

Perspectives on Use and Organizational Impact of Measurement and Analytical Methods in CMMI High Maturity Organizations: Results from the SEI Annual Survey Series

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CMMI Technology Conference & User Group
Denver, Colorado – 19 November 2009



Today's Talk

Scope of the presentation

A focus on results from the 2009 high maturity survey in the SEI's annual measurement & analysis surveys

- Heavier focus here today given current interest in our field
- Contrary to the abstract, we're again postponing the reporting of trends in the general population surveys over time until we have more data

Summary, lessons learned & next steps



Why do this Work?

An insufficient shared understanding of *high maturity* measurement & analysis

- Confusion about what is necessary to meet the goals of CMMI based process improvement

More & better guidance needed throughout the community

- Value of improving measurement capability often not appreciated in lower maturity organizations

Need for continuous improvement as the field matures

- Understanding high maturity practices in organizational context
- Sharing experiences in the wider community



The Need for Evidence

A great deal of recent discussion

- What does it take to attain high maturity status?
- What can one reasonably expect to gain by doing so?

We need clarification

- Along with good examples of what has worked well and what has not

Questions in surveys done in 2008 & 2009 center on value added by process performance modeling

- As a function of extent of use & understanding of PPMs
- As well as organizational resources & management support

Focus here today on the 2009 survey

- Response rate: 55%



The SEI High Maturity Measurement & Analysis Workshops: A Quick Overview

1st workshop co-located with SEPG NA 2008 in Tampa

- A small invited group of leaders in the field
- Mostly focused on building trust & recognizing opportunity for mutual benefits ... in what is rapidly becoming a viable community of practice

Workshops 2 & 3 co-located with 2008 CMMI Technology Conference here in Denver & SEPG NA 2009 in San Jose

- 25 presentations describing adoption, analytical methods, use & value added by CMMI process performance modeling
- To appear in forthcoming SEI Technical Report (CMU/SEI-2009-TR-021)

4th workshop will be co-located here Immediately after this conference

- 22 presentations accepted ... more than can fit in the workshop



Today's Talk

Scope of the presentation

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Summary, lessons learned & next steps



Why do the 2008 & 2009 High Maturity Samples Differ?

This year we surveyed high maturity lead appraisers (HMLAs).

- Provides a useful comparison with those of the perspectives from the appraised organizations

Intent is to reuse & modify the 2008-2009 questionnaire in future years

- Using the 2008 results as the baseline for tracking changes in high maturity organizations over time

Only a limited number of organizations have achieved high maturity status

But we won't ask the same people to answer the same questions over & over each year

- (Surveyed appraisal sponsors & their designees in 2008)



Comparable Organization Scope in Both Years

Similar organizational context in the 2008 and 2009 high maturity surveys

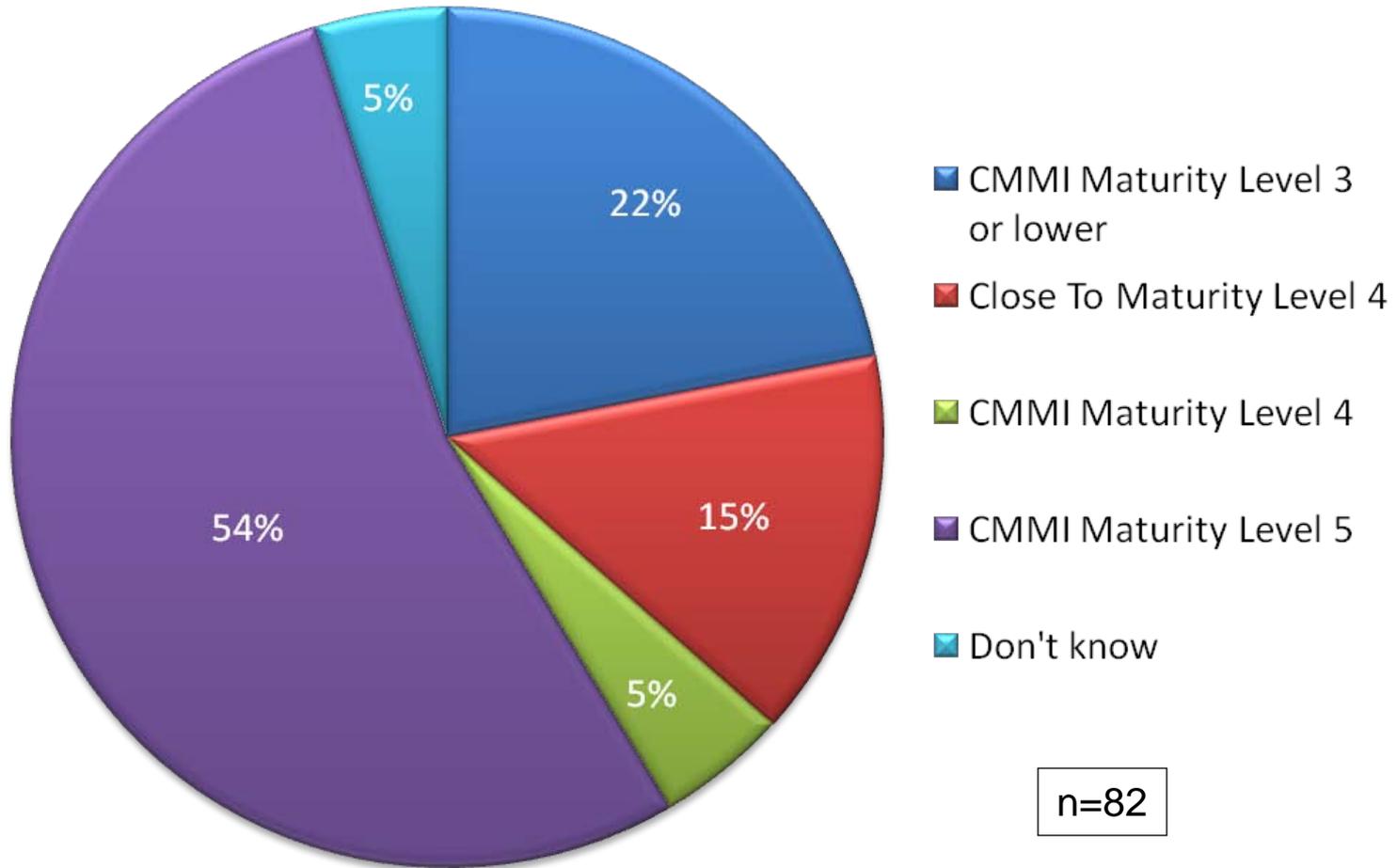
- Sector (commercial, contracted new development, in-house or proprietary development or maintenance, defense contractors, other government contractors, DoD or military organizations)
- Focus (product or system development, maintenance or sustainment, acquisition, service provision)
- Engineering discipline (software, systems, hardware, design, test)
- Number of FTE software, hardware or systems engineering employees

They do differ somewhat by country

- More from China & relatively fewer from India
- Possibly since the 2009 engagements are more recent



Maturity Level



Synopsis & Implications₁

Evidence of considerable understanding & use of process performance models (PPMs)

- But also variation in responses
- The same is true for judgments about how useful PPMs have been

There is room for continuous improvement among high maturity organizations - as in less mature organizations

Nevertheless

- Judgments about value added by process performance modeling also vary predictably
- As a function of the understanding & reported use of the models

More widespread adoption & improved understanding of what constitutes a suitable process performance model holds promise to improve CMMI-based performance outcomes considerably



Synopsis & Implications₂

Overall results from HMLAs in 2009 are consistent with reports from HM appraisal sponsors in 2008 survey

- HMLAs somewhat **more** positive than the sponsors about the analytical approaches taken by these organizations
- But slightly less positive overall in judgments of value added
- Strength of association also varies across the years

As seen in:

- Comparisons of approaches taken & methods used
- Comparisons of use & value added

When control for achieved high maturity status

- HMLA reports of use & value added both improve concomitantly
- See forthcoming TR for more detail

We will see how & if more recent high maturity organization sponsor perspectives mirror HMLAs in future surveys



The Survey Data Do *Not* Speak for Themselves

Perceptions & expectations often differ among survey respondents

- & they probably do by maturity level

We're not claiming cause & effect

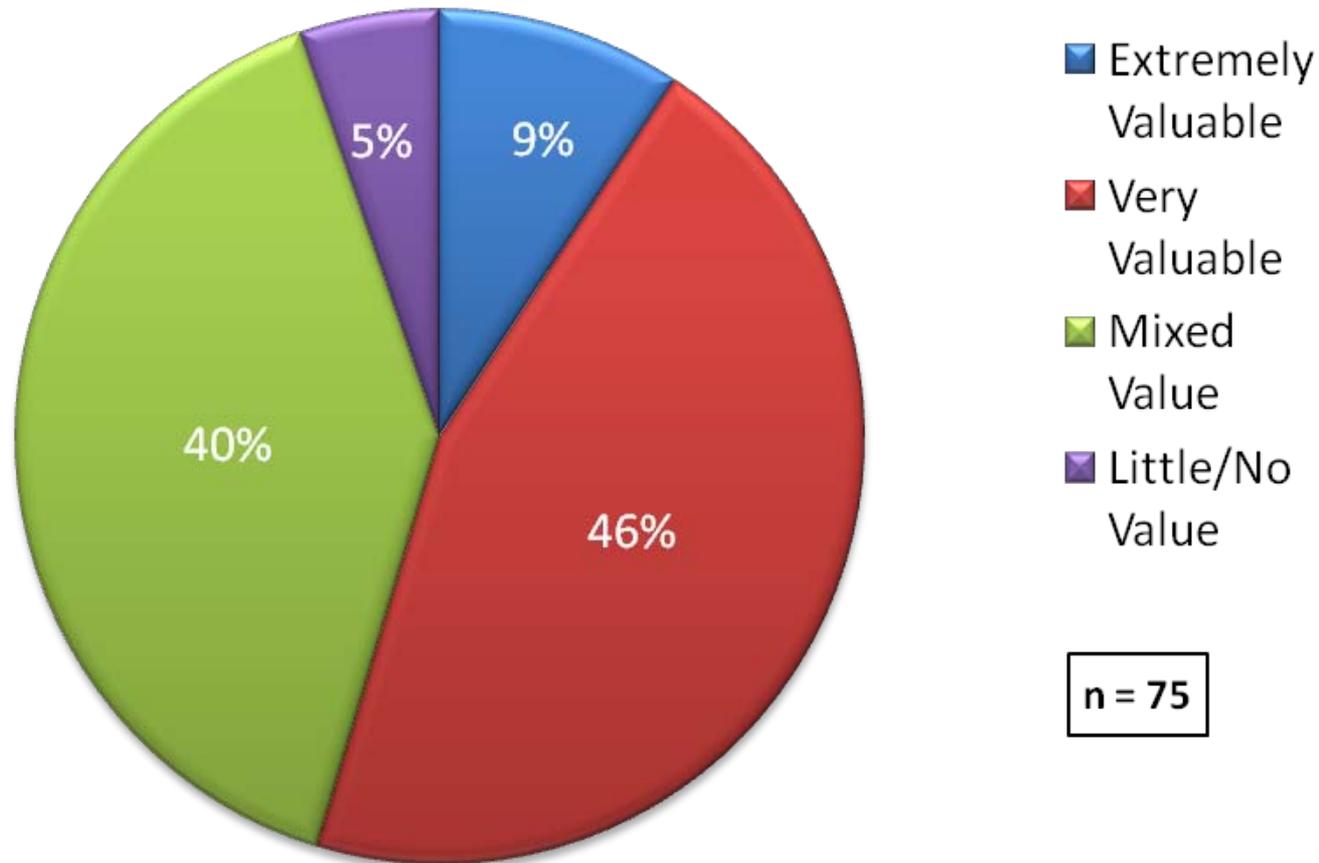
- It's statistical association at one point in time
- Cause & effect often are recursive

Results described more fully in two SEI technical reports

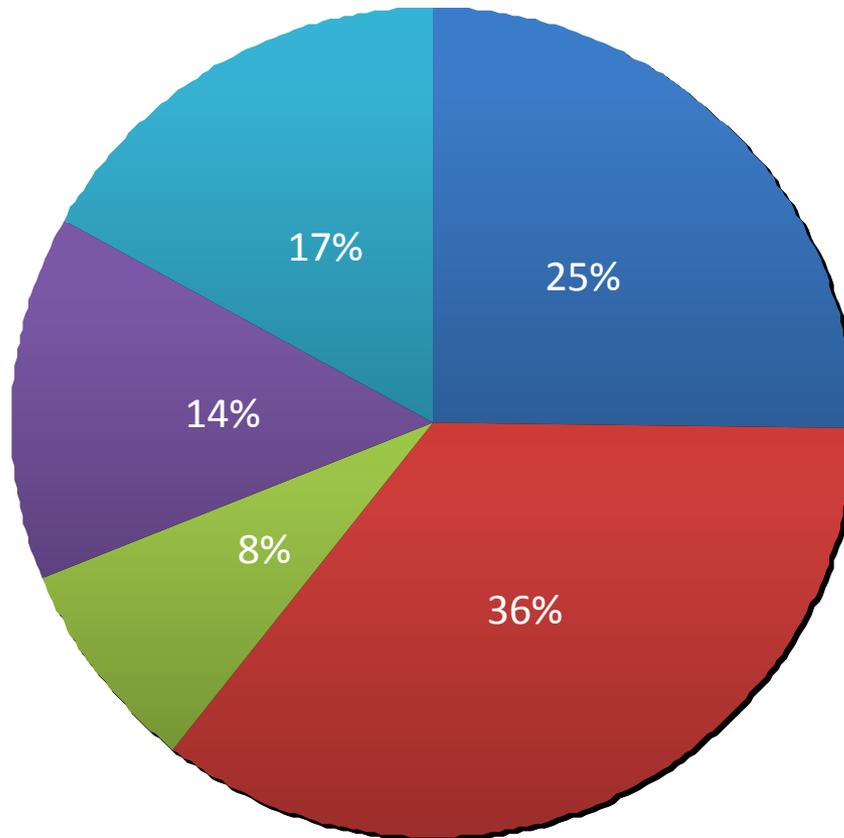
- CMU/SEI-2008-TR-024, ESC-TR-2008-024
- CMU/SEI-2009-TR-020, ESC-TR-2009-020 (forthcoming)



In your best judgment, how useful have process performance models been for this organization overall?



How often are process performance model predictions used to inform decision making in the organization's status and milestone reviews?



Of interest as a performance measure in its own right

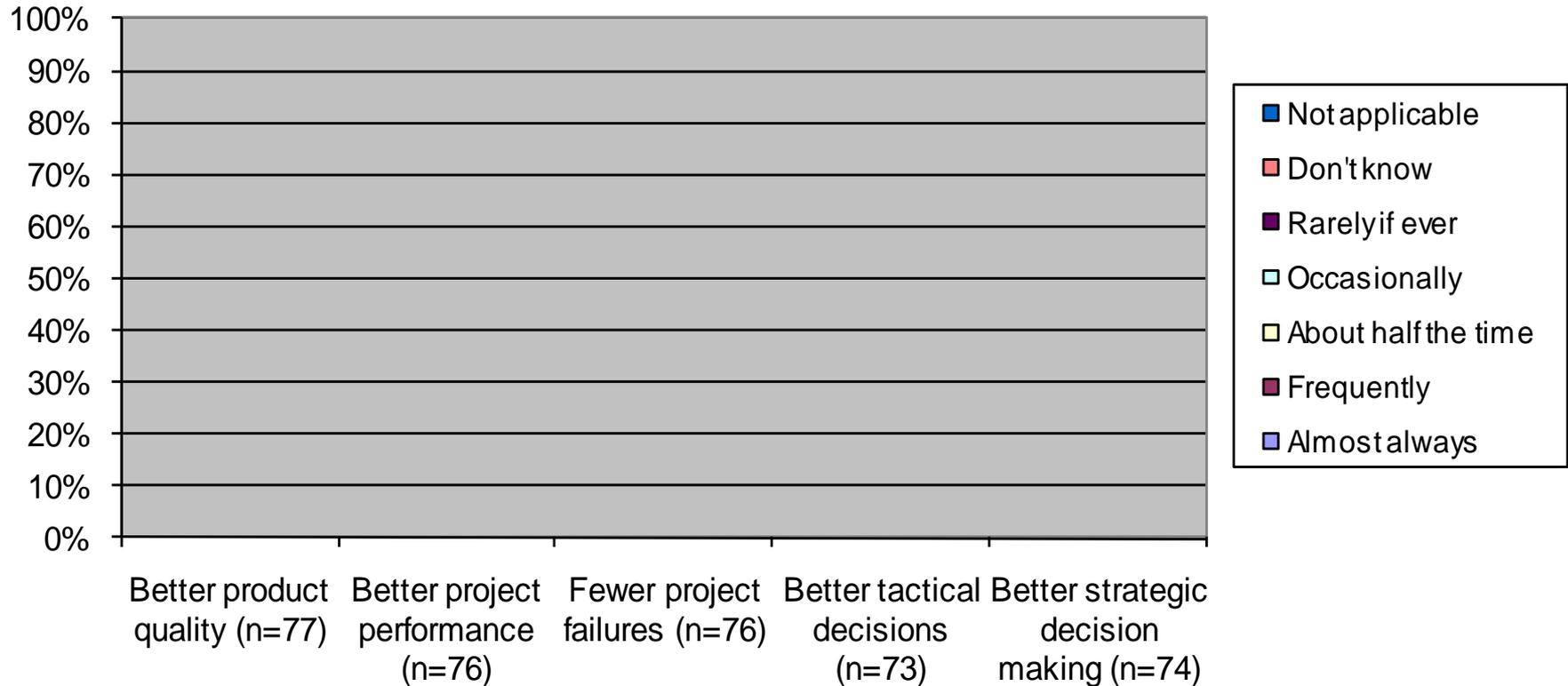
Also for its impact on overall outcome

- Almost Always
- Frequently
- About half the time
- Occasionally
- Rarely

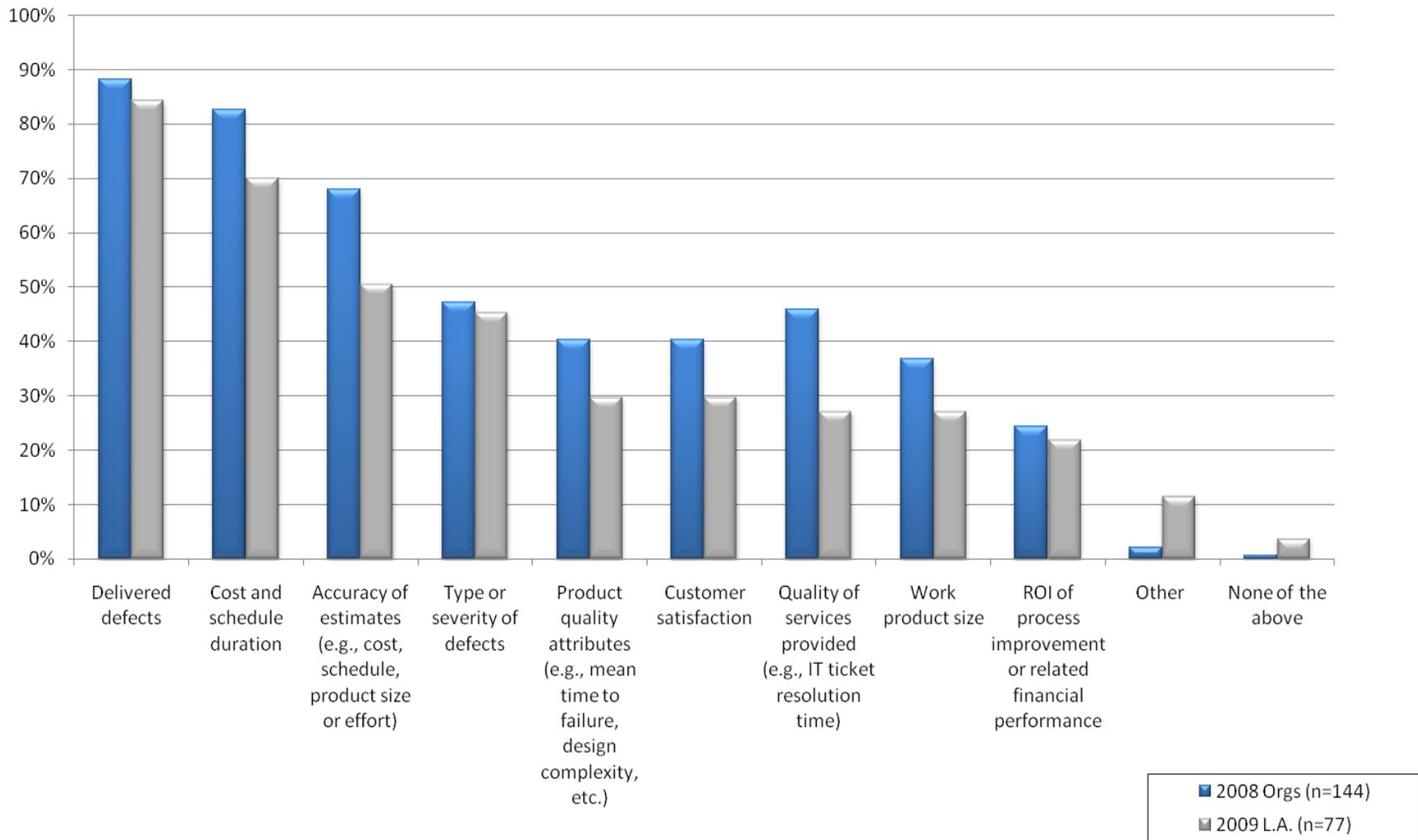
n = 71



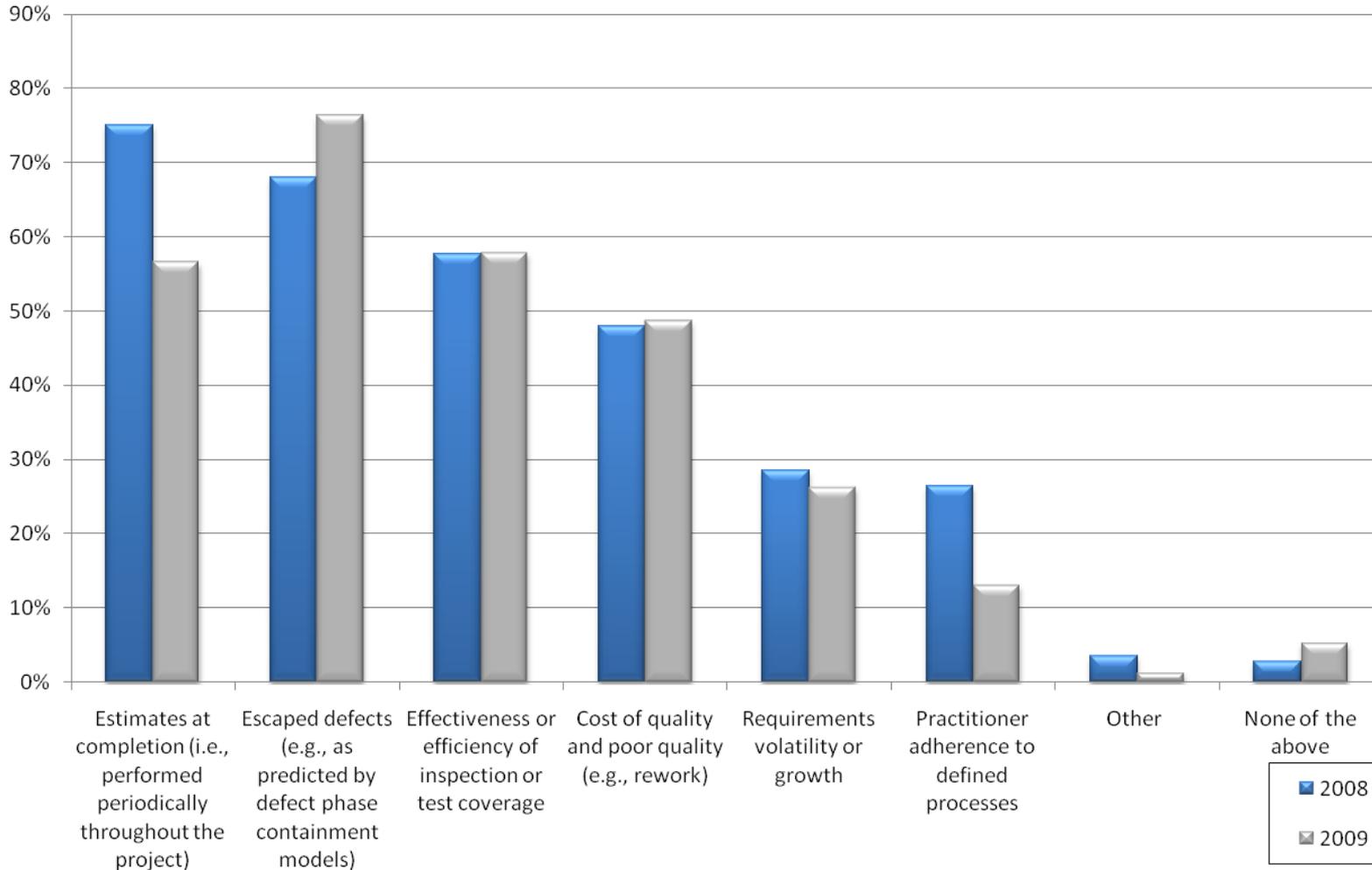
2009: Statements about the possible results of using process performance modeling



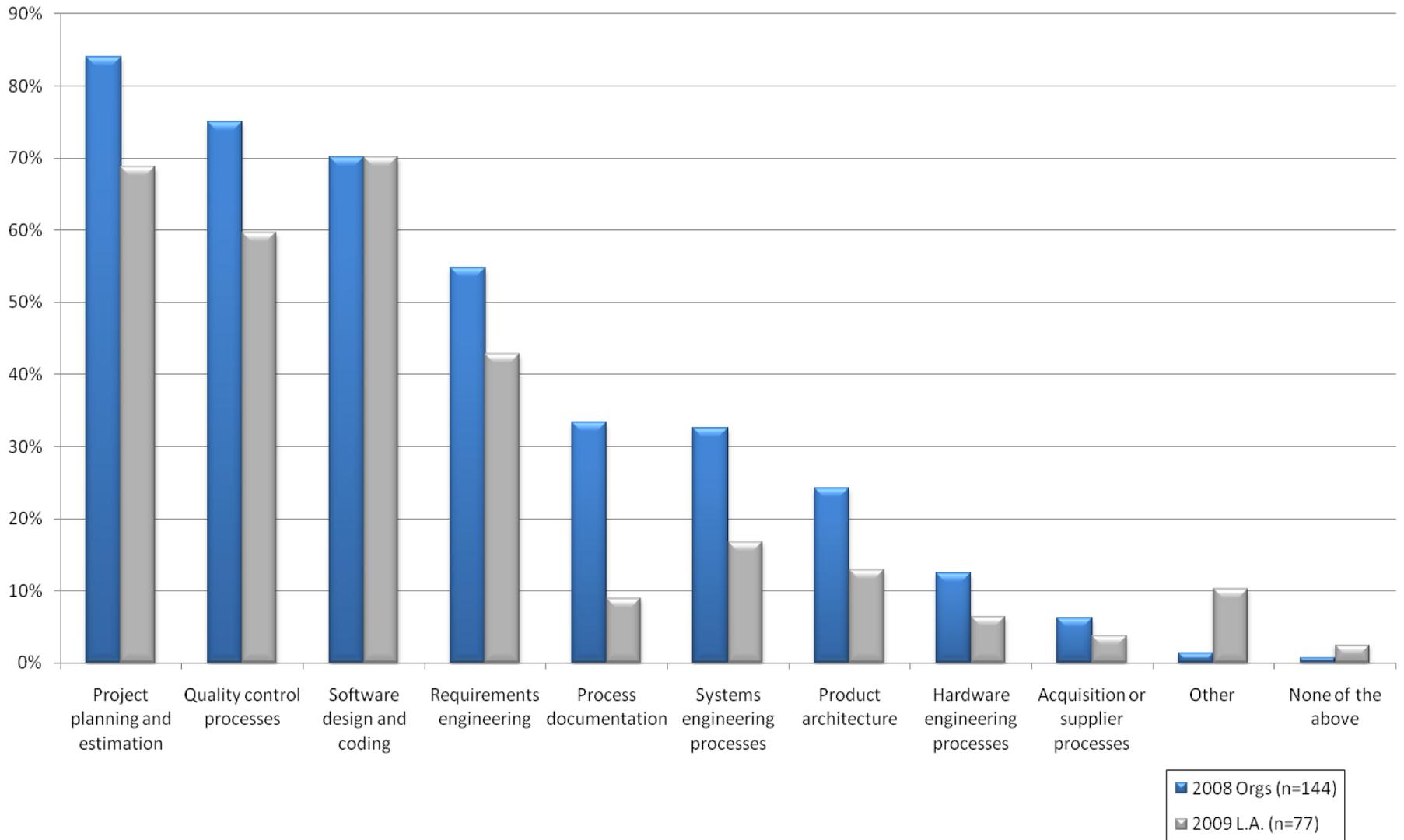
Which of the following product quality and project performance outcomes were routinely predicted with process performance models in the organization?



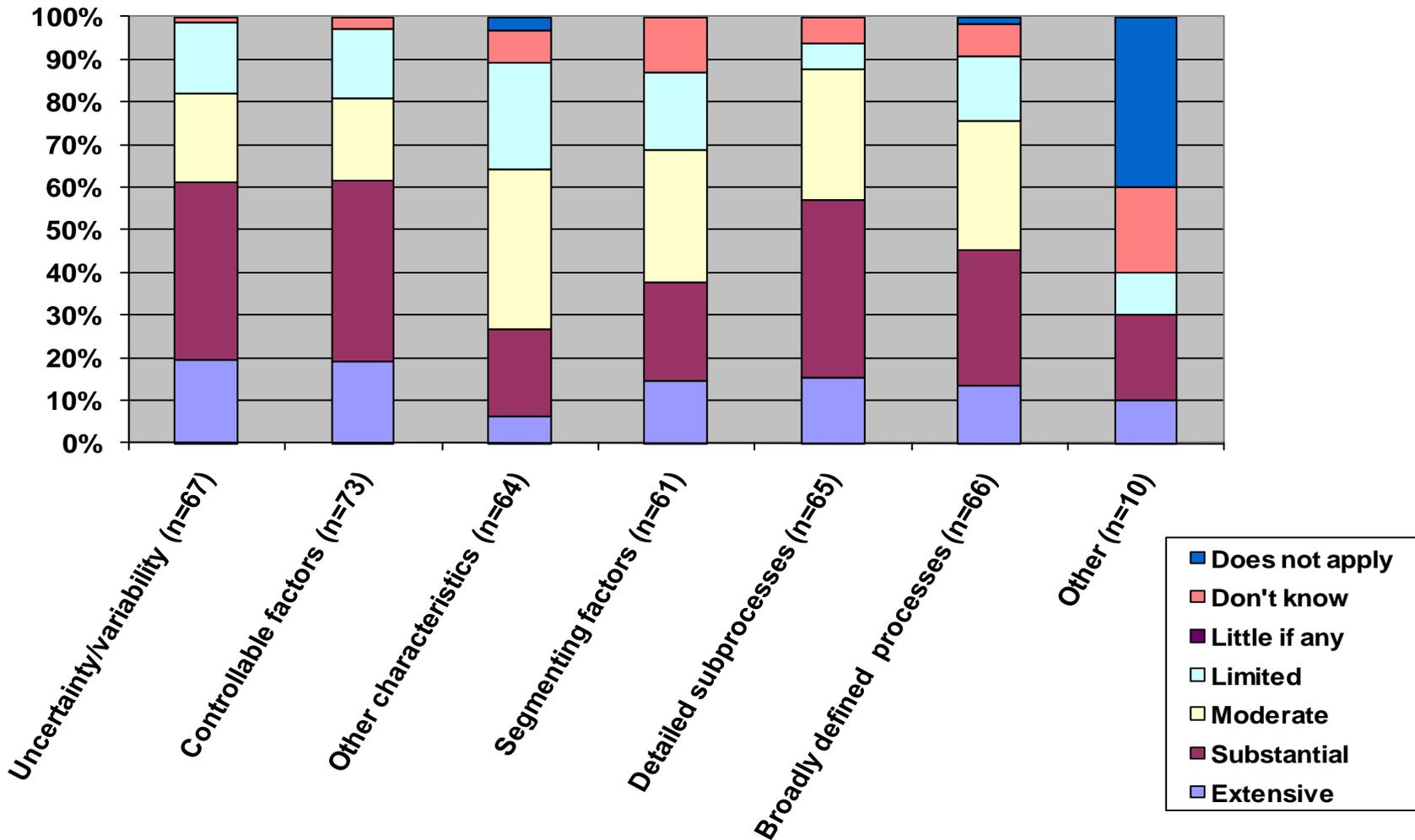
Which of the following (often interim) process performance outcomes are routinely predicted with process performance models in your organization?



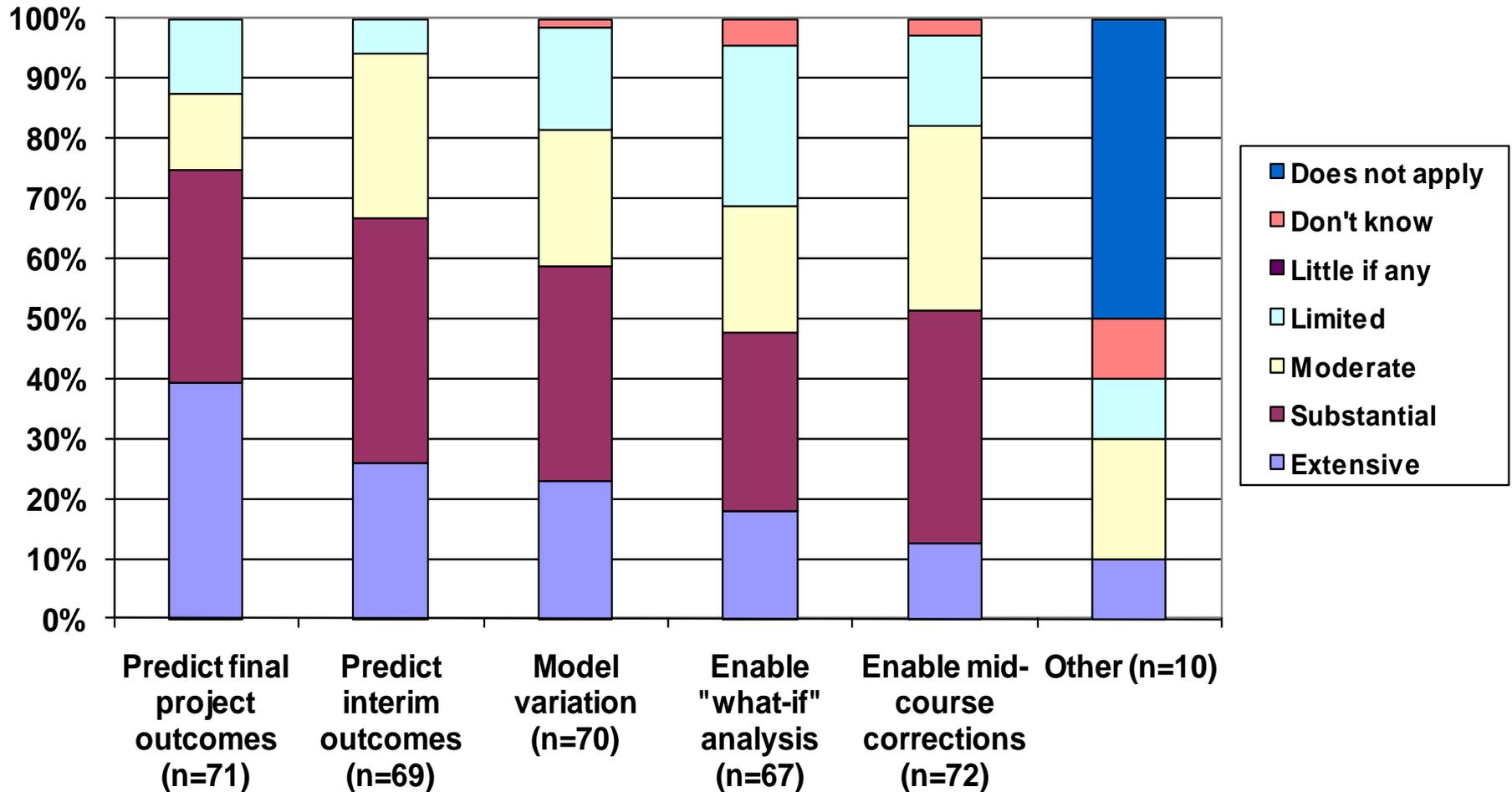
Which of the following processes and activities were routinely modeled in the organization?



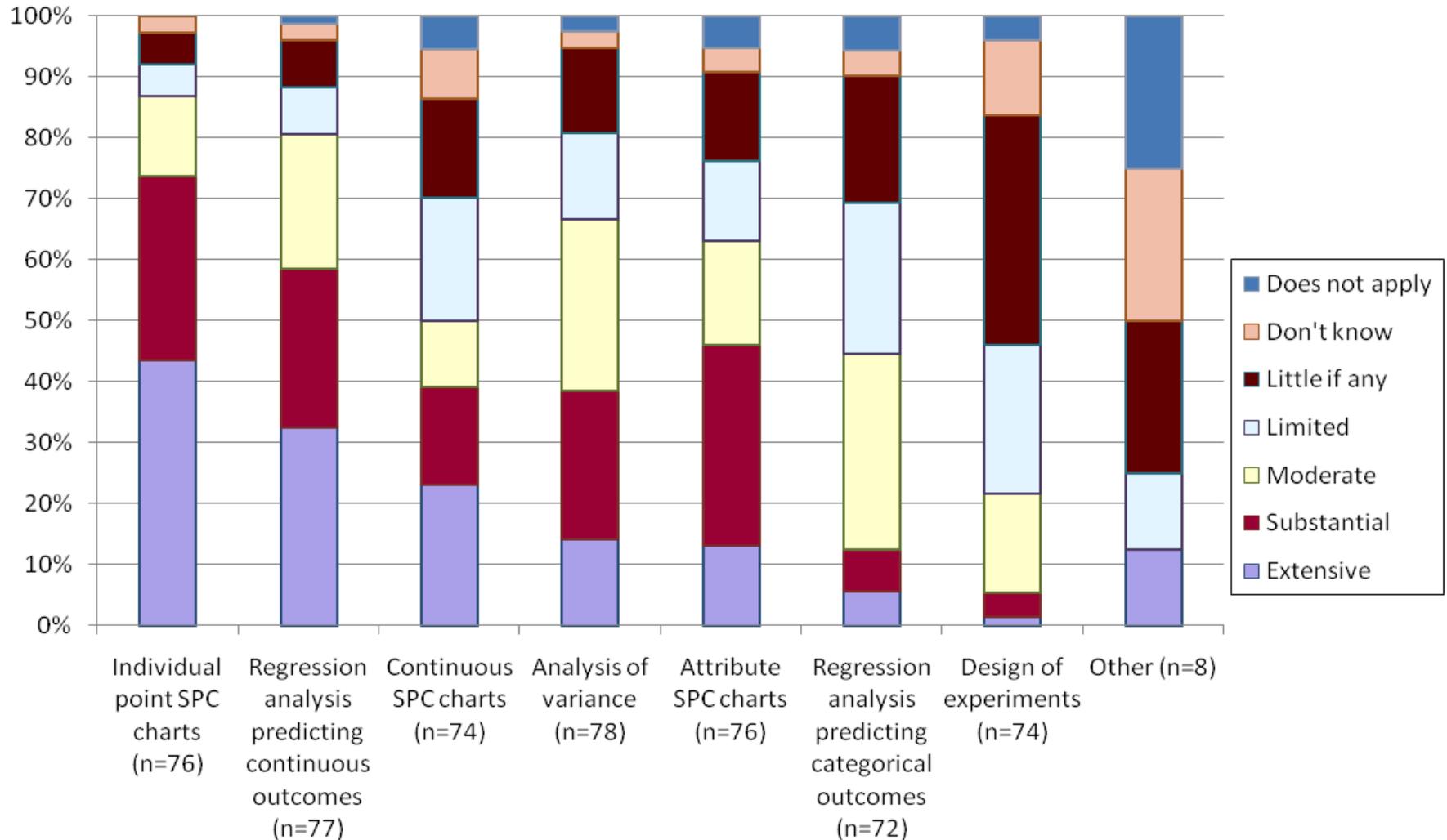
How much emphasis does the organization place upon the following in its process performance modeling?



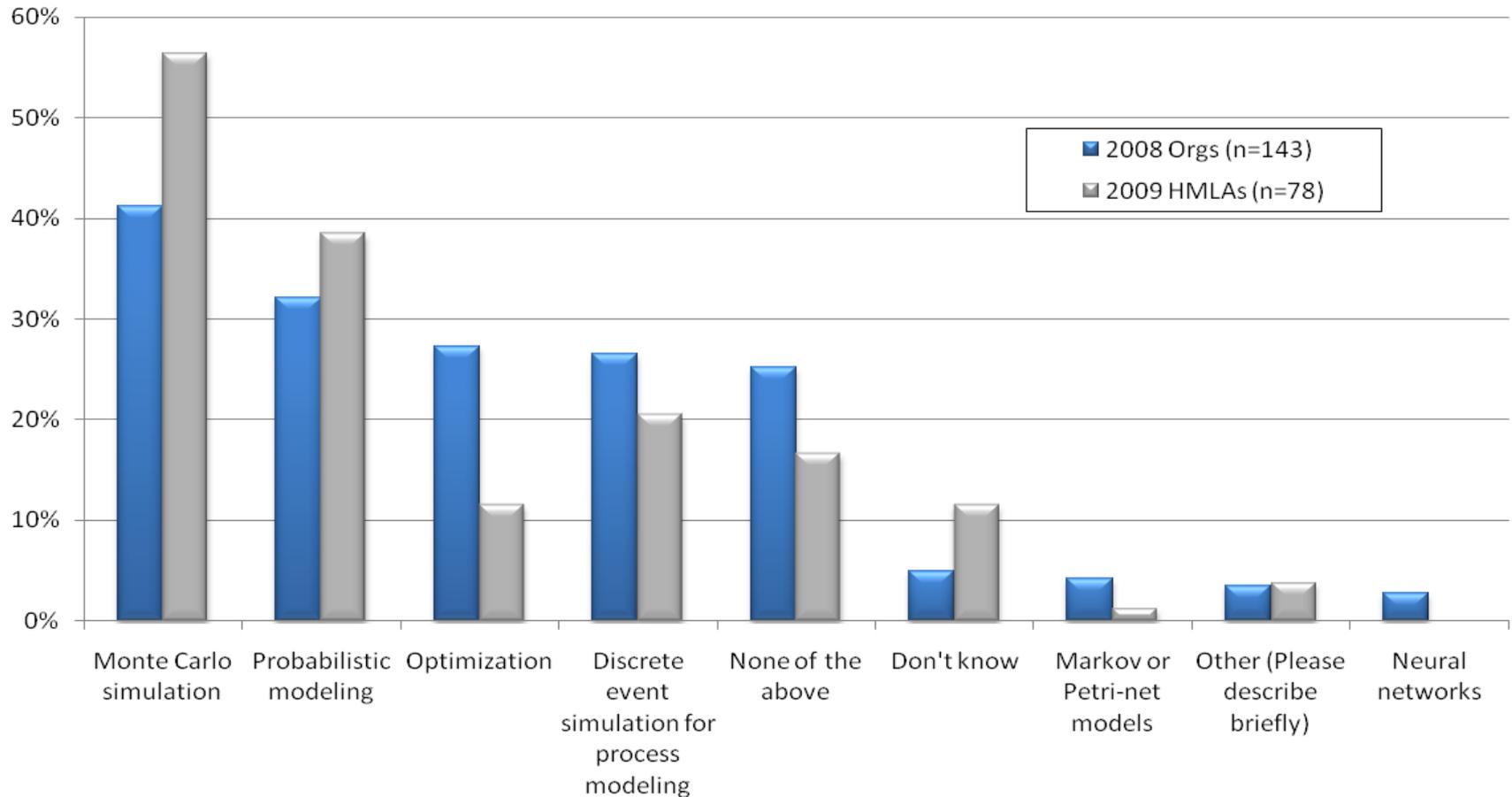
To what degree are your organization's process performance models used for the following purposes?



To what extent are the following statistical methods used in your organization's process performance modeling?



Which of the following other optimization approaches are used in your organization's process performance modeling?



Healthy PPM Ingredients: Emphasis

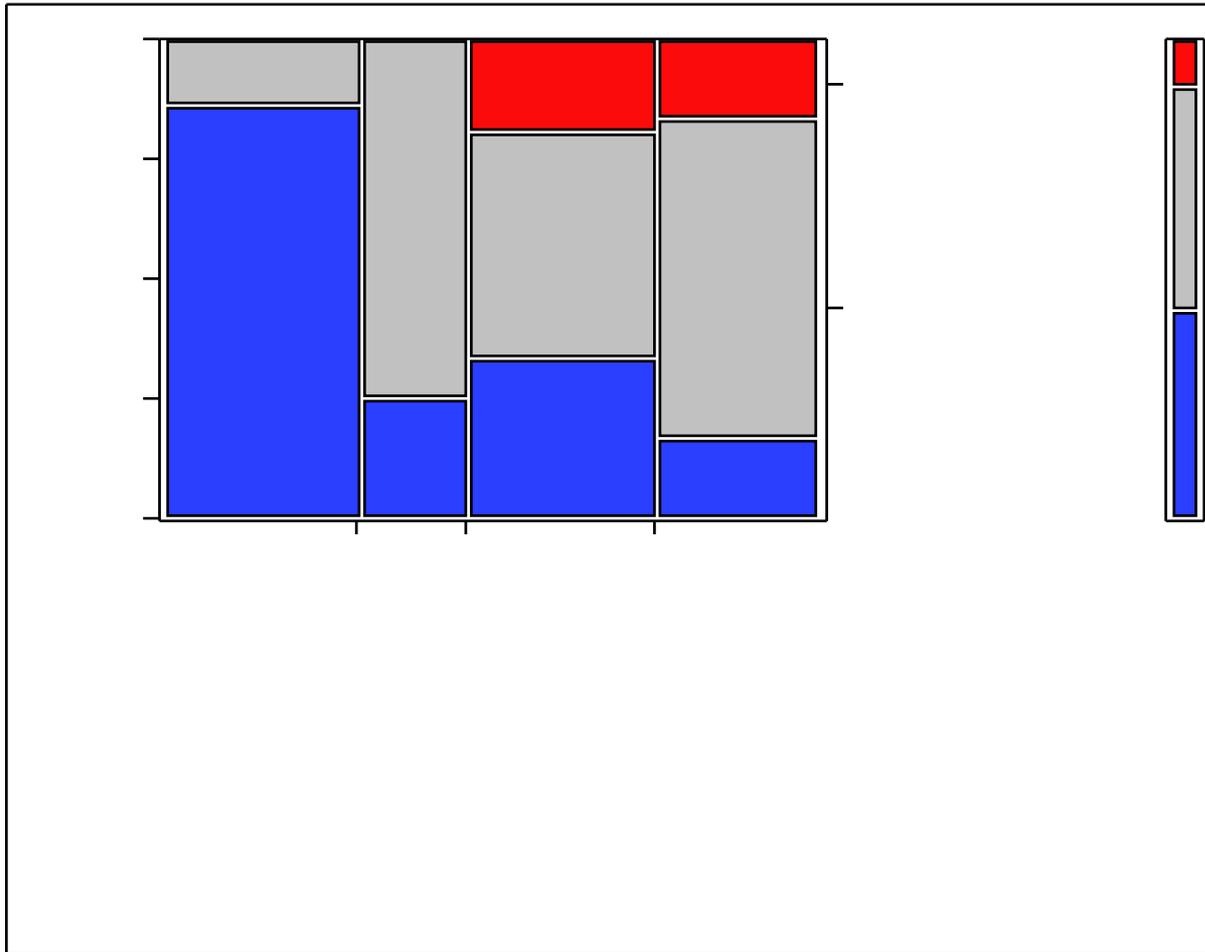
How much emphasis does your organization place upon the following in its process performance modeling?

- Accounting for uncertainty and variability in predictive factors and predicted outcomes
- Factors that are under management or technical control
- Other product, contractual or organizational characteristics, resources or constraints
- Segmenting or otherwise accounting for uncontrollable factors
- Factors that are tied to detailed subprocesses
- Factors that are tied to larger, more broadly defined organizational processes

Note that values on the extremes of this & all other weighted sum measures require consistency of replies across all of the component sub questions



Relationship Between Healthy PPM Ingredients & Overall Value Attributed to PPMs: Emphasis



Still room for improvement in PPM emphasis

Which does seem to pay off

gamma = .67,
p<.000, n = 73



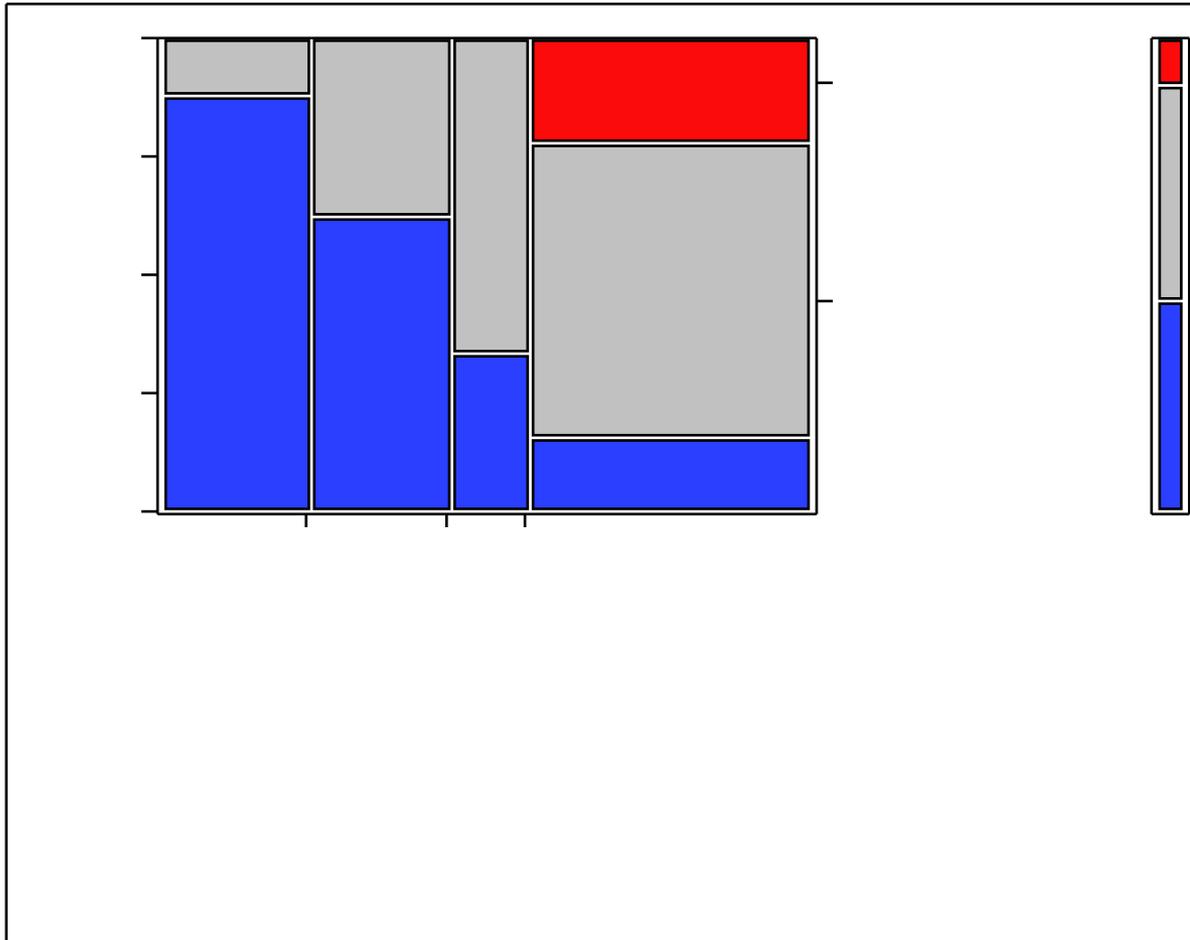
Healthy PPM Ingredients: Usage

To what degree are your organization's process performance models used for the following purposes?

- Predict final project outcomes
- Predict interim outcomes during project execution (e.g., connecting “upstream” with “downstream” activities)
- Model the variation of factors and understand the predicted range or variation of the predicted outcomes
- Enable “what-if” analysis for project planning, dynamic re-planning and problem resolution during project execution
- Enable projects to achieve mid-course corrections to ensure project success



Relationship Between Healthy PPM Ingredients & Overall Value Attributed to PPMs: Use



More do report using PPMs for the right reasons

gamma = .82,
p<.000, n = 74



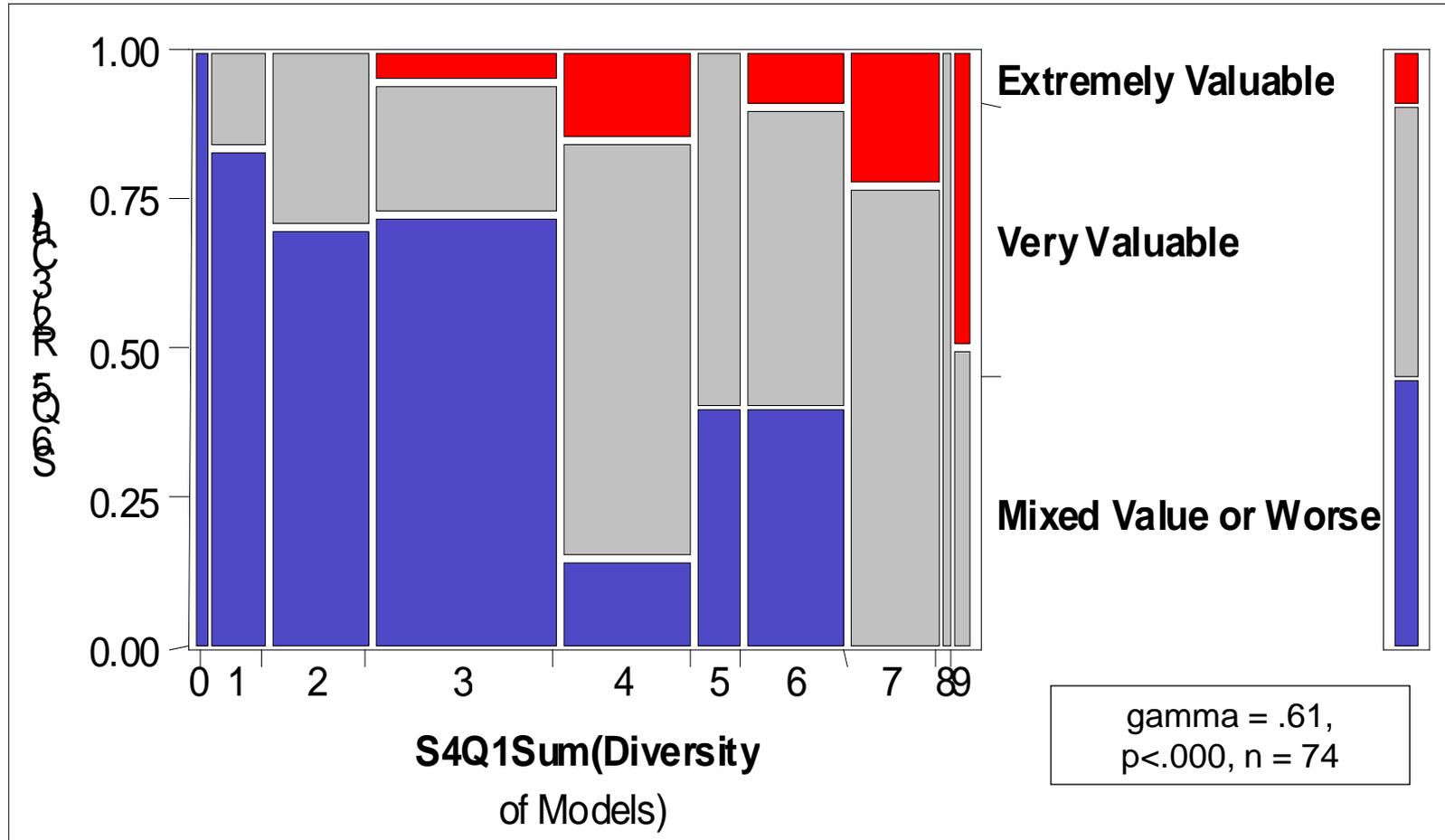
Diversity of PPMs

Which of the following product quality and project performance outcomes are routinely predicted with process performance models in your organization?

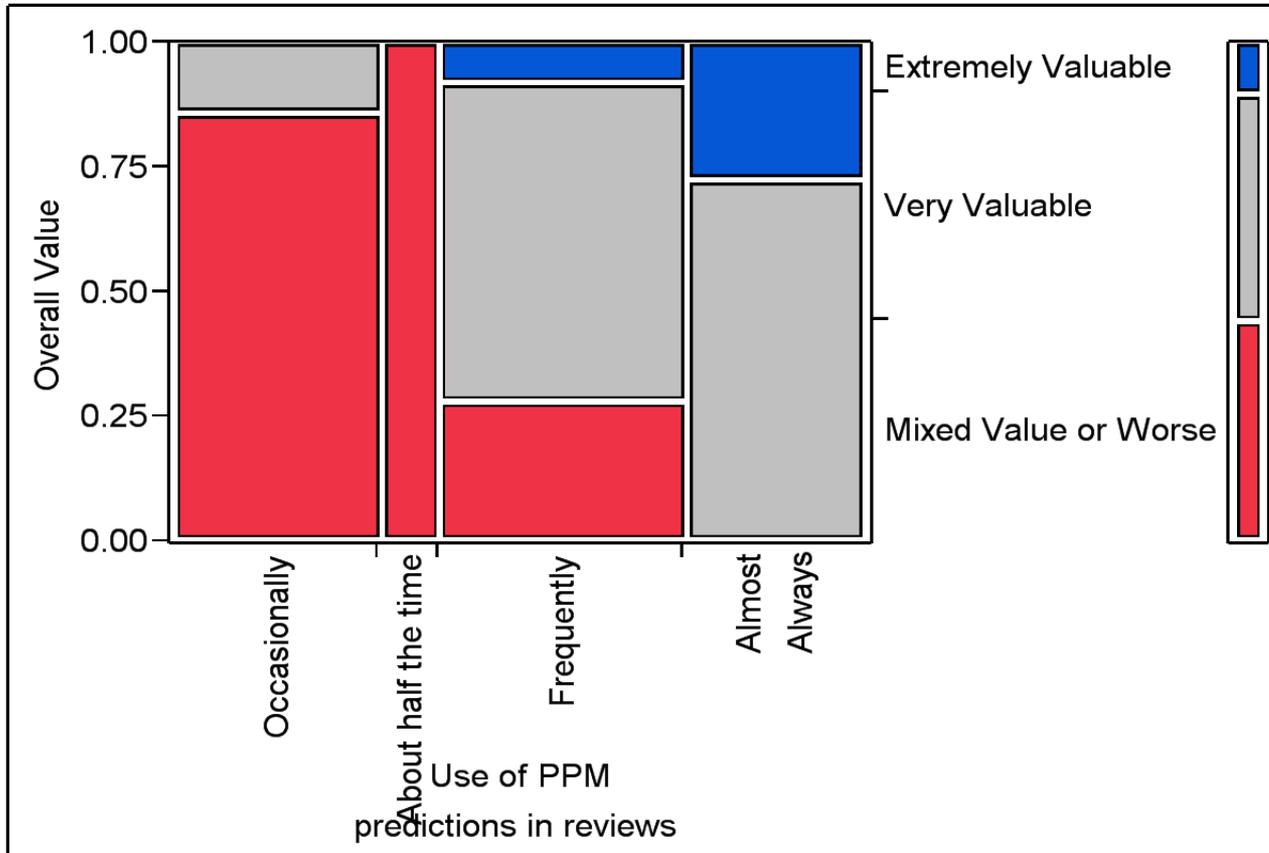
- Delivered defects
- Type or severity of defects
- Product quality attributes (e.g., mean time to failure, design complexity, maintainability, interoperability, portability, usability, reliability, complexity, reusability or durability)
- Quality of services provided (e.g., IT ticket resolution time)
- Cost and schedule duration
- Work product size
- Accuracy of estimates (e.g., cost, schedule, product size or effort)
- ROI of process improvement or related financial performance
- Customer satisfaction



Relationship Between Diversity of Models Used & Overall Value Attributed to PPMs



2009: Relationship Between Use of PPM Predictions in Reviews & Overall Value Attributed to PPMs

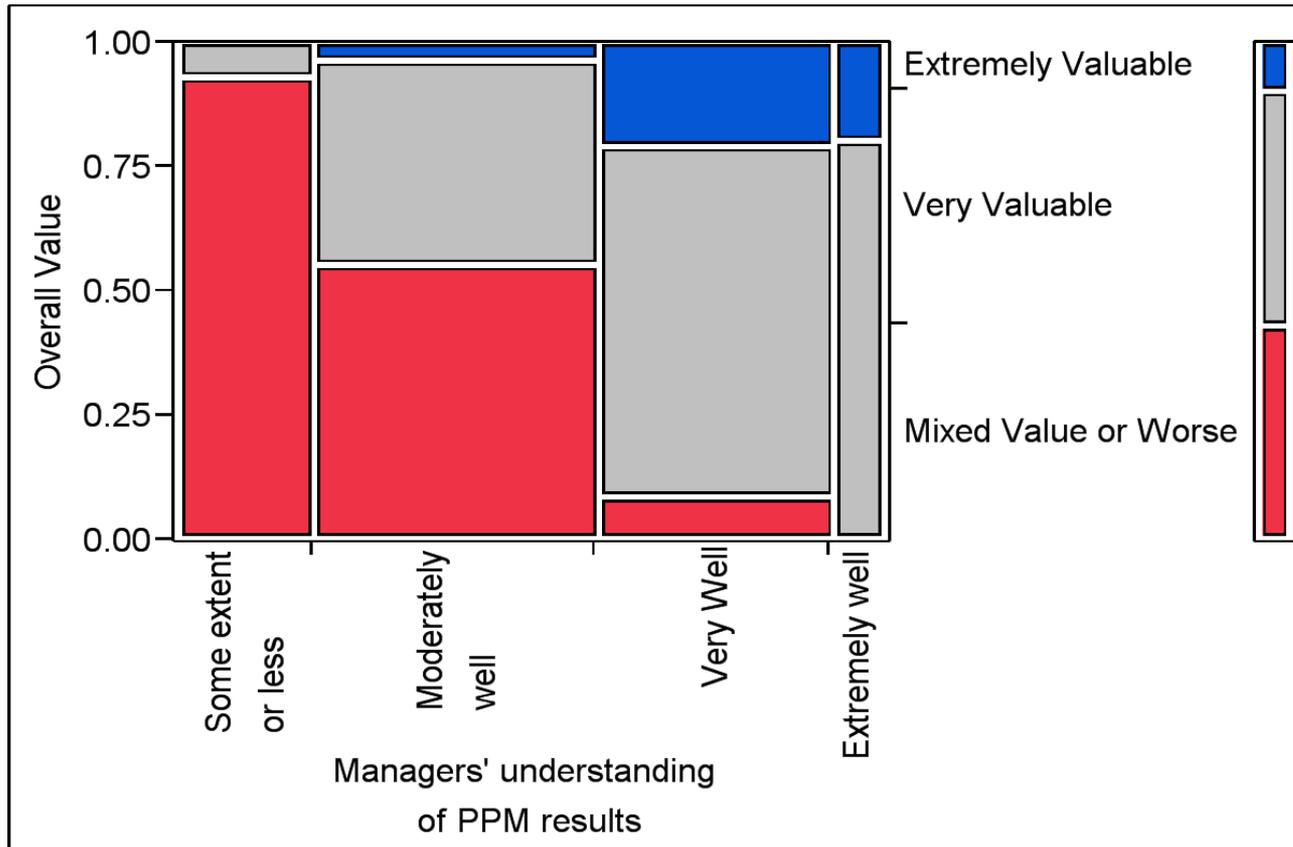


How often are process performance model predictions used to inform decision making in the organization's status and milestone reviews?

gamma = .89,
p < .000, n = 70



2009: Relationship Between Managers' Understanding of Model Results & Overall Value Attributed to PPMs



How well do the managers in the organization who use process performance model results understand the results that they use?

gamma = .85,
p<.000, n = 72



Stakeholder Involvement

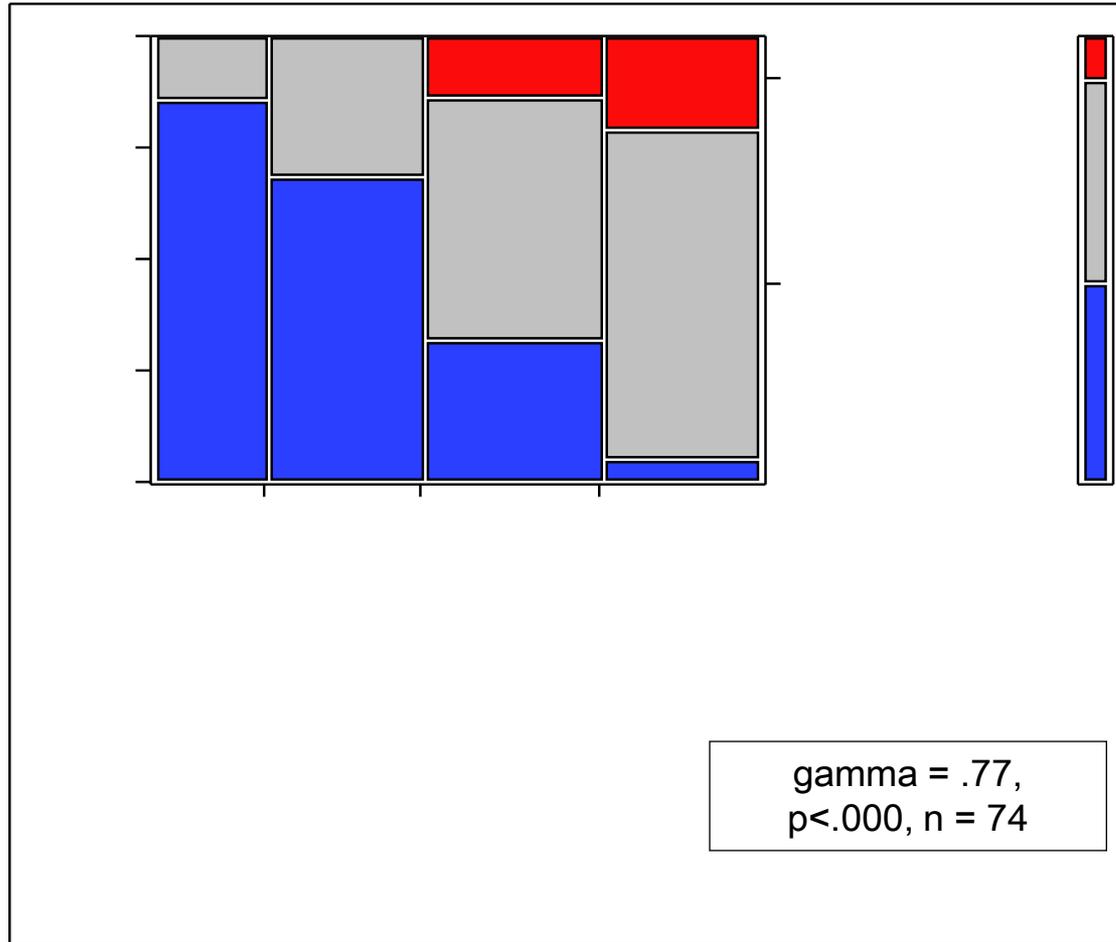
How would you characterize the involvement of various potential stakeholders in setting goals and deciding on plans of action for measurement and analysis in your organization?

- Customers
- Executive and senior managers
- Middle managers (e.g., program or product line)
- Project managers
- Project engineers and other technical staff
- Process and quality engineers
- Measurement specialists

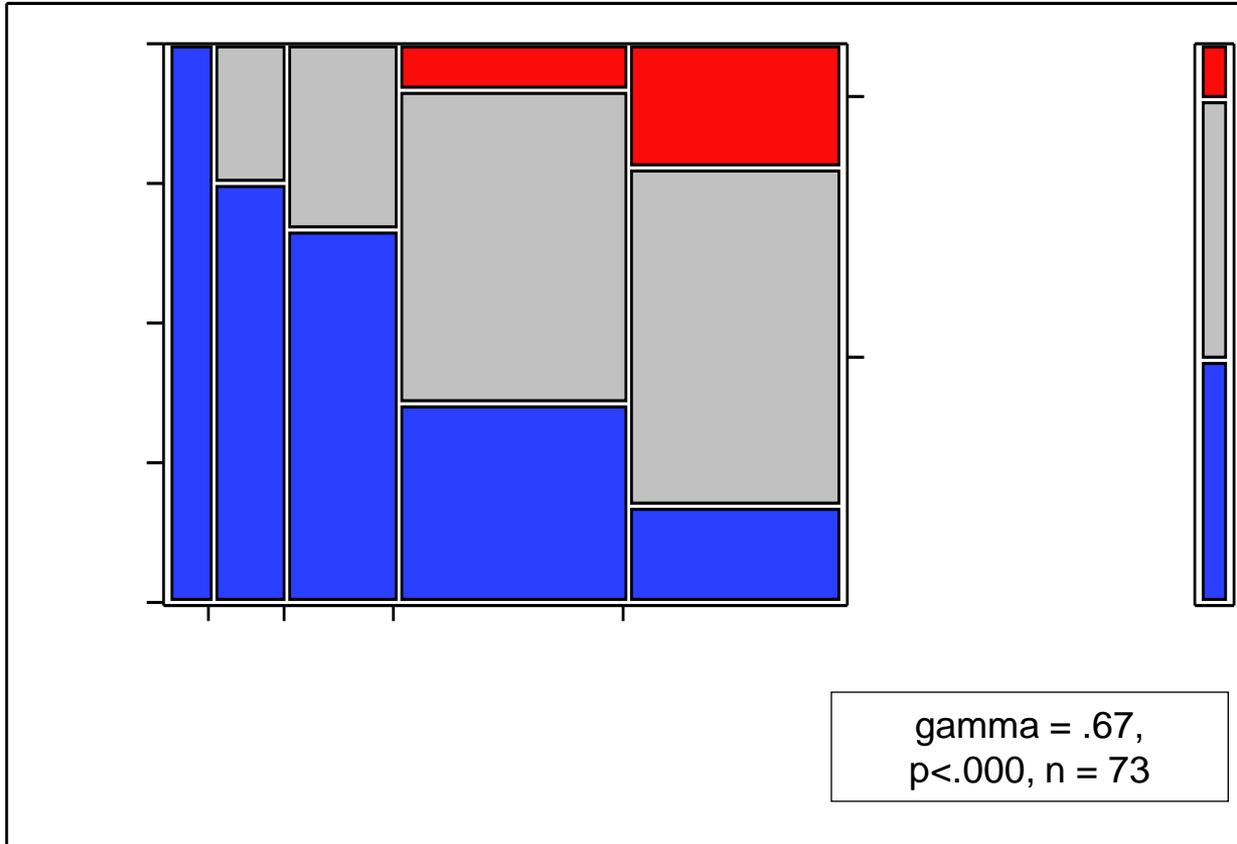
**As per GQ(I)M
Measurement &
Analysis SG1, SP1
As well as GP 2.7**



2009: Relationship Between Stakeholder Involvement & Overall Value Attributed to PPMs



Relation Between Quality of Project Manager Training & Overall Value Attributed to PPMs



How would you best characterize the measurement related training that is available (for project managers) in the organization?



Today's Talk

Scope of the presentation

A focus on results from the 2009 high maturity survey in the SEI's annual measurement & analysis surveys

 *Summary, lessons learned & next steps*



Summary of Results₁

Similar overall results in 2008 & 2009

- Yet the HMLAs are more likely to report more consistent use of process performance modeling approaches & analytical methods than are the appraisal sponsors
- & HMLA reports of use & value added both improve concomitantly among organizations that have achieved their appraised high maturity goals

Some conjectures about *why* that is so

- The HMLAs are reporting about *more recent* appraisals & coaching engagements
- The HMLAs are basing their judgments on evidence gathered at the project or program level
 - The sponsors may or may not have less consistent insight there
- The sponsors have a better understanding about overall goals & objectives
 - Which may not be addressed by the process performance modeling



Summary of Results₂

Considerable understanding & use of PPMs ... as in the 2008 survey

- But also variation in responses
- The same is true for judgments about how useful PPMs have been

Nevertheless

- Judgments about value added by process performance modeling also vary predictably in both surveys
- As a function of:
 - Understanding & reported use of the models
 - Organizational resources & management support

More widespread adoption & improved understanding of what constitutes a suitable process performance model holds promise to improve CMMI-based performance outcomes considerably



Bottom Line:

Responses to 2009 survey of high maturity lead appraisers are consistent with the responses from representatives from appraised high maturity organizations surveyed in 2008

The community can be confident that the appraisers' judgments are consistent with the organizations' own views of the value of measurement & analysis to their work



Thank You for Your Attention!

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The SEI Survey Series

First one completed in 2006

2008 surveys discussed in depth here last year

Two surveys done in both 2008 & 2009 with parallel samples

- High Maturity
 - With a focus on issues faced with respect to the adoption & productive use of high maturity measurement & analysis practices
 - In particular Process Performance Baselines & Models
 - Replicated in 2009 with High Maturity Lead Appraisers instead of organizational sponsors
- General population
 - With a short set of questions for tracking the diffusion of measurement & analysis over time through the broader software & systems engineering community
 - Among other things, the questions allow us to make some useful comparisons by CMMI maturity level
 - 2008 survey replicated in 2009 with ASQ & measurement focused organizations as well as broader sample of SEI customers



How do the Samples differ?

2008: Sponsors of organizations appraised at maturity level 4 & 5

2009: HMLAs asked to answer from perspective of organizational units

- With which they worked & were most recently appraised for CMMI-based high maturity status
- As lead appraisers, appraisal team members, or in a coaching capacity

Relatively small number of HMLAs with direct experience at time of 2009 survey

- Realized sample would include HMLA replies about organizations that did not achieve appraised high maturity goals
- But also wanted to better understand HMLA reports about use & value added by analytical approaches & methods used for process performance modeling among organizations seeking appraised high maturity status



HMLA Role

