Enterprise Services for Defense Transformation

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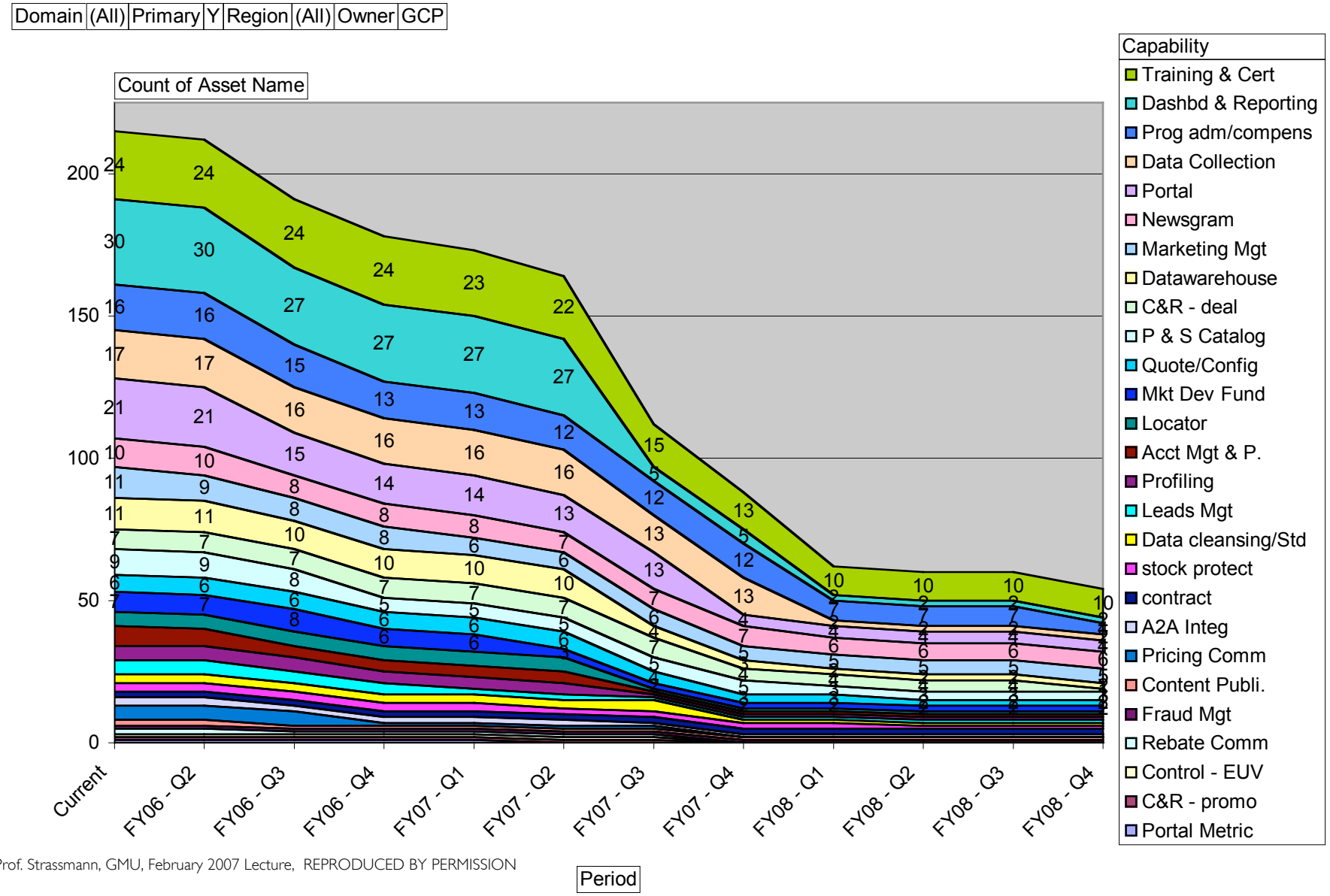
George Mason University, February 19, 2007

Case Study

Hewlett-Packard Cost Reduction

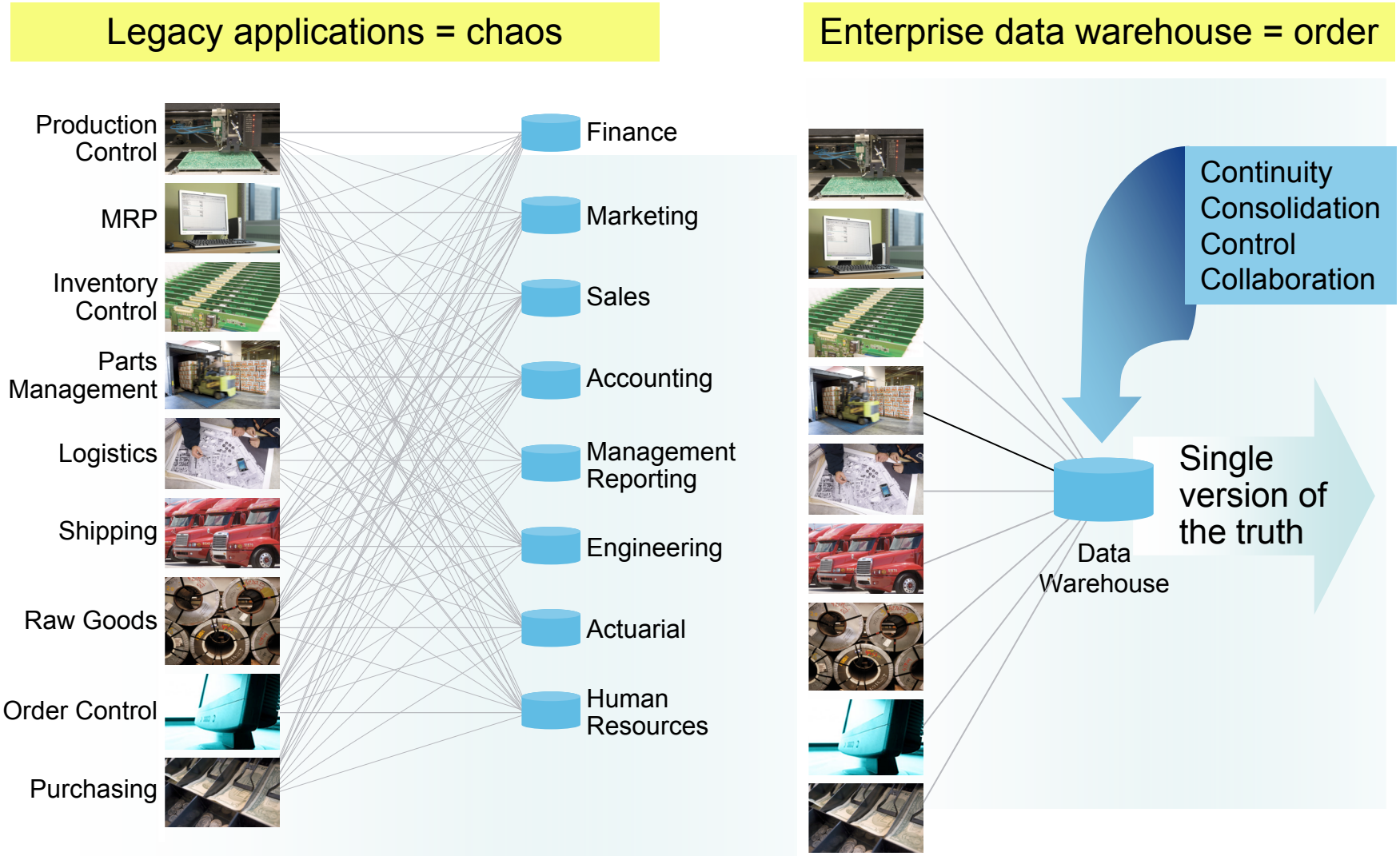
Example of Application Simplification



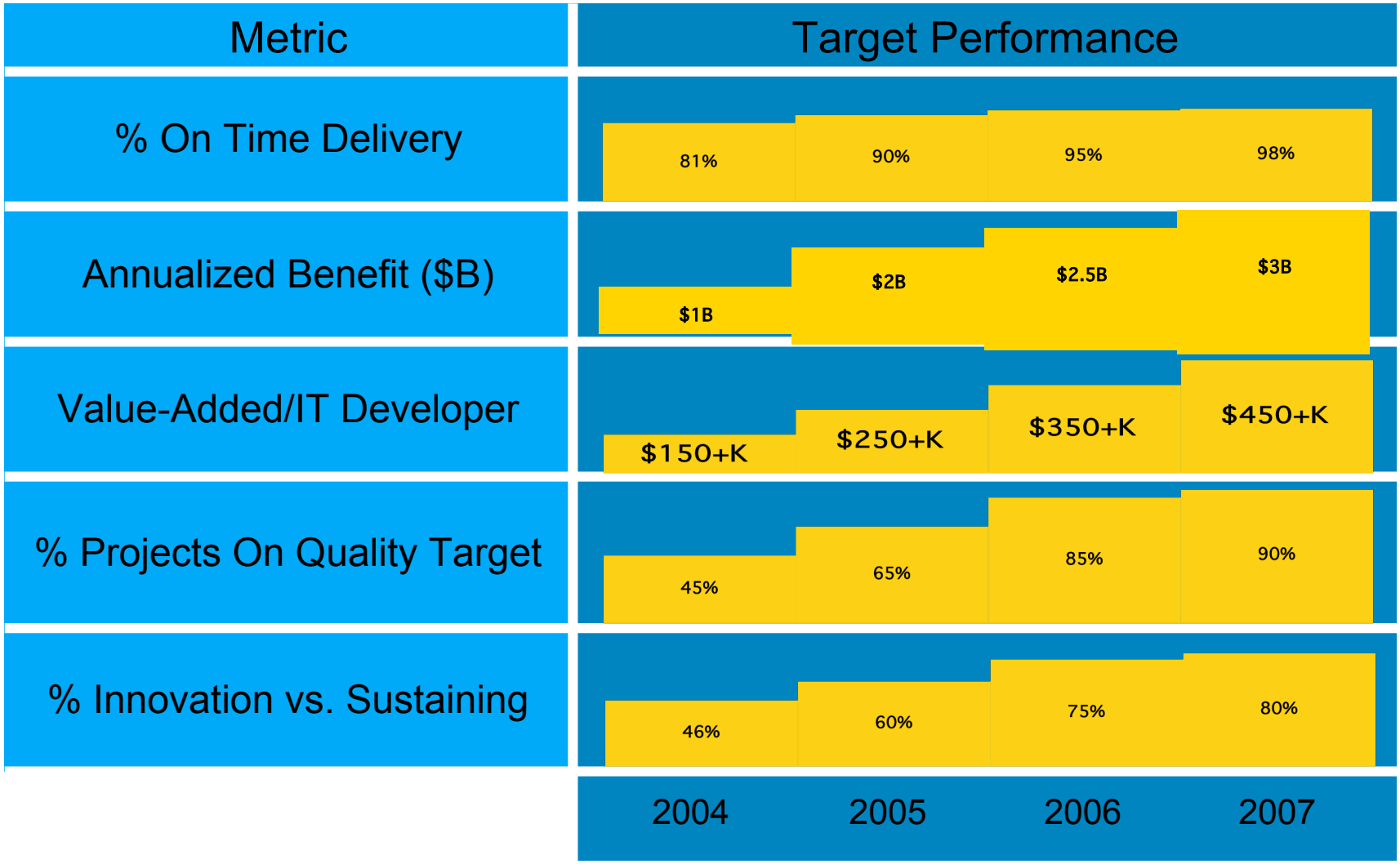
Transformation Indicators - HP Case

	BEFORE TRANSFORMATION	AFTER TRANSFORMATION	IMPROVEMENT
Base Year	2003	2008	2003-2008
Total Revenue (in $ Millions)	$73,000	$112,000	53%
I.T. Budget in Base Year (in $ Millions)	$3,045	$2,113	-31%
I.T. Workforce	19,000	8,000	58%
Number of Applications	4,691	1,500	68%
Number of Servers	19,000	10,000	47%
Number of Development Sites	100	29	71%
Number of Data Centers	85	6	93%
% Innovation	25%	40%	60%
% of Budget on Software Maintenance	35%	15%	57%
I.T. Budget Spent on Infrastructure	56%	24%	57%

Enterprise Data Warehouse



IT Portfolio Scorecard



Opportunity to Standardize, Consolidate and Integrate

A Transformation Calculator (See BASELINE January 2007)

	BEFORE TRANSFORMATION	
	BASE YEAR	**2003**
A	Number of full-time-equivalent workers in information technology	19,000
B	Number of applications	4,691
C	Number of servers	19,000
D	Number of development sites	100
E	Number of data centers	85
F	Percentage of software budget spent on maintenance	35%
G	Percentage of I.T. budget spent on infrastructure	56%
	AFTER TRANSFORMATION	
	PROJECTED YEAR	**2008**
H	Number of full-time-equivalent workers in information technology	8,000
I	Number of applications	1,500
J	Number of servers	10,000
K	Number of development sites	29
L	Number of data centers	6
M	Percentage of software budget spent on maintenance	15%
N	Percentage of I.T. budget spent on infrastructure	24%

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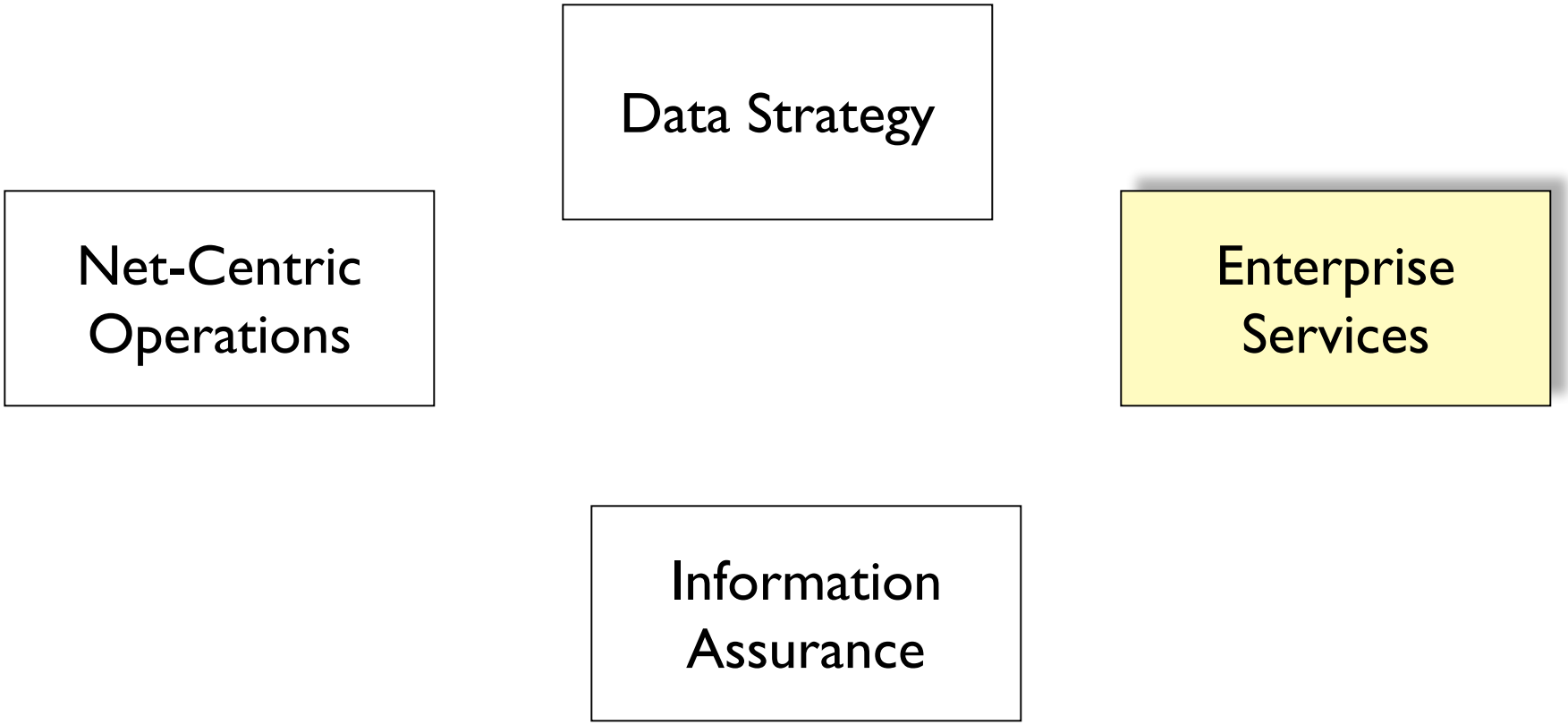
Calculating the Transformation % - (Baseline January 2007)

	INDICATORS TO MEASURE I.T. TRANSFORMATION	
O	Percentage reduction in I.T. full-time equivalents ((**A - H**) ÷ **A**)	58%
P	Percentage reduction in the number of applications ((**B - I**) ÷ **B**)	68%
Q	Percentage reduction in the number of servers ((**C - J**) ÷ **C**)	47%
R	Percentage reduction in development sites ((**D - K**) ÷ **D**)	71%
S	Percentage reduction in data centers ((**E - L**) ÷ **E**)	93%
T	Percentage reduction in software maintenance ((**F - M**) ÷ **F**)	57%
U	Percentage reduction in spending on infrastructure ((**G - N**) ÷ **G**)	57%
	YOUR TRANSFORMATION SCORE, AND WHAT IT MEANS	
	Average of transformation indicators (**Average of O , P, Q , R , S , T, U**)	**64%**
	If your score is greater than 50%, your transformation is:	Exceptional
	If your score is between 30% and 50%, your transformation is:	Material
	If your score is between 10% and 30%, your transformation is:	Moderate
	If your score is between 5% and 10%, your transformation is:	Marginal
	If your score is less than 5%, your transformation is:	Inconsequential

Case Study

The Department of Defense

Components of Transformation in DoD



Organization for Transformation in DoD

Warfighter Mission Area

Business Mission Area

Intelligence Mission Area

Distribution of DoD I.T. Spending

	FY 07 Budgets - $B	% of Total
Air Force	$7.4	24%
Army	$6.2	20%
Navy	$6.3	21%
Agencies and Other	$10.6	35%
Total DoD	$30.4	100%

Most DoD I.T. Spending in Infrastructure

Number of Projects	Project Category	FY 07 Budgets - $B	% of Total
2,261	Functional Area Applications	$13.6	45%
1,397	Communications and Computing Infrastructure	$13.4	44%
470	Info Assurance and Related Activities	$3.4	11%
4,128	Total DoD I.T. Spending	$30.4	100%

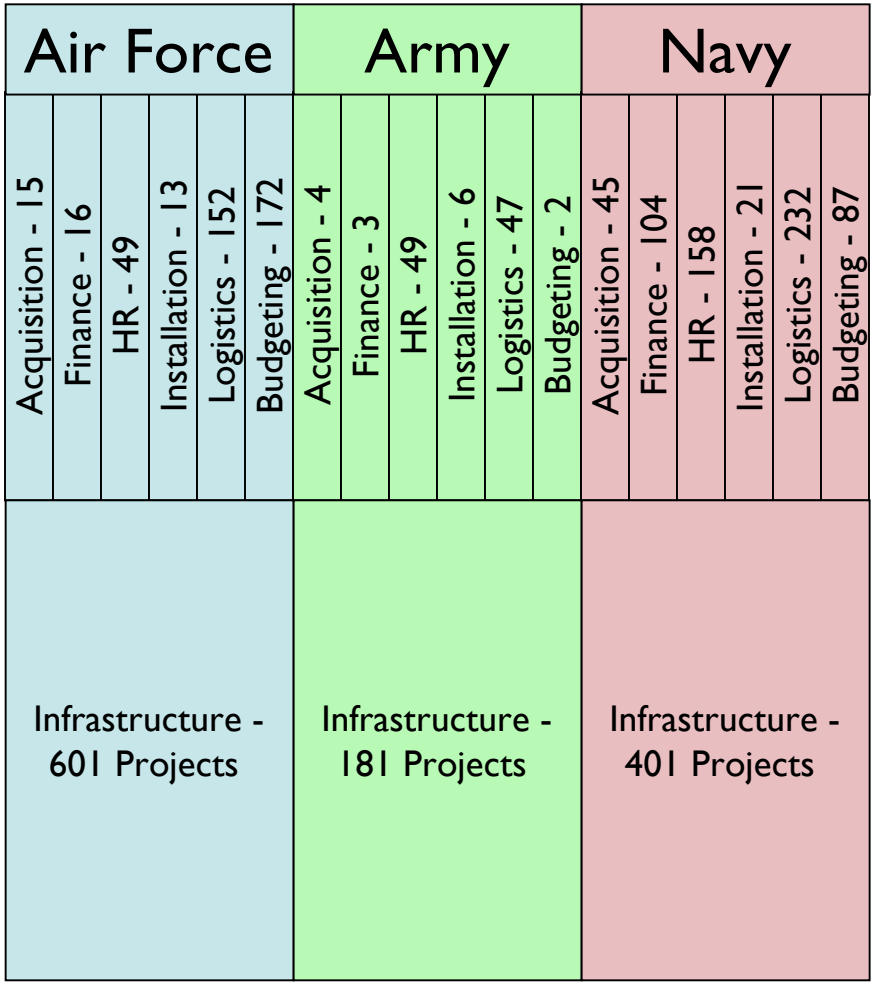
Scope of Business Management Systems

DoD Investment Review Boards	Air Force	Army	Navy	Agencies	Business Management Systems
Finance	67	161	148	107	483
Personnel	164	320	174	134	792
Logistics	780	730	406	169	2,085
Property	71	122	44	17	254
Other	65	0	26	12	103
Total	1,147	1,333	798	439	3,717

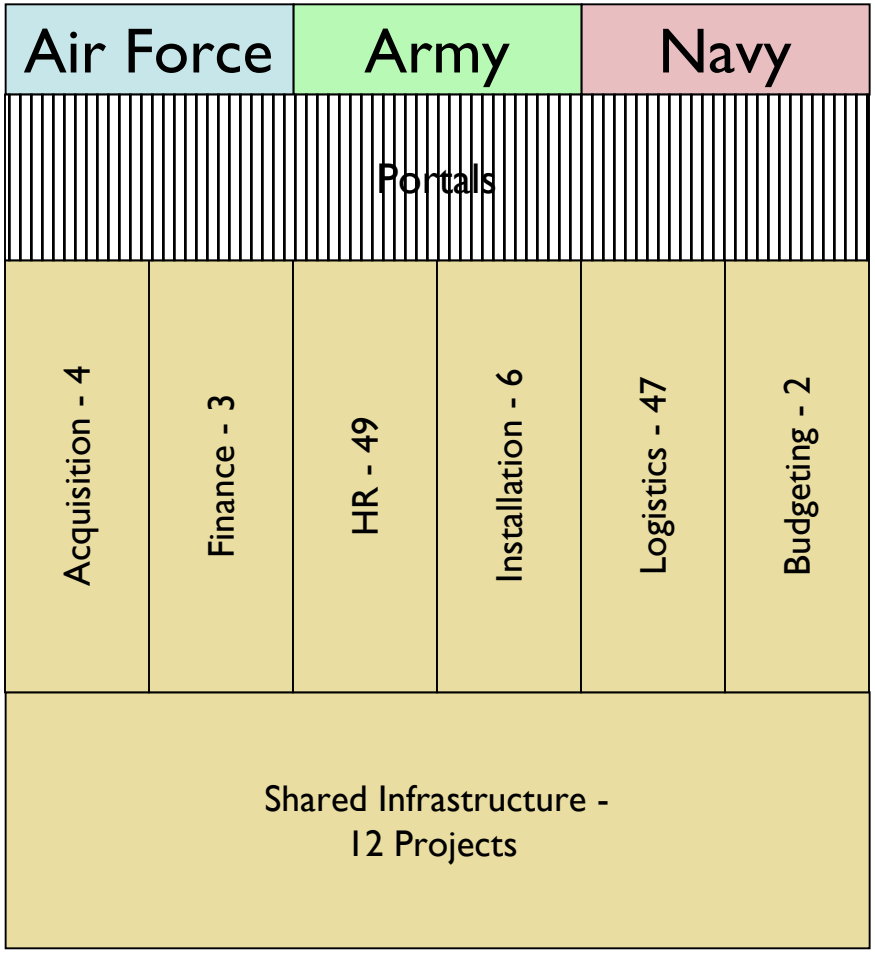
Business Mission in Military Services

Business Applications	Number of Applications	FY07 - $ Millions
Air Force	417	$1,436
Army	111	$1,353
Navy	647	$1,057
Total Applications	1,175	$3,846
Infrastructure		
Air Force	601	$1,998
Army	181	$1,489
Navy	401	$1,710
Total Infrastructure	1,183	$5,197
Total Spending on Business Mission		$9,043

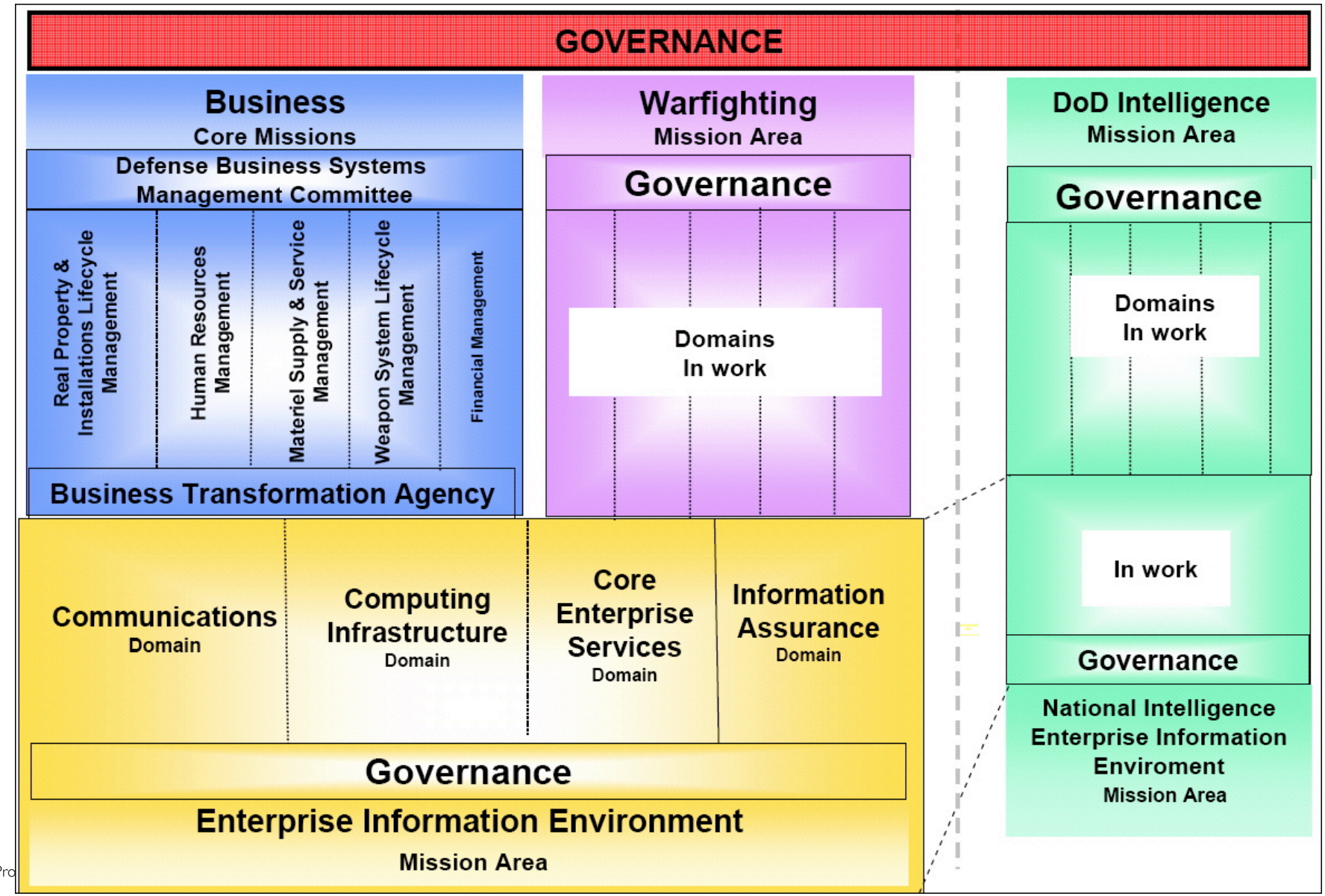
Current Organization of I.T. Spending in Services



Proposed Ultimate Organization of I.T. Spending in Services



Organization for Transformation of DoD - As Defined by NII



Potential Cost Reduction Through Consolidation of DoD Systems

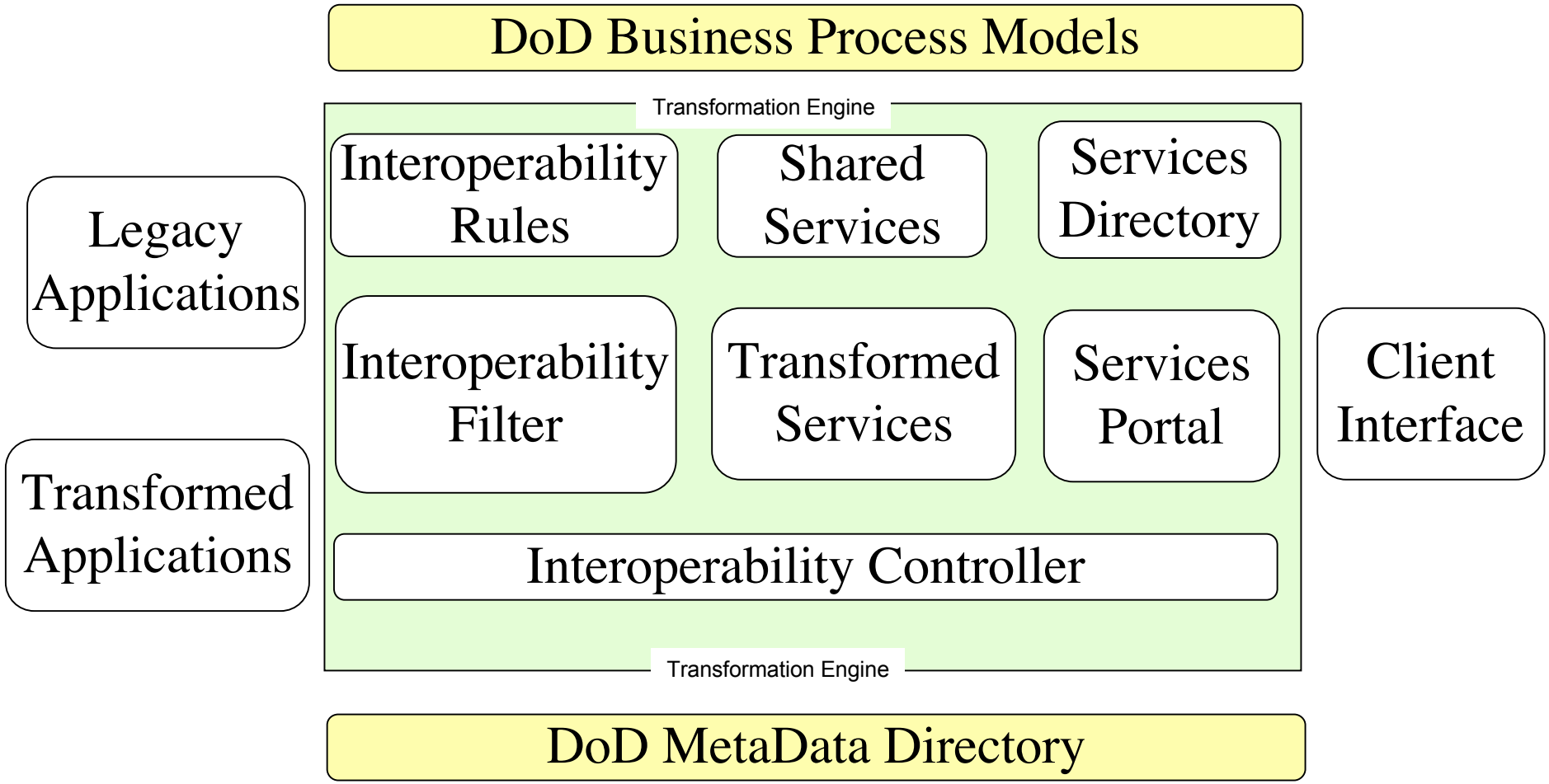
Business Mission	Current Number of Applications	FY07 - $ Millions	Consolidated Number of Applications	Estimated Cost - $ Millions
Acqusition	64	$119	6	$154
Finance, Accounting	123	$644	12	$295
Human Resource	256	$835	26	$614
Installation	40	$110	4	$96
Logistics	431	$1,729	43	$1,034
Budgeting and Other	261	$408	26	$626
Applications	1,175	$3,846	118	$2,820
Infrastructure	1,183	$5,197	12	$2,839
Total Spending		$9,043		$5,659

NOTE: Cost/Function Point = $1,200; Function Points/Application = 20,000; Function Points/Infrastructure = 200,000

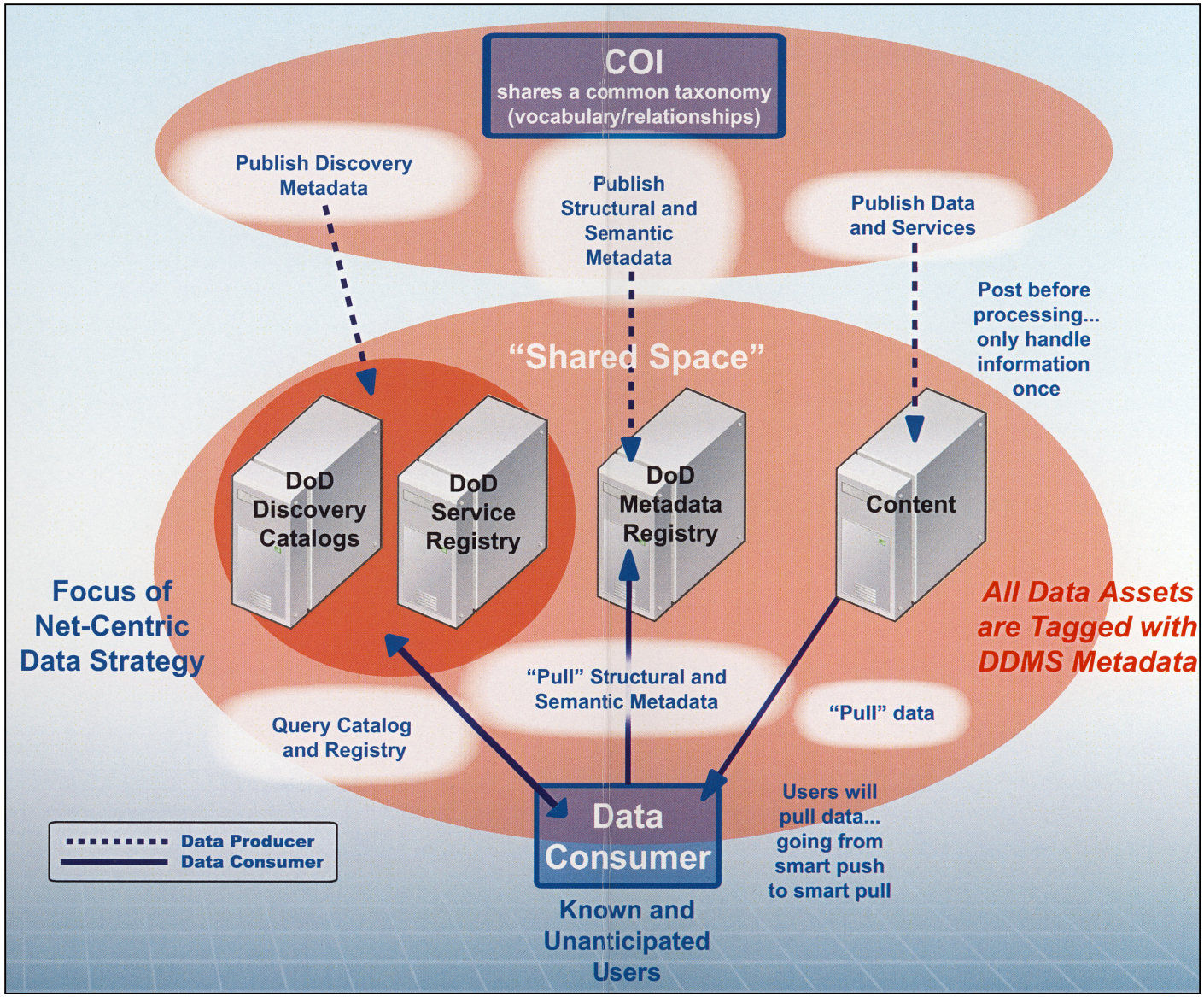
What is Needed: A Business Transformation Engine

- **Interoperability** to share data;
  - Reduce mediation costs
- **I.T. cost reduction**;
  - Consolidate applications, use shared components
- **Operating cost reduction**;
  - Automate reliability, security and information assurance
- **Rapid delivery** of new capabilities;
  - Reduce integration costs for innovation

Functions of the Business Transformation Engine



The DoD Policy Context: Data Sharing for Net-Centric Operations



Application Transformation Functions

- DoD Business Process Models provide the means for resolving procedural and process issues across different Communities of Interest.
- Shared Services include Application Development Services and Application Component Services.
- Transformed Services are applications that can be certified as fully compliant with DoD policies.
- Services Directory identifies the contents and access processes for delivery of "composite applications" that can utilize parts of available services.
- Services Portal provides a standard interface that can be adapted to meeting customers' requirements.

Case Study

Managing Software

Current State of Software According to Capers Jones

- Initial requirements are seldom more than 50% complete.
- Finding and fixing bugs is the most expensive software activity.
- Creating documents is the second most expensive software activity.
- Most forms of testing touch less than 50% of the code being tested.
- There are more defects in test cases than in the software itself.
- About 5% of modules in applications will contain 50% of all defects.
- About 7% of all defect repairs will accidentally inject new defects.
- About 5% of software outsource contracts end up in litigation.
- About 35% of projects > 10,000 function points will be cancelled.
- About 50% of projects > 10,000 function points will be one year late.

Proliferation of Software Choices

- More than 600 programming languages;
- More than 40 different formal methods;
- More than 38 different kinds of size metrics;
- More than 26 named development methods;
- More than 25 international standards organizations.

Proliferation of Software Development Methodologies (Partial)

- Capability maturity model (CMM);
- Capability maturity model integration (CMMI);
- CASE tools;
- CRYSTAL development approach;
- Dynamic system development method (DSDM);
- Extreme programming (XP);
- ISO 9000-9004 standards;
- Personal software process (PSP);
- Rapid application development (RAD);
- Structured process (TSP);
- Unified modeling language (UML).

Proliferation of Metrics to Measure Size of Software

- IFPUG function points;
- Backfired function points;
- Cosmic function points;
- Engineering function points;
- Feature points;
- Mark II function points;
- NESMA function points;
- Object points;
- Use-case points;
- Web-object points;
- Lines of code;
- Number of source code logical statements.

Testing Requirements for a Large Systems Project

Requirements inspections
Design inspections
Document inspections
Code inspections
Test plan and test case inspection
Defect repair inspection
Software quality assurance reviews
Unit testing
Component testing
New function testing
Regression testing
Performance testing
System testing
Acceptance testing

Paperwork Exceeds Programming Work

Monthly status reports to executive management;
Weekly progress reports to clients;
Daily communication between clients and the prime contractor;
Daily communication between the prime contractor and sub contractors;
Daily communication between developers and development management;
Full email support among all participants;
Full voice support among all participants;
Video conference communication among remote locations;
Automated distribution of documents and source code among developers;
Automated distribution of change requests to developers;
Automated distribution of defect reports to developers;
Emergency or "red flag" communication for problems.

Staff Requirements for a Large Software Project (Partial List)

Configuration Control Specialists
Cost Estimating Specialists
Customer Liaison Specialists
Data Base Administration Specialists
Data quality Specialists
Decision Support Specialists
Domain Knowledge Specialists
Human Factors Specialists
Integration Specialists
Maintenance specialists for post-release defect repairs
Outsource/Package Evaluation Specialists
Performance Specialists
Project Cost Estimating Specialists
Quality Assurance Specialists
Technical Writing Specialists
Testing Specialists

What Happens in DoD Development Centers

- Each unit selects a different software improvement model.
- The result is political battle between the units.
- Each striving to have its choice adopted as the standard.

Findings from Benchmark Studies

- For several years after adoption of a new software development approach productivity and quality levels do tend to improve.
- When DoD is revisited years later, the new method has been abandoned and productivity and quality results have declined back to the levels before the improvement program started.
- New management wants to start a new software process improvement program. Data on the earlier improvement programs has vanished.

Project Success/Failure Probabilities

Project Function Points	Projects Completed Early	Project Completed On Time	Projects Completed Late	Projects Cancelled
10	8%	89%	2%	1%
100	7%	80%	8%	5%
1,000	6%	60%	17%	17%
10,000	3%	23%	35%	39%
100,000	1%	15%	36%	48%

What is a Function Point?

- A function point is a unit of measurement to express the amount of business functionality an information system provides to a user.
- Function points are an ISO recognized software metric to size an information system based on the functionality that is perceived by the user of the information system.
- The size is determined by identifying the components of the system as seen by the end-user: the inputs, outputs, inquiries, interfaces to other systems, and logical internal files.
- There can be 70-300 Lines of Code per Function Point.

A Software Cost Reduction Calculator

	BEFORE CONSOLIDATION	
	Base Year	2003
A	Number of enterprise applications (@ 100,000 function points each)	1
B	Number of major applications (@ 15,000 function points each)	10
C	Number of minor applications (@ 5,000 function points each)	5
D	Number of maintenance applications (@ 100 function points each)	25
E	Number of databases (@ 2,000 function points each)	15
F	Number of networks (@ 15,000 function points each)	4
G	Total number of function points (A x 100000 + B x 15000 + C x 5000 +D x 100 + E x 2000 + F x 15000)	367,500
H	% of function points in development (@ $1,500 per function point)	5%
I	% of functions points in maintenance (@ $150 per function point)	95%
J	Total software cost (G x H x 1,500) + (G x I x 150)	$79,931,250
K	Number of full-time equivalents in development; assumes fully loaded salary of $125,000 (G x H x 1500 / 125,000)	221
L	Number of full-time equivalents in maintenance; assumes fully loaded salary of $75,000 (G x I x 150 / 75,000)	698

Reduction of Software Costs through Consolidation

	AFTER CONSOLIDATION	
	Projected year	2010
M	Number of major applications (@ 15,000 function points)	5
N	Number of minor applications (@ 5,000 function points)	2
O	Number of maintenance applications (@ 100 function points)	5
P	Number of portal-driven applications (@ 5 function points)	50
Q	Number of data warehouses (@ 75,000 function points)	1
R	Number of networks (@ 75,000 function points)	1
S	Total number of function points (M x 15000 + N x 5000 + O x 100 + P x 5 + Q x 75000 + R x 75000)	236,000
T	% of function points in development (@ $750/function point)	25%
U	% of functions points in maintenance (@ $25/function point)	75%
V	Total software cost (S x T x 750) + (S x U x 25)	$48,675,000
W	Number of full-time equivalents in development; assumes fully-loaded salary of $125,000 (S x T x 750/125000)	354
X	Number of full-time equivalents in maintenance; assumes fully-loaded salary of $75,000 (S x U x 25/75000)	59
	REDUCTIONS THROUGH CONSOLIDATION	
Y	Total number of function points = -(S-G)/S	-36%
Z	Total software cost -(J-V)/J	-39%
AA	Personnel in software development -(K-W)/K	61%
BB	Personnel in software maintenance -(L-X)/L	-92%

Summary

- *There are thousands of ways how systems projects can fail - there are only a few ways how they can succeed.*
- *Transformation calls for consolidation of applications and data center operations.*