Information Quality:
What's Enterprise Architecture Got to Do with It?

ABSTRACT- -

This tutorial explores the relationships between the disciplines of Information Quality and Enterprise Architecture. It provides a highly practical approach to Enterprise Architecture that addresses the ways in which the dimensions of Information Quality are reflected in multiple aspects of an enterprise, and enables the architect to focus on Information Quality issues and solutions.

BIOGRAPHY- -

P. Kathie Sowell
President
Custom Enterprise Solutions, LLC

Ms. Sowell is a recognized leader in Enterprise Architecture, having been the principal author of DoD's original architecture framework, and a principal developer of other frameworks for Government and Industry. She retired from The MITRE Corporation, where she performed a leadership role in Enterprise Architecture for many Government clients. Her expertise has been tapped by NATO Headquarters, the Australian Ministry of Defence, Canadian corporations, the Danish Embassy, the Swedish military, and State and local governments. For five years she served as a curriculum developer, Technical Director, and Director of the DoD Division of the Federated Enterprise Architecture Certification Institute (FEAC). She now provides Enterprise Architect Certification and consulting through her company, Custom Enterprise Solutions, LLC, and National-Louis University.

The MIT 2009 Information Quality Industry Symposium

Information Quality:
What's Enterprise Architecture Got to Do with It?

P. Kathie Sowell

Custom Enterprise Solutions, LLC

The MIT 2009 Information Quality Industry Symposium

Objectives of this presentation

➢ Demonstrate the compatibility of the data quality discipline with Scenario-Based Enterprise Architecture

2

The MIT 2009 Information Quality Industry Symposium

But First, What is Enterprise Architecture?

- **In general …**

  Enterprise Architecture is a **discipline** for analyzing the business of a community of interest, where the business should go, why it's not there yet, and how to get it there

- **From an IT perspective …**

  Enterprise Architecture is a **discipline** for assessing and recommending candidate information technology solutions in an integrated context with business and mission operations

The MIT 2009 Information Quality Industry Symposium

What Is an Architecture?

"In simple terms, an enterprise can be viewed as any purposeful activity, and an architecture can be characterized as the structure (or structural description) of any activity." – Randy Hite, GAO

The MIT 2009 Information Quality Industry Symposium

What is an Architecture?

An architecture is "the structure of components, their relationships, and the principles and guidelines governing their design and evolution over time."

- C4ISR Architecture Framework, Version 2.0, derived from IEEE

The MIT 2009 Information Quality Industry Symposium

What Is an Enterprise?

- Random House Dictionary:
  – A project undertaken
  – A commercial company

- Randy Hite (GAO): any purposeful activity

- Roget's Thesaurus II: an exciting, often hazardous undertaking

The MIT 2009 Information Quality Industry Symposium

Which Definition of Enterprise Should We Use In Enterprise Architecture?

- Some people think an Enterprise Architecture is always about a single organization (XYZ Corporation EA, Treasury Department EA)

- Others think an enterprise should often be about a problem area, whether it involves a single organization or many (Federal Health Care EA, Homeland Security EA)

> Your "enterprise" is
> whatever your architecture is about.
>
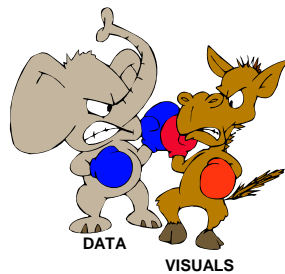> Choose your enterprise carefully.

The MIT 2009 Information Quality Industry Symposium

What's the Problem?

In the Enterprise Architecture Community, there are two *seemingly* opposed approaches:

- "It's the data, stupid" vs. "Let the pictures tell the story"

DATA

VISUALS

3

The MIT 2009 Information Quality Industry Symposium

What does "It's the data, stupid" really mean?

- The (only) important aspect of an enterprise architecture is the underlying data.

- It doesn't matter how you express this data to humans.

- It doesn't matter *if* you express this data to humans.

- It is only important that the data conform to the data standards you have set up
  - format standards for storing in a database
  - quality standards for usability

4

The MIT 2009 Information Quality Industry Symposium

## What does "Let the pictures tell the story" really mean?

- The underlying data has to be "good," but

- Humans think and understand quickly and well via visuals (pictures).

- Humans are the ones analyzing enterprise architecture data.

- Humans are the ones making decisions based on analysis of the enterprise architecture data.

- Most of these decisionmakers are not computer scientists.

5

The MIT 2009 Information Quality Industry Symposium

But wait, they are both right.

SCENARIO-BASED ENTERPRISE ARCHITECTURE:
VISUAL, DATA-FOCUSED, TELLS A STORY

DATA

VISUALS
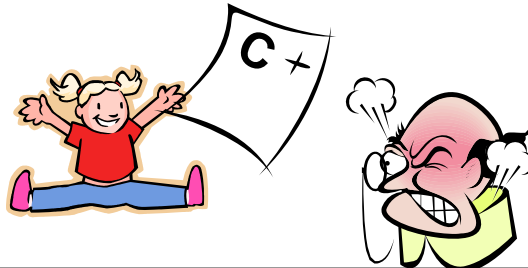
6

The MIT 2009 Information Quality Industry Symposium
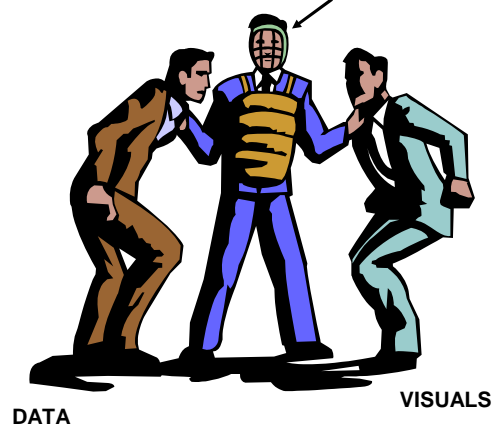
How can they both be right?

Information Quality professionals know that the definition of data "quality" is circumstantial:

- Data quality depends on where, when, why, how, and by whom the data needs to be used.

- One person's "good enough" is another person's disaster.

C +

7

The MIT 2009 Information Quality Industry Symposium

The Enterprise Architecture approach recommended here can help us take advantage of this circumstantial definition of data quality:

- Enterprise architecture "products" or "artifacts" are the visual renderings of selected information about your enterprise.

- Visual artifacts allow human stakeholders and decisionmakers to quickly grasp the logic of your message and analyze its validity and repercussions.

- The different circumstances under which information is to be used can be expressed as different story lines.

- To tell these different stories, we need a sequential, visual representation of our underlying enterprise architecture data.

Combine the discipline of Information Quality

with Scenario-Based Enterprise Architecture
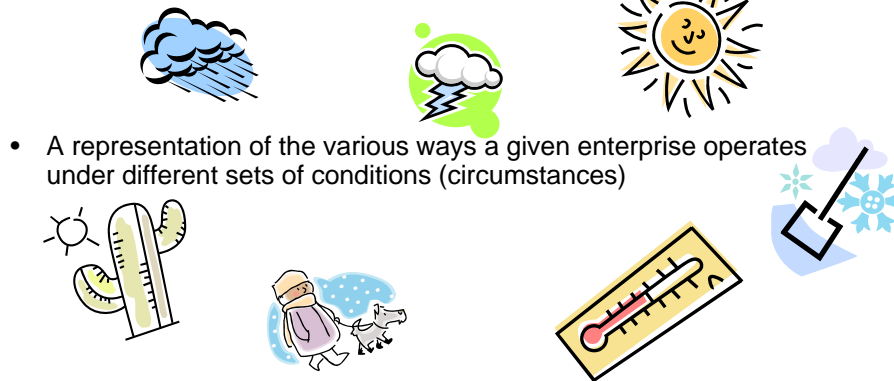
8

The MIT 2009 Information Quality Industry Symposium

What is Scenario-Based Architecture?

- A representation of the various ways a given enterprise operates under different sets of conditions (circumstances)

- Examining a range of scenarios can help you determine if your enterprise (and its information/data) is robust enough to operate under the likely circumstances.

9

The MIT 2009 Information Quality Industry Symposium

What are the basic components of a Scenario-Based Architecture?

- **Purpose Statement: Tells what you intend to analyze via the architecture**

- **Activity Model: Shows the essential activities that occur, under any and all circumstances (i.e., irrespective of specific circumstances)**

- **Node Connection Model: Shows which business performers exchange information, irrespective of specific circumstances**

- **Information Exchange Matrix: Shows the detailed characteristics of the information exchanged**

- **Scenario Sequence Models: Illustrate multiple storylines showing the different ways the enterprise operates under specific conditions**

- **Capability Progression Model: Defines what it means to achieve certain levels of capability**

- **And, if you need details about technology used: ***
  - **Systems Connection Model**
  - **Systems Data Exchange Matrix**

* For illustration, we will not consider technology factors here

10

The MIT 2009 Information Quality Industry Symposium

What does a Scenario-Based Architecture with these components look like?

One each per architecture

Purpose Statement: e.g.,
"Analyze XYZ to determine
such and such"

↓ Activity Model

Node Connection Model

CAPABILITY PROGRESSION MODEL
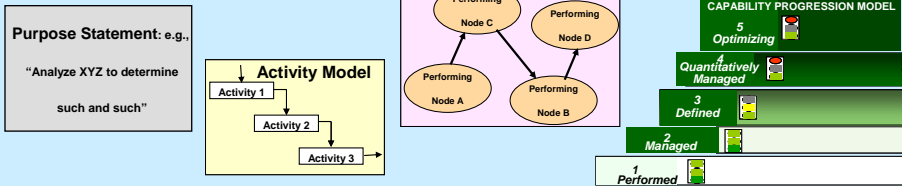
These represent the whole of the enterprise under consideration.

One each per scenario

Information Exchange Matrix

Scenario Sequence Diagram
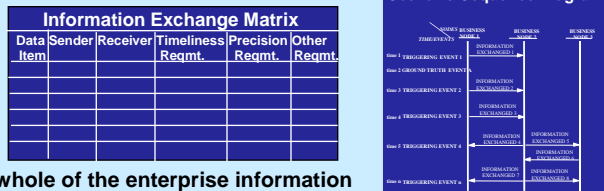
These tap into the whole of the enterprise information to select threads that illustrate specific story lines (sets of circumstances).

11

The MIT 2009 Information Quality Industry Symposium

Purpose Statement sets the stage for your enterprise analysis

- Why you are developing the architecture
- What issues you will examine, what questions you hope to answer
- Who are your stakeholders, decisionmakers
- What artifacts (models) you will construct
- How you will approach and tailor the models
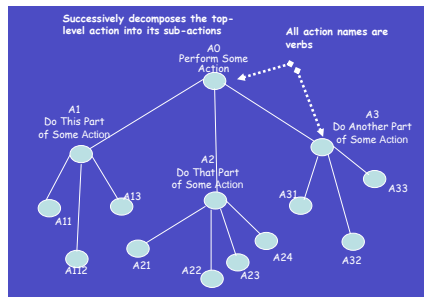- How you will know when you are finished
- How you will know if you have succeeded

The MIT 2009 Information Quality Industry Symposium

The Activity Model shows the relevant* actions that take place in your enterprise (irrespective of scenario)

Successively decomposes the top-level action into its sub-actions

All action names are verbs

A0
Perform Some Action

A1
Do This Part of Some Action

A2
Do That Part of Some Action

A3
Do Another Part of Some Action

A11
A13
A31
A33
A112
A21
A22
A23
A24
A32

Activity Hierarchy Tree

Successively decomposes the top-level action into its sub-actions For each action of interest, a diagram illustrates the input/outputs between its sub-actions

Controls come in from the top... every box must have one

Outputs go out from the right...every box must have one

Do This Part of Some Action
A1

Do That Part of Some Action
A2

Inputs come in from the left

Do Another Part of Some Action
A3

Mechanisms come in from the bottom & show who or what performs the action
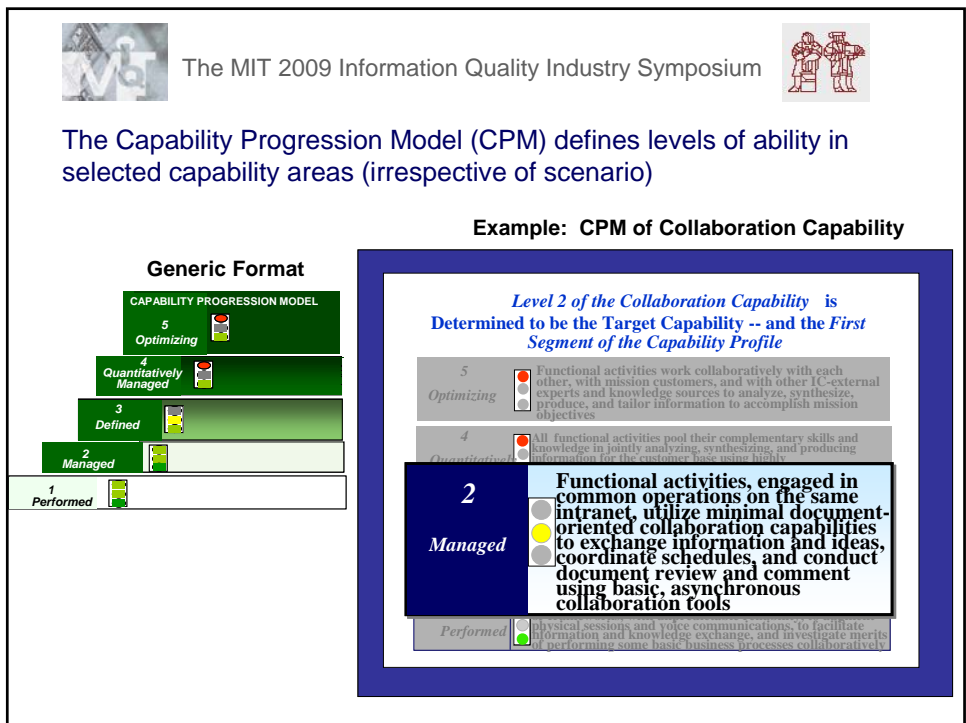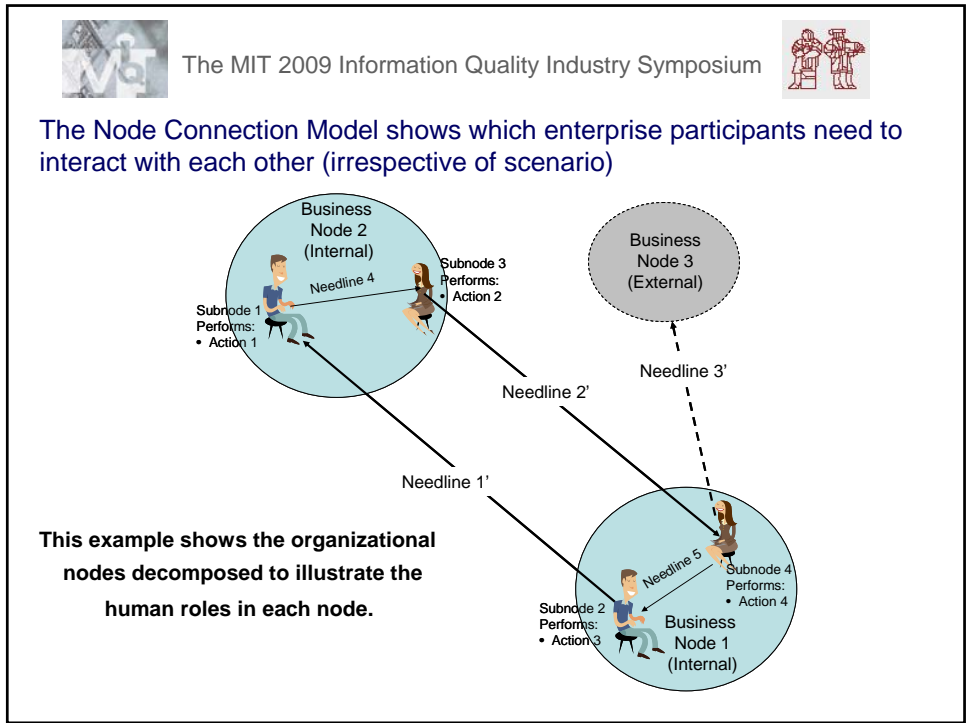
Activity Flow Model

* Relevant to the purpose & scope of the architecture

The MIT 2009 Information Quality Industry Symposium

The Node Connection Model shows which enterprise participants need to interact with each other (irrespective of scenario)

Business Node 2 (Internal)

Subnode 3 Performs:
• Action 2

Needline 4

Subnode 1 Performs:
• Action 1

Business Node 3 (External)

Needline 3'

Needline 2'

Needline 1'

Needline 5

Subnode 4 Performs:
• Action 4

Subnode 2 Performs:
• Action 3

Business Node 1 (Internal)

This example shows the organizational nodes decomposed to illustrate the human roles in each node.

The MIT 2009 Information Quality Industry Symposium

The Capability Progression Model (CPM) defines levels of ability in selected capability areas (irrespective of scenario)

Example: CPM of Collaboration Capability

Generic Format

CAPABILITY PROGRESSION MODEL

5 Optimizing

4 Quantitatively Managed

3 Defined

2 Managed

1 Performed

Level 2 of the Collaboration Capability is **Determined to be the Target Capability -- and the** *First Segment of the Capability Profile*

5 Optimizing — Functional activities work collaboratively with each other, with mission customers, and with other IC-external experts and knowledge sources to analyze, synthesize, produce, and tailor information to accomplish mission objectives

4 Quantitatively — All functional activities pool their complementary skills and knowledge in jointly analyzing, synthesizing, and producing information for the customer base using highly

2 Managed — **Functional activities, engaged in common operations on the same intranet, utilize minimal document-oriented collaboration capabilities to exchange information and ideas, coordinate schedules, and conduct document review and comment using basic, asynchronous collaboration tools**

Performed — physical sessions and voice communications, to facilitate information and knowledge exchange, and investigate merits of performing some basic business processes collaboratively
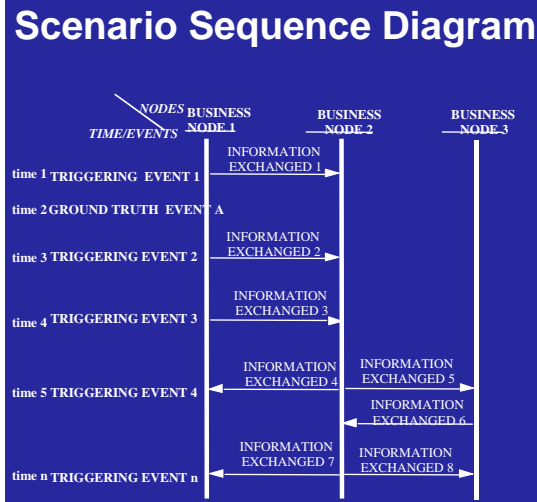
The MIT 2009 Information Quality Industry Symposium

A Scenario Sequence Diagram shows a series of events, and the information exchanges that occur in response the to events *of a given scenario*

The MIT 2009 Information Quality Industry Symposium

The Information Exchange Matrix captures the relevant quality (and other) characteristics of information *as it is used in a given scenario*

Who needs what information or goods may differ by scenario.
Required characteristics of that information or data may differ by scenario.

The MIT 2009 Information Quality Industry Symposium

But where does information quality fit in?

- Information quality depends on where, when, why, how, and by whom the information needs to be used.

- The various scenarios illustrate where, when, why, how, and by whom the information needs to be used, one storyline at a time.

- The Capability Progression Model provides a scale for defining capabilities related to information quality (and other factors).

- The Information Exchange Matrix details the characteristics, including quality attributes, of information as it is used in these various circumstances

- Examination of the Information Exchange Matrix in context with the Capability Progression Scale allows the architect to define "success" for each scenario.
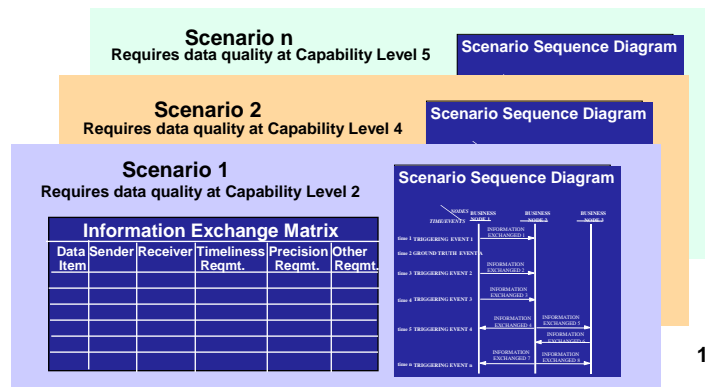
13

The MIT 2009 Information Quality Industry Symposium

By examining a representative range of these scenarios and their information quality requirements, the architect can measure the range of quality requirements for given information items. **For example:**

- "Depending on circumstances, information item X needs to be.."
  - from one minute to one hour old
  - validated by a level one manager to a level three manager
  - precise to a level of one decimal place to three decimal places

Scenario n
Requires data quality at Capability Level 5

Scenario Sequence Diagram

Scenario 2
Requires data quality at Capability Level 4

Scenario Sequence Diagram

Scenario 1
Requires data quality at Capability Level 2

Scenario Sequence Diagram

Information Exchange Matrix

Data Item	Sender	Receiver	Timeliness Reqmt.	Precision Reqmt.	Other Reqmt.

15

The MIT 2009 Information Quality Industry Symposium

Summary

- Yes, it is the data (and information) that is important.
- Yes, it is the visual representation of that data that is important.
- The quality of the data depends on the circumstances.
- Visual, Scenario-Based Enterprise Architecture helps you explain the circumstances and the resulting data quality assessment to human decisionmakers.

16