



A Practical Framework for Software Measurement and Analysis

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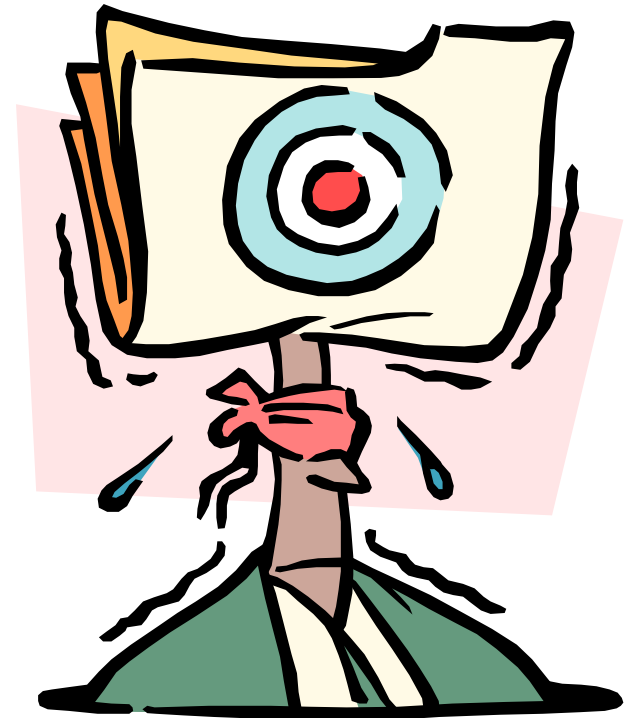
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Agenda

- Motivation for Measurement
- Measurement Framework
 - Decision-Makers
 - Information Needs
 - Measurement Process
 - Information Model
- Measurement Maturity
- Framework Application
- Summary

Today's Management Environment

- Customer focus requires dynamic balancing of needs versus means
- Rapidly changing technology and markets require speed and agility
- Bottom-line focus requires accurate and concise communication of objectives and results



Role of Measurement

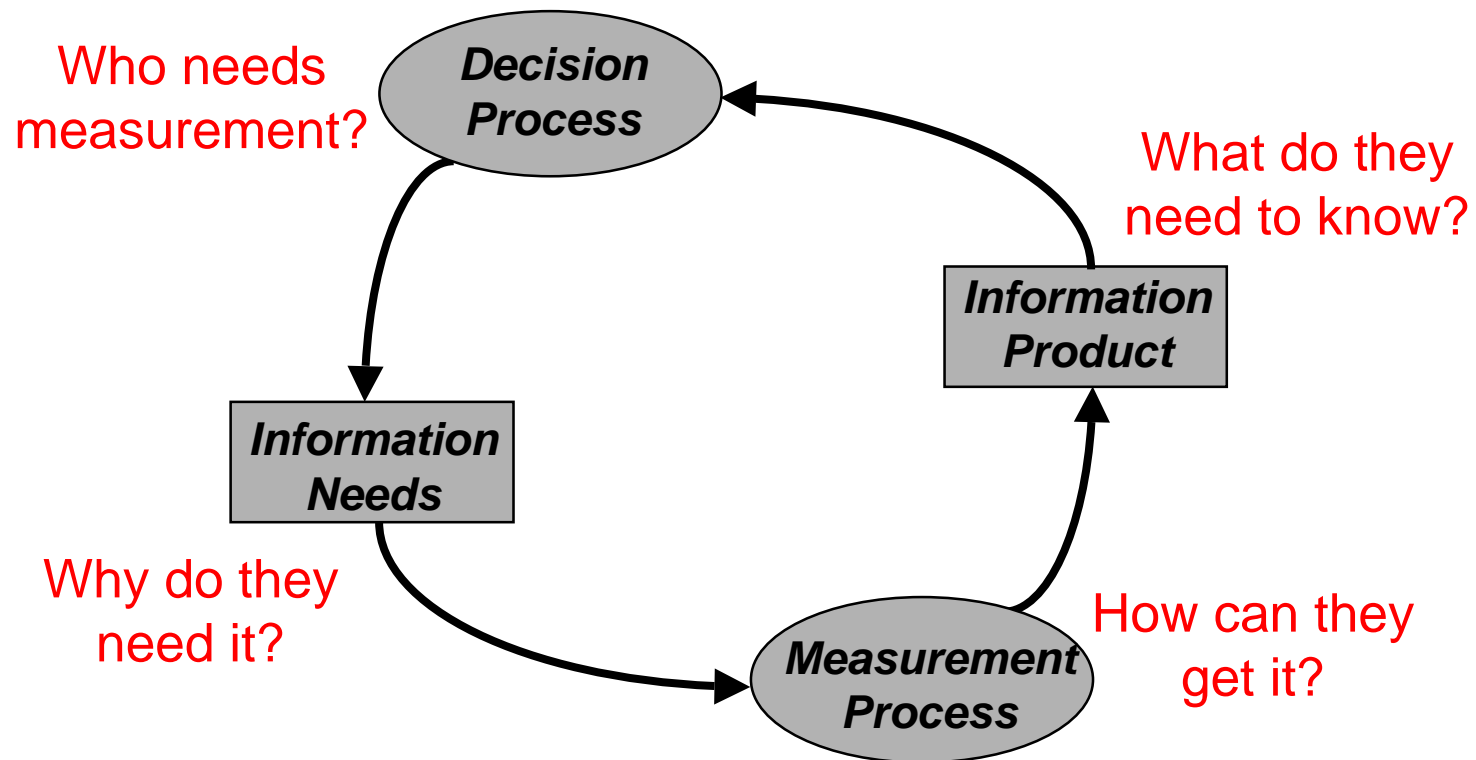
- The purpose of measurement in a software producing organization is to provide information that improves decision making in time to affect the business or mission outcome
- Key concepts
 - information for decision making
 - in time to affect the outcome
 - focused on business or mission goals
- Measurement provides the information necessary to rapidly adapt a business, process, or project to changing circumstances

Motivation for Framework

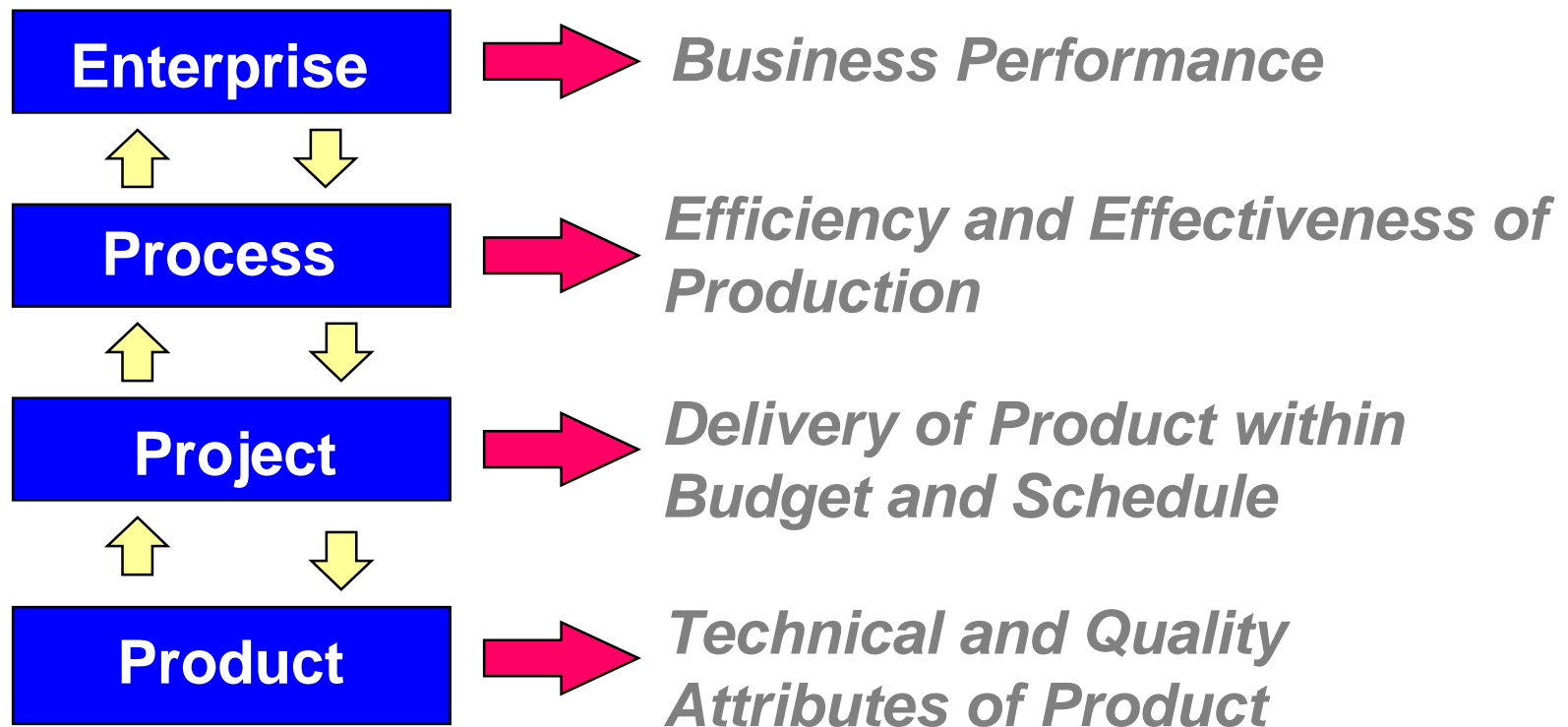
- Clarify basic concepts and terms
- Define comprehensive implementation strategy
- Integrate measurement activities across multiple levels for multiple purposes
- Ensure appropriate coverage of information needs
- Coordinate measurement transition across the organization

Alignment, alignment, alignment!

Framework Elements



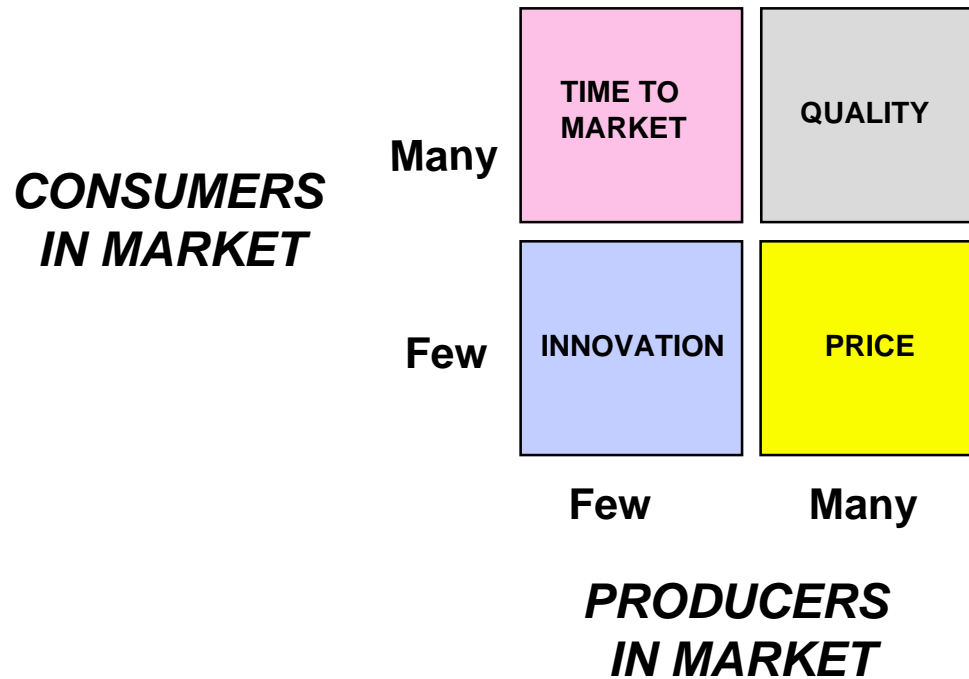
Hierarchy of Decision Making



Information Needs

- Objectives
 - Business goals
 - Customer requirements
 - Intermediate targets
- Obstacles to Achieving Objectives
 - Risks
 - Problems/Constraints
 - Lack of Information

Market Discriminators

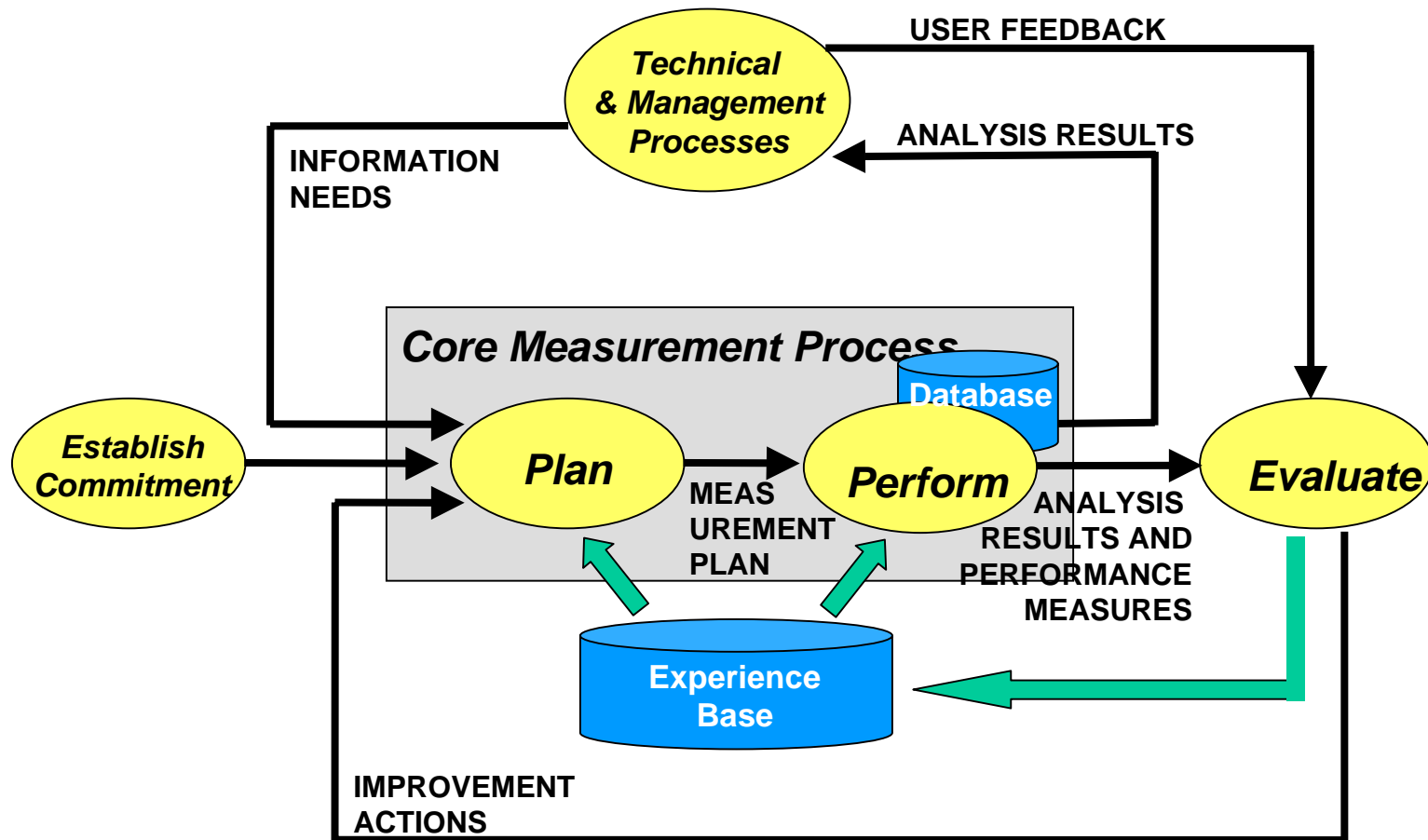


Adapted from D.N. Card, "Is Timing Really Everything?" IEEE Software, September 1995

Measurement Process Model

- Generic activities appropriate to any measurement system
- Activities must be further refined for specific organizational context and information need
- Based on Plan-Do-Check-Act cycle

Measurement Process Model



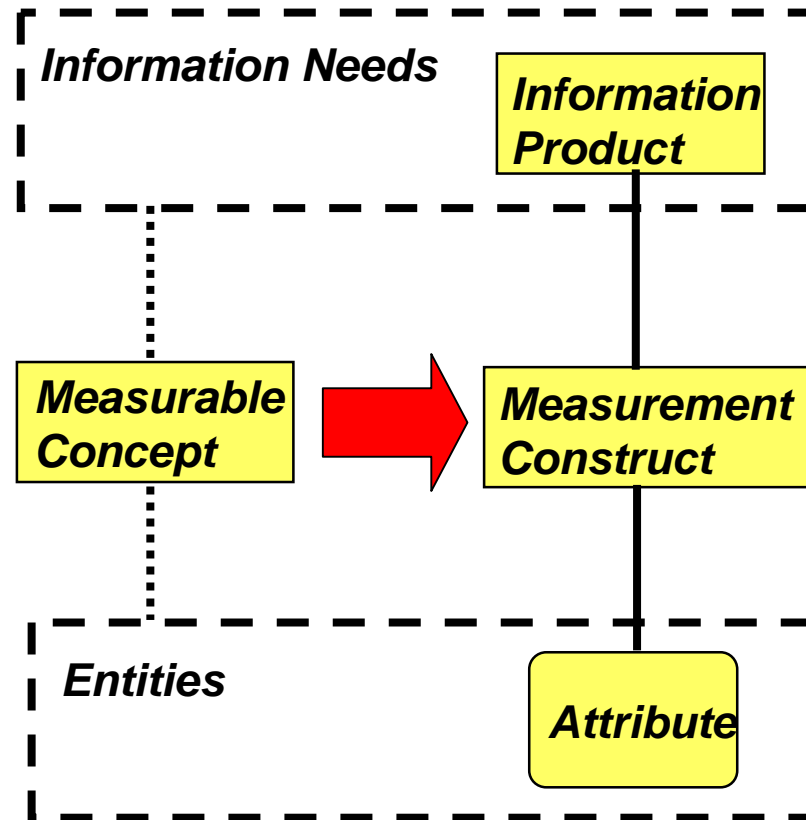
Adapted from ISO/IEC CD 15939, Information Technology – Software Measurement Process



Measurement Information Model

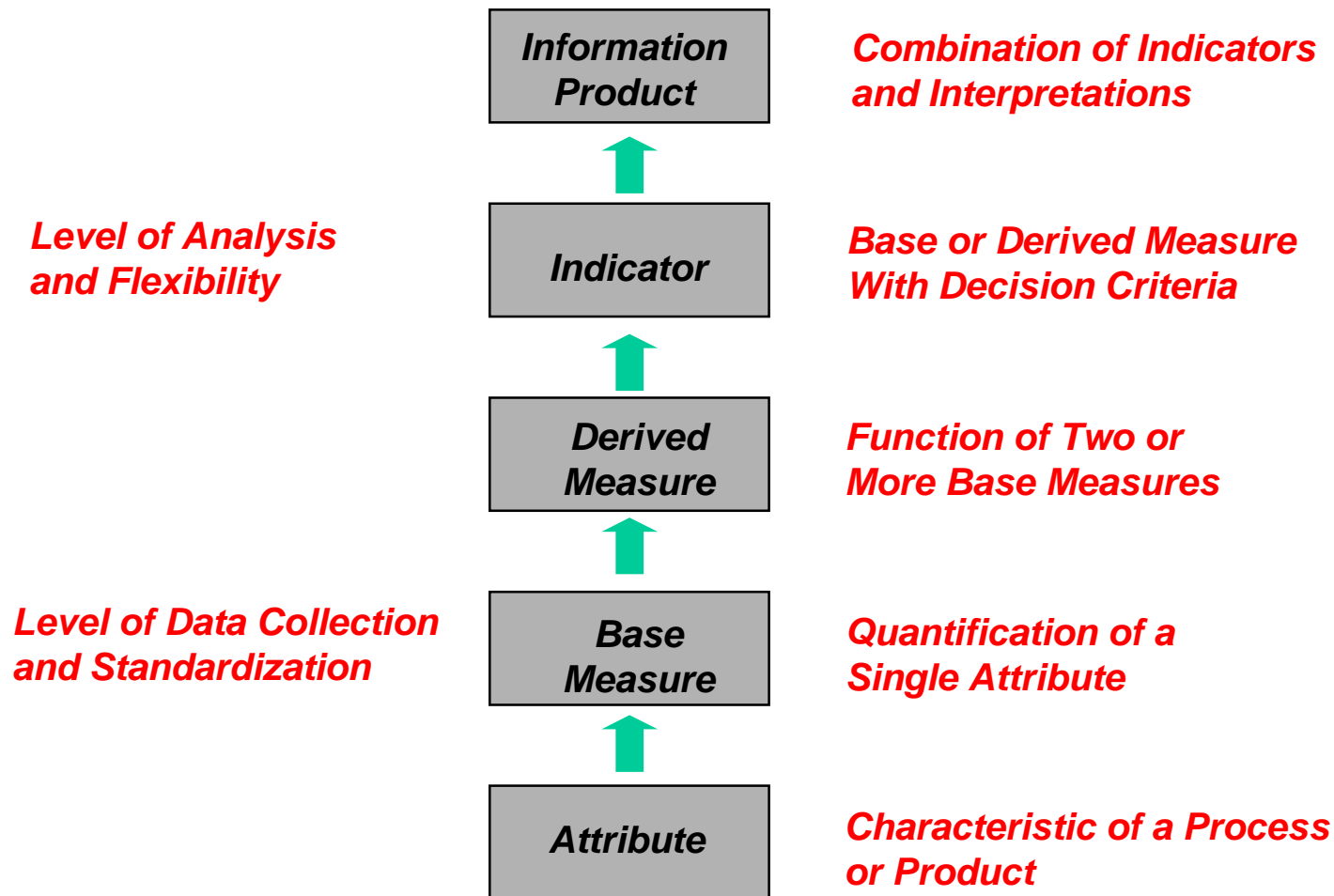
- Defines measurement product
- Links measurable entities to information needs
- Provides rigorous definitions of basic concepts
- Avoids use of “metric”
- Explains prevalence of three-level measurement models (e.g., GQM)

Measurement Information Model



Adapted from ISO/IEC CD 15939, Information Technology – Software Measurement Process

Measurement Construct



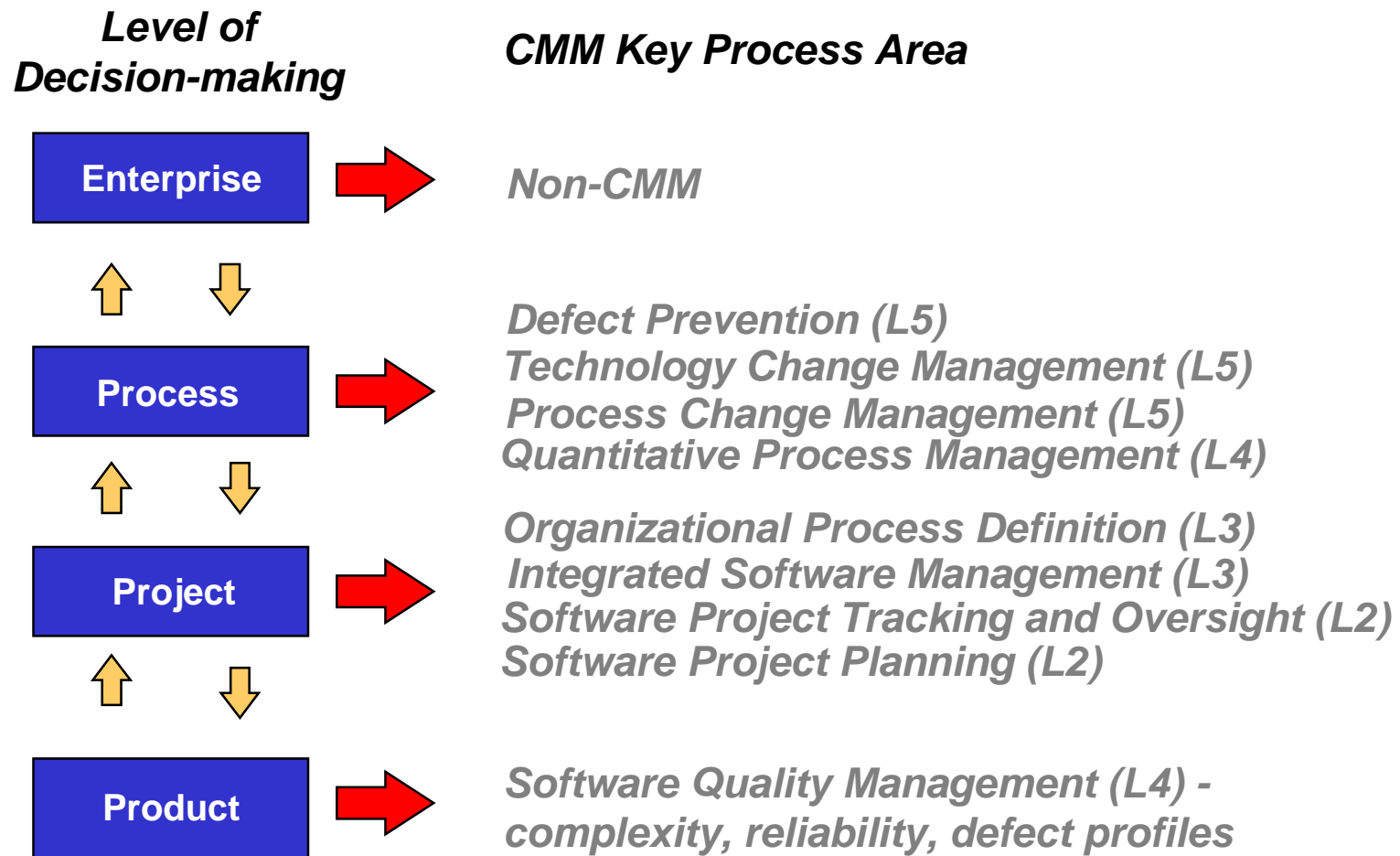
Examples of Analyses

Level of Information Need	Typical Analyses (for Indicators)
Enterprise	Balanced Scorecard Return on Investment
Process	Statistical Process Control Orthogonal Defect Classes
Project	Parametric Estimation Earned Value Tracking
Product	Reliability Complexity

Views Of Maturity

- Process Maturity (e.g., CMM) – combines information needs and technical sophistication
- Measurement Process Maturity (e.g., CMMI and ISO 15504) – evolution of measurement practices
- Technical Sophistication – transition from visual and Delphi techniques to simple statistics to analytical and dynamic modeling

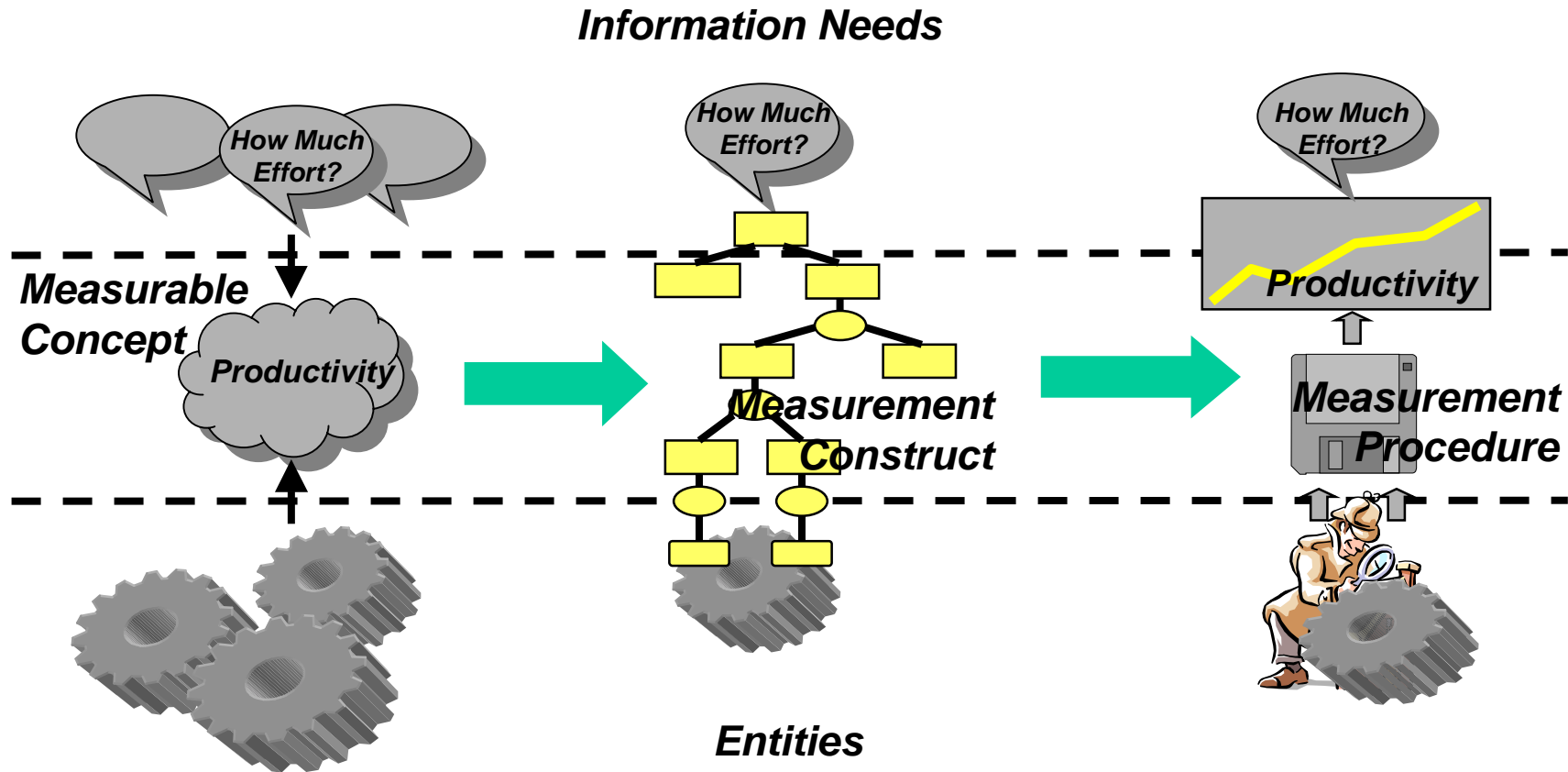
Measurement and the CMM



Framework Application

- Establish business goals before measuring
- Provide flexibility at the level of indicators and analyses
- Standardize at the level of base measures
 - Create a dictionary of base measures
 - Use standard base measures at all user levels
- Define measurement constructs in an evolutionary and iterative manner
- Plan both data collection (base measures) and analysis (indicators)

Measurement Planning



Summary

- Framework provides a systematic view of measurement throughout the organization
- Key elements based on ISO/IEC 15939:2002
- Adopted as the basis for new Measurement and Analysis Process Area in CMMI
- Compatible with existing measurement approaches (e.g., GQM, PSM)