Measuring the Impact of RD and REQM CMMI Process Areas

Aldo Dagnino
Director of Manufacturing Solutions

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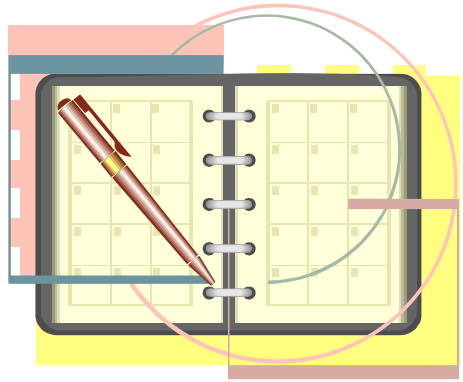
Agenda



- Introduction
- CMMI Appraisal Results
- Methodology to Measure economic Benefits
- Conclusions

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Why do Defects Occur?

- **Poorly defined requirements - approx 55%**
- **Poor design - approx 25%**
- **Coding issues - approx 15%**
- **Other - approx 5%**

- Poor specification, scoping, and communication of release requirements is the **number 1 failure point** in making quality , customer-centric software

Patton, R. (2001), Software Testing, SAMS Publishers, USA

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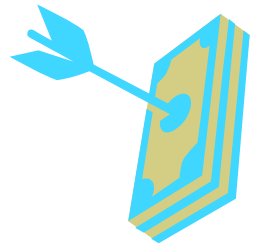
Business Objective Guide to CMMI Appraisal



- Reduce the effort and cost of defect removal activities after system verification by 30% in Manufacturing Solutions Department
- The above business objective guided the scoping of the CMMI internal SAS appraisal.
  - The CMMI appraisal was focused on CMMI Level 2 process areas
  - After conducting the appraisal, it became evident that a primary source of defect generation were the RD and REQM process areas

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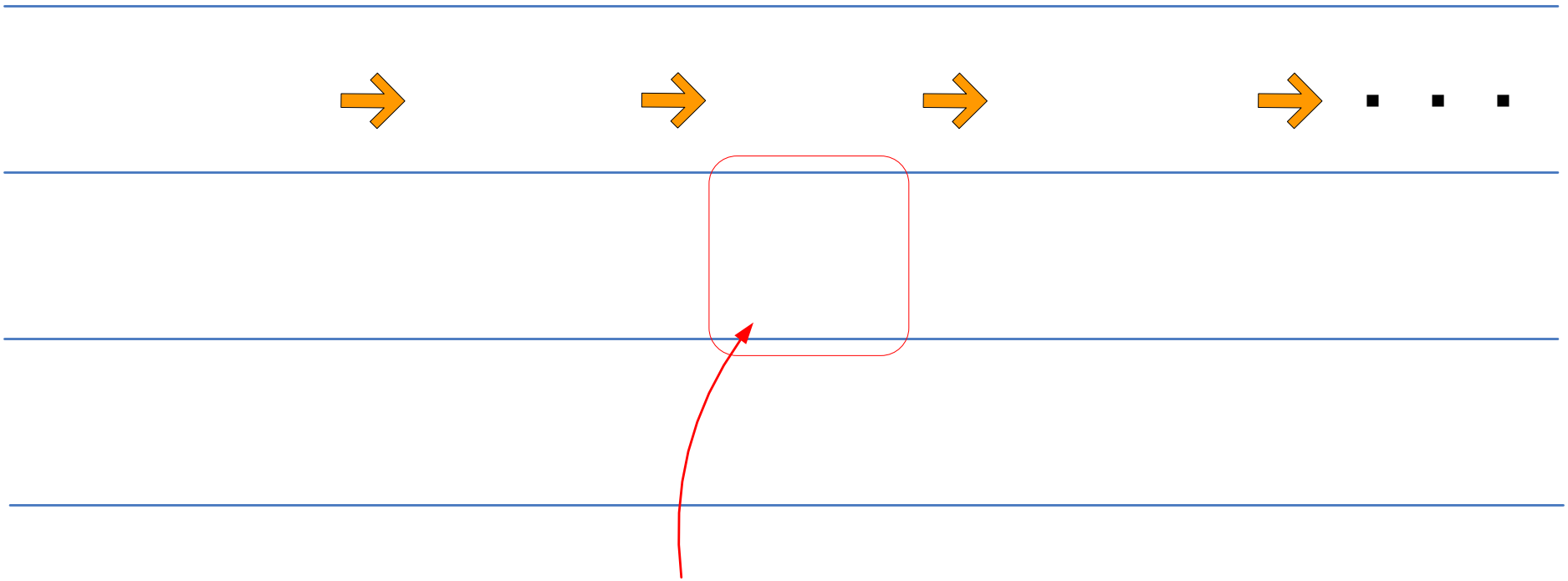
Chronology of Events



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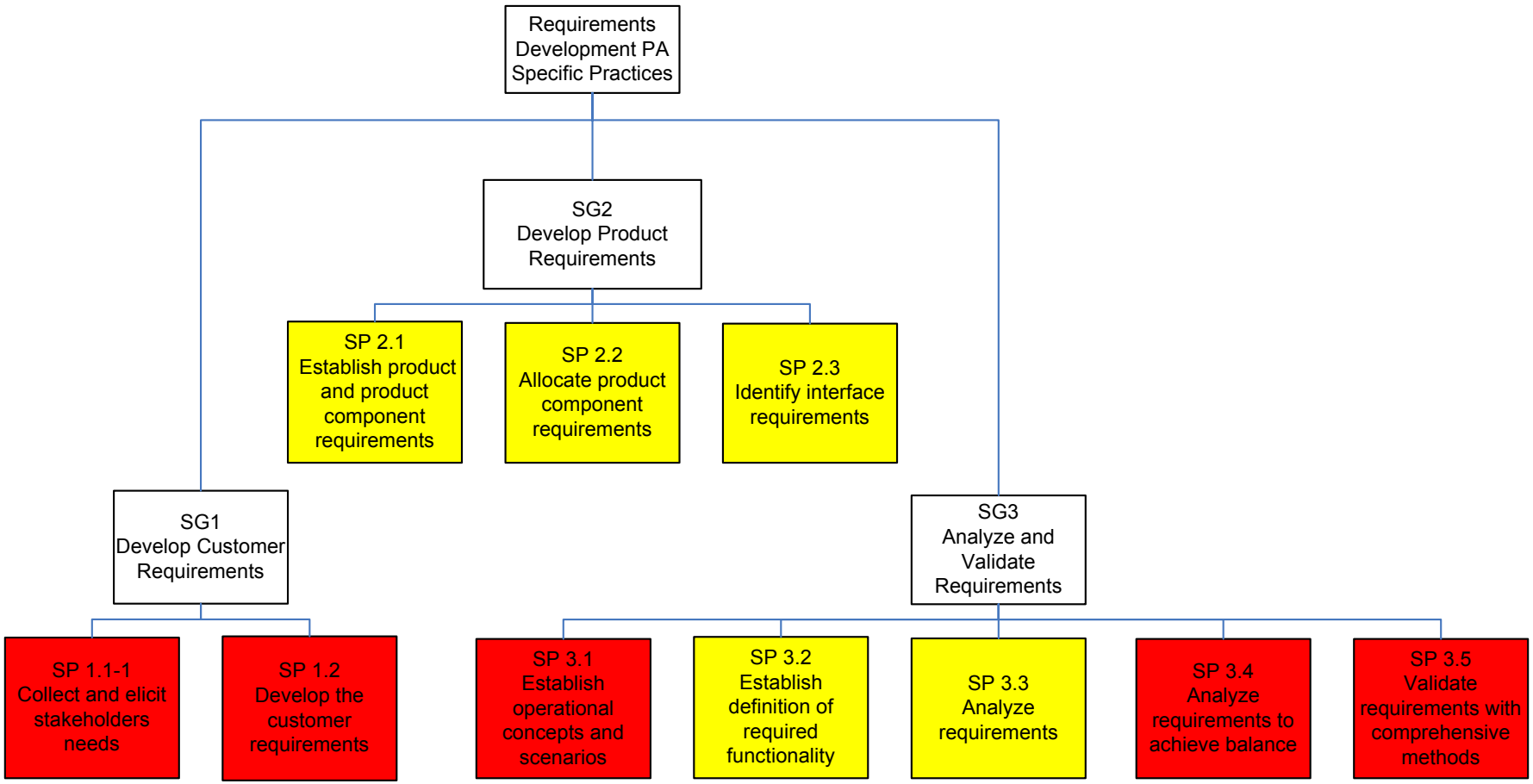
RD Specific Goals/Practices - Appraisal Results



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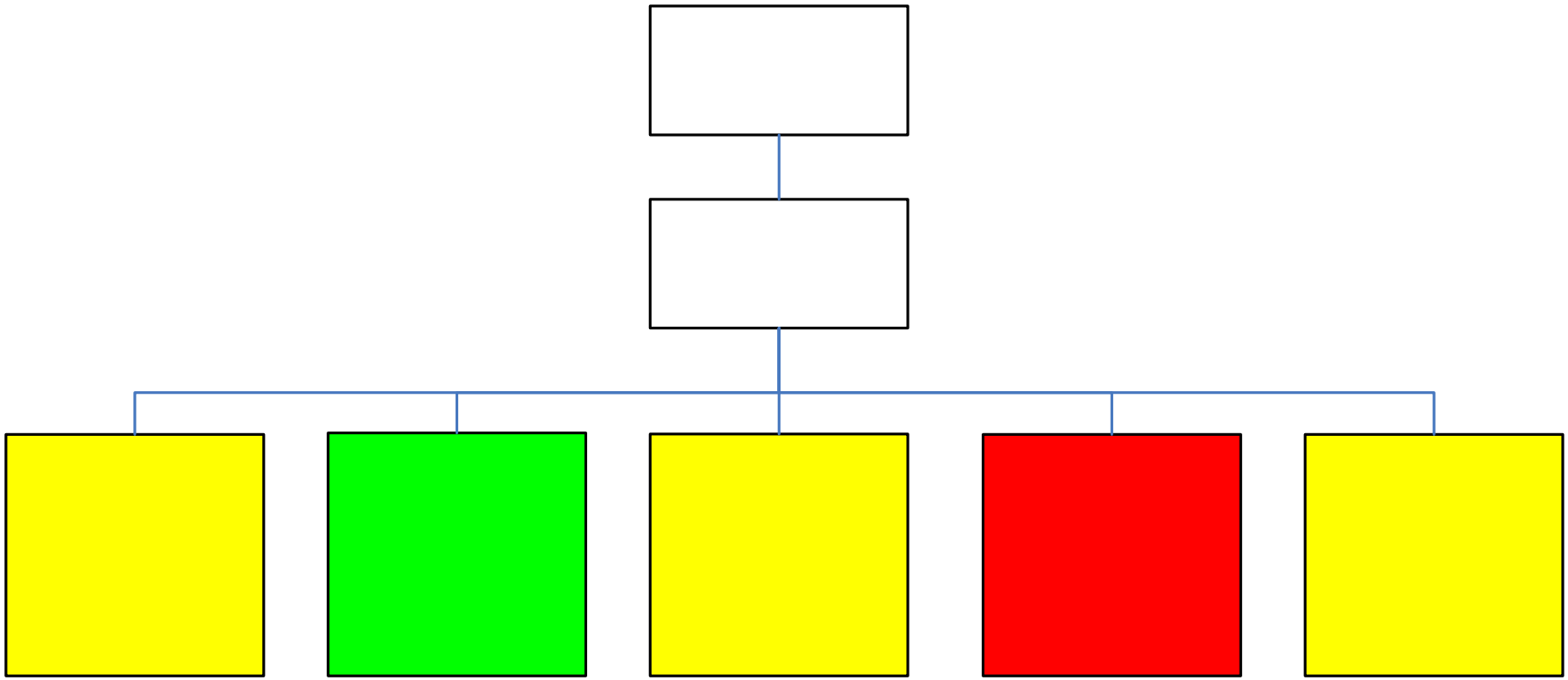
REQM Specific Goals/Practices – Appraisal Results



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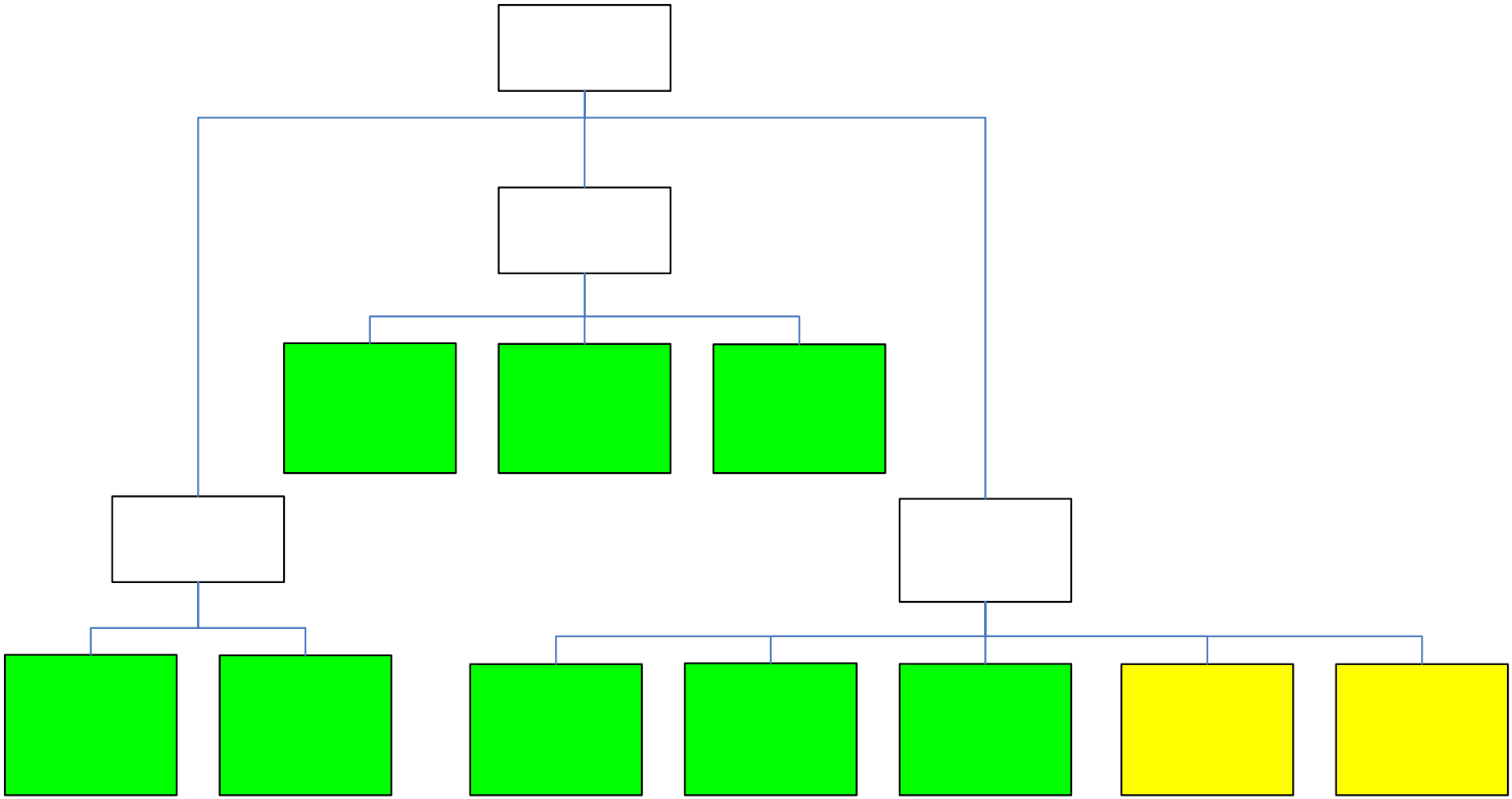
RD Specific Goals/Practices – Enhanced Process



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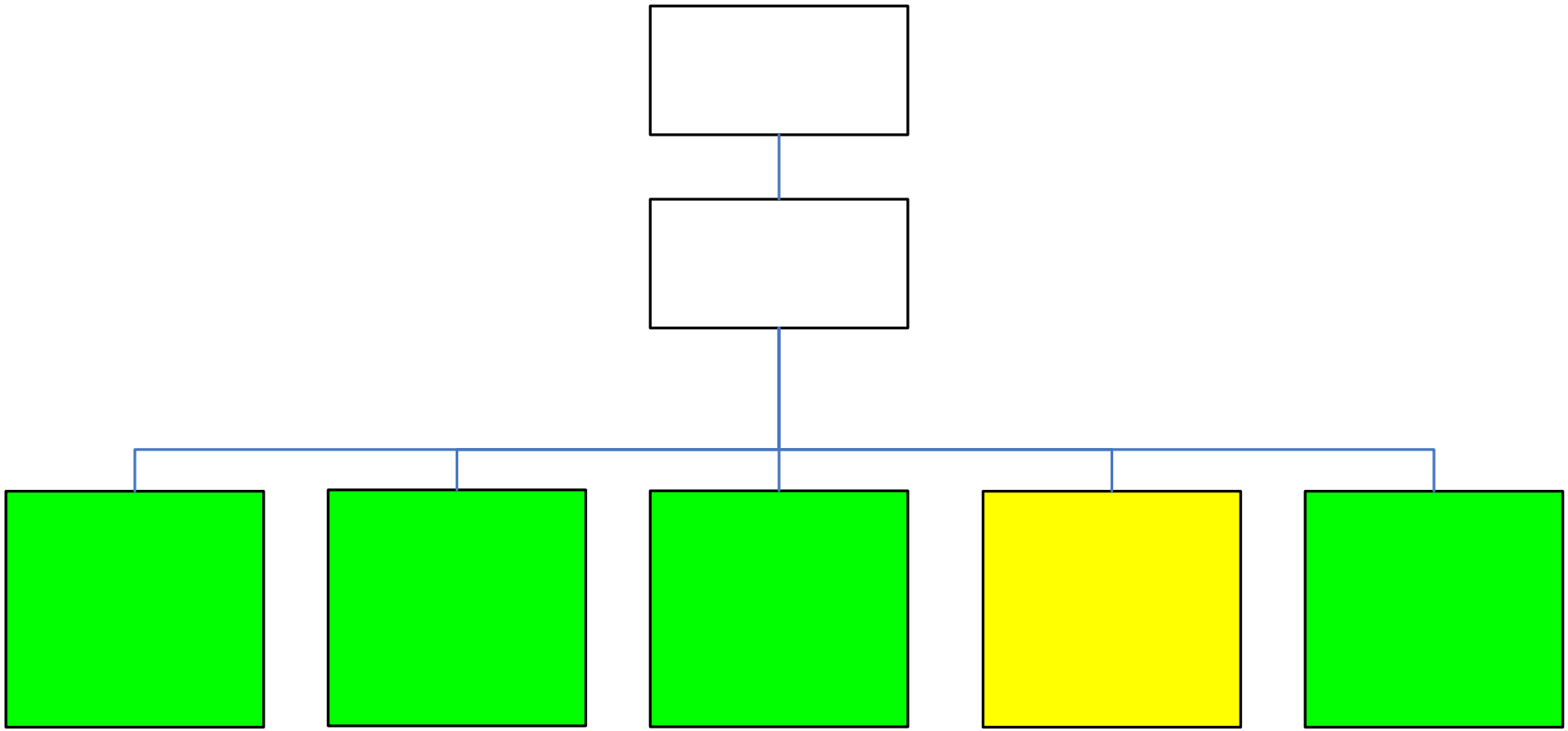
REQM Specific Goals/Practices – Enhanced Process



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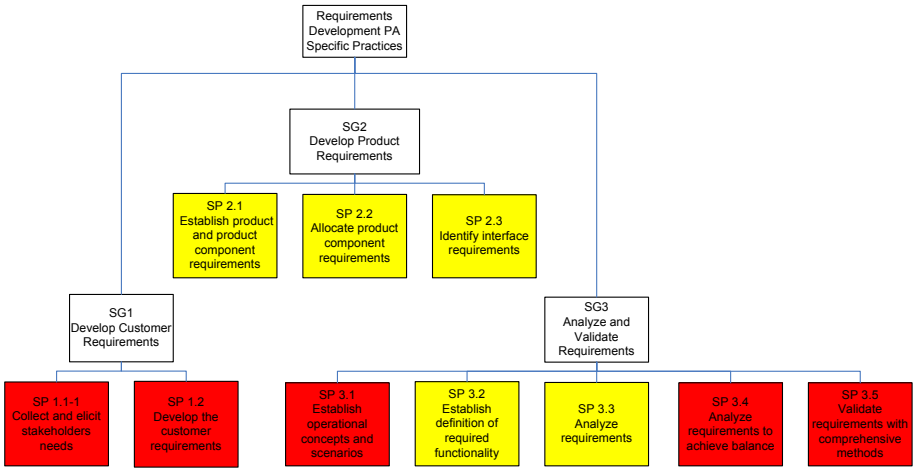
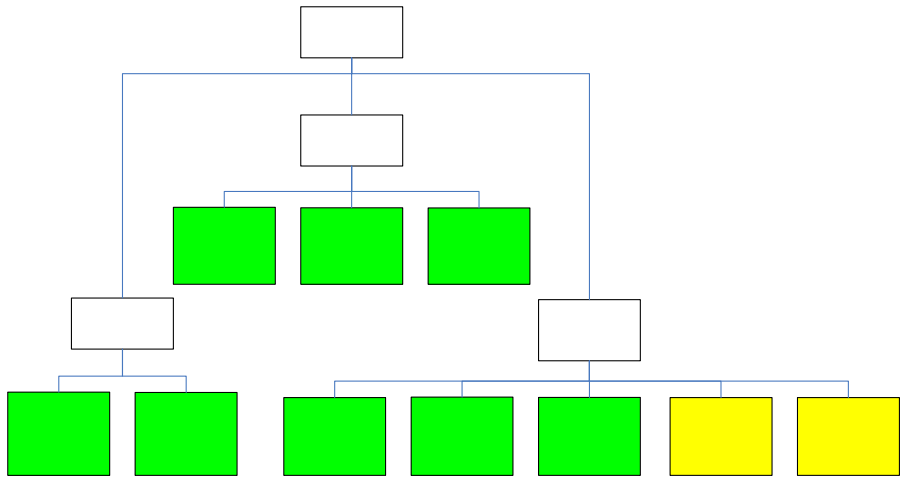
RD - Before and After





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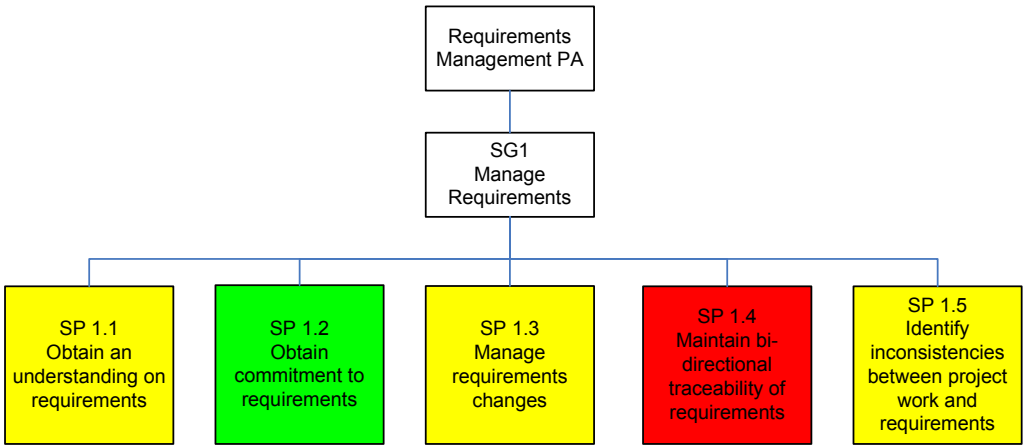
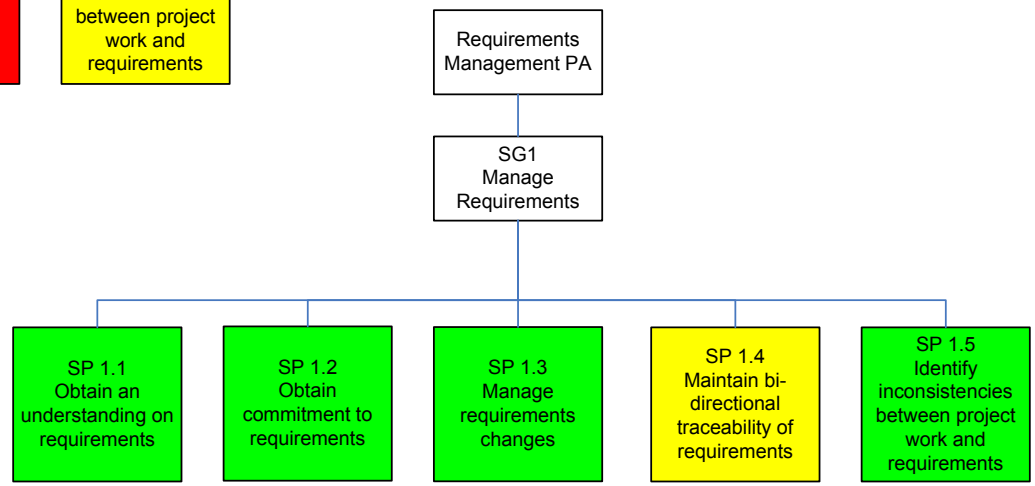
REQM - Before and After





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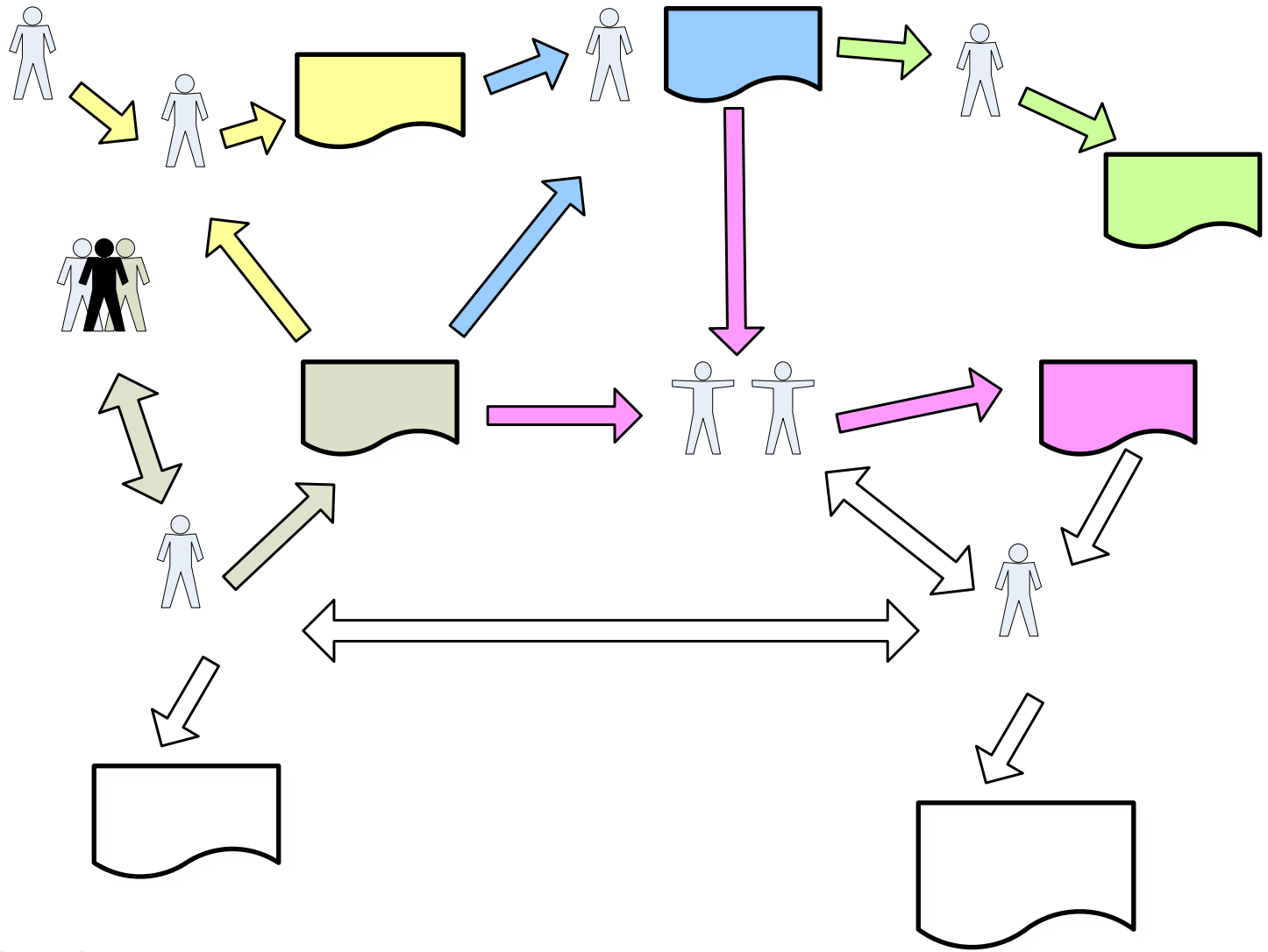
New RE Process



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MA Process Area

- Measurement Objective
  - To measure the defect removal effort in hours spent by software developers to fix defects identified, documented, and categorized in the SAS DEFECTS system
- Measures
  - # of defects in each category associated with RD and REQM
  - Actual development time associated with fixing each defect. Time includes developers' time and also subsequent tester's time to review the fixes
  - Cumulative time that accounts for all defect types across the whole project.

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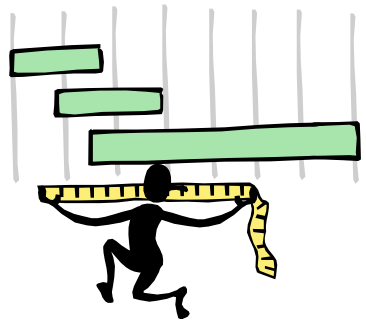
MA Process Area



- Measurement Data Collection
  - Defects are identified by test team and documented in the DEFECTS database
  - Defect types are defined in a collaborative fashion between testers and developers
  - Time associated with defect removal will be recorded by developers in time-sheet database
  - Time associated with reviewing defect removal by testers will be recorded in time-sheet database
- Analysis of Measurement Data
  - Measurement data will be analyzed using the RE Economic Benefit Calculation explained later

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MA Process Area

- Reporting of Measurement Data
  - Three primary reports will be generated
    - Histogram that presents the number of defects within their types at time t1 and at time t2
    - Cumulative defect removal time graphics for each defect type for time t1 and time t2
    - Histogram of total time and cost for all defect removal for time t1 and time t2

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Defect Types Associated with Requirements Development

- Market Requirements Document (MRD)
  - Requirement not documented in MRD
  - Requirement not properly specified in MRD
  - Requirement creep in MRD
  - Development misunderstood requirement in MRD
- Product Requirements Specification (PRS)
  - Requirement not documented in PRS
  - Requirement not properly specified in PRS

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Defect Types Associated with Requirements Management

- Change in requirement not documented in MRD
- Change in requirement not documented in PRS
- Change in requirement not properly documented in MRD
- Change in requirement not properly documented in PRS

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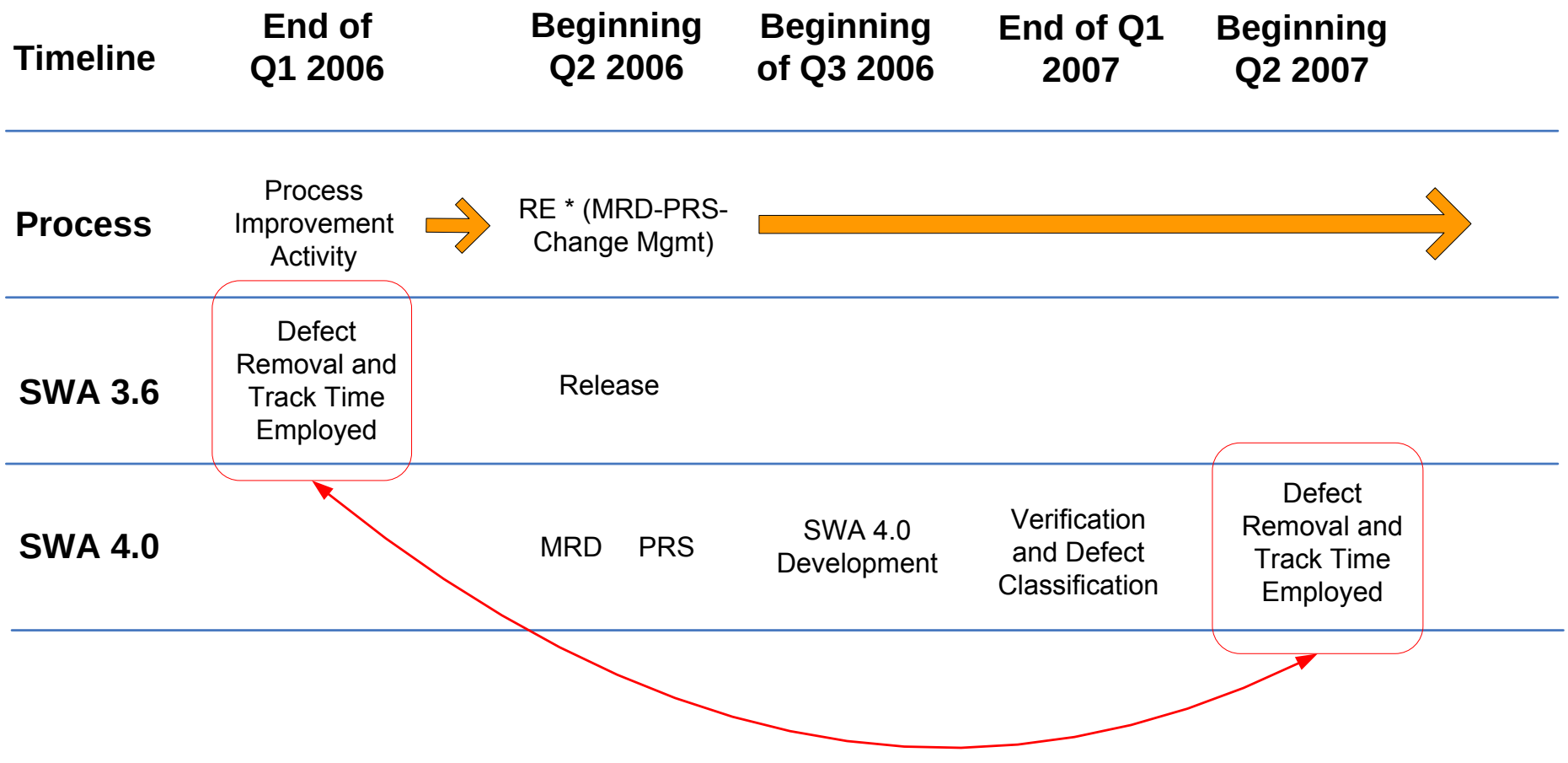
Compare Defect Removal Effort and Cost



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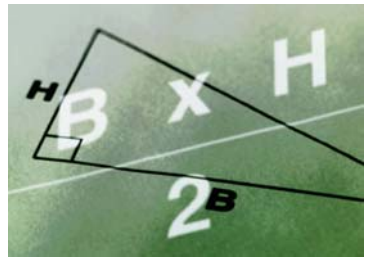
RE Economic Benefit Calculation



$t_{1\,(k)}$ = time to fix defects of type “k” at time t_1

$t_{2\,(k)}$ = time to fix defects of type “k” at time t_2

$t_{1\,(k,i)}$ = time to fix defect of type “k” at time t_1 and at occurrence i

$t_{2\,(k,j)}$ = time to fix defect of type “k” at time t_2 and at occurrence j

C = hourly average cost of development

T_Δ = time differential between fixing all defect types at time 1 and at time 2

$$t_{1\,(k)} = \sum_{I=1}^{n} [\, t_{1\,(k,i)} \,]$$

$$t_{2\,(k)} = \sum_{j=1}^{m} [\, t_{2\,(k,j)} \,]$$

$$T_\Delta = \sum_{k=1}^{s} [t_{(1,k)} - t_{(2,k)}]$$

Expected Economic Benefit = $T_\Delta * C$

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Conclusions

- Having a quantitative business objective guiding the internal CMMI appraisal and process improvement activity is essential
- Use the Measurement and Analysis PA as a basis for measurement
- Start “small”
- Find “high impact” area that shows a “large” benefit

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