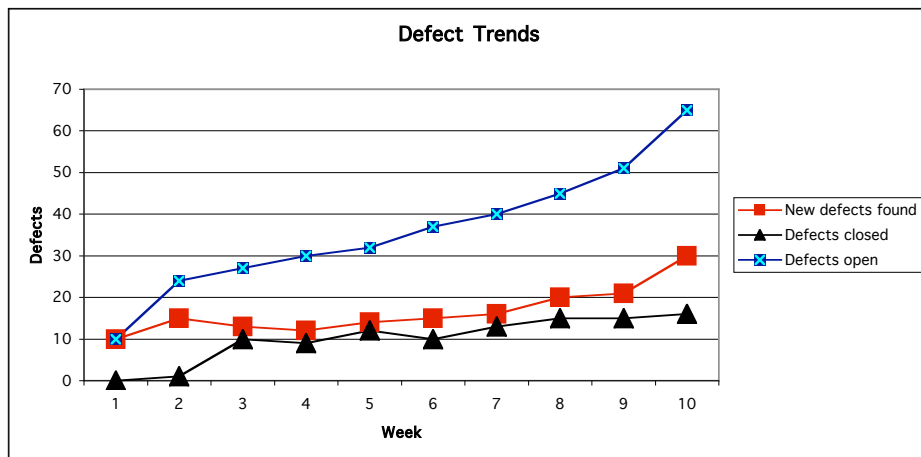
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Defect Trends, Early in the Project



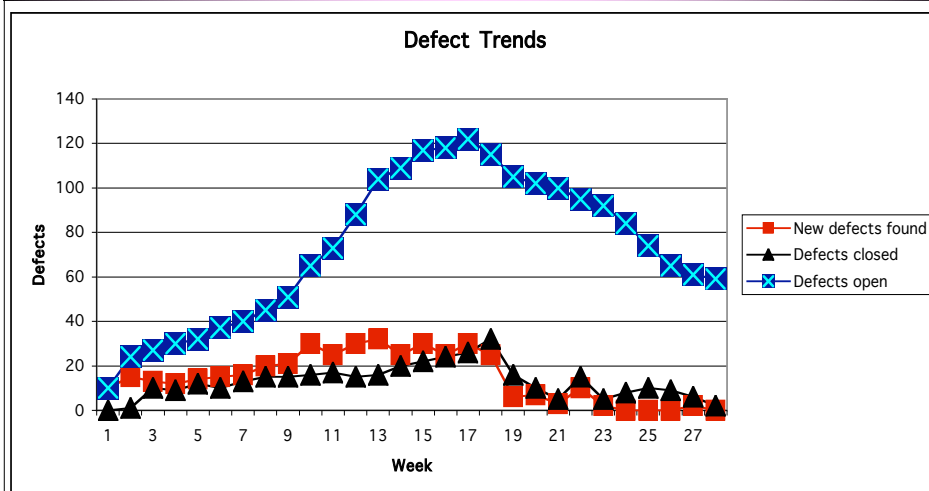
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Defect Trends: Found/Closed, Full Graph



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About Cost to Fix a Defect

- The more proactive you are, the higher your costs will be later in the project
 - The fewer defects you find later, the higher the cost of each defect
 - The lower the total overall cost
- Make sure you know what you're measuring
- NEVER measure cost to fix a defect by individual
- Cost to fix a defect is excellent for any project where you provide a product at the end. If you're providing a service, you may have trouble using this metric.

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Cost to (Find and) Fix a Defect, Initial

Company (for a specific release)	# of people	Cost per person-day	# of days	# of system test fixes	person-days	Average days to fix during system test	System test cost to fix a defect
Dan	5	\$500	40	125	200	1.6	\$800
Avery	10	\$500	20	30	200	6.7	\$3,333

- Avery's project is different, so update calculation

Company (for a specific release)	# of people	Cost per person-day	# of days	# of system test fixes	person-days	Average days to fix during system test	System test cost to fix a defect
Dan	5	\$500	40	125	200	1.6	\$800
Avery	10	\$500	20	30	200	1.0	\$200

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Cost to (Find and) Fix a Defect, Total Picture

Project	System test cost to fix a defect	# of System test fixes	System test total cost	pre-release total cost	Average time to fix post-release	post release cost to fix	post-release # of fixes	post release total cost	Total pre and post release defect fix cost
Dan	\$800	125	\$100,000	\$100,000	15 person-days	\$7,500	23	\$172,500	\$272,500
Avery	\$200	30	\$6,000	\$37,250	5 person-days	\$2,500	2	\$5,000	\$42,250

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Fault Feedback Ratio

- What's the total picture about productivity?
 - What do the creators create? How much good stuff, and how much to redo?
 - Best to measure this weekly
- FFR tells you how good the work products are initially, and how much wheel-spinning they are doing

Date	Size in LOC	FFR (this week only)	Average pre-release cost to fix a defect
1/1	425,000	14%	1 person-days
4/1	800,000	16%	3 person-days
7/1	1,500,000	12%	2 person-days
10/1	2,000,000	18%	3 person-days

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Late in the Project Trends

- Defect trends
 - How many problems are open?
 - The more open problems, the longer it takes to handle each one
 - Do people choose the easiest problems to fix first?
 - Then the remaining problems take longer to fix
 - How long does it take to fix a problem?
 - If problems take longer and longer to fix, the system becomes unmaintainable
 - How many new problems are introduced when fixing problems?
 - The higher the Fault Feedback Ratio, the longer the developers take to fix problems

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My Minimum Metrics

- Schedule estimates, actuals, and EQF
- Staffing
- Requirements changes
- FFR throughout the project
- Cost to fix a defect throughout the project
- Defect find/close trends throughout the project

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Summary

- Choose what you'll need to measure
 - Start at the beginning of the project
- Act based on your measurements
 - Projects don't improve if you leave them alone
- No matter what, learn from your projects...

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