NJ SPIN
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Identifying Software Quality Best Practices

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What Defines a Best Practice?

- Common Best Practices
- Criteria for identifying a Best Practice
- Characteristics of a Best Practice
  - Documented
  - Repeatable
  - Transferable
  - Proven performance

Software Quality Defined

- Conformance to requirements
- Absence of defects
- Meets certification standards
- Maintainable
- Scalable
- Reliable
- Usable
- Secure

Quality Best Practices

- A quality best practice is a process that achieves the definition of quality

Dr. Tom DeMarco says "a product's quality is a function of how much it changes the world for the better. "[DeMarco, T., *Management Can Make Quality (Im)possible*, Cutter IT Summit, Boston, April 1999]

Another definition, coined by Gerald Weinberg in *Quality Software Management: Systems Thinking*, is "Quality is value to some person."

Level of Software Quality

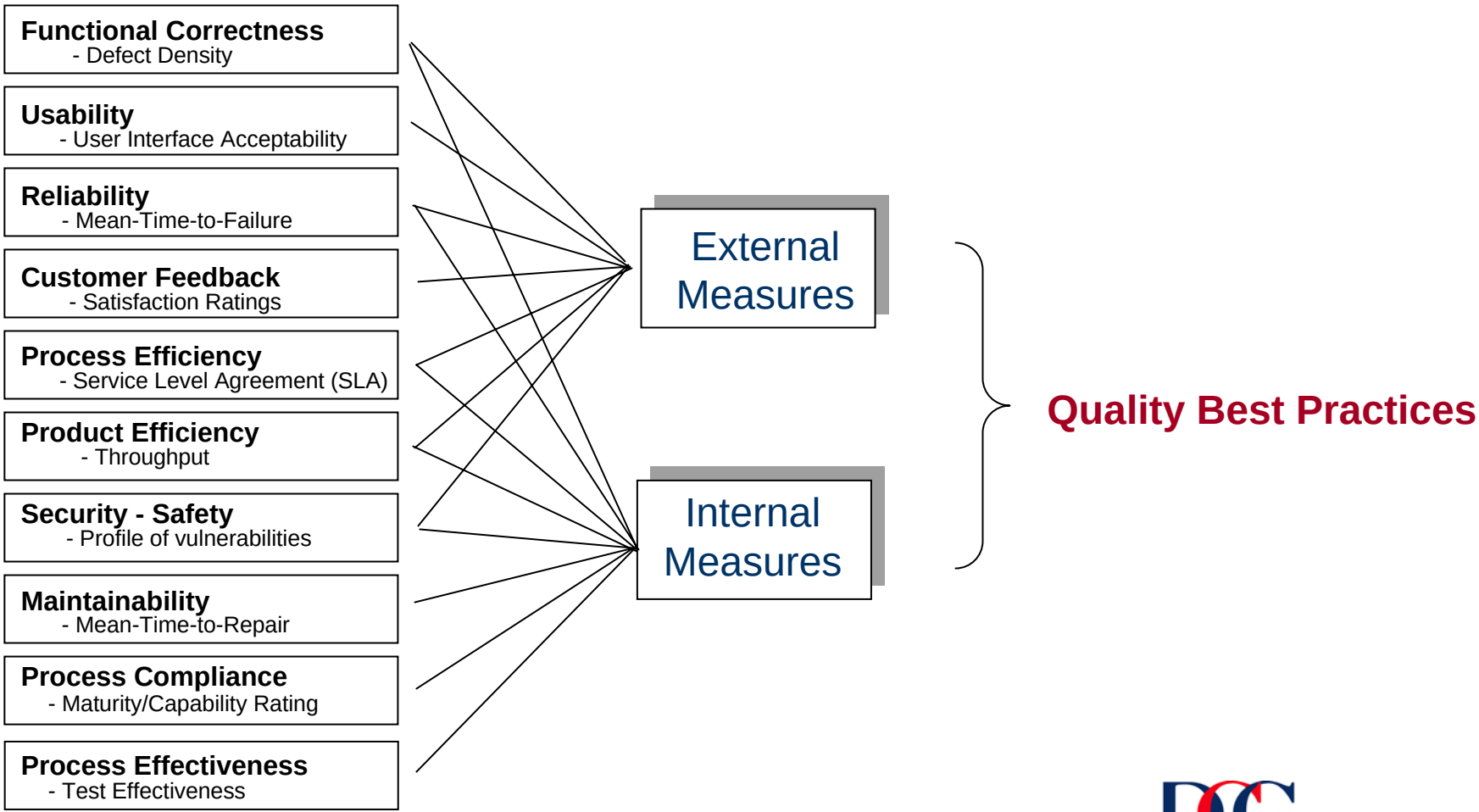
- A defined process
- Compliance to a standard
- Tracking defects
- Number of CRs
- Maintenance costs

Measurement is the Key

- DeMarco -- …changes the world for the better
- Weinberg -- …value to some person

Steve McConnell's *Code Complete* divides software into two pieces: internal and external quality characteristics

Measures of Importance



Typically There is a Measure Missing

Project	Cost (000's)	Quality (Defects Released)
PO Special	$500	12
Vendor Mods	$760	18
Pricing Adj.	$ 80	5
Store Sys.	$990	22

Tracking Quality with Size

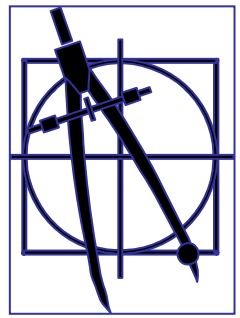
Project	Size (Functional Value)	Cost (000's)	Rate	Quality (Defects Released)	Density
PO Special	250	$500	$2,000	12	.048
Vendor Mods	765	$760	$ 993	18	.023
Pricing Adj.	100	$ 80	$ 800	5	.050
Store Sys.	1498	$990	$ 660	22	.014

Characteristics of Effective Sizing

- Meaningful to developer and user
- Defined (industry recognized)
- Consistent (methodology)
- Easy to learn and apply
- Accurate, statistically based
- Available when needed (early)
- Addresses project level information needs

Why Function Points?

Function Point Analysis is a standardized method for measuring the functionality delivered to an end user.



- Consistent method
- Easy to learn
- Available early in the lifecycle
- Acceptable level of accuracy
- Meaningful internally and externally

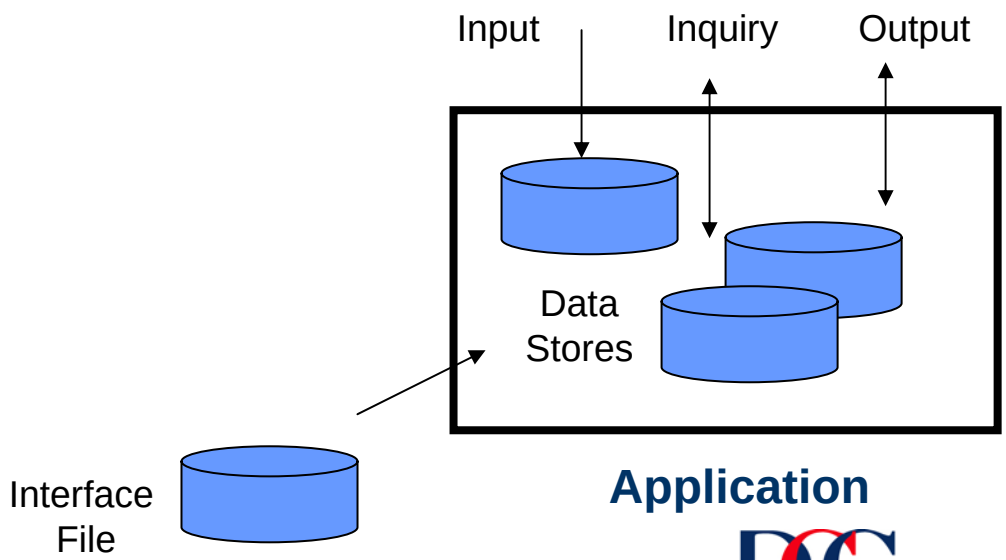
Function Point counts have replaced Line of Code counts as a sizing metric that can be used consistently and with a high degree of accuracy.

The Function Point Methodology

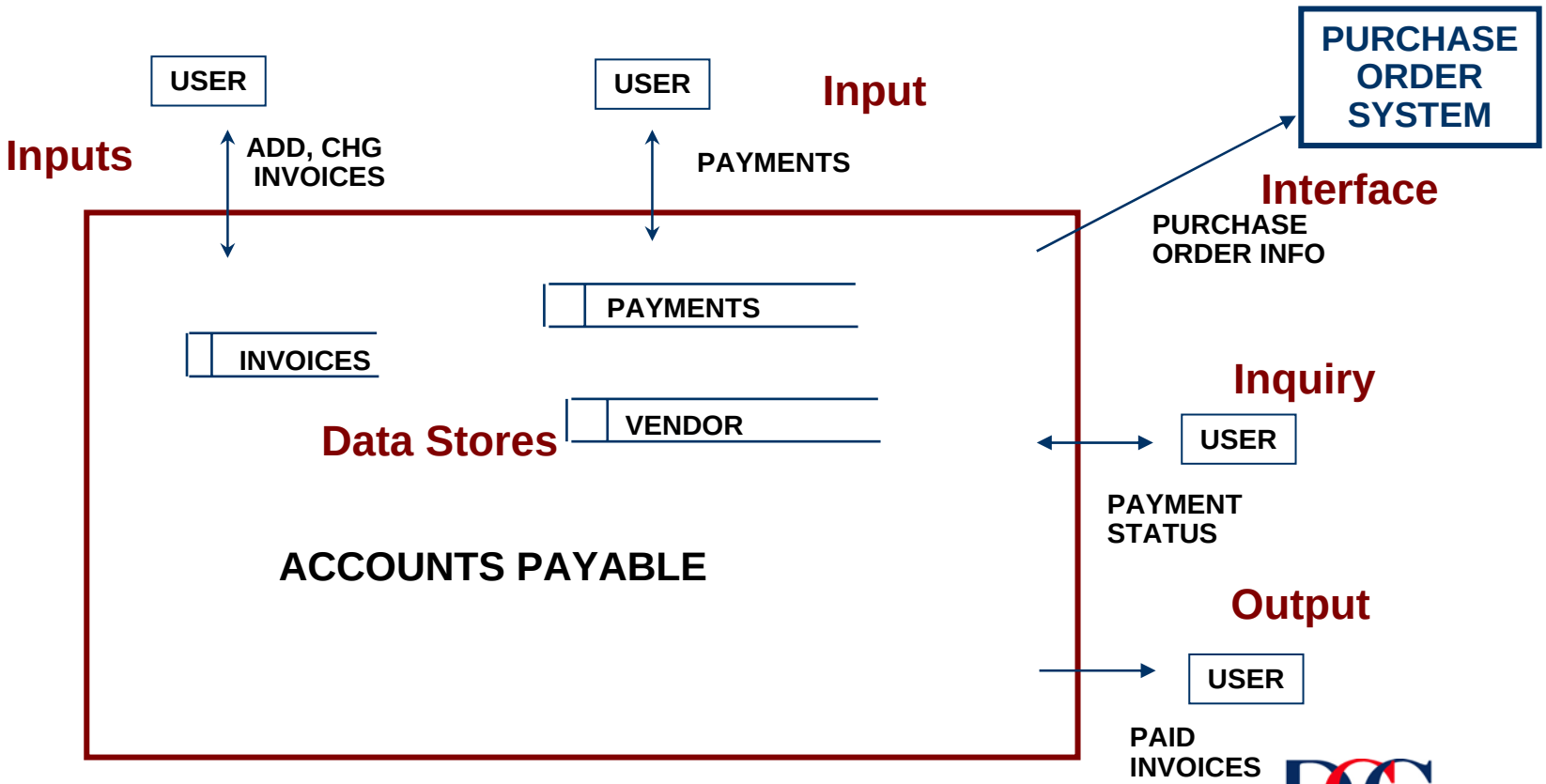
The software deliverable is sized based upon the functionality delivered

- **Inputs**
- **Outputs**
- **Inquiries**
- **Data Stores**
- **Interface Files**

Five key components are identified based on logical user view



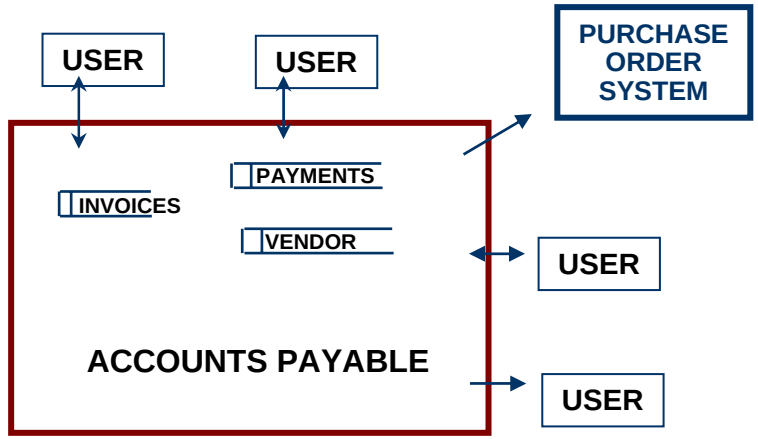
Exercise -- Identify the Functionality



Determine the Functional Size

The FP Lite™ Process

1) Identify Components
2) Assess Complexity
3) Apply Weightings
4) Compute Function Points



Components:	Low		Avg.		High		Total
Data Stores	___	X 7	3	X 10	___	X 15	30
Interfaces	___	X 5	1	X 7	___	X 10	7
Inputs	___	X 3	3	X 4	___	X 6	12
Outputs	___	X 4	1	X 5	___	X 7	5
Inquiries	___	X 3	1	X 4	___	X 6	4
						Function Point Size	58

Function Point Quality Measures

- Defect Density
  - Measures the number of defects identified across one or more phases of the development project lifecycle and compares that value to the total size of the application.

$$\frac{\textbf{Number of defects (by phase or in total)}}{\textbf{Total number of function points}}$$

- Test Case Coverage
  - Measures the number of test cases that are necessary to adequately support thorough testing of a development project.

$$\frac{\textbf{Number of test cases}}{\textbf{Number of function points}}$$

Function Point Quality Measures

- Cost per FP
  - Cost per function point may also be used to compare the cost of developing an internal solution to the cost of purchasing a commercial package solution

$$\frac{\textbf{Total cost}}{\textbf{Total function points}}$$

- Repair Cost Ratio
  - Used to track the costs to repair applications that are operational

$$\frac{\textbf{(Total hours to repair} \times \textbf{Cost per hour)}}{\textbf{Release function points}}$$

Function Point Quality Measures

- Reliability
  - A measure of the number of failures an application experiences relative to its functional size.

$$\frac{\text{Number of production failures}}{\text{Total application function points}}$$

- Rate of Growth
  - Growth of an application's functionality over a specified period of time.

$$\frac{\text{Current number of function points}}{\text{Original number of function points}}$$

- Stability
  - Used to monitor how effectively an application or enhancement has met the expectations of the user.

$$\frac{\text{Number of changes}}{\text{Number of application function points}}$$

Non-FP Quality Measures

Defect Removal Efficiency

Tracks the number of defects removed by lifecycle phase.

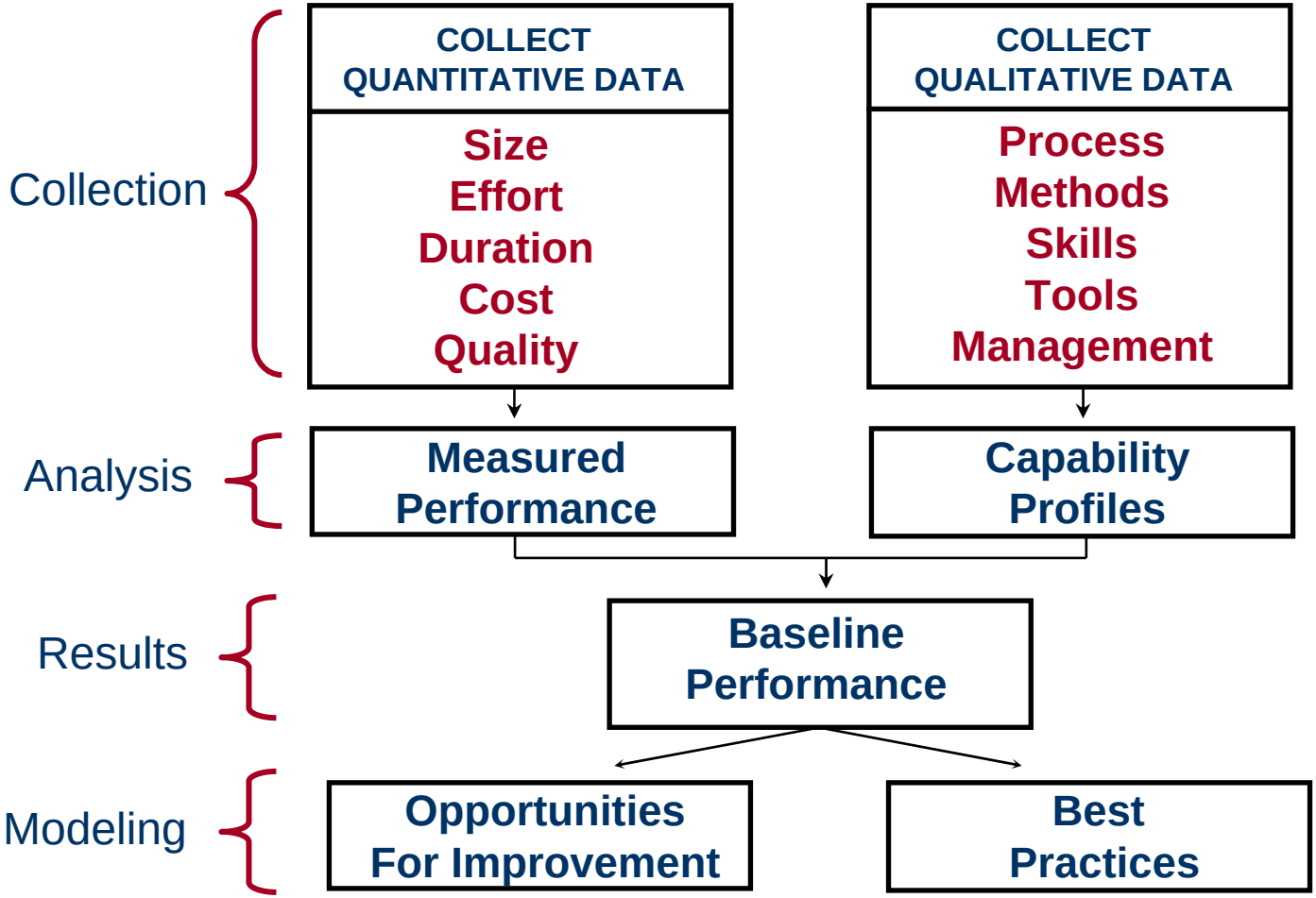
	Peer Reviews			Testing				
Range	Reqs.	Design	Code	Unit Test	Sys. Test	UAT	Prod	Total
Insertion Rate	21	30	35	17	11	3		117
Defects Found	5	16	27	31	24	12	2	117
Removal Efficiency	4.3%	13.7%	23.1%	26.5%	20.5%	10.3%	1.7%	
	Review Effectiveness		41.0%	**Test Effectiveness**		57.3%		

Customer Satisfaction

Gather information relating to delivery performance, communication, management, solutions, etc.

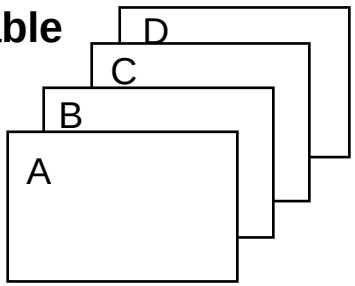
Level of importance.

Quantitative & Qualitative Performance Measurement



Developing a Performance Profile

Product Deliverable



Performance Indicators

Duration (Months)
Cost (Effort)
Quality (Defects)

Quality Risk Factors

Management
Definition
Design
Build
Test
Environment

SIZE

A	21
B	36
C	58
D	110
:	550

DEFECT DENSITY

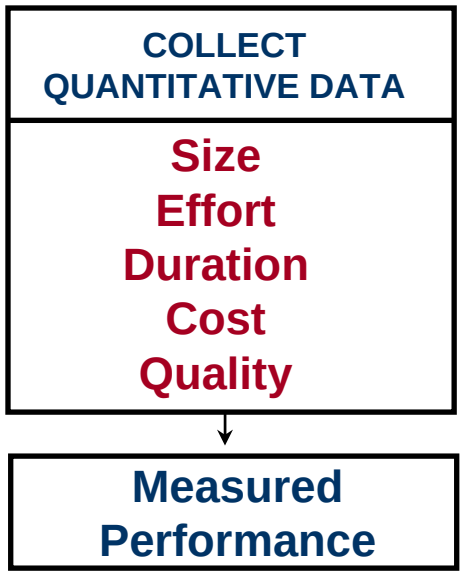
.01 DD/FP
.04 DD/FP
.16 DD/FP
.08 DD/FP
.12 DD/FP

PROFILES

PROFICIENCIES

INADEQUACIES

Quantitative Performance Evaluation



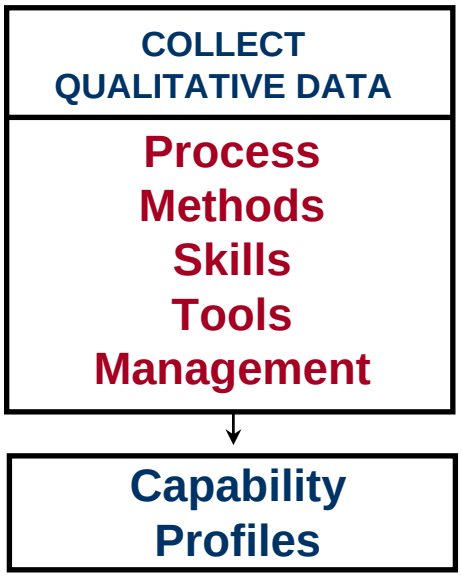
Quantitative Assessment

- Perform functional sizing on all selected projects.
- Collect data on project level of effort, cost, duration and quality.
- Calculate productivity rates for each project, including functional size delivered per staff month, cost per functional size, time to market, and defects delivered.

Results

	Baseline Productivity
Average Project Size	133
Average FP/SM	10.7
Average Time-To-Market (Months)	6.9
Average Cost/FP	$939
Delivered Defects/FP	0.0301

Qualitative Performance Evaluation



Qualitative Assessment

- Conduct Interviews with members of each project team.
- Collect Project Profile information.
- Develop Performance Profiles to display strengths and weaknesses among the selected projects.

Results

Project Name	Profile Score	Management	Definition	Design	Build	Test	Environment
Accounts Payable	55.3	47.73	82.05	50.00	46.15	43.75	50.00
Priotity One	27.6	50.00	48.72	11.36	38.46	0.00	42.31
HR Enhancements	32.3	29.55	48.72	0.00	42.31	37.50	42.31
Client Accounts	29.5	31.82	43.59	0.00	30.77	37.50	42.31
ABC Release	44.1	31.82	53.85	34.09	38.46	53.13	42.31
Screen Redesign	17.0	22.73	43.59	0.00	15.38	0.00	30.77
Customer Web	40.2	45.45	23.08	38.64	53.85	50.00	34.62
Whole Life	29.2	56.82	28.21	22.73	26.92	18.75	53.85
Regional - East	22.7	36.36	43.59	0.00	30.77	9.38	30.77
Regional - West	17.6	43.18	23.08	0.00	26.92	9.38	26.92
Cashflow	40.6	56.82	71.79	0.00	38.46	43.75	38.46
Credit Automation	23.5	29.55	48.72	0.00	38.46	6.25	26.92
NISE	49.0	38.64	56.41	52.27	30.77	53.13	53.85
Help Desk Automation	49.3	54.55	74.36	20.45	53.85	50.00	38.46
Formula One Upgrade	22.8	31.82	38.46	0.00	11.54	25.00	46.15

Modeled Improvements

Project Name	Profile Score	Management	Definition	Design	Build	Test	Environment
Accounts Payable	55.3	47.73	82.05	50.00	46.15	43.75	50.00
Priotity One	27.6	50.00	48.72	11.36	38.46	0.00	42.31
HR Enhancements	32.3	29.55	48.72	0.00	42.31	37.50	42.31
Client Accounts	29.5	31.82	43.59	0.00	30.77	37.50	42.31
ABC Release	44.1	31.82	53.85	34.09	38.46	53.13	42.31
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Formula One Upgrade	22.8	31.82	38.46	0.00	11.54	25.00	46.15

	Baseline Productivity
Average Project Size	133
Average FP/SM	10.7
Average Time-To-Market (Months)	6.9
Average Cost/FP	$939
Delivered Defects/FP	0.0301

Process Improvements:

- Peer Reviews
- Requirements Management
- Configuration Management

Performance Improvements:

Productivity ~ +131%

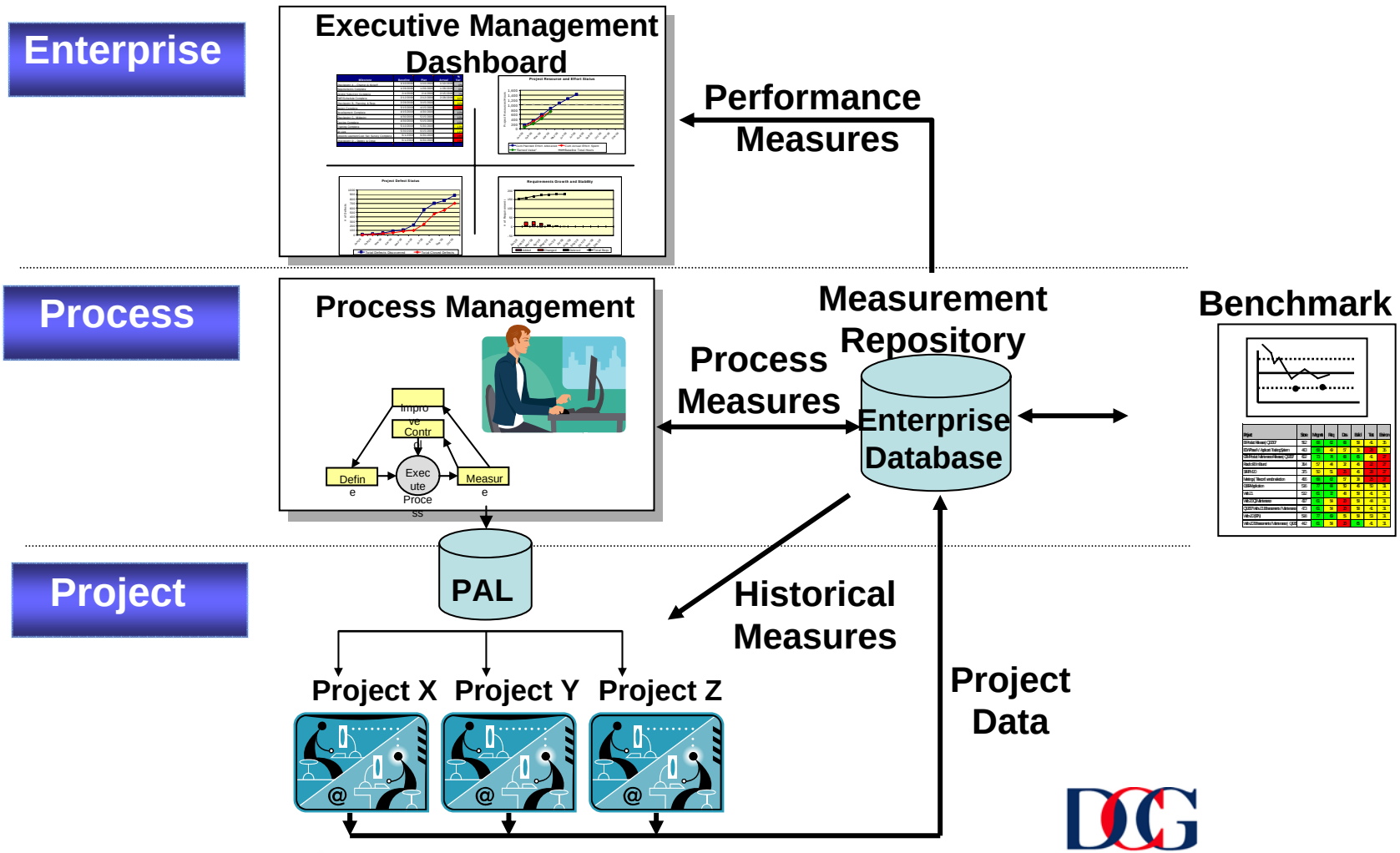
Time to Market ~ -49%

Defect Ratio ~ -75%

Project Name	Profile Score	Management	Definition	Design	Build	Test	Environment
Accounts Payable	75.3	61.73	82.05	60.00	60.15	53.75	50.00
Priotity One	57.6	57.00	55.72	18.36	45.46	22.00	49.31
HR Enhancements	52.3	32.55	51.72	23.00	42.31	57.50	49.31
Client Accounts	69.5	53.82	65.59	12.00	50.77	67.50	49.31
ABC Release	74.1	55.82	69.85	49.09	52.46	63.13	49.31
Screen Redesign	67.0	43.73	63.59	21.00	36.38	20.00	51.77
Customer Web	59.2	49.45	27.08	58.64	53.85	54.00	49.62
Whole Life	50.2	49.82	32.21	27.73	31.92	24.75	53.85
Regional - East	57.7	59.36	49.59	0.00	30.77	9.38	50.77
Regional - West	52.6	55.18	30.08	0.00	33.92	19.38	26.92
Cashflow	67.6	66.82	71.79	0.00	49.46	53.75	49.46
Credit Automation	60.5	41.55	78.72	0.00	50.46	26.25	46.92
NISE	79.0	68.64	76.41	62.27	65.77	53.13	53.85
Help Desk Automation	79.3	64.55	74.36	47.45	63.85	54.00	58.46
Formula One Upgrade	52.8	49.82	52.46	0.00	31.54	25.00	56.15

	Productivity Improvement
Average Project Size	133
Average FP/SM	24.8
Average Time-To-Market (Months)	3.5
Average Cost/FP	$467
Delivered Defects/FP	0.0075

Overall Measurement Framework



Summary

- A best practice delivers measurable value
- Measurement is key to identifying and ensuring best practice results
- Use size as a normalizing factor
- Organizational best practices are identifiable