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Sustaining a Maturing Information Quality Process: The Aera Energy Experience

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Executive Summary/Abstract: This practice-oriented presentation describes the steps Aera Energy LLC took to institutionalize a successful Information Quality environment and practice. Key elements of the effort include information quality assessment and reporting, Enterprise Architecture planning and implementation, information stewardship, value-centric IT system development and an enterprise-wide commitment to nurture a data quality culture. Significant improvements in data accuracy, cycle-time reductions in data acquisition value-streams, and savings in IT development costs are examples of benefits already being enjoyed .

Outline

- Introduction
  - Aera Energy LLC
  - Information Quality Case for Action
- The Four Pillars of Information Quality
  - Business Direction
  - Program
  - Practice
  - Environment & Culture
- Results
- Lessons Learned
  - Data Quality Measurement
  - Leading Change
- Conclusions & Next Steps

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Aera Energy LLC

- One of California's largest oil and gas producers
- Accounts for almost 1/3 of the state's production
- Formed in 1997
- Jointly owned by Shell and ExxonMobil
- Approx. 1,150 employees
- Approx. 15,000 active wells, 100,000+ total wells in databases (including abandoned and active wells)

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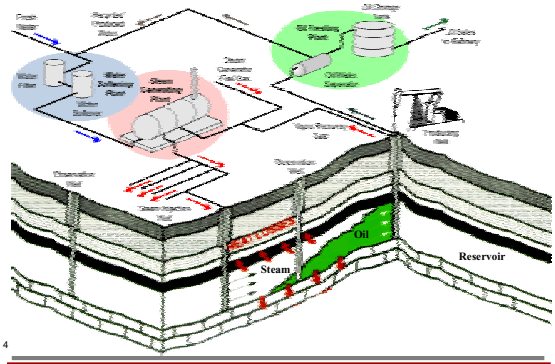
Case for Action

Lots of Diverse Data About Wells, Reservoirs, Equipment, Facilities,etc.



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Case For Action

Lack of Quality Data

- Caused by:
  - Many disparate systems (over 800 when we started)
  - Lack of standard processes and data definitions
  - The fact that data quality was not a core competency
- Resulting in:
  - Time wasted finding, validating, reconciling and correcting bad data (survey results indicated 40% of staff time wasted)
  - Increased decision risk due to uncertainty of data
  - High cost to maintain many systems and databases

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Case For Action

The 1999 Challenge

- How to design and implement an information quality process that is...
  - Effective enough to yield real and sustained improvements in data quality
  - Robust enough to easily adapt to business changes
  - Simple enough to be adopted enterprise-wide
  - Flexible enough to easily fit into existing business processes

…while building and learning from initiatives begun since Aera's formation in 1997?

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Case for Action
The Answer

- Systematically address the four pillars of any successful process:
  - Business direction (why?)
  - Program (who?)
  - Practice (what, when, where?)
  - Culture & environment (how?)

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Business Direction
Elements of Guidance

- Aera Purpose
  "Our Energy Achieves What Others Cannot And Creates Success for Those We Touch"
- From Aera Vision
  - World Class Process Performance
    'We value and use data and information management as a competitive advantage"
- From Aera Values
  - Being Accountable to Each Other
  - Passion For Learning and Improving

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Business Direction
Elements of Guidance (cont'd)

- From Enterprise Architecture Principles
  - Data Stewardship Principle
    "Data is an asset and resource of the Enterprise and is managed accordingly"
  - Common Language Principle
    "Data is defined. Data definitions are consistent across the Enterprise"
  - Architectural Framework (Zachman) Principle
    "Information and technology decisions are consistent within an enterprise architectural framework that promotes adaptability by distinguishing levels of architectures and dimensions of knowledge"

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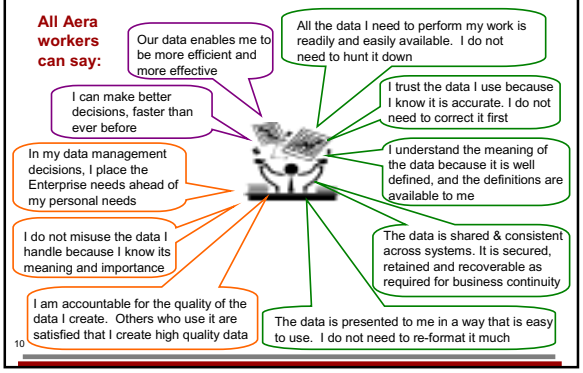
Business Direction
Vision Of Success - Information Quality



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Program
IQ Resources

- Central Data Architecture & Information Quality function
- Entire Information Management & Technology (IM&T) department
- Formal business partners
  - Information and Process Owners (IPO)
  - Business Information Stewards (BIS)
  - Data management specialists
  - Records retention coordinators
- Informal business partners
  - Continuous Improvement (CI) internal consultants
  - Other internal change agents

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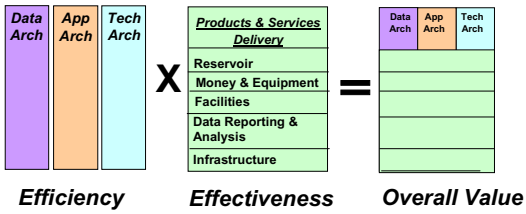
Program
Value-Driven Matrix IM&T Organization



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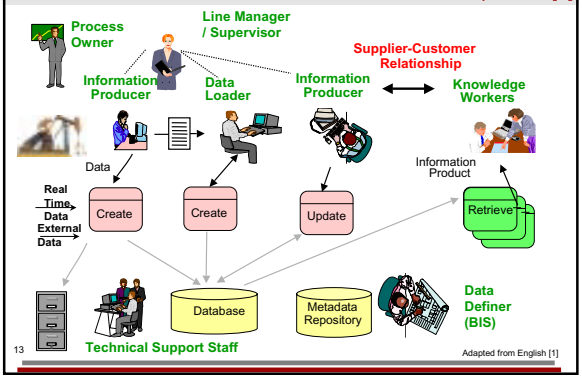
Program
Seven Stewardship Roles [1]



Adapted from English [1]

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Program
Initial Stewardship Implementation

- Information & Process Owners (IPO) were selected to lead Aera's core processes
- Conceptual data model developed during the enterprise architecture planning effort had identified 53 major subject areas
- IPO members assigned 30 individuals as Business Information Stewards for these 53 subject areas

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Program
Information Stewardship Established at Four Levels

- Strategic
  - Accountable for corporate policies. Set business direction and ratify stewardship guidance elements. Commit resources
  - Senior Leadership Team
- Tactical
  - Accountable for the definition of business data, across business units
  - Information & Process Owners, and their appointed Business Information Stewards
- Operational
  - Accountable for the business data content
  - All workers, as information producers, knowledge workers, data loaders
- Technical
  - Accountable for the information technology
  - IM&T staff and business staff who create & maintain own systems

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Practice
Roles of the Data Architecture & Information Quality Function

- Information quality process owner
- Data architecture and administration (data modeling, definitions, business rules, reference data, data security, retention and archiving policies, etc.)
- Metadata repository
- Data quality assessment & reporting
- Data migration & conversion
- Centralized data loading
- Document management (records retention, technical library, well files and engineering drawings)
- Internal consulting for improvement projects

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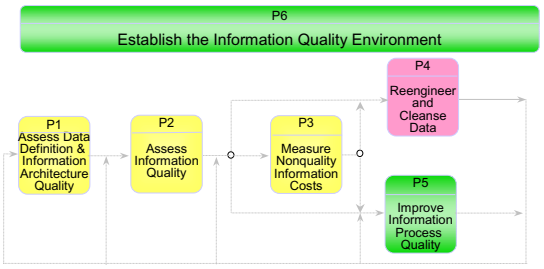
Practice
Total Quality data Management (TQdM®)



Adapted from English [1]

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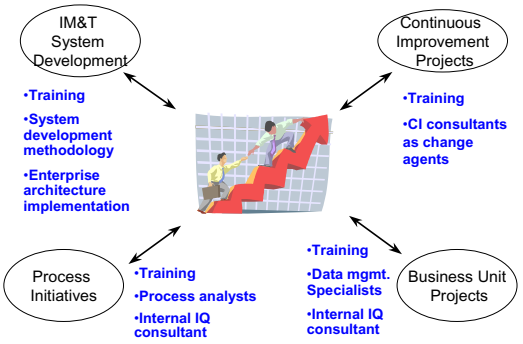
Practice
Enterprise-wide IQ Implementation



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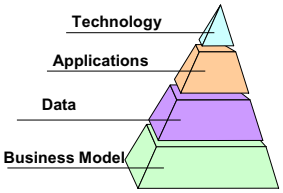
Practice
Define Needs Through an Enterprise Architecture Plan



❹Plan the Technology
❸Plan the Applications
❷Understand the Data Needed
❶Understand the Business

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Practice
Enterprise Architecture Implementation

- Mission is to deliver quality information by integrating People, Process & Technology:
  - Develop standard **Processes** across the Enterprise
  - Lead **Process** Improvement efforts
  - Develop, maintain, and enhance information systems (**Technology**) to support the architected Enterprise (goal: approx. 120 systems)
  - Train and empower employees and contractors (**People**) to implement the standard processes using the supporting information systems

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Practice
System Development Framework

SDLC Tracks	System Development Life Cycle Phases						
	Feasibility	Planning	Analysis	Design	Build	Implementation	Run and Maintain
Project Management							
Business Process Re-design							
Change Management							
Data Modeling							
Data Quality Assessment & Conversion							
Application							
Technology							
Quality Assurance & Testing							

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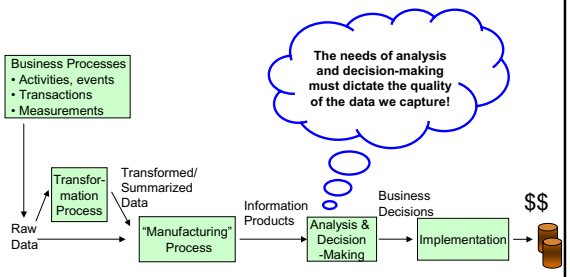
Practice
Information Products in the Business Intelligence Process



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Environment & Culture

- Training
- Leadership development
- Company newsletter
- Intranet site
- Road-shows
- Job postings that include data quality expectations
- Information Directory (meta-data repository)
- Rewards & recognition
- Share of mind

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Sample Results

- Number of duplicate records in GIS data set decreased by 90%.
- Time spent reconciling and correcting data decreased from 40% to 30% between early 2000 and late 2001.
- In recent survey of Aera staff, 63% of respondents indicated that data quality is better now than it was two years before.
- Error rate in well log data decreased 60% from 4.3 to 1.7 errors per log.
- In one business unit, cycle-time in collection of well monitoring data cut by 76% from 184 days to 44 days.
- Currently enjoying a 20% data entity re-use, reducing the overall costs and cycle-time of new systems development.
- Two thirds of leadership and management group, and half of all employees trained in IQ principles, methods and accountability.

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Lessons Learned
Data Quality Measures

- Successfully negotiating the growing pains of initial implementation:
  - Defining "quality"
  - Accuracy, timeliness, vs. other attributes
  - Database quality vs. process monitoring
  - Frequency of measurement (monthly vs. quarterly or semi-annually)
  - Ownership of metrics
  - Vital few vs. useful many
  - Rolled up index (health of Aera's DQ) vs. granular metrics
  - Expansion driven by the Enterprise Architecture Implementation priorities

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Lessons Learned
Building for the Long-Term

"Lasting improvement does not take place by pronouncements or official programs.

Change takes place slowly inside each of us and by the choices we think through in quiet wakeful moments, lying in bed just before dawn"

Peter Block [2]

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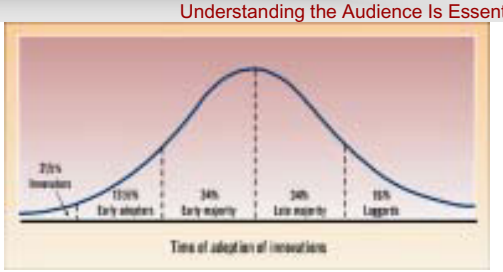
Lessons Learned
Understanding the Audience Is Essential



- Aera workers appear to fit the typical profile for adoption of innovations [3].
- Accordingly, our Information Quality practice and culture are being adopted progressively throughout the enterprise.
- The different elements of our Information Quality process are experiencing different adoption rates.

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Lessons Learned
Lasting Change Requires High-Leverage Intervention

Increasing Leverage

		Example
Create the Future	Visions	"With high quality data through information stewardship, we will derive a sustained competitive advantage from the use of our information resources."
Transform	Mental Models	"Information management is a core process. We value the work it takes to achieve information quality, as much as we value the work it takes to execute our other core processes."
Create Change	Structures	" We've aligned our organization structures, job descriptions, rewards & recognition systems to enable us to achieve our data quality aspirations."
Anticipate, Adapt	Patterns of Behaviors	"We are implementing several preventive measures, such as validation screens, data quality assessment, and initial training for Information Producers and Data Loaders."
React	Events	"We actively engage in aggressive data correction efforts."

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Conclusion & Next Steps

- Continue to use Enterprise Architecture Implementation as the key implementation tool for Information Quality
- Increase usage of metadata repository
- Expand internal IQ consulting function
- Actively reward and recognize IQ change agents
- Strengthen partnerships with other company initiatives (Lean, Reservoir Management, Total Process Reliability, etc..)
- Expand & optimize data quality measurement and reporting
- Include stewardship of documents (electronic and paper "un-structured data")
- Continue to focus on people, process, and technology

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References

[1] English, L. P., *Improving Data Warehouse and Business Information Quality: Methods for Reducing Costs and Increasing Profits*, John Wiley & Sons, NY,1999

[2] Block, P., *The Empowered Manager: Positive Political Skills at Work*, Jossey-Bass, NY,1991

[3] Rogers, E. M., *Diffusion of Innovations*, The Free Press, NY, 1995

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