Enterprise Deployment of PSM and CMMI Measurement Process

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Advanced Information Systems

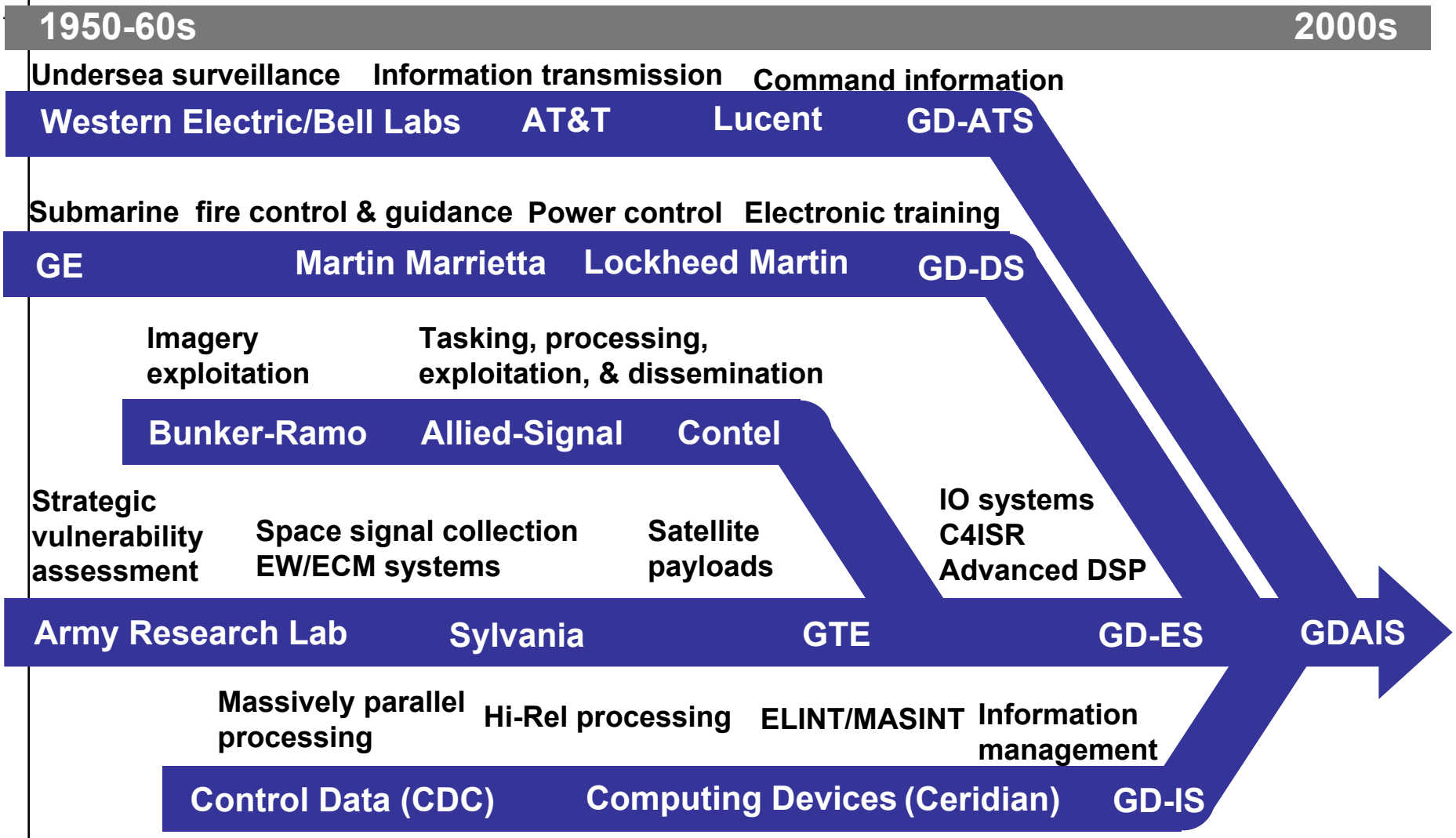
Topics

- Why a Common Enterprise Measurement Process?
- Process
  - Plan Development
  - Plan Execution
  - Evaluation
  - Sample Specification
  - Sample Measures
- Lessons Learned
- Summary and Conclusions

General Dynamics Advanced Information Systems (GDAIS)

- **GDAIS** is an operating unit of the General Dynamics Corporation.
- We are a recognized leader in software development and electronics systems design and integration, offering a state of the art, growth-focused, employee-oriented environment with a strong government and commercial customer base requiring a variety of high technology products and services.

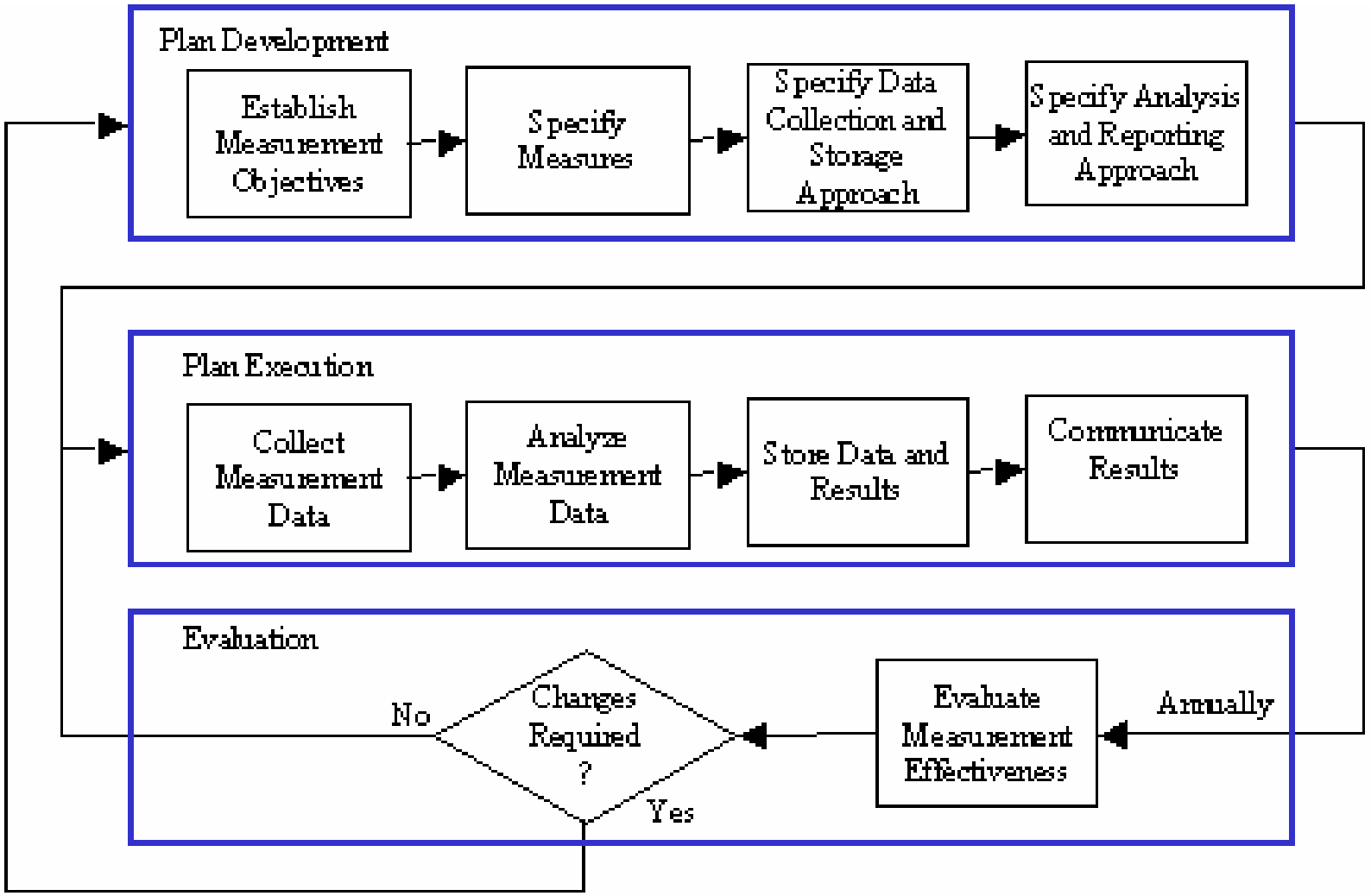
Organizational Context



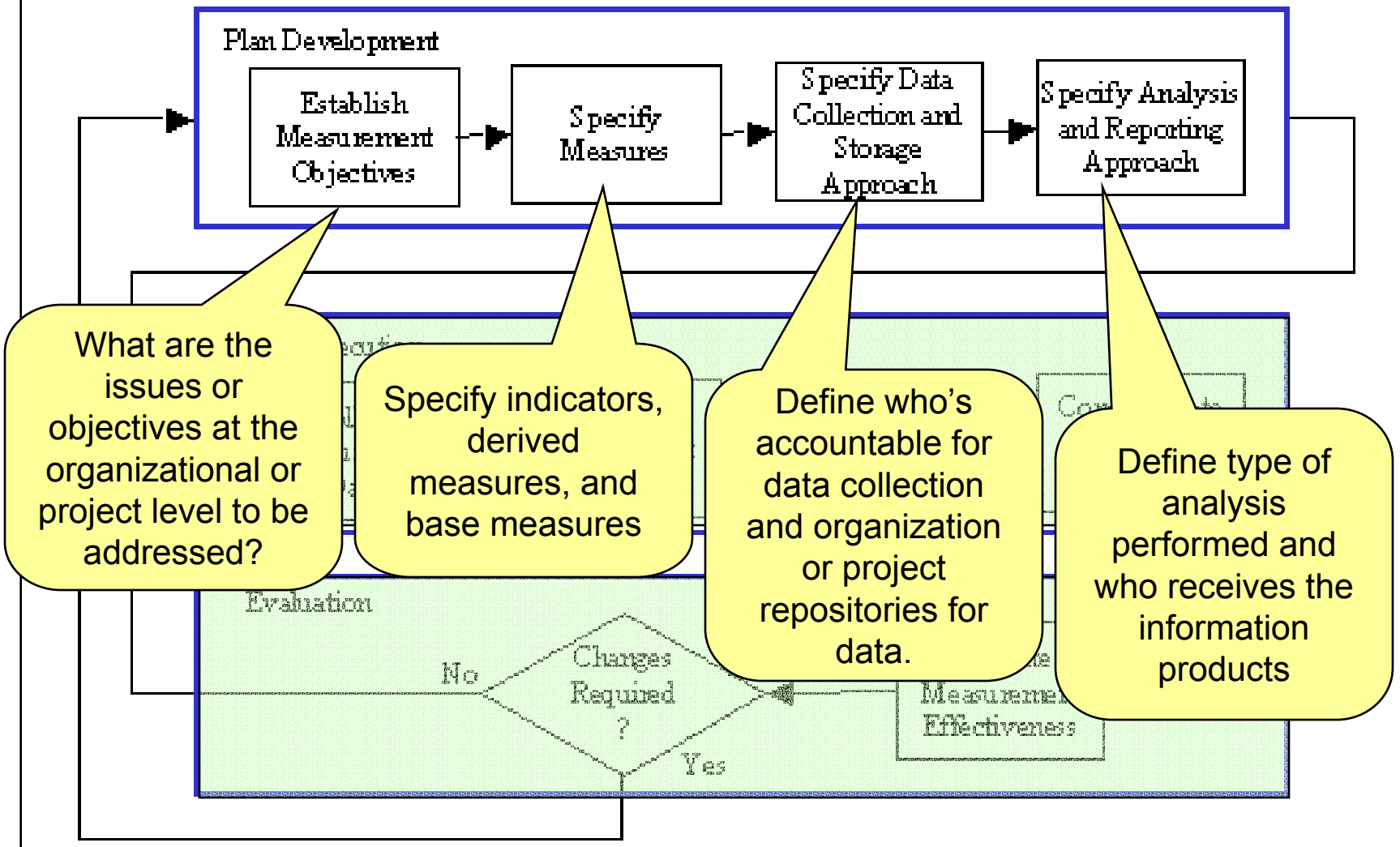
Why a Common Enterprise Measurement Process?

- Process Improvement is not unique to any function or discipline so why should measurement process?
- Measurement process should be easy to understand and follow to be successful
- If measurement process is good for Engineering then it should also be good for Finance, Human Resources, etc.
- It helps communication having a common language for measurements throughout the enterprise

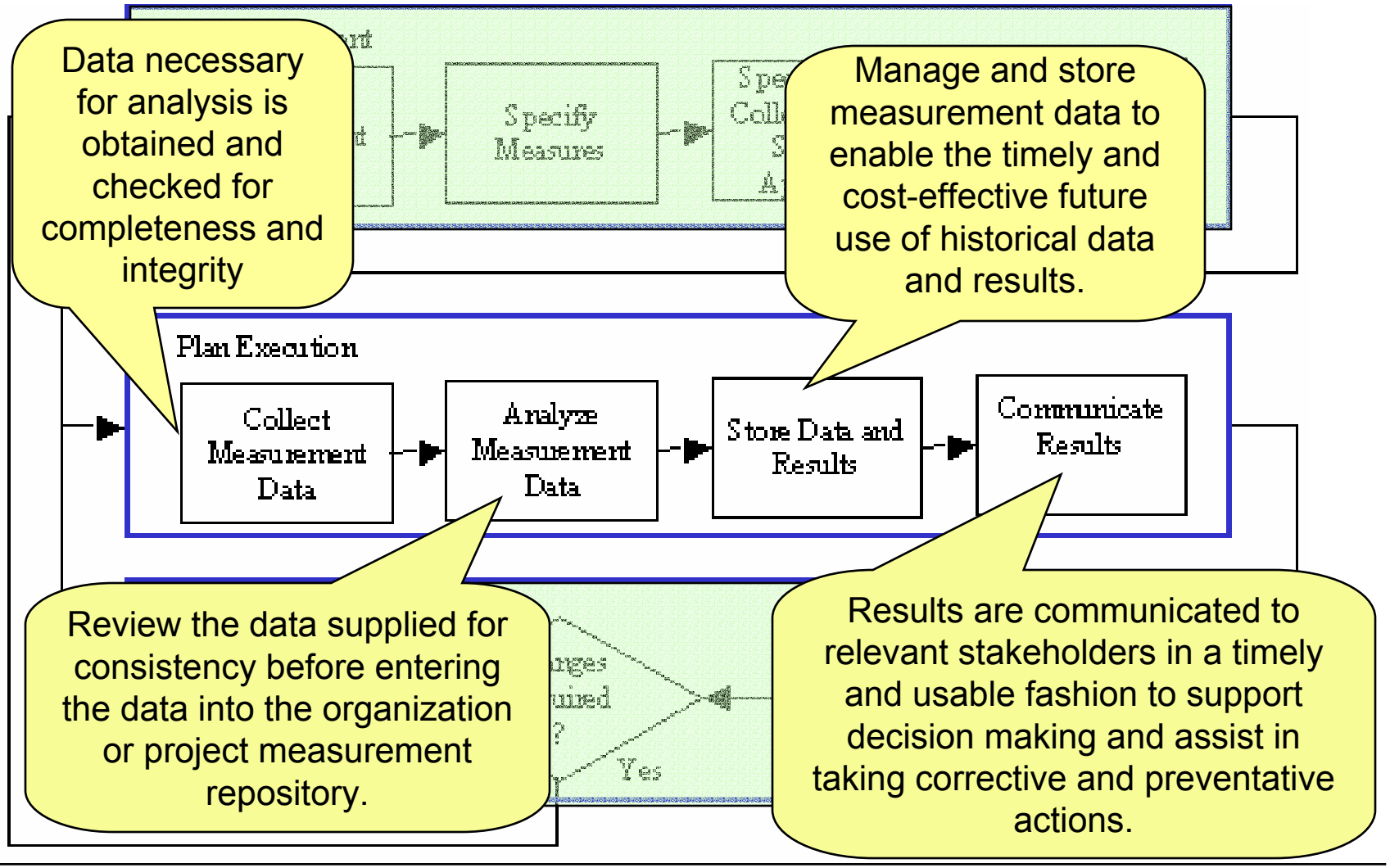
Measurement Process



Plan Development



Plan Execution



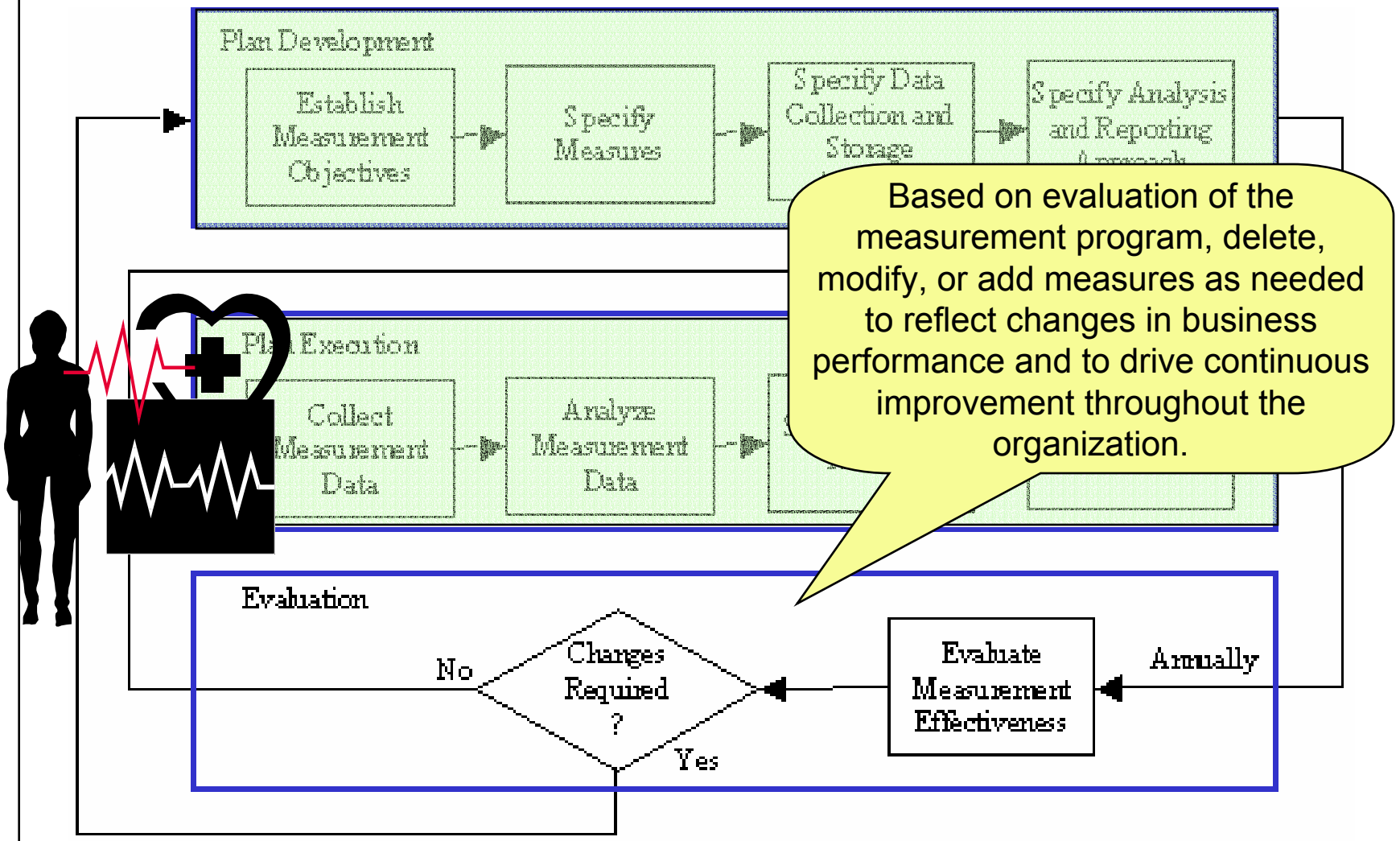
Data necessary for analysis is obtained and checked for completeness and integrity

Manage and store measurement data to enable the timely and cost-effective future use of historical data and results.

Review the data supplied for consistency before entering the data into the organization or project measurement repository.

Results are communicated to relevant stakeholders in a timely and usable fashion to support decision making and assist in taking corrective and preventative actions.

Evaluation


Plan Development
Establish Measurement Objectives
Specify Measures
Specify Data Collection and Storage
Specify Analysis and Reporting
Plan Execution
Collect Measurement Data
Analyze Measurement Data
Based on evaluation of the measurement program, delete, modify, or add measures as needed to reflect changes in business performance and to drive continuous improvement throughout the organization.
Evaluation
No
Changes Required ?
Yes
Evaluate Measurement Effectiveness
Annually

Sample Measurement Specification

Information Need	SE	SW	HW	ESS	Indicator
Predictability Indicators					
Need to know the stability of the project requirements.	R	A	A	A	Requirements Stability
Productivity Indicators					
Need to know the engineering productivity rates.	R				Productivity - Systems Engineering
		R			Productivity - Software Engineering
			R		Productivity - Hardware Engineering
				R	Productivity - ESS

Information Needs and Indicator Table

Used PSM concept of Issues

Used PSM concept of Categories by grouping similar measures

Sample Measurement Specification

Indicator	Description	Base Measures	Analysis	Reporting Guidelines	Source	Format	Green	Yellow	Red
Productivity - Systems Engineering	Number of hours per requirement generated by the Systems Engineering organization	Systems Engineering Hours Total Requirements	Comparison of actual to goal	Monthly Report	Project Engineer	Excel bar graph of actuals and goal vs. project	Actual less than or equal to goal	Actual 5% or less above goal	Actual more than 5% above goal
Requirements Stability	Measure that reflects the % of requirements that have changed (added, modified, or deleted) from last baseline. Stability = (Req. Changes/Total Requirements)	Requirements Changes Total Requirements	Comparison of actual to goal	Monthly Report	Project Engineer	Excel line graph of Req. Stability vs baseline number	Actual less than or equal to goal	Actual 5% or less above goal	Actual more than 5% above goal

Indicator Specification Table

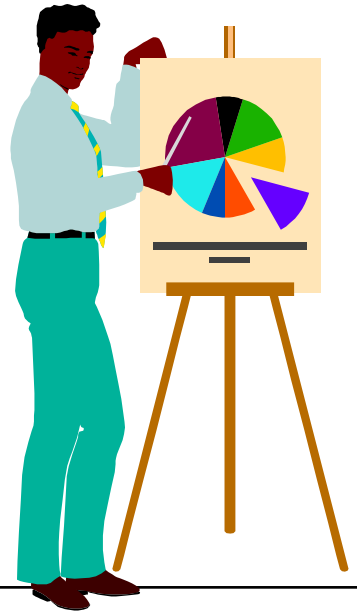
Sample Measurement Specification

Base Measure	Attribute	Measurement Method	Method Type	Scale	Unit of Measure
Systems Engineering Hours	Direct Applied Labor	Measure total hours charged to date on the project by Systems Engineers	Objective	Integer value greater or equal to zero	Hours
Total Requirements	Requirements	Count total requirements documented for project	Objective	Integer value greater than zero	Count

Base Measure Specification Table

Business Areas With Defined Measures

- Strategic Planning
- Business Development
- Ethics
- Security
- Environmental, Health, and Safety
- Human Resources
- Information Technology
- Quality
- Supply Chain Management
- Program Management
- Manufacturing
- Systems Engineering
- Software Engineering
- Hardware Engineering
- Engineering Support and Specialties
- Technology Management

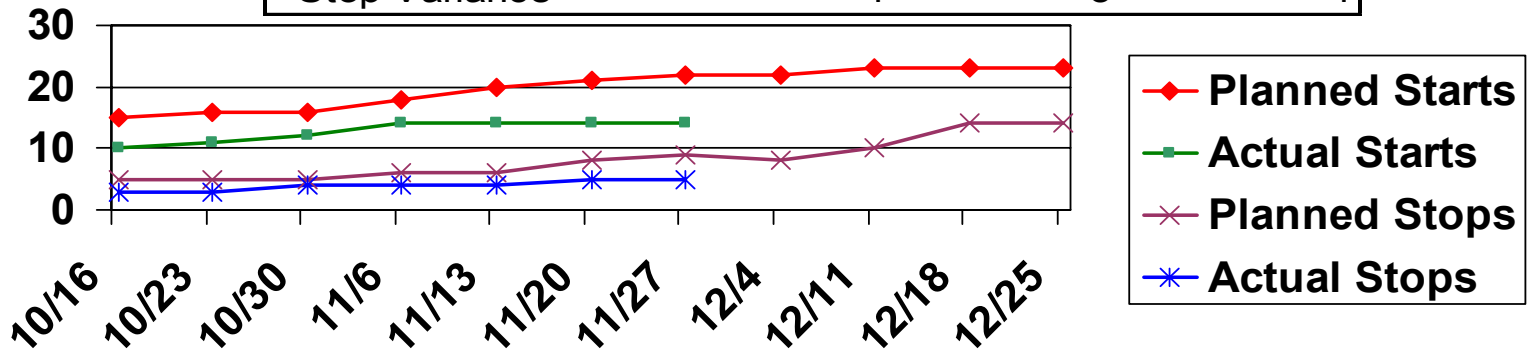


Information Product Examples

Notional Data

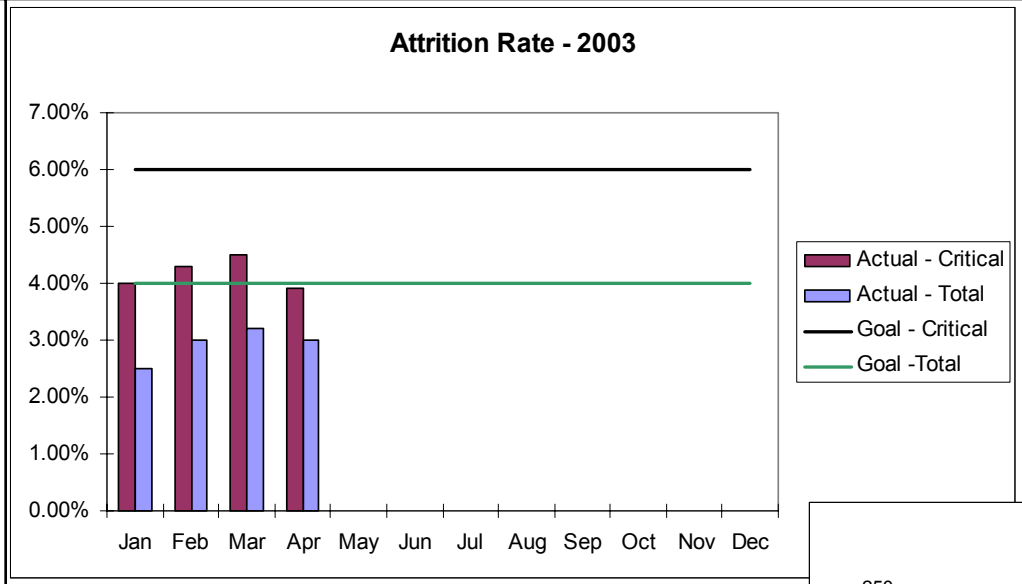
Inchstone Performance

	This Month 11/27	Last Month 11/20	Delta
Planned Starts	22	21	1
Actual Starts	14	14	0
Start Variance	-8	-7	-1
Planned Completions	9	8	1
Actual Completions	5	5	0
Stop Variance	-4	-3	-1



Week Ending	10/16	10/23	10/30	11/6	11/13	11/20	11/27	12/4	12/11	12/18	12/25
Planned Starts	15	16	16	18	20	21	22	22	23	23	23
Actual Starts	10	11	12	14	14	14	14				
Start Variances	-5	-4	-4	-4	-6	-7	-8				
Planned Stops	5	5	5	6	6	8	9	8	10	14	14
Actual Stops	3	3	4	4	4	5	5				
Stop Variances	-2	-2	-1	-2	-2	-3	-4				

Information Product Examples

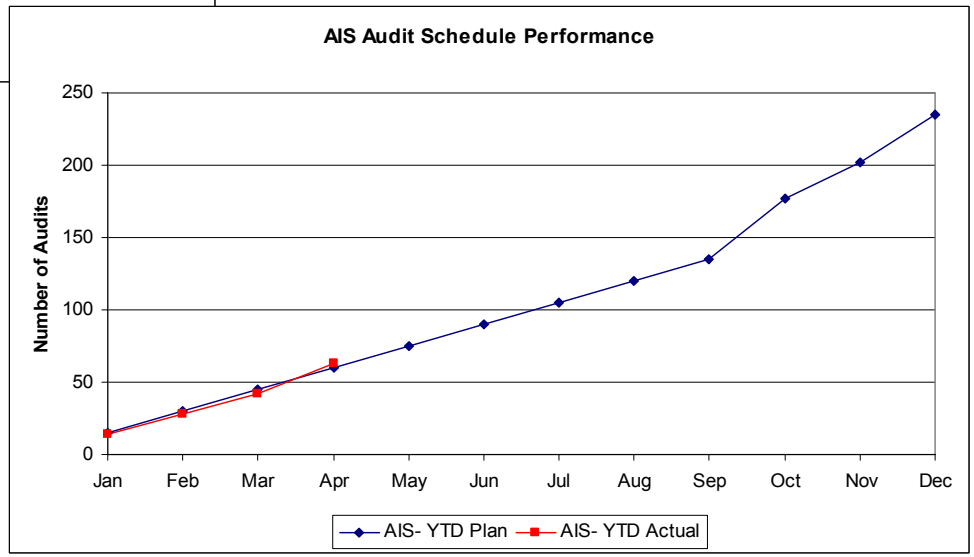


Notional Data

Human Resources

Quality Org

Notional Data



Lessons Learned

- Don’t start without support of top level management
- Ensure broad review of process to include non-measurement experts.
- Provide help to organizations in specifying measures and collection methods.
- Expect resistance to documenting measures since it becomes a commitment by the organization to collect and report the information.
- Make measures part of higher level management reviews to help institutionalization.
- Keep measures simple and their number small so you don’t scare organizations
- Provide training on the process and how to use measures to improve organization performance

Summary & Conclusions

- Process is CMMI and ISO 9001:2000 compliant
  - Reviewed by two CMMI Lead-Assessors from different companies and ISO auditors
- Institutionalization has been slower than expected, but we're staying the course.
- Don't reinvent the measurement process – leverage PSM, CMMI, and ISO.
- Collecting and using measures is much harder than documenting the process and specifying them.