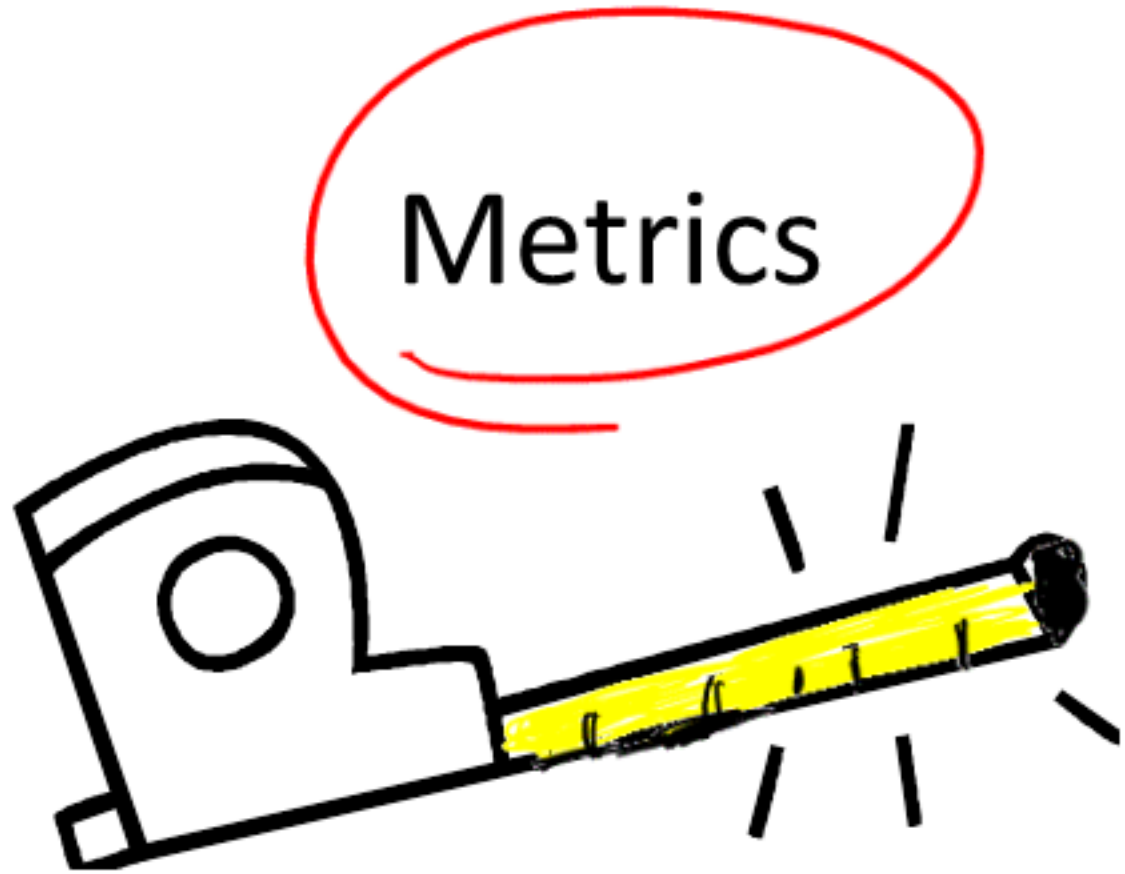
SE4831 : Software Quality Assurance



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Instructor

Objectives

- Explain the objectives for software quality metrics
- Compare and contrast the relationship between measures, metric, and indicators
- Explain why trending is important to metrics management
- List Recommended quality indicators and justify the need for different metrics based on project phase
- Draw a diagram showing the process for managing metrics in a project
- List some interesting metrics

Objectives of Software Quality Management

1. **Facilitate management control, planning and managerial intervention.**

Keep track of project.

2. **Identify situations for development or maintenance process improvement (preventive or corrective actions).** Based on:

Goal-Question-Metric Paradigm

- Goals
  - What is the organisation trying to achieve? The objective of process improvement is to satisfy these goals
- Questions
  - Questions about areas of uncertainty related to the goals. You need process knowledge to derive these
- Metrics
  - Measurements to be collected to answer the questions

Goal

I would like to improve the quality of SW deployed in the field?

⇒ What functions are used in the field?

⇒ How well is the SW performing?

⇒ What do people think of the SW?

What metrics should I use to assess them?

- How many times does SW crash?
- What SW is crashing?
- How many users of the SW?

countable / measurable

Goal: Reduce time to market?

Are all features needed?

Can we cycle the product?

Requirements

Who is working on the project?

What are they doing w/ their time?

Metrics

- Time spent on a task.
- How much overhead do I have?
- How much rework do I have?
  - Changed LOC after first repository checkin

Measures, Metrics, and Indicators

- Measure

A comparision used to ascertain a condition based on a standard
⇒ Requires a standard unit

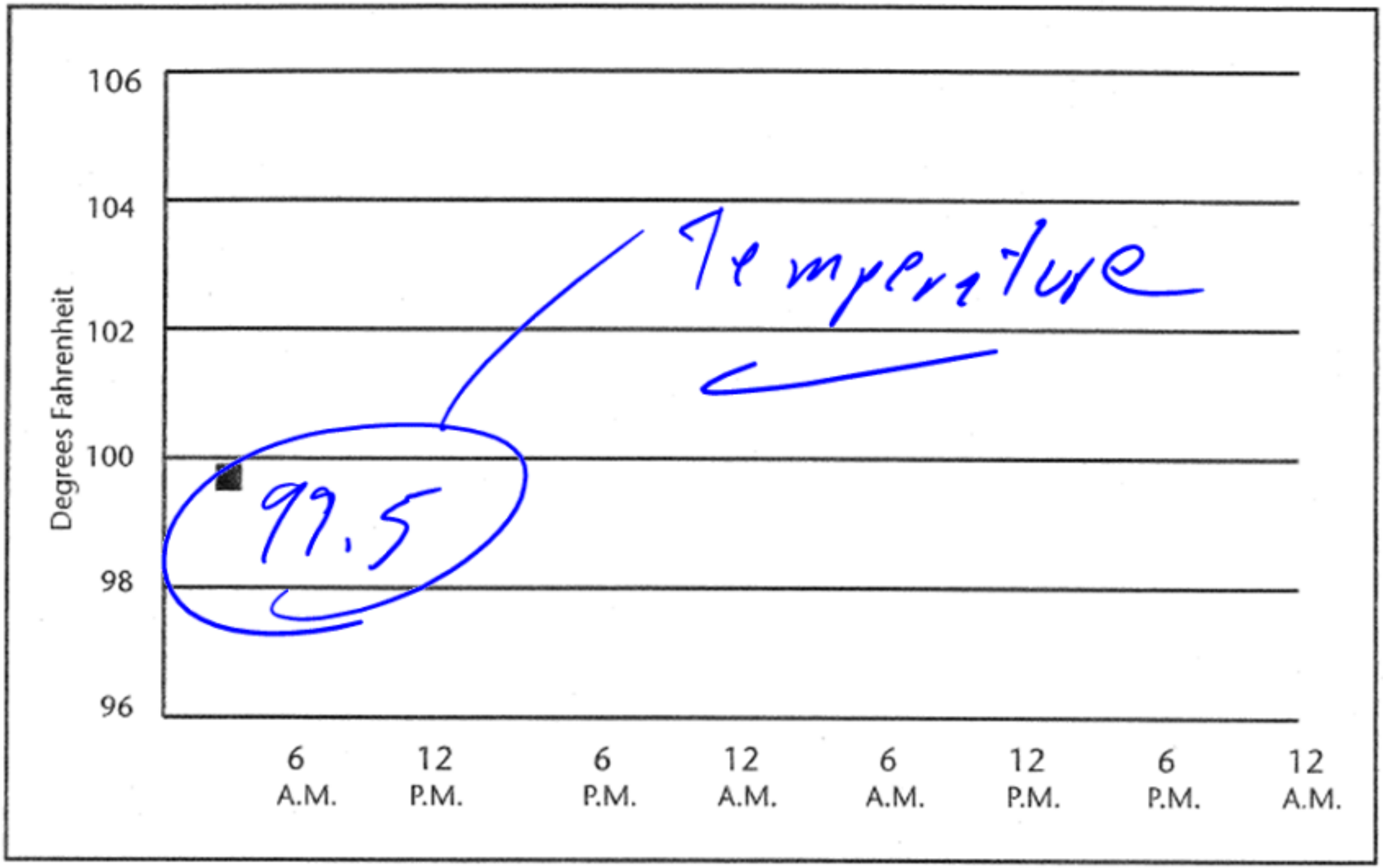
- Metric

A qualitive measure of the degree in which a system possess a given attribute

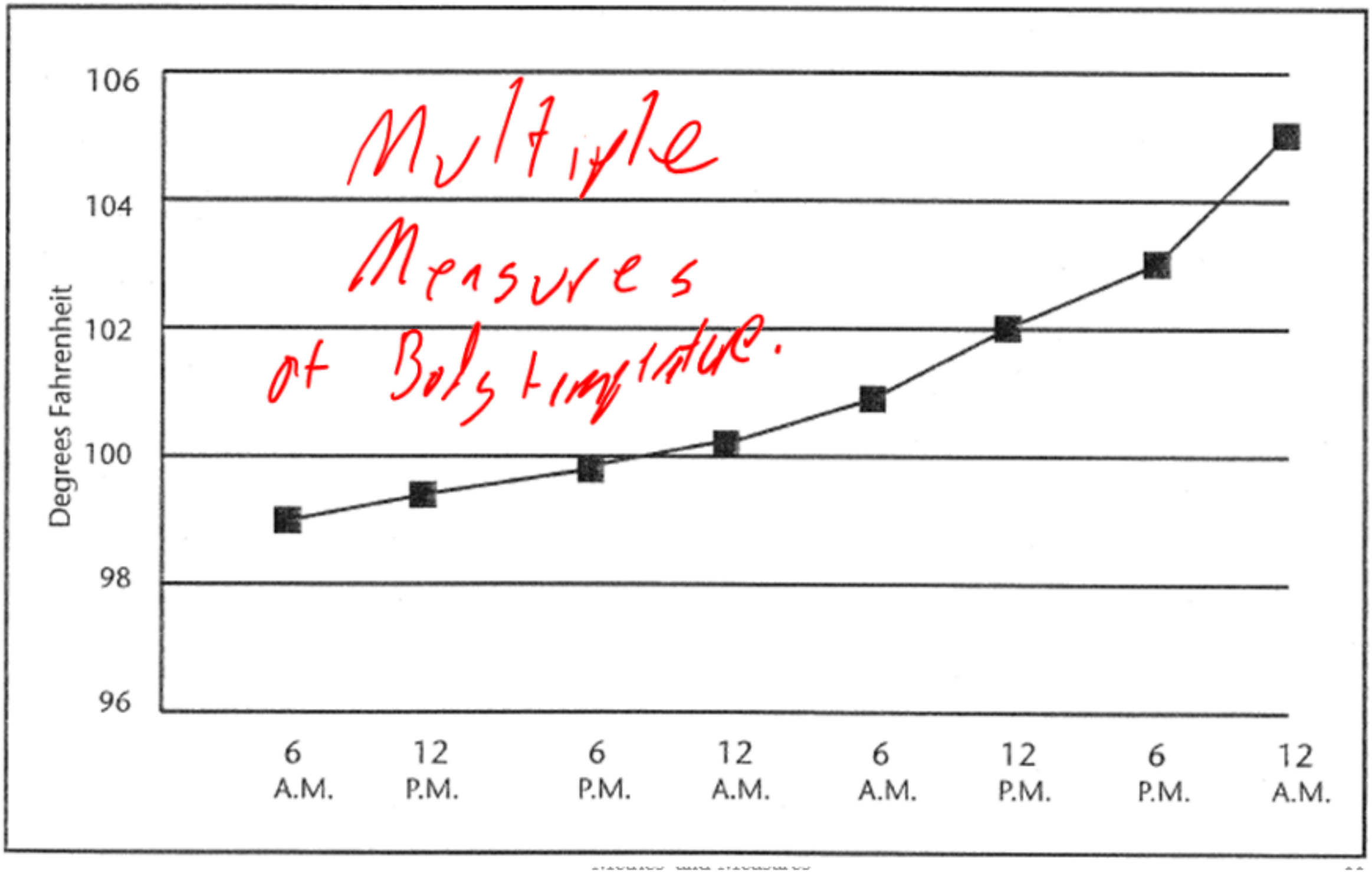
- Indicator

Combines a metric w/ analysis

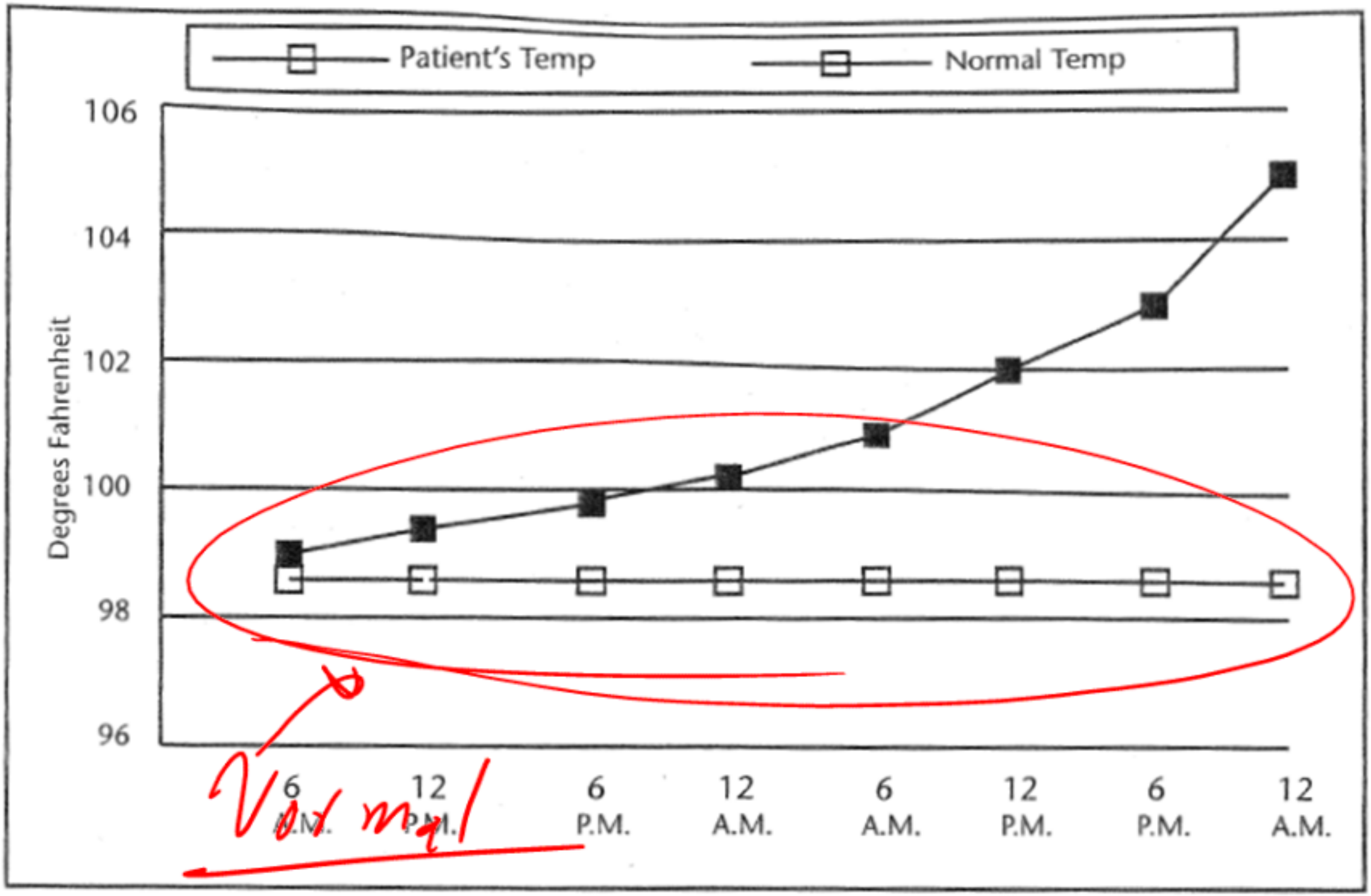
Body Temperature Measure



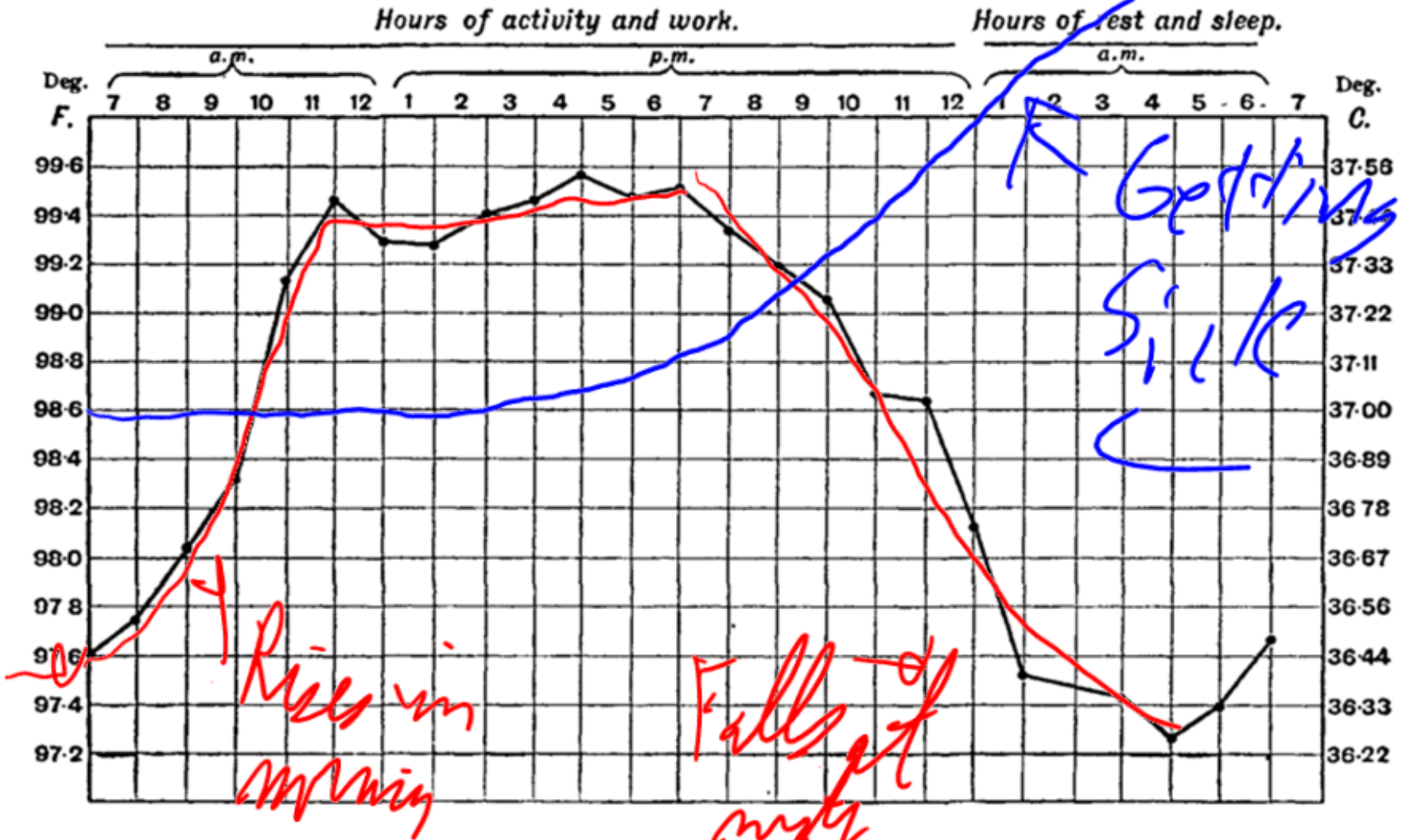
Body Temperature (Metric)



Body Temperature compared with Normal (indicator)



Another body temperature compared with Normal



Why is trending important?

Gives us a context to compare.

Trending example

Quality Indicators

- Progress
- Stability
- Process Compliance
- Quality Evaluation Effort
- Test Coverage
- Defect detection efficiency
- Defect removal rate
- Defect age profile
- Defect density
- Complexity

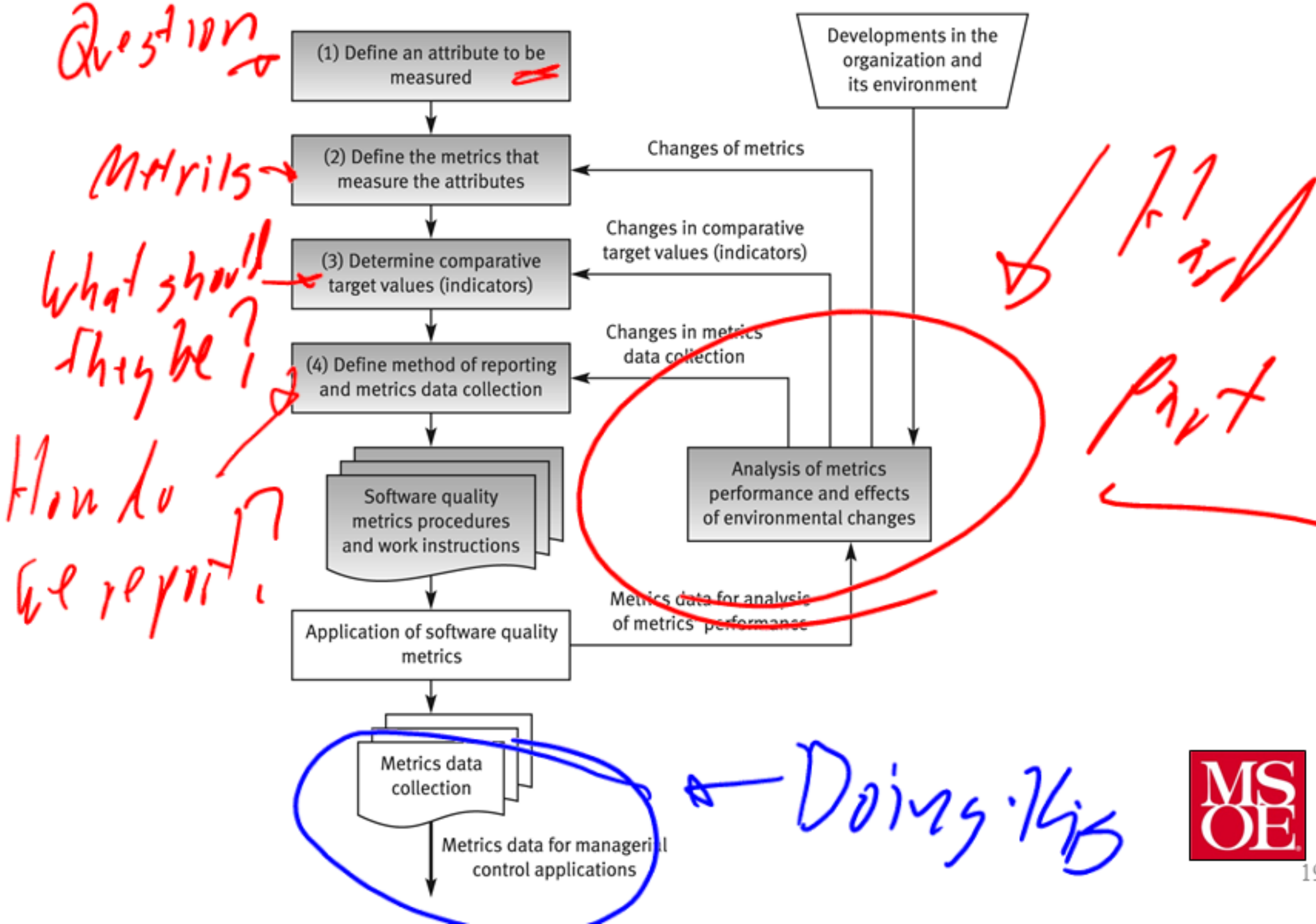
Table 16.1 Quality Indicators by Development Phase

	Software Requirements Analysis	*Preliminary Design*	*Detailed Design*	*Code and Unit Testing*	*CSC Integration and Testing*	*CSCI Testing*
Process Indicators						
Management Concern:						
Progress	Requirements volume	Top level design complete	Detailed design complete	Units completed	Tests accomplished	Tests accomplished
Stability	System requirements stability	Software requirements stability	Top level design stability	Detailed design stability	Software stability	Software stability
Compliance	Process compliance	<—				—>
Quality effort	Quality evaluation effort	<—				—>
Defect detection						
1. Test coverage				Percentage of paths executed	Percentage of paths executed	Percentage of functions executed
2. Defect detection efficiency		Defect detection efficiency	<—			—>

	Software Requirements Analysis	*Preliminary Design*	*Detailed Design*	*Code and Unit Testing*	*CSC Integration and Testing*	*CSCI Testing*
Product Indicators						
Completeness	System requirements stability	Software requirements traceability				
1. Defect removal rate	Open and closed problem reports	<———				——>
2. Age profile	Problem report age profile	<———				——>
3. Defect density	Defect density	<———				——>
Complexity	Requirements complexity	Design complexity	Design complexity	Code complexity		

Source: [4].

The process of defining software quality metrics



How can we use metrics?

- Improving software quality
  - Reliability
  - Quality
  - Customer Satisfaction
- Modeling software development process
  - Estimating release times
  - Estimating delivered quality
- Improving Software development

Question

- How do we determine the stability of a software system

Indications of Module Change

- Software Maturity Index
  - Metric developed by IBM

$$SMI = 1 - \frac{CSI}{LOC}$$

  - Characterizes extent of change for individual modules
    - LOC – Lines of Code for the Module
    - CSI – Changed Source Instructions
      - SMI = 0 if a new module is being created
      - SMI = 1 if a module is unchanged
- Must understand both the module one is working on, but also the modules with which they interact.

Question

- How do we determine which modules are more likely to fail in the field?

Looking at test data?

Code churn

- Code churn is defined as lines added, modified or deleted to a file from one version to another.

Unstable modules