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

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  – 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

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)

Case for Action

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

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

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?
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?)

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

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”

Business Direction

Vision Of Success - Information Quality

- All Aera workers can say:
  - Our data enables me to be more efficient and more effective
  - I can make better decisions, faster than ever before
  - I trust the data I use because I know it is accurate. I do not need to hunt it down
  - In my data management decisions, I place the Enterprise needs ahead of my personal needs
  - I do not misuse the data I handle because I know its meaning and importance
  - I am accountable for the quality of the data I create. Others who use it are satisfied that I create high quality data
  - The data is shared & consistent across systems. It is secured, retained and recoverable as required for business continuity
  - The data is presented to me in a way that is easy to use. I do not need to re-format it much
  - I understand the meaning of the data because it is well defined, and the definitions are available to me

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

Program

Value-Driven Matrix IM&T Organization

- Data Arch
- App Arch
- Tech Arch
- Products & Services
- Delivery
- Reservoir
- Money & Equipment
- Facilities
- Data Reporting & Analysis
- Infrastructure

Efficiency
Effectiveness
Overall Value
**Program**

**Seven Stewardship Roles [1]**

- 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

**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

**Practice**

**Total Quality data Management (TQdM®)**

- Establish the Information Quality Environment
- Assess Data Definition & Information Architecture Quality
- Assess Information Quality
- Measure Nonquality Information Costs
- Improve Information Process Quality
- Reengineer and Cleanse Data
- Improve Information Process Quality

**Practice**

**Enterprise-wide IQ Implementation**

- Training
  - System development methodology
  - Enterprise architecture implementation
- Training
  - CI consultants as change agents
- Training
  - Data mgmt. Specialists
  - Internal IQ consultant
- Training
  - Business Unit Projects

**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
Technology Applications Business Model Data

Plan the Technology Plan the Applications Understand the Data Needed Understand the Business

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

Define Needs Through an Enterprise Architecture Plan

Enterprise Architecture Implementation

Feasibility Planning Analysis Design Build Implementation


System Development Framework

Practice

Information Products in the Business Intelligence Process

Environmental & 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

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.
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

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]

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.

Lessons Learned

Lasting Change Requires High-Leverage Intervention

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.”

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

References

