Four Effective Metadata Strategies

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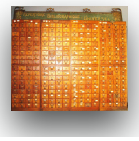


Peter Aiken, Ph.D.

- I've been doing this a long time
- My work is recognized as useful
- Associate Professor of IS (vcu.edu)
- Institute for Defense Analyses (ida.org)
- DAMA International (dama.org)
- MIT CDO Society (iscdo.org)
- Anything Awesome (anythingawesome.com)
- Experienced w/ 500+ data management practices worldwide
- 13 books and dozens of articles
- Multi-year immersions
  - US DoD (DISA/Army/Marines/DLA)
  - Nokia
  - Deutsche Bank
  - Wells Fargo
  - Walmart
  - HUD …

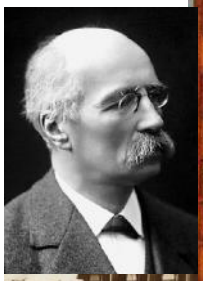
$1,500,000,000.00 USD

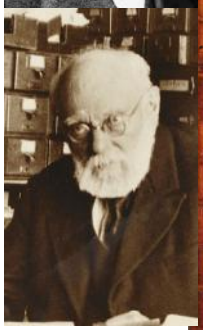
Program Overview

Four Effective Metadata Strategies

- Defining metadata in the context of data management
  - Defining data management
  - What do we mean by the term 'using data as metadata' and why is this important? (Hint: leverage)
  - Specific teachable example (iTunes→Music™/.mp3 player app)
  1. Metadata is a gerund–do not treat it as a noun
     - Metadata is a use of data, not a type of data
  2. Enforce metadata to be the language of data governance
     - Make metadata the language of data governance
  3. Treat glossaries/repositories as capabilities not technology
     - Cyclic improvements do not start with technologies
  4. Build from metadata building blocks
     - Many many many resources are available to jump-start metadata efforts
- Benefits, application & sources
  - Understand that metadata defines organizational interoperability
- Take Aways, References and Q&A

Henri La Fontaine
Nobel Peace Prize, 1913





Paul Otlet

https://en.wikipedia.org/wiki/Mundaneum#/media/File:Mundaneum_Tiráng_Kartelkaarten.jpg | http://www.mundaneum.org/en

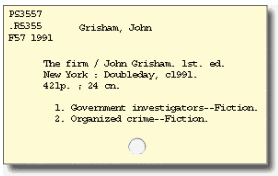
Special thanks to Peter A. Campbell @ Solvay for this contribution

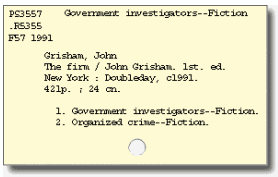
1. **Library** - a place you physically travel to in order to access reference materials and other forms of knowledge
2. You searched manually for potentially useful items by reading abstracts and other information printed on 3 x 5 **index cards** and organized into a **card catalog** (pictured)
3. The cards also contain an **address** in the library where a **physical** copy of the item(s) of interest are located

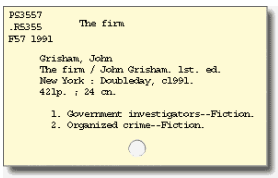
Analogy: a Library Card Catalog

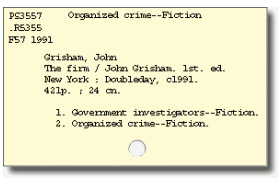
- Identifies
  - What books are in the library, and
  - Where they are located
- Search by
  - Subject area
  - Author, or
  - Title
- Catalog shows
  - Author
  - Subject tags
  - Publication date and
  - Revision history
- Determine which books will meet the reader's requirements
- Without the catalog, finding things is difficult, time consuming and frustrating

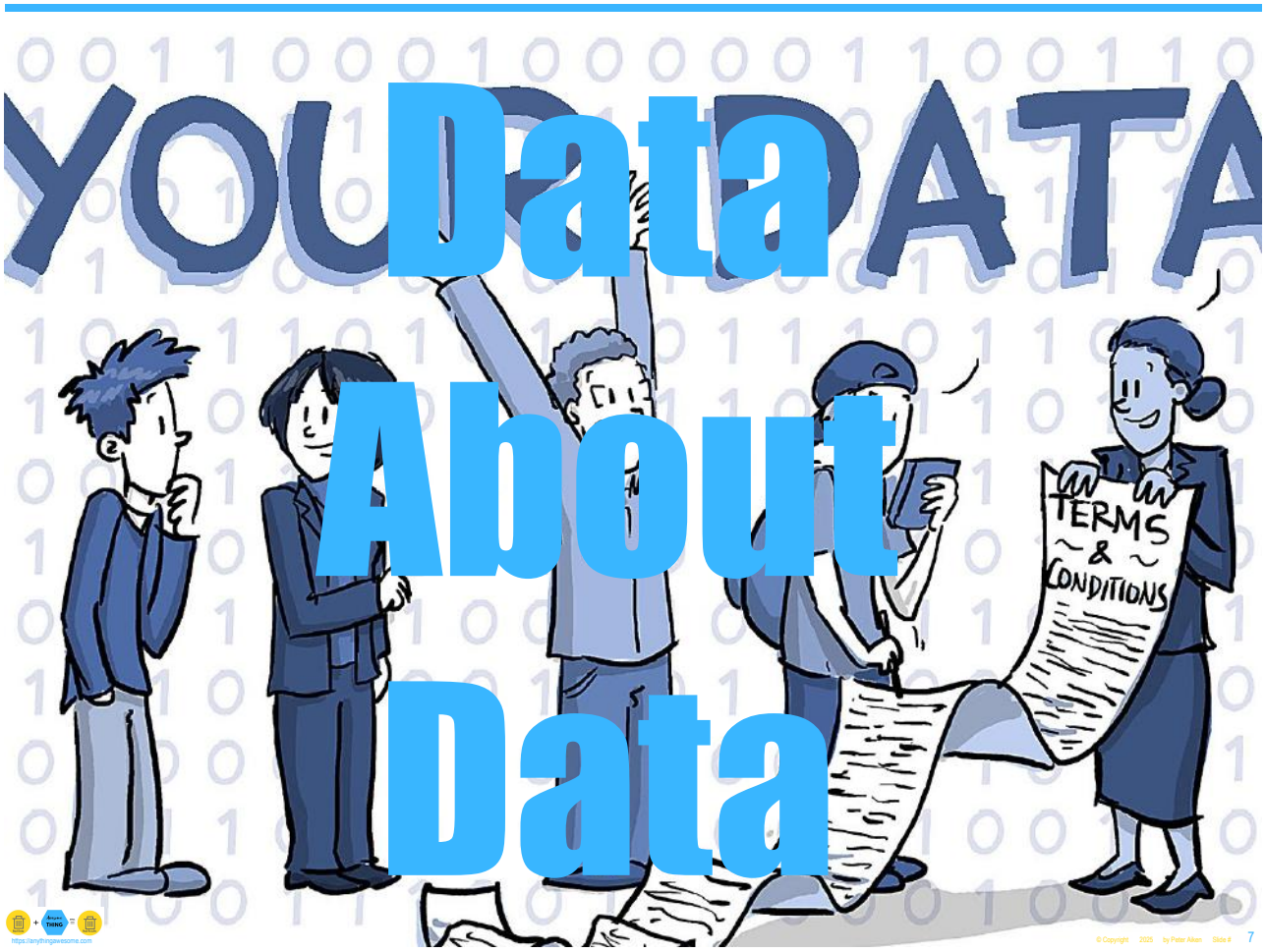
from *The DAMA Guide to the Data Management Body of Knowledge* © 2009 by DAMA International



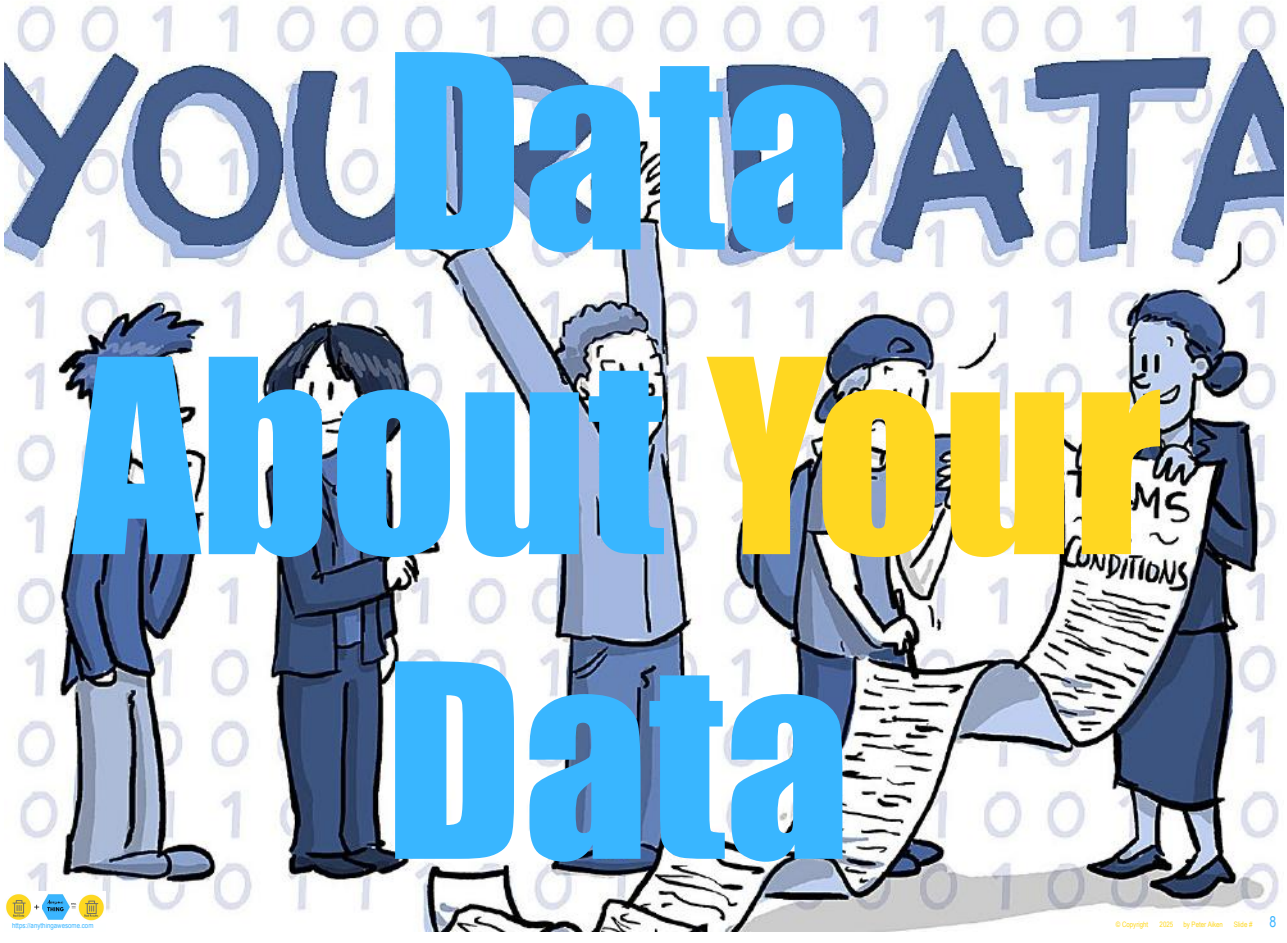








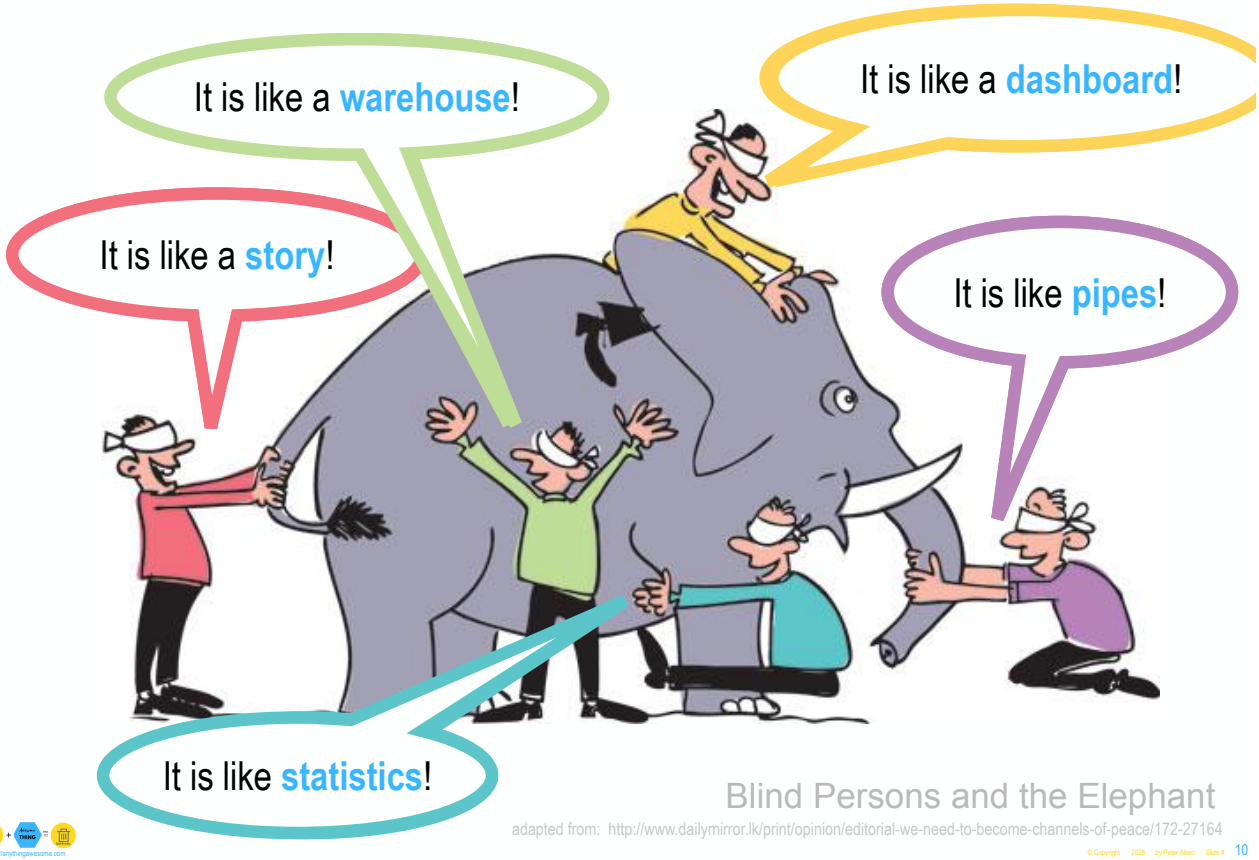
Data About Data



Data About Your Data

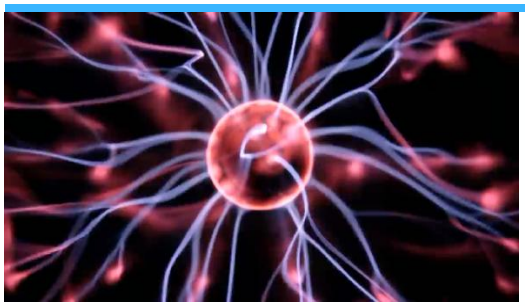
Misunderstanding Data Management

Data Is Not Broadly or Widely Understood



Blind Persons and the Elephant

adapted from: http://www.dailymirror.lk/print/opinion/editorial-we-need-to-become-channels-of-peace/172-27164



Unrefined data management definition

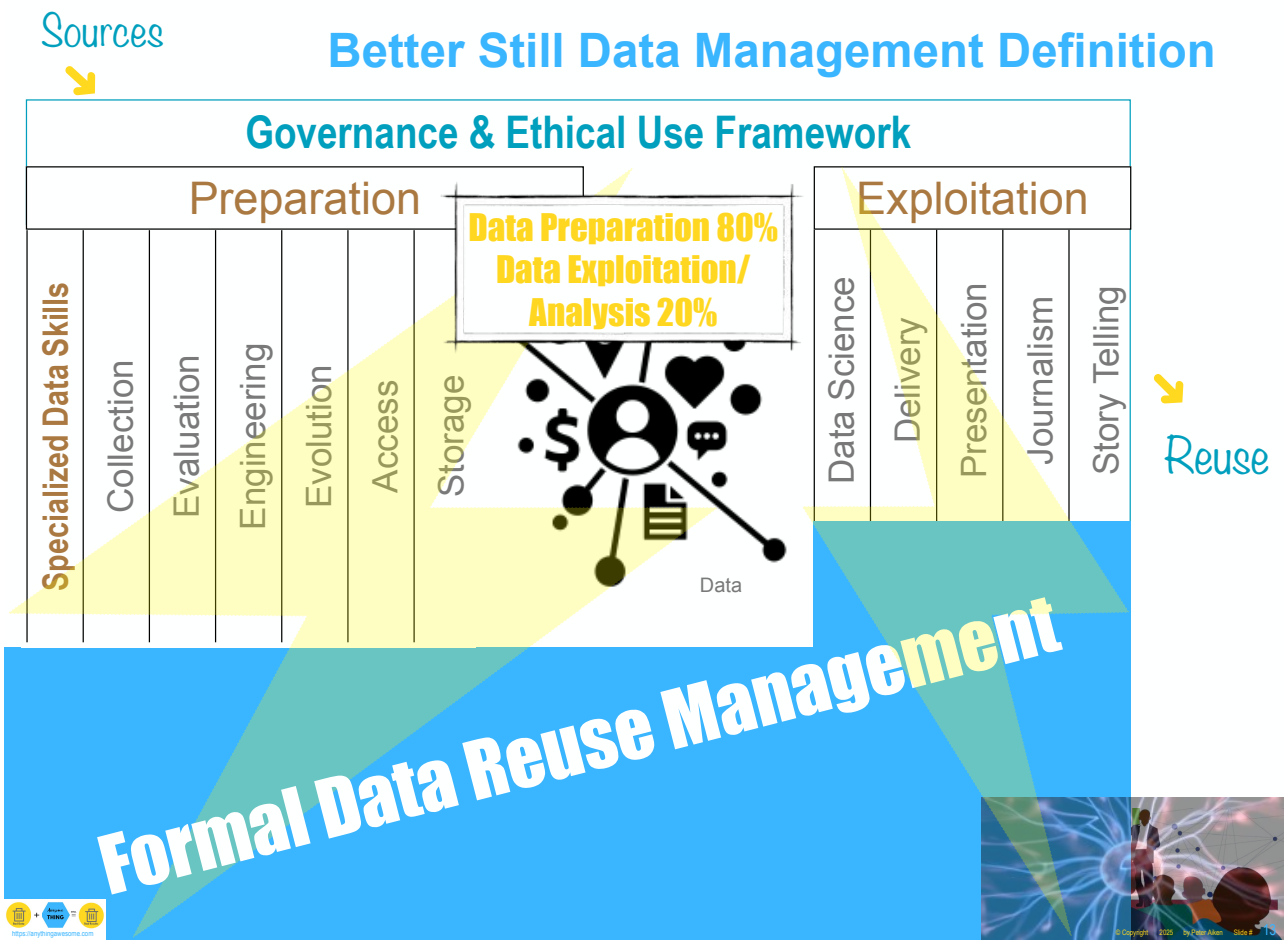
Sources

Data Management

Uses

More refined data management definition

Sources → Data Management → Reuse



The Prefix Meta-

Meta

1. Situated behind: metacarpus.

2. a. Later in time: metestrus.
   b. At a later stage of development: metanephros.

3. a. Change; transformation: metachromatism.

4. a. Beyond; transcending; more comprehensive: metalinguistics.
b. At a higher state of development: metazoan.

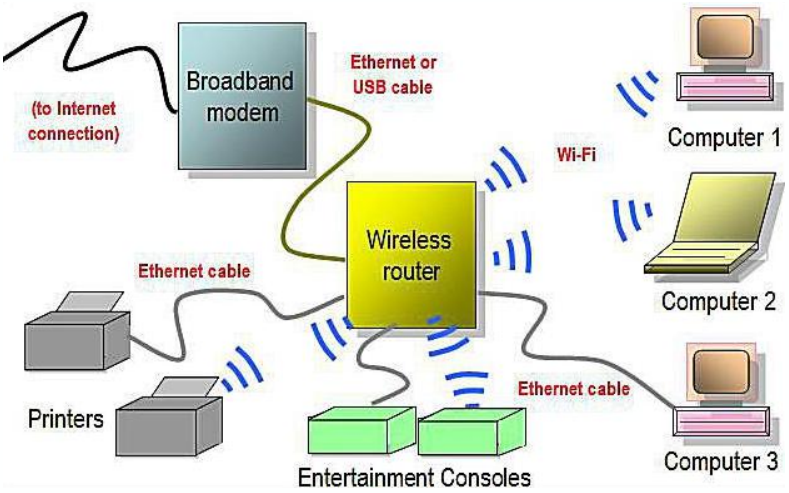
5. Having undergone metamorphosis: metasomatic.

6. a. Derivative or related chemical substance: metaprotein.
   b. Of or relating to one of three possible isomers of a benzene ring with two attached chemical groups, in which the carbon atoms with attached groups are separated by one unsubstituted carbon atom: meta-dibromobenzene.

Definition of the prefix *meta-* (Emphasis added – source: *American Heritage English Dictionary* © 1993 Houghton Mifflin).

The Most Likely Managed Metadata in Your Organization

- Tracking network users and access points is metadata
- Your organization's networking group allocates the responsibility for knowing (at least):
  - All the devices permitted to logon to your network
  - Locations of all permitted access points
- This responsibility belongs to a named individual(s)



Meta Data, Meta-data, Metadata

- In the history of language, whenever two words are pasted together to form a combined concept initially, a hyphen links them
- With the passage of time, the hyphen is lost. The argument can be made that that time has passed
- So, the term is "metadata"
- By-the-way, there is a copyright on the term "metadata," but it has not been enforced

Check Status (TARR contains current status, correspondence address and attorney of record for th return to TESS)

Typed Drawing

Word Mark	METADATA
Goods and Services	IC 009. US 038. G & S: COMPUTER PROGRAMS. FIRST USE: 1981092
Mark Drawing Code	(1) TYPED DRAWING
Serial Number	73561844
Filing Date	October 7, 1985
Current Filing Basis	1A
Original Filing Basis	1A
Published for Opposition	June 24, 1986
Registration Number	1409260
Registration Date	September 16, 1986
Owner	(REGISTRANT) MEGADYNE INFORMATION SYSTEMS CORPORAT BOULEVARD SANTA MONICA CALIFORNIA 90401
	(LAST LISTED OWNER) METADATA INC. LIMITED LIABILITY CO BRENTWOOD TENNESSEE 37027
Assignment Recorded	ASSIGNMENT RECORDED
Attorney of Record	RICHARD L. BERNACCHI
Type of Mark	TRADEMARK
Register	PRINCIPAL
Affidavit Text	SECT 15. SECT 8 (6-YR).
Live/Dead Indicator	LIVE

Separating the Wheat From the Chaff

Is well organized data worth more?

Pre-Information Age Metadata

- Examples of information architecture achievements that happened well before the information age:
  - Page numbering
  - Alphabetical order
  - Table of contents
  - Indexes
  - Lexicons
  - Maps
  - Diagrams

"While we can arrange things with the intent to communicate certain information, we can't actually make information. Our users do that for us."

Example from: *How to make sense of any mess* by Abby Covert (2014) ISBN: 1500615994

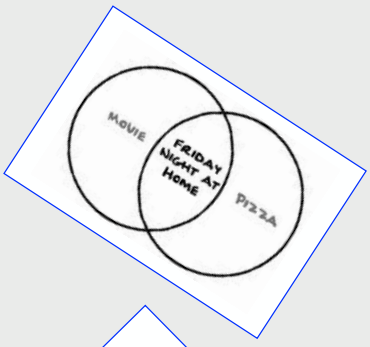
https://www.youtube.com/watch?v=60oD1TDzAXQ&feature=emb_logo

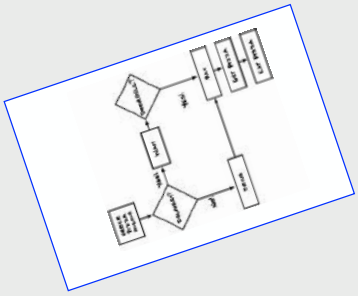
https://www.youtube.com/watch?v=r10Sod44rME&t=1s

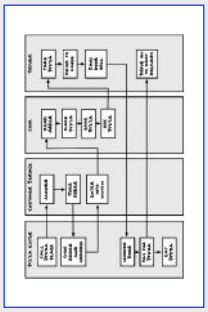
https://www.youtube.com/watch?v=XD2OkDPAl6s

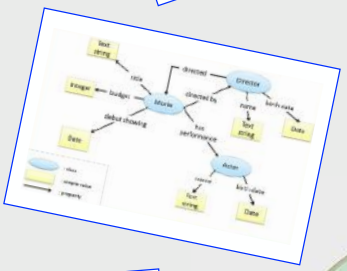
Remove the Structure and Things Fall Apart Rapidly

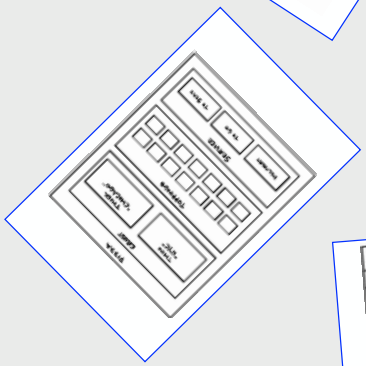
- Better organized data increases in value

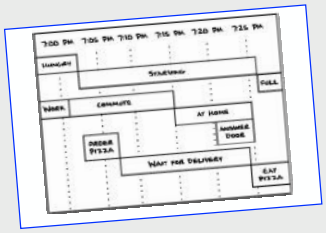


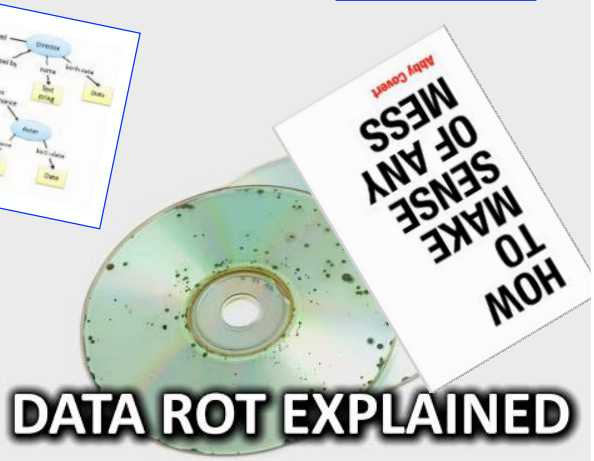












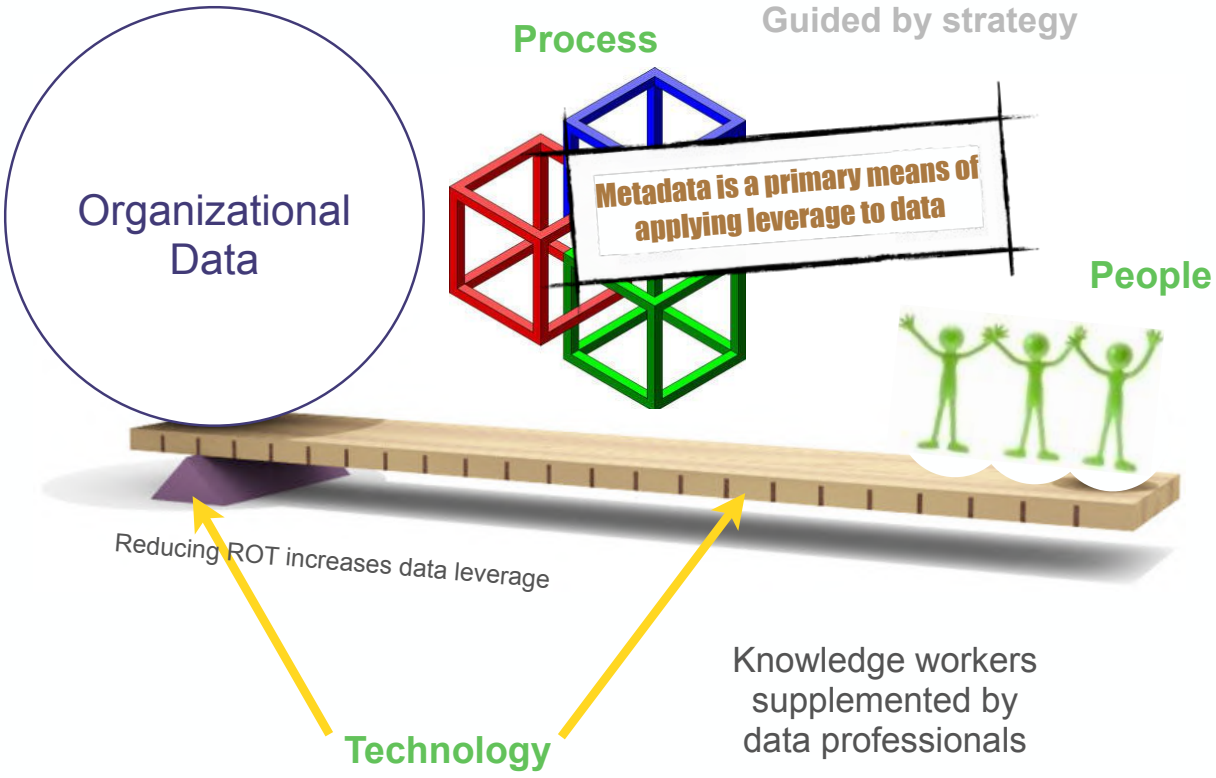
Separating the Wheat From the Chaff

- Better organized data increases in value
- Poor data management practices are costing organizations money/time/effort
- 80% of organizational data is **ROT**
  - **R**edundant
  - **O**bsolete
  - **T**rivial
- The question is which data to eliminate?
  - Most enterprise data is never analyzed

Leverage Is an Engineering Concept

- Using proper engineering techniques, a human can lift a bulk that is weighs much more than the human

A Wholistic Approach to Obtaining Data Leverage

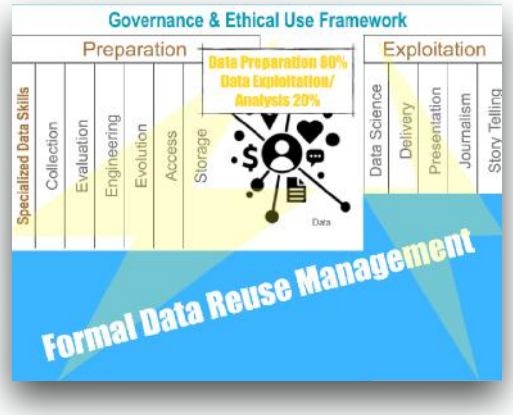


https://www.computerhope.com/jargon/f/framework.htm

Data Leverage Is a Multi-Use Concept

- Permits organizations to better manage their data
  - Within the organization, and
  - With organizational data exchange partners
  - In support of the organizational mission
- Leverage is enabled by metadata
  - Obtained by implementation of data-centric technologies, processes, and human skill sets
  - Focus on the non-ROT data
    - The bigger the organization, the greater potential leverage exists
- Treating data more asset-like simultaneously
  - Lowers organizational IT costs and
  - Increases organizational knowledge worker productivity

Metadata Yields …



Valuable information about your data assets:

- Do we have these specific (or this class of) data assets? **Yes!**
- What is the quality of … **Not suitable!** **35¢/apiece**
- What will be the cost to improve this class of data assets?
- Can these data assets be provided more granularly? **Not easily!**
- … (increasing insight)

Data Management Body of Knowledge (DM BoK V2)

Practice Areas

from *The DAMA Guide to the Data Management Body of Knowledge* 2E © 2017 by DAMA International

Metadata Management

Metadata Management

Definition: Planning, Implementation, and control activities to enable access to high quality, integrated metadata

Goals:
1. Provide organizational understanding of business terms and usage.
2. Collect and integrate metadata from diverse sources.
3. Provide a standard way to access metadata.
4. Ensure metadata quality and security.

Business Drivers

Inputs:
- Business Requirements
- Metadata Issues
- Data Architecture
- Business Metadata
- Technical Metadata
- Process Metadata
- Operational Metadata
- Data Governance Metadata

Activities:
1. **Define Metadata Strategy (P)**
2. **Understand Metadata Requirements (P)**
   1. Business User Requirements
   2. Technical User Requirements
3. **Define Metadata Architecture (P)**
   1. Create MetaModel (D)
   2. Apply Metadata Standards (C)
   3. Manage Metadata Stores (C)
4. **Create and Maintain Metadata (O)**
   1. Integrate Metadata (O)
   2. Distribute and Deliver Metadata (O)
5. **Query, Report and Analyze Metadata**

Deliverables:
- Metadata Strategy
- Metadata Standards
- Metadata Architecture
- MetaModel
- Unified Metadata
- Metadata Stores
- Data Lineage
- Impact Analysis
- Dependency Analysis
- Metadata Control Process

Suppliers:
- Business Data Stewards
- Data Managers
- Data Governance Bodies
- Data Modelers
- Database Administrators

Participants:
- Data Stewards
- Project Managers
- Data Architects
- Business Analysts
- System Analysts

Consumers:
- Application Developers Analyst
- Data Integrators
- Business Users
- Knowledge Workers
- Customers & Collaborators
- Data Scientists
- Data Journalists

Technical Drivers

Techniques:
- Data Lineage and Impact Analysis
- Metadata for Big Data Ingest

Tools:
- Metadata Repository Management Tools
- Metadata Repositories in other Tools

Metrics:
- Metadata Coverage Scorecard
- Metadata Repository Contribution
- Metadata Usage Reports
- Metadata Quality Scorecard

(P) Planning, (C) Control, (D) Development, (O) Operations

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2. Understand Metadata Requirements (P)
   1. Business User Requirements
   2. Technical User Requirements
3. Define Metadata Architecture (P)
   1. Create MetaModel (D)
   2. Apply Metadata Standards (C)
   3. Manage Metadata Stores (C)
4. Create and Maintain Metadata (O)
   1. Integrate Metadata (O)
   2. Distribute and Deliver Metadata (O)
5. Query, Report and Analyze Metadata

Deliverables:
- Metadata Strategy
- Metadata Standards
- Metadata Architecture
- MetaModel
- Unified Metadata
- Metadata Stores
- Data Lineage
- Impact Analysis
- Dependency Analysis
- Metadata Control Process

Suppliers:
- Business Data Stewards
- Data Managers
- Data Governance Bodies
- Data Modelers
- Database Administrators

Participants:
- Data Stewards
- Project Managers
- Data Architects
- Business Analysts
- System Analysts

Consumers:
- Application Developers Analyst
- Data Integrators
- Business Users
- Knowledge Workers
- Customers & Collaborators
- Data Scientists
- Data Journalists

Technical Drivers

Techniques:
- Data Lineage and Impact Analysis
- Metadata for Big Data Ingest

Tools:
- Metadata Repository Management Tools
- Metadata Repositories in other Tools

Metrics:
- Metadata Coverage Scorecard
- Metadata Repository Contribution
- Metadata Usage Reports
- Metadata Quality Scorecard

(P) Planning, (C) Control, (D) Development, (O) Operations

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Metadata Management

Metadata Management

Definition: Planning, Implementation, and control activities to enable access to high quality, integrated metadata

Goals:
1. Provide organizational understanding of business terms and usage.
2. Collect and integrate metadata from diverse sources.
3. Provide a standard way to access metadata.
4. Ensure metadata quality and security.

Business Drivers

Inputs:
- Business Requirements
- Metadata Issues
- Data Architecture
- Business Metadata
- Technical Metadata
- Process Metadata
- Operational Metadata
- Data Governance Metadata

Activities:
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2. **Understand Metadata Requirements (P)**
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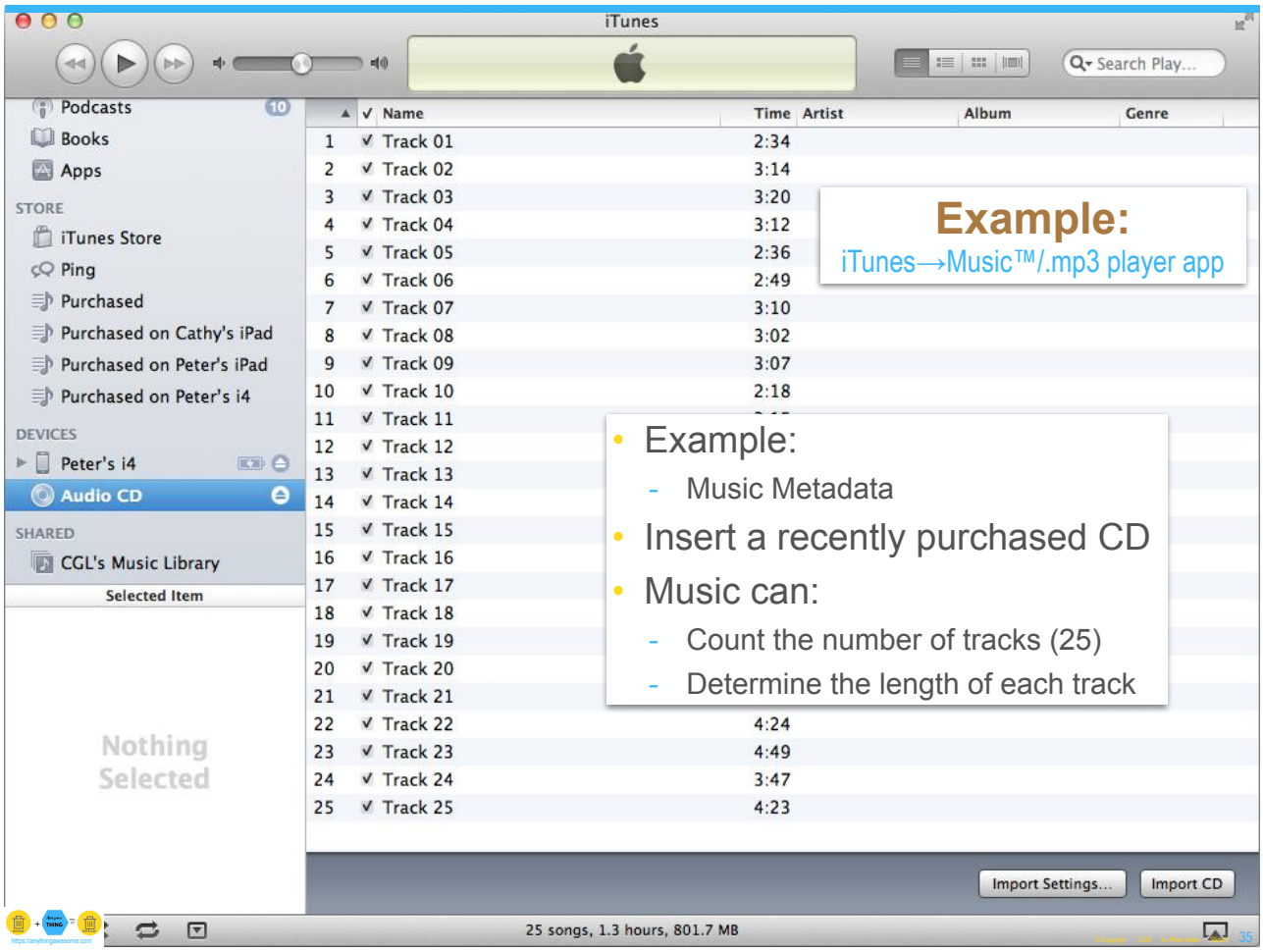
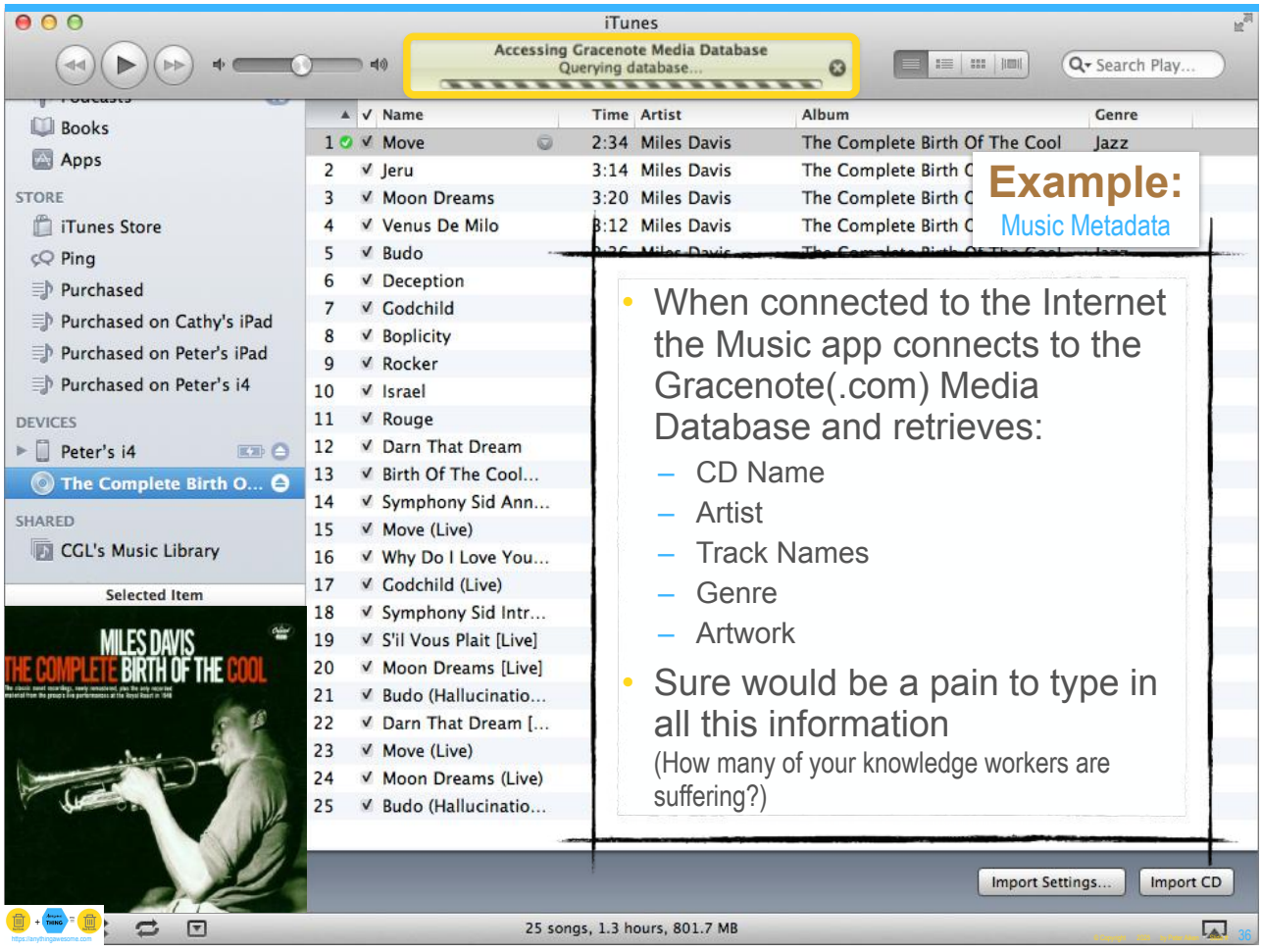
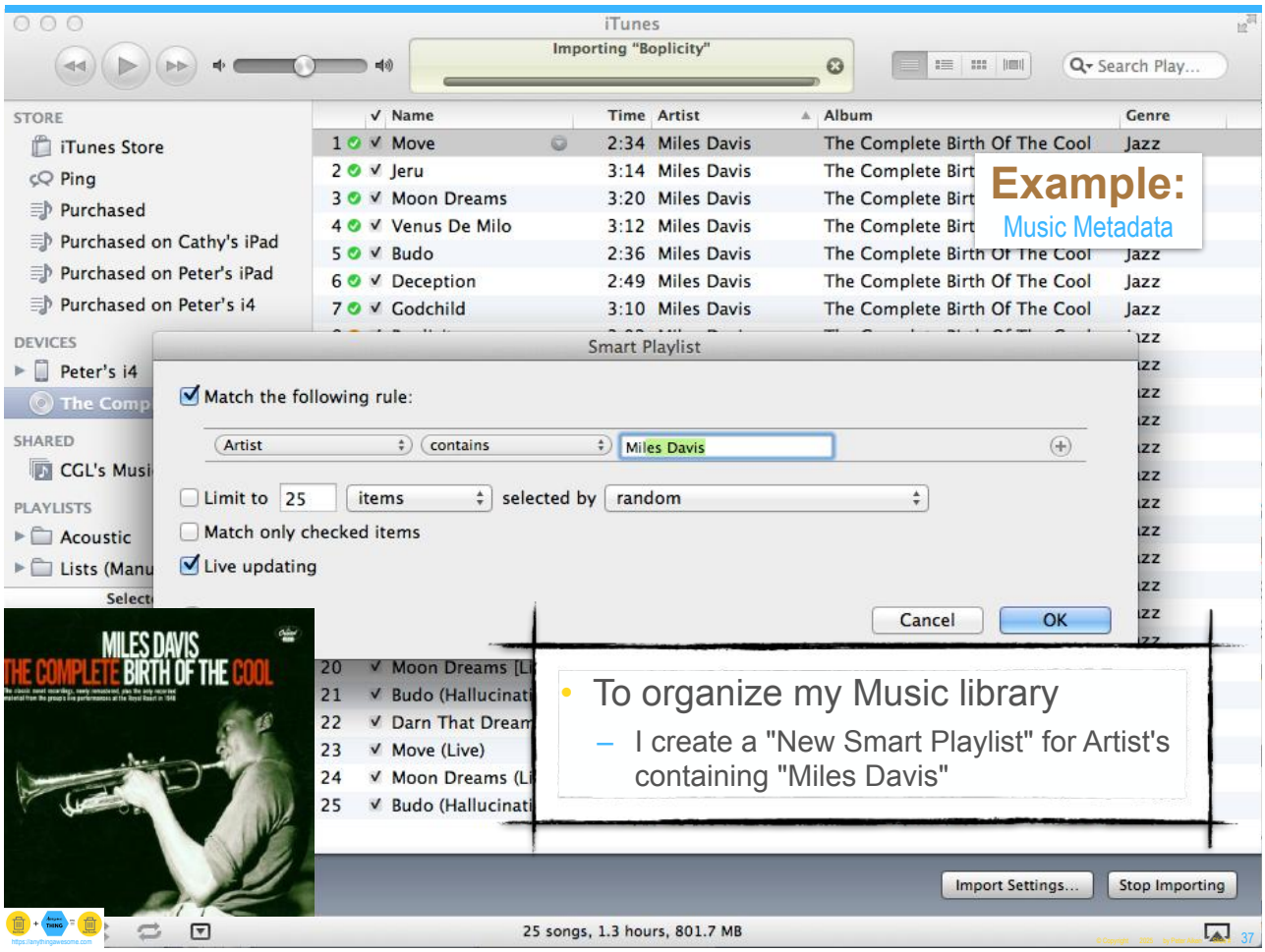
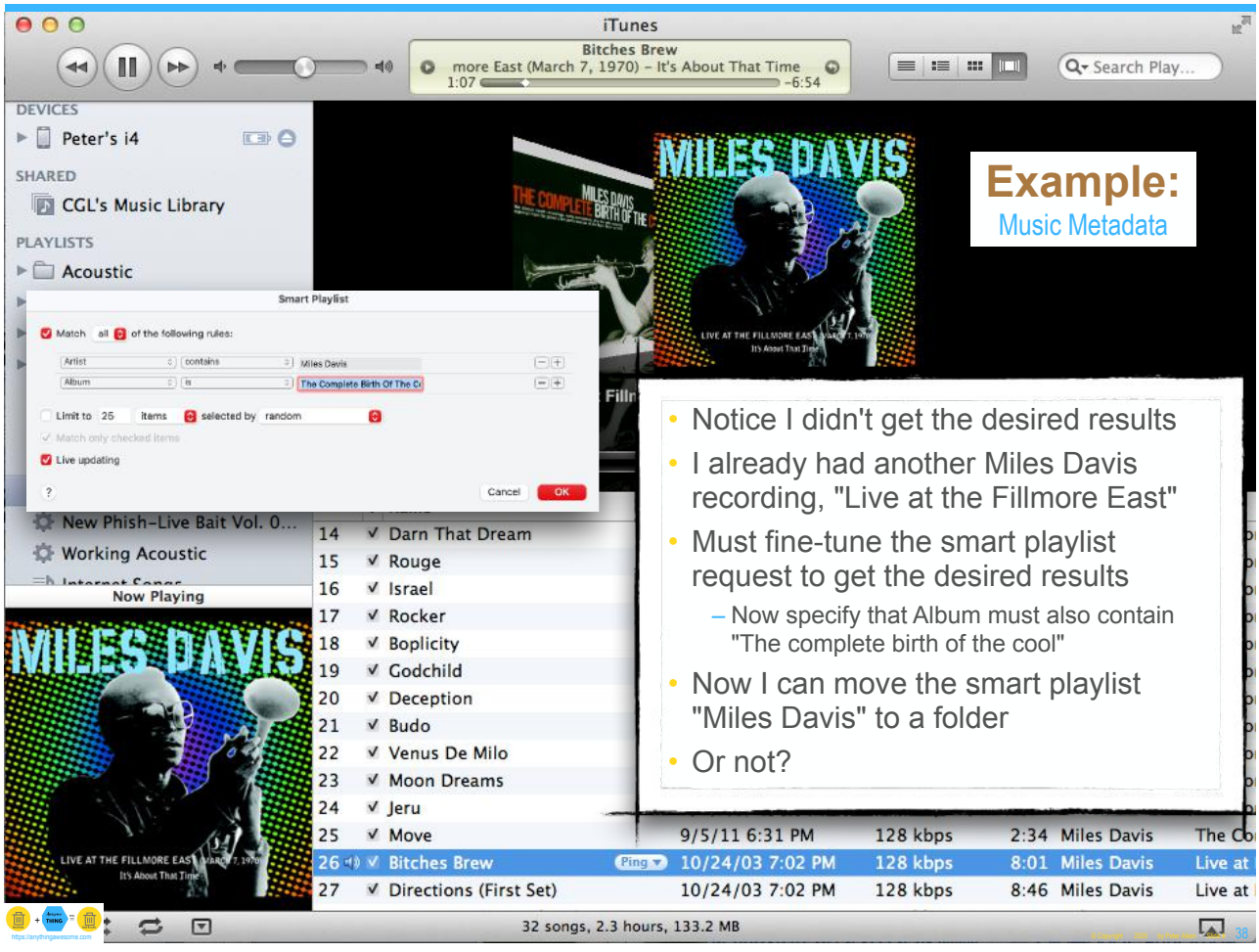
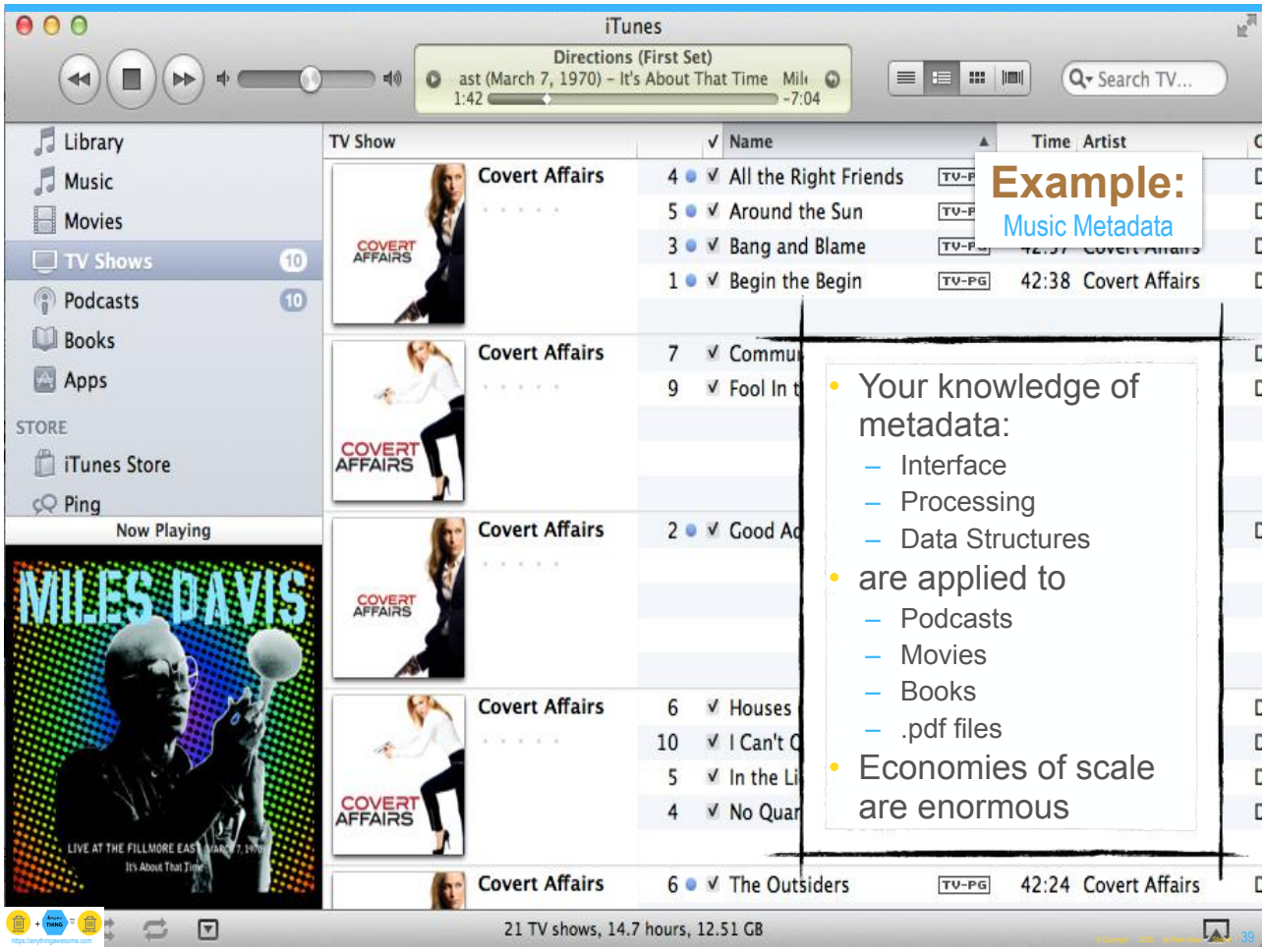

iTunes
Search Play...
Podcasts
Books
Apps
STORE
iTunes Store
Ping
Purchased
Purchased on Cathy's iPad
Purchased on Peter's iPad
Purchased on Peter's i4
DEVICES
Peter's i4
Audio CD
SHARED
CGL's Music Library
Selected Item
Nothing Selected
Name
Time
Artist
Album
Genre
1 Track 01 2:34
2 Track 02 3:14
3 Track 03 3:20
4 Track 04 3:12
5 Track 05 2:36
6 Track 06 2:49
7 Track 07 3:10
8 Track 08 3:02
9 Track 09 3:07
10 Track 10 2:18
11 Track 11
12 Track 12
13 Track 13
14 Track 14
15 Track 15
16 Track 16
17 Track 17
18 Track 18
19 Track 19
20 Track 20
21 Track 21
22 Track 22 4:24
23 Track 23 4:49
24 Track 24 3:47
25 Track 25 4:23
Example:
iTunes→Music™/.mp3 player app
Example:
Music Metadata
Insert a recently purchased CD
Music can:
Count the number of tracks (25)
Determine the length of each track
Import Settings...
Import CD
25 songs, 1.3 hours, 801.7 MB

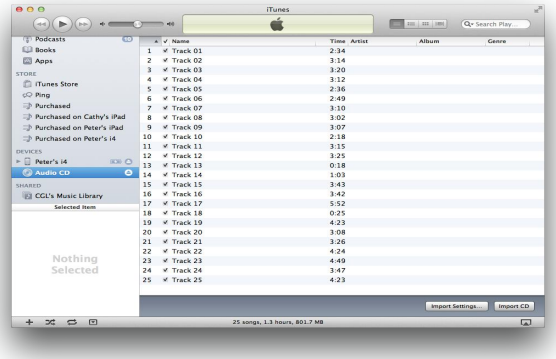

iTunes
Accessing Gracenote Media Database
Querying database...
Search Play...
Books
Apps
STORE
iTunes Store
Ping
Purchased
Purchased on Cathy's iPad
Purchased on Peter's iPad
Purchased on Peter's i4
DEVICES
Peter's i4
The Complete Birth O...
SHARED
CGL's Music Library
Selected Item
MILES DAVIS
THE COMPLETE BIRTH OF THE COOL
Name
Time
Artist
Album
Genre
1 Move 2:34 Miles Davis The Complete Birth Of The Cool Jazz
2 Jeru 3:14 Miles Davis The Complete Birth C
3 Moon Dreams 3:20 Miles Davis The Complete Birth C
4 Venus De Milo 3:12 Miles Davis The Complete Birth C
5 Budo
6 Deception
7 Godchild
8 Boplicity
9 Rocker
10 Israel
11 Rouge
12 Darn That Dream
13 Birth Of The Cool...
14 Symphony Sid Ann...
15 Move (Live)
16 Why Do I Love You...
17 Godchild (Live)
18 Symphony Sid Intr...
19 S'il Vous Plait [Live]
20 Moon Dreams [Live]
21 Budo (Hallucinatio...
22 Darn That Dream [...
23 Move (Live)
24 Moon Dreams (Live)
25 Budo (Hallucinatio...
Example:
Music Metadata
When connected to the Internet the Music app connects to the Gracenote(.com) Media Database and retrieves:
CD Name
Artist
Track Names
Genre
Artwork
Sure would be a pain to type in all this information
(How many of your knowledge workers are suffering?)
Import Settings...
Import CD
25 songs, 1.3 hours, 801.7 MB

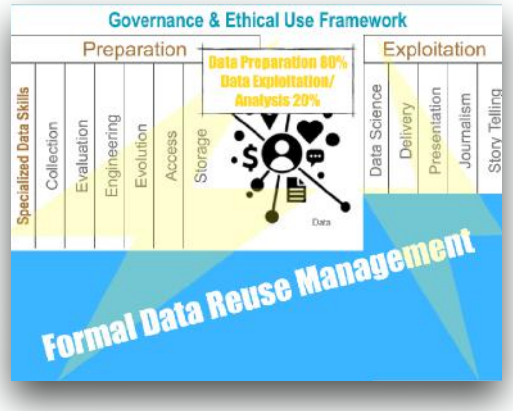

iTunes
Importing "Boplicity"
Search Play...
STORE
iTunes Store
Ping
Purchased
Purchased on Cathy's iPad
Purchased on Peter's iPad
Purchased on Peter's i4
DEVICES
Peter's i4
SHARED
CGL's Musi
PLAYLISTS
Acoustic
Lists (Manu
Name
Time
Artist
Album
Genre
1 Move 2:34 Miles Davis The Complete Birth Of The Cool Jazz
2 Jeru 3:14 Miles Davis The Complete Birt
3 Moon Dreams 3:20 Miles Davis The Complete Birt
4 Venus De Milo 3:12 Miles Davis The Complete Birt
5 Budo 2:36 Miles Davis The Complete Birth Of The Cool Jazz
6 Deception 2:49 Miles Davis The Complete Birth Of The Cool Jazz
7 Godchild 3:10 Miles Davis The Complete Birth Of The Cool Jazz
Example:
Music Metadata
Smart Playlist
Match the following rule:
Artist
contains
Miles Davis
Limit to 25 items selected by random
Match only checked items
Live updating
Cancel
OK
MILES DAVIS
THE COMPLETE BIRTH OF THE COOL
20 Moon Dreams
21 Budo (Hallucinati
22 Darn That Dream
23 Move (Live)
24 Moon Dreams (Li
25 Budo (Hallucinati
To organize my Music library
I create a "New Smart Playlist" for Artist's containing "Miles Davis"
Import Settings...
Stop Importing
25 songs, 1.3 hours, 801.7 MB


iTunes
Bitches Brew
more East (March 7, 1970) – It's About That Time
1:07
-6:54
Search Play...
DEVICES
Peter's i4
SHARED
CGL's Music Library
PLAYLISTS
Acoustic
Smart Playlist
Match all of the following rules:
Artist contains Miles Davis
Album is The Complete Birth Of The Co
Limit to 25 items selected by random
Match only checked items
Live updating
Cancel
OK
New Phish-Live Bait Vol. 0...
Working Acoustic
Now Playing
MILES DAVIS
LIVE AT THE FILLMORE EAST
It's About That Time
MILES DAVIS
THE COMPLETE BIRTH OF THE
Example:
Music Metadata
Notice I didn't get the desired results
I already had another Miles Davis recording, "Live at the Fillmore East"
Must fine-tune the smart playlist request to get the desired results
Now specify that Album must also contain "The complete birth of the cool"
Now I can move the smart playlist "Miles Davis" to a folder
Or not?
14 Darn That Dream
15 Rouge
16 Israel
17 Rocker
18 Boplicity
19 Godchild
20 Deception
21 Budo
22 Venus De Milo
23 Moon Dreams
24 Jeru
25 Move 9/5/11 6:31 PM 128 kbps 2:34 Miles Davis
26 Bitches Brew Ping 10/24/03 7:02 PM 128 kbps 8:01 Miles Davis
27 Directions (First Set) 10/24/03 7:02 PM 128 kbps 8:46 Miles Davis
32 songs, 2.3 hours, 133.2 MB



Metadata Yields …





Valuable information about your Music™ assets:

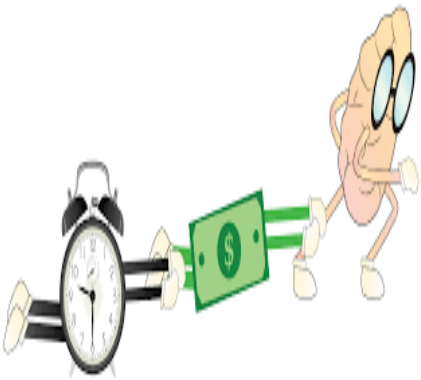
- Do we have these specific Miles Davis recordings? **Yes!**
- Most my played Miles Davis recording **Bitches Brew**
- What will be the cost to acquire more of this class of data assets? **$1.29/each**
- Can I listen to the entire album before dinner? **Not easily!**

Program Overview

Four Effective Metadata Strategies

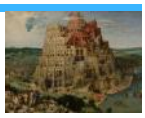
- Defining metadata in the context of data management
  - Defining data management
  - What do we mean by the term 'using data as metadata' and why is this important? (Hint: leverage)
  - Specific teachable example (iTunes→Music™/.mp3 player app)
  1. Metadata is a gerund–do not treat it as a noun
     - Metadata is a use of data, not a type of data
  2. Enforce metadata to be the language of data governance
     - Make metadata the language of data governance
  3. Treat glossaries/repositories as capabilities not technology
     - Cyclic improvements do not start with technologies
  4. Build from metadata building blocks
     - Many many many resources are available to jump-start metadata efforts
- Benefits, application & sources
  - Understand that metadata defines organizational interoperability
- Take Aways, References and Q&A

Comprehension by others is critical!

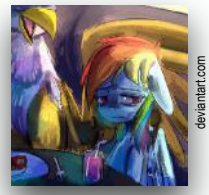


- If others do not understand what you do then you are perceived with a cost bias
- If others understand what you do then you can be perceived with a *value* bias

Understanding = Interoperability

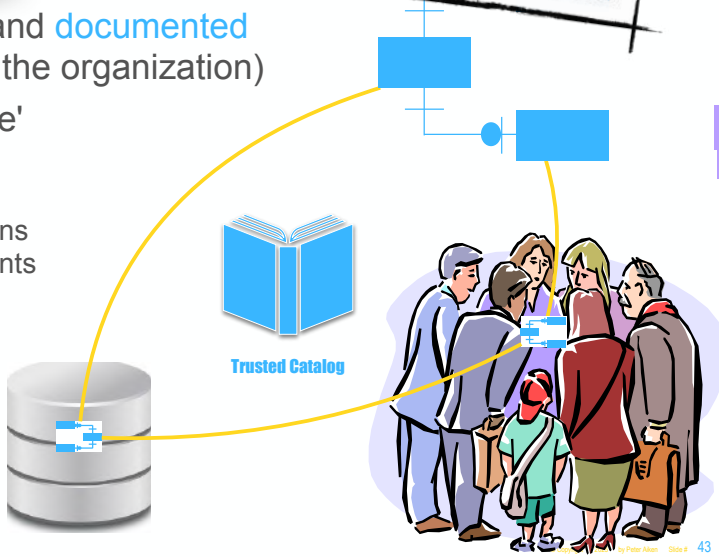


- All organizations have architectures
  - Business
  - Process
  - Systems
  - Security
  - Technical
  - Data/Information



> Common vocabulary expressing integrated requirements ensuring that data assets are stored, arranged, managed, and used in systems in support of organizational strategy

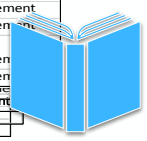
- Some are better understood and documented (and therefore more useful to the organization)
- 'Understanding an architecture'
  - Documented and articulated as a (digital) blueprint illustrating the commonalities and interconnections among the architectural components
- Ideally the understanding is shared by
  - Business
  - Technical
  - Systems



Business Glossary

- aka
  - data dictionary
  - data item dictionary
  - data directory
  - data catalog
  - data repository
  - metadata repository
  - data resource dictionary
  - data asset dictionary
  - data definition dictionary
  - data structure dictionary
  - data element dictionary
  - enterprise repository
  - term bank
- Start of Enterprise Taxonomy
- Defines Initial Entities for Conceptual Data Model
- Engages the Business Community to Validate Entities and provide meaningful, agreed upon business definitions

Entity	Description	Domain Area
Donor	Funder	Business Development
Solicitations	Need for Work	Business Development
Solicitations Proposal	Response to Need for Work	Business Development
Pre-Positioning	Intelligence Gathering	Business Development
Award/Sub-Award	Funding Vehicle	Business Development
Terms Conditions	Details about a Funding Vehicle	Business Development
Budget	Amount of Money Available	Business Development
Work Plan	Set of Activities to Complete	Business Development
PMP	Monitoring Plan for Activities	Business Development
Project	An NGO Project is defined as a self-contained set of interventions or activities with the following characteristics: a) an external client; b) purchase order, contract or agreement; c) expected deliverables, outcomes and results; d) a beginning and end date of implementation; e) an approved budget; and full and/or part time NGO staff	Project Management
Geographic Area		Project Management
Office Locations	Location in which a Central Office resides	Project Management
Project Roles		Project Management
Project Artifacts		Project Management
Project Budget		Project Management
Project Work Plan		Project Management
Milestones	Schedule of completed activities	Project Management
Monitoring	Plan to measure Activities	Project Management
Evaluation	Assessment of Activities	Project Management
Indicators	Target of Outcome	Project Management
Outcomes	Statement of what needs to be accomplished	Project Management
Acct Receivable	Payments to NGO	Financial Management
Chart of Accounts	Defined Accounts	Financial Management
Payroll	Process to Pay Worker	Financial Management
Supplier	Provider of Goods or Service	Financial Management
Contract	Binding Agreement	Financial Management
Purchase Order	Statement of Good or Service	Financial Management
Performance	Level of Success	Talent Management
Benefits		Talent Management
Skills		Talent Management
Worker	Person who has been hired by NGO	Talent Management
Candidate	Potential hire of NGO	Talent Management



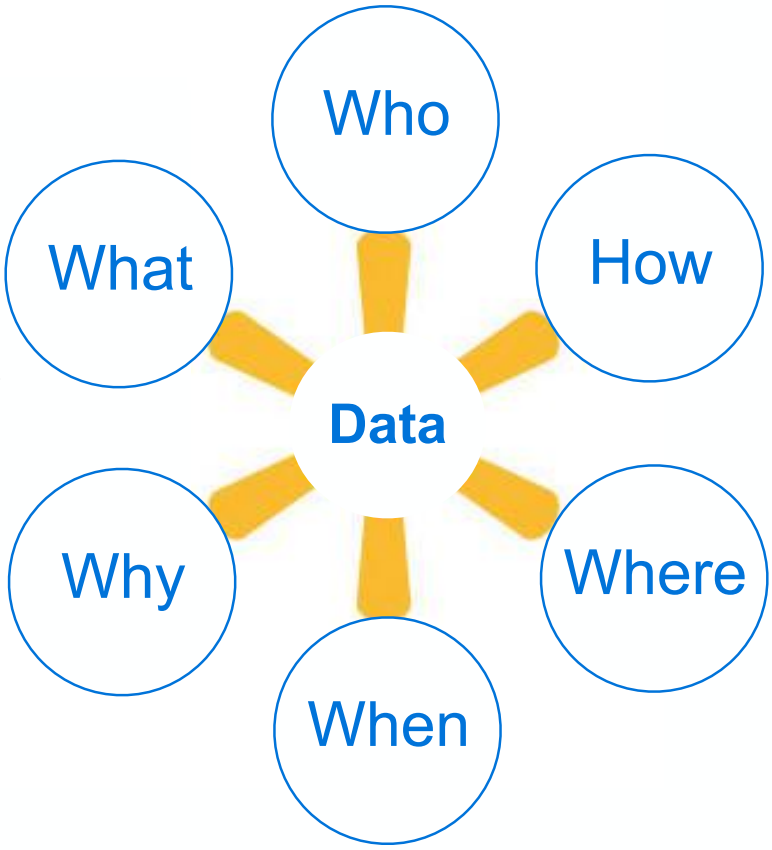
Trusted Catalog

Your spark makes us

Walmart

Defining Metadata

Metadata is any combination of any circle and the data in the center that unlocks the value of the data!

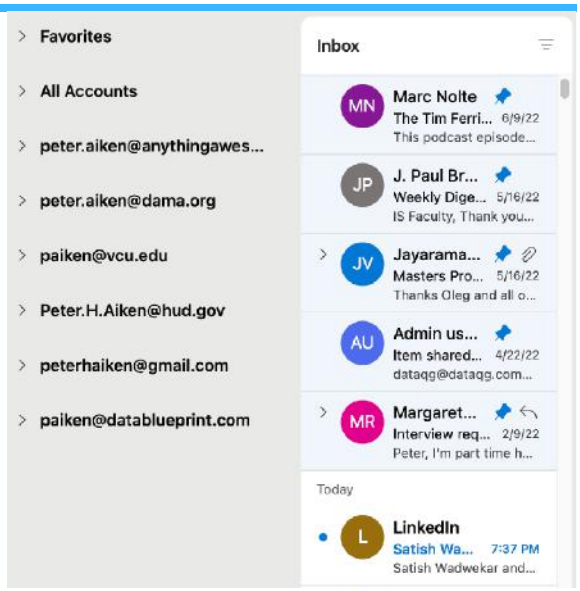


Adapted from Brad Melton

InBox Use of Metadata

Metadata is used to navigate/manage email

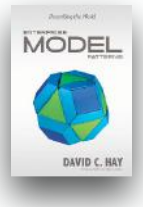
What: "Subject"
How: "Priority"
Where: "USERID/Inbox", "USERID/Personal"
Why: "Body"
When: "Sent" & "Received"



- Find the important stuff/weed out junk
- Organize for future access/outlook rules
- *Imagine how managing e-mail (already non-trivial) would change if Outlook did not make use of metadata Who: "To" & "From?"*

Definitions

- Metadata is
  - Everywhere in every activity and integral to all
  - To data what data is to real life. Data reflects real life transactions, events, objects, relationships, etc. Metadata reflects data transactions, events, objects, relations, etc.
  - The data that describe the structure and workings of an organization's use of information, and which describe the systems it uses to manage that information.
    [quote from David Hay's book, page 4]



  - Data describing various facets of a data asset, for the purpose of improving its usability throughout its life cycle [Gartner 2010]
  - **Metadata unlocks the value of data, and therefore requires management attention** [Gartner 2011]
- Metadata Management is
  - The set of processes that ensure proper creation, storage, integration, and control to support associated use of metadata

Metadata …

- Isn't
  - Is not a noun
  - One persons data is another's metadata
- Is more of a verb?
  - Represents a use of existing facts, rather than a type of data itself
- It is a ***gerund***
  - a form that is derived from a verb but that functions as a noun
  - e.g., the word *asking* in do you mind my *asking* you?
- Therefore, metadata describes a <u>use</u> of data, not a <u>type</u> of data
  - The use of some attributes of data to understand or manage that same data from a different (usually higher) level of abstraction

ger·und
/ˈjerənd/

noun GRAMMAR

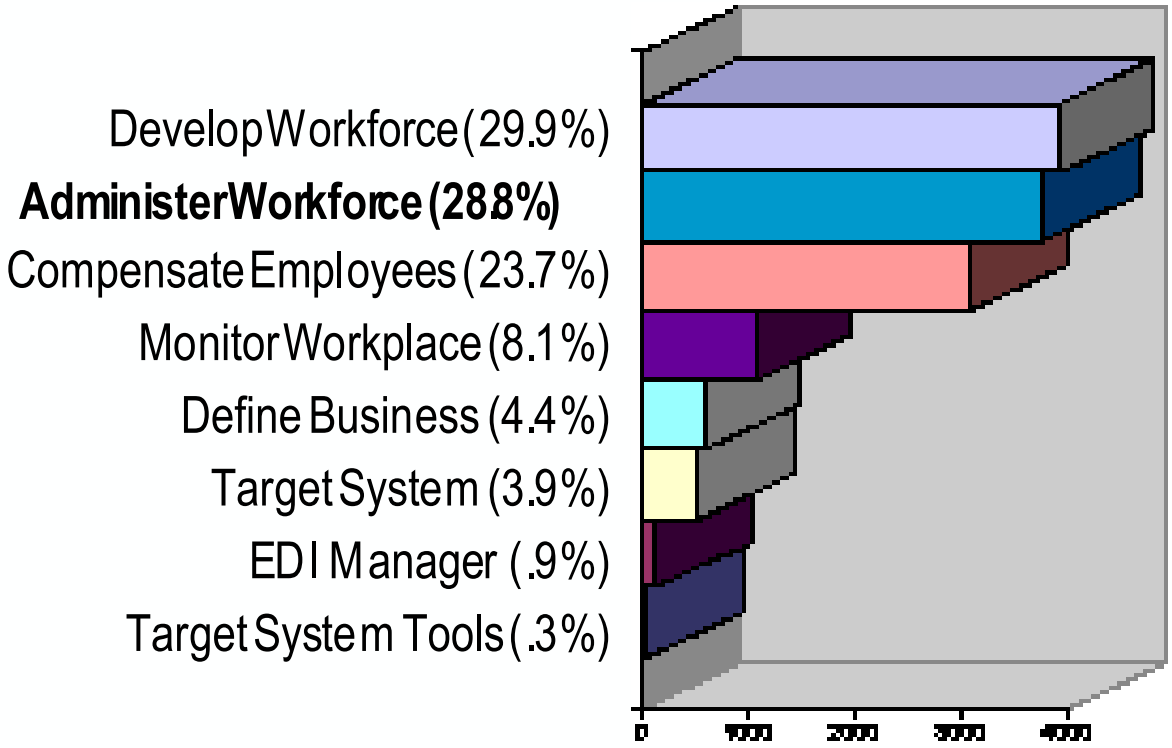
Case Study

Reverse-engineering a commercial client–server system from PeopleSoft yielded a valuable resource and proved to be cost-effective. The authors describe the motivations for, approach to, and results of this project, commissioned by the Commonwealth of Virginia's government.

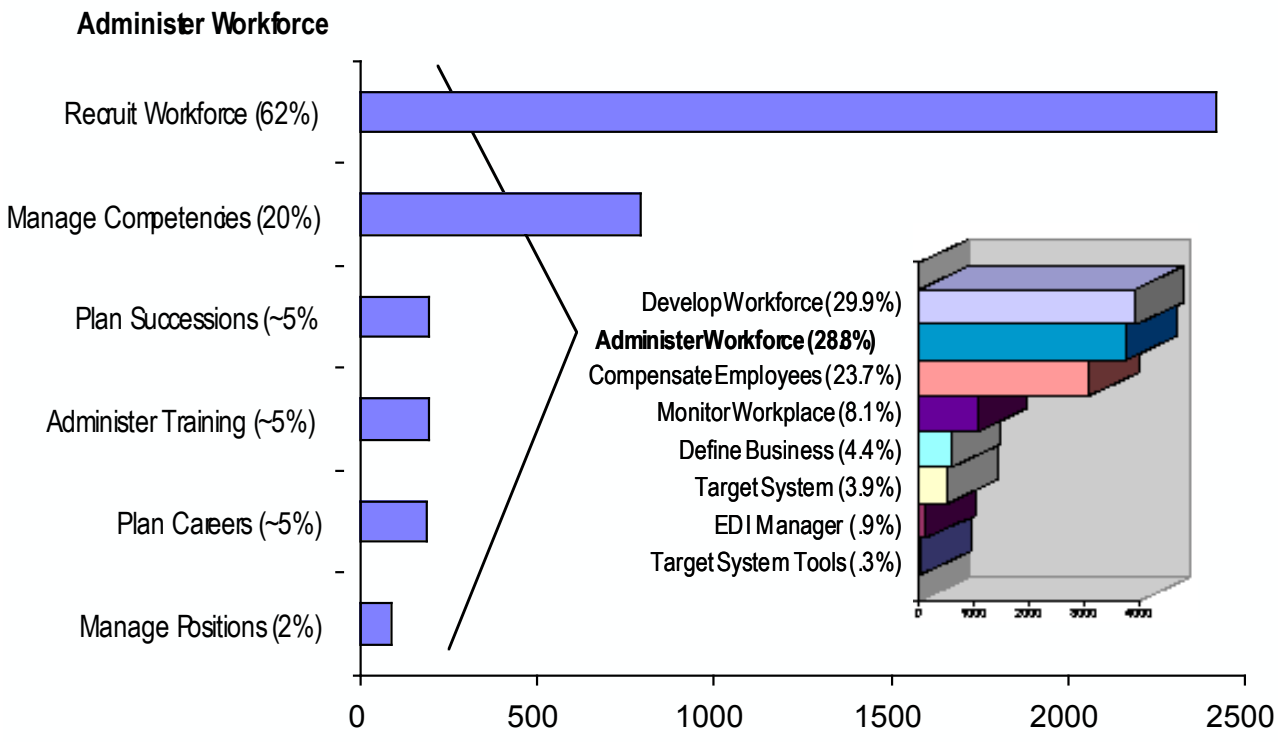
Reverse-Engineering New Systems for Smooth Implementation

Peter Aiken and Ojelanki K. Ngwenyama, Virginia Commonwealth University
Lewis Broome, Innovative Business Solutions

Metadata Uses



Metadata Uses



```
W-Z0137 - SECURITY - YOU MAY NOT UPDATE ON THIS SCREEN
107 Class List                                  SYSTEMS ANALYSIS AND DESIGN
                                                HUBONA G
Screen: ___  SID: _________  Course: INFO361902   Term: 993  Fall 1999

                                                                  Page  1 of  3

Line  Student Name              Student ID    Col Cls Maj   Registration Status

   1  AKHTAR, HASINA                        BUS JR  ISY   Enrolled
   2  BATDORF, MARK A.                      BUS JR  BFO   Enrolled
   3  BOWKER, ASHLEY                        BUS UC  ISY   Enrolled
   4  BRINKLEY, STEPHEN C                   BUS UC  ACC   Enrolled
   5  DANIELSEN, ANTHONY                    BUS UC  ISY   Enrolled
   6  DAUGHTRY, DAVID L                     BUS UC  ISY   Enrolled
   7  DAWSON, STEFANI P                     BUS SR  FIN   Enrolled
   8  DEBERRY, CHERYL M                     BUS UC  ISY   Enrolled
   9  DIDDEN, CHRISTOPHER                   BUS UC  ISY   Enrolled
  10  DIGGS, SAMUEL                         DUO US  DHU   Enrolled
  11  DIXON, BRIAN                          BUS UC  ISY   Enrolled
  12  GRANT, JAMES T                        BUS SR  ISY   Enrolled
  13  HAAS, MICAH P                         CHS SR  MAS   Enrolled
  14  HAMILTON, GARY M                      BUS UC  ISY   Enrolled
  15  HOLICKY, JOSEPH J, III                BUS UC  ISY   Enrolled

A                                                        Sun 05 Sep 11:13
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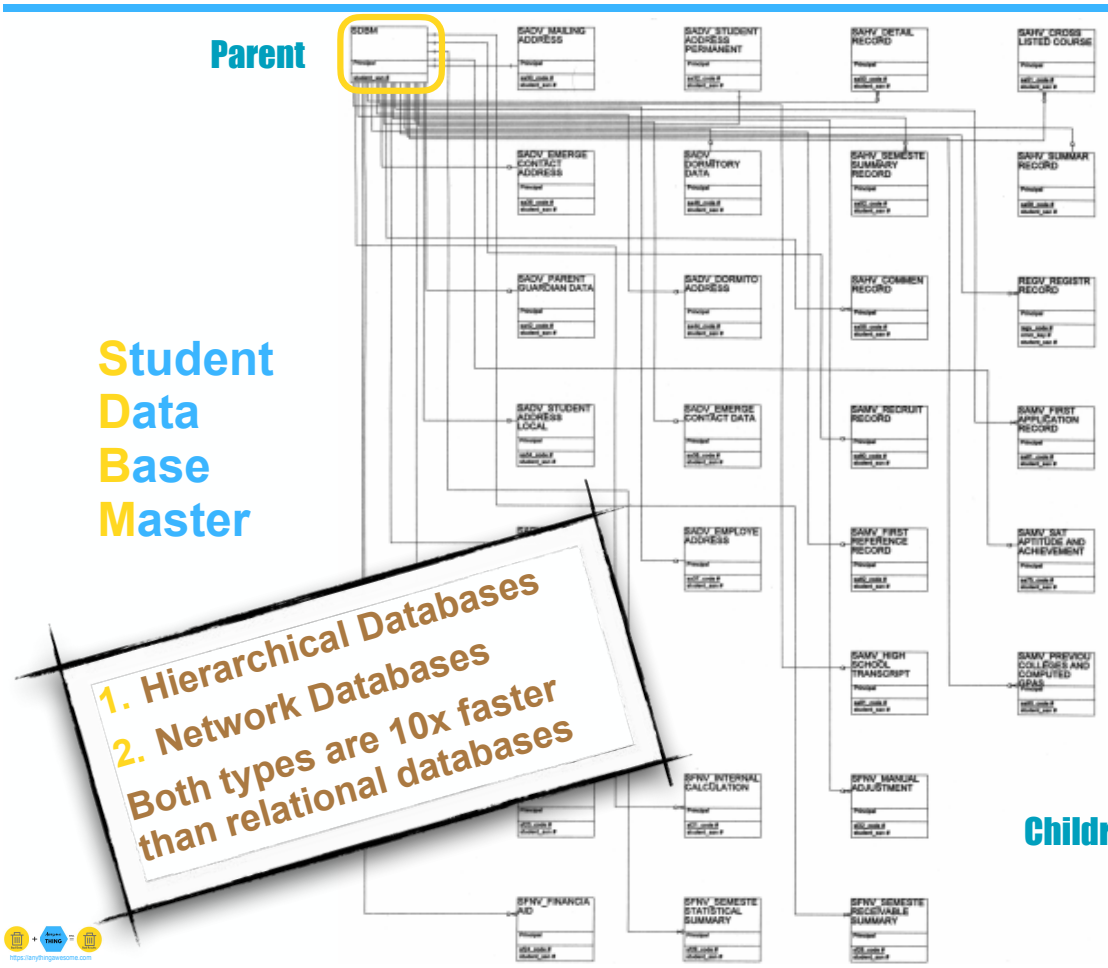
Parent

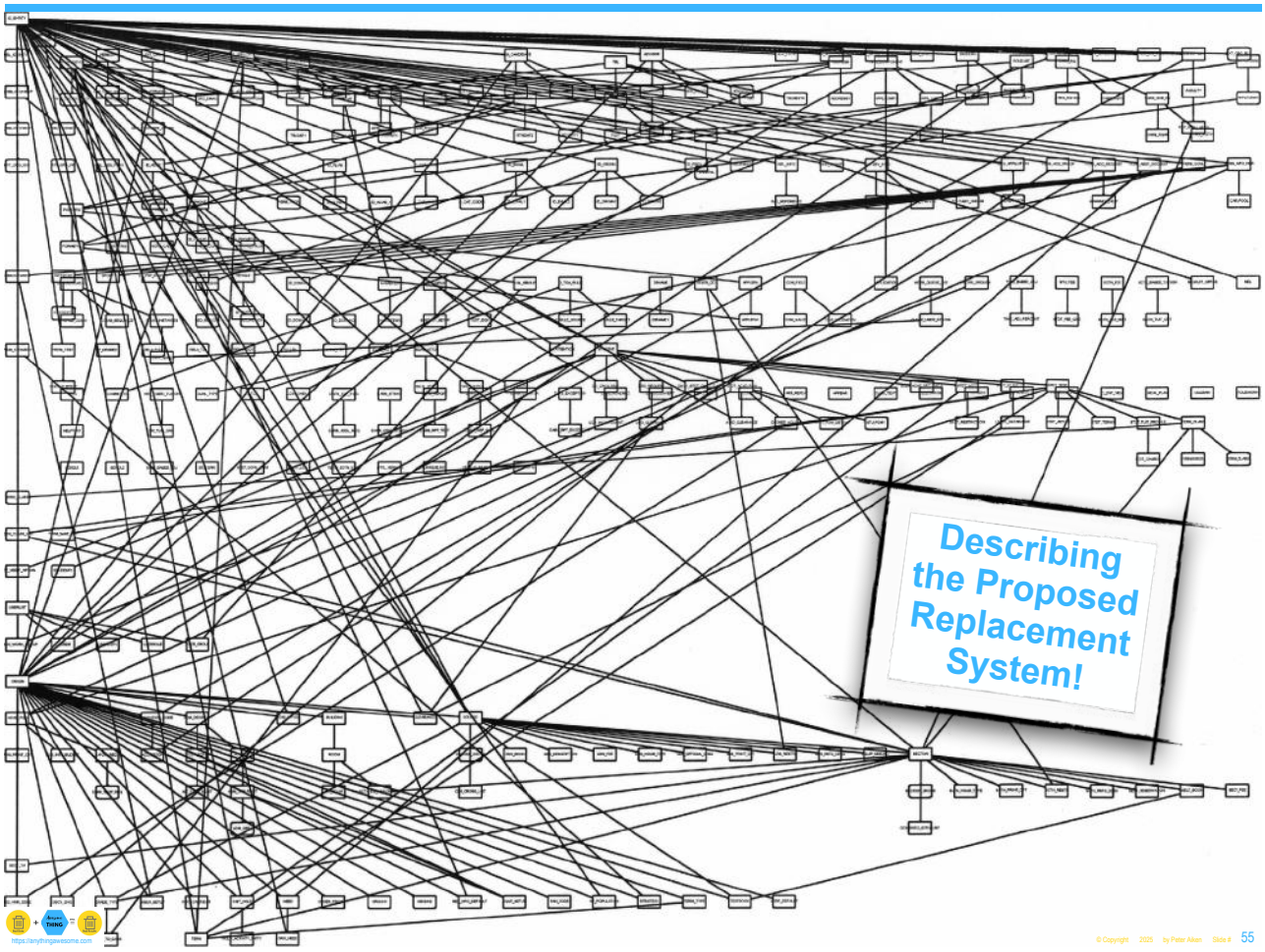


Student Data Base Master

1. Hierarchical Databases
2. Network Databases

Both types are 10x faster than relational databases

Children



Keep the Proper Focus

- Wrong question:
  - Is this metadata?
- Right question:
  - Would we obtain value if we include it in the scope of our metadata practices?
- Value proposition
  - Is this aspect of our data worth including within the scope of our metadata practices?

Program Overview

Four Effective Metadata Strategies

- Defining metadata in the context of data management
  - Defining data management
  - What do we mean by the term 'using data as metadata' and why is this important? (Hint: leverage)
  - Specific teachable example (iTunes→Music™/.mp3 player app)
  1. Metadata is a gerund–do not treat it as a noun
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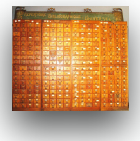
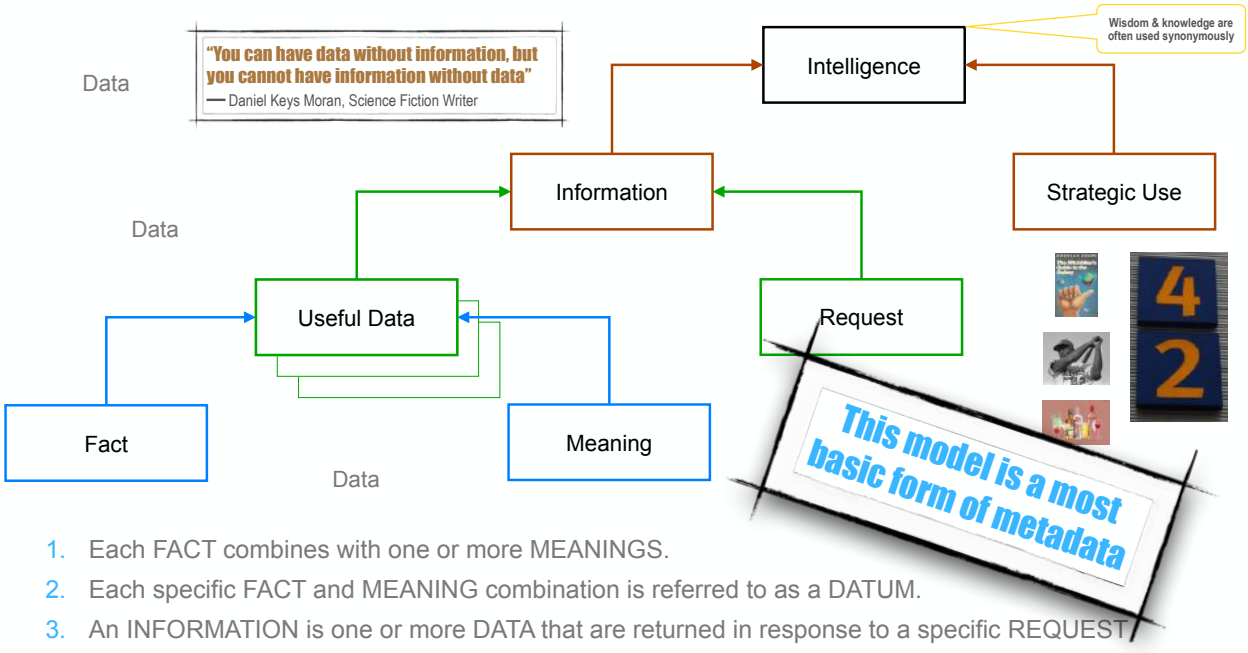
     - Many many many resources are available to jump-start metadata efforts
- Benefits, application & sources
  - Understand that metadata defines organizational interoperability
- Take Aways, References and Q&A



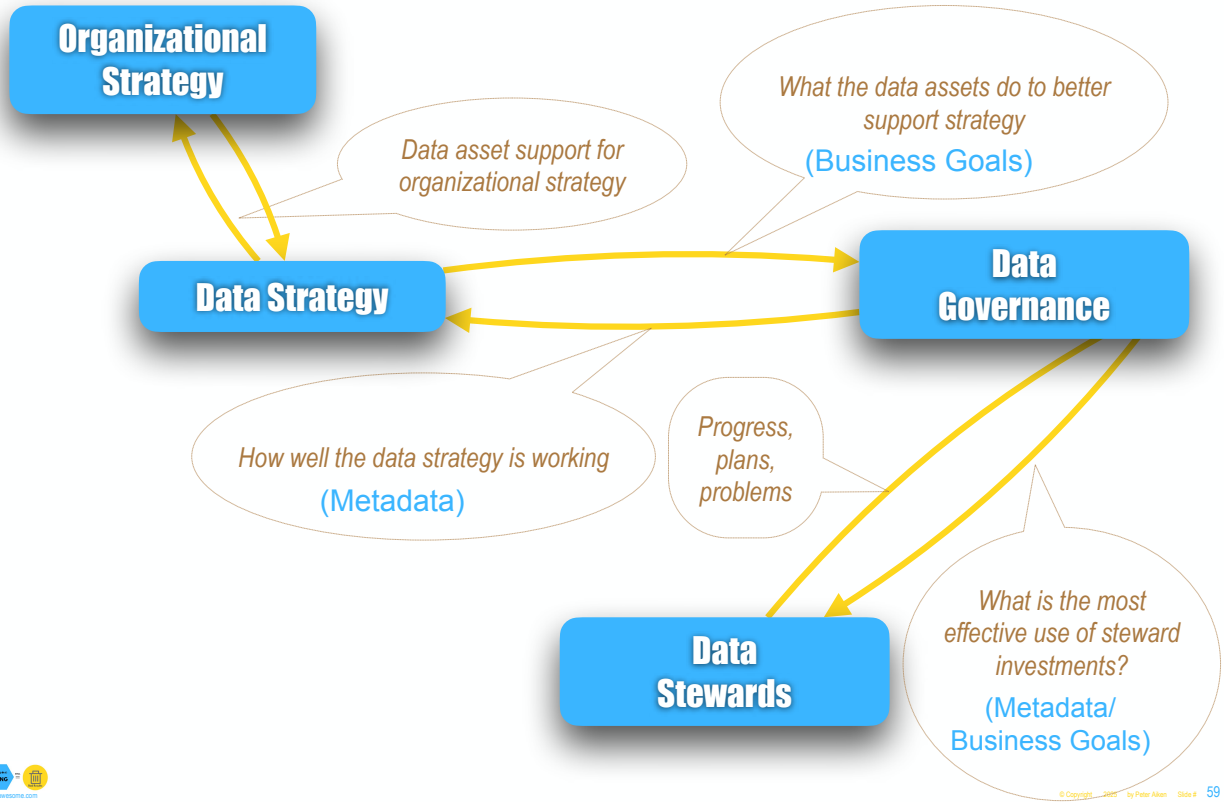
A Model Precisely Defining 3 Important Concepts



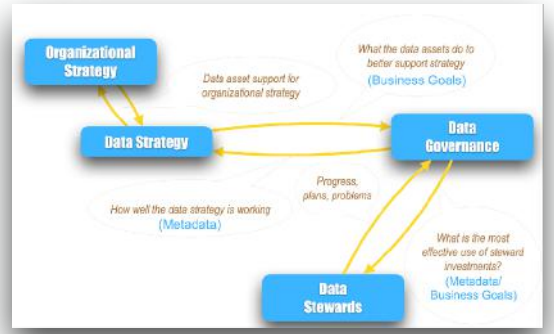
1. Each FACT combines with one or more MEANINGS.
2. Each specific FACT and MEANING combination is referred to as a DATUM.
3. An INFORMATION is one or more DATA that are returned in response to a specific REQUEST.
4. INFORMATION REUSE is enabled when one FACT is combined with more than one MEANING.
5. INTELLIGENCE is INFORMATION associated with its STRATEGIC USES.
6. DATA/INFORMATION must formally arranged into an ARCHITECTURE.

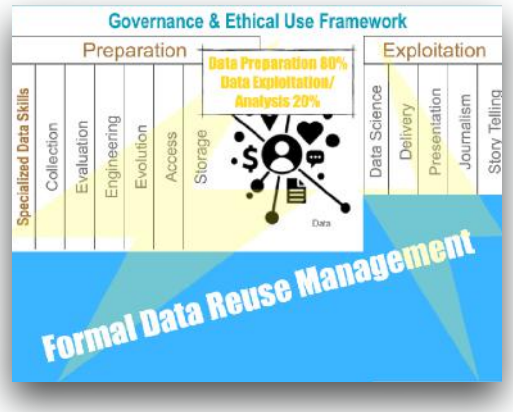
[Built on definitions from Dan Appleton. 1983]

Data Strategy and Governance in Strategic Context



Metadata Yields …





Valuable information about your data governance assets & processes:

- Do we have a shared understanding of our goals? **Yes!**
- Are we and IT focused on similar goals **Yes**
- How cost effective are we being? **2¢/each**
- What kind of metadata do we find most valuable? **Supply Chain**
- … (increasing insight)

Program Overview

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  - Defining data management
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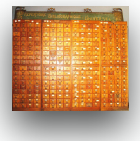

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Bed

Definition of Bed

From Wikipedia, the free encyclopedia

For other uses, see Bed (disambiguation).

A **bed** is a piece of furniture which is used as a place to sleep or relax.[1][2]

Most modern beds consist of a soft, cushioned mattress on a frame, the lid base, ase. inner- attress- prings ovide additional support and

1. All data models are incomplete without definitions
2. Purpose statements are generally better than definitions
3. All is metadata

Bedroom on the Detmold Open-air Museum premises

Purpose Statement Incorporates Motivational Metadata

Entity:	BED
Data Asset Type:	Principal Data Entity
Purpose:	Beds are the primary means to be used to track patients within the Facility. Each bed will track exactly 1 patient.
Source:	Maintenance Manual for File and Table Data (Software Version 3.0, Release 3.1)
Attributes:	Bed.Description Bed.Status Bed.Sex.To.Be.Assigned Bed.Reserve.Reason
Associations:	>0-+ Room
Status:	DRAFT

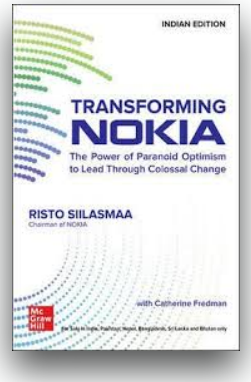
Bed.Id

A purpose statement describing
- **Why the organization is maintaining information about this business concept;**
- **Sources of information about it;**
- **A partial list of the attributes or characteristics of the entity; and**
- **Associations with other data items(read as "One room contains zero or many beds.")**

(Pre Microsoft Acquisition)

NOKIA

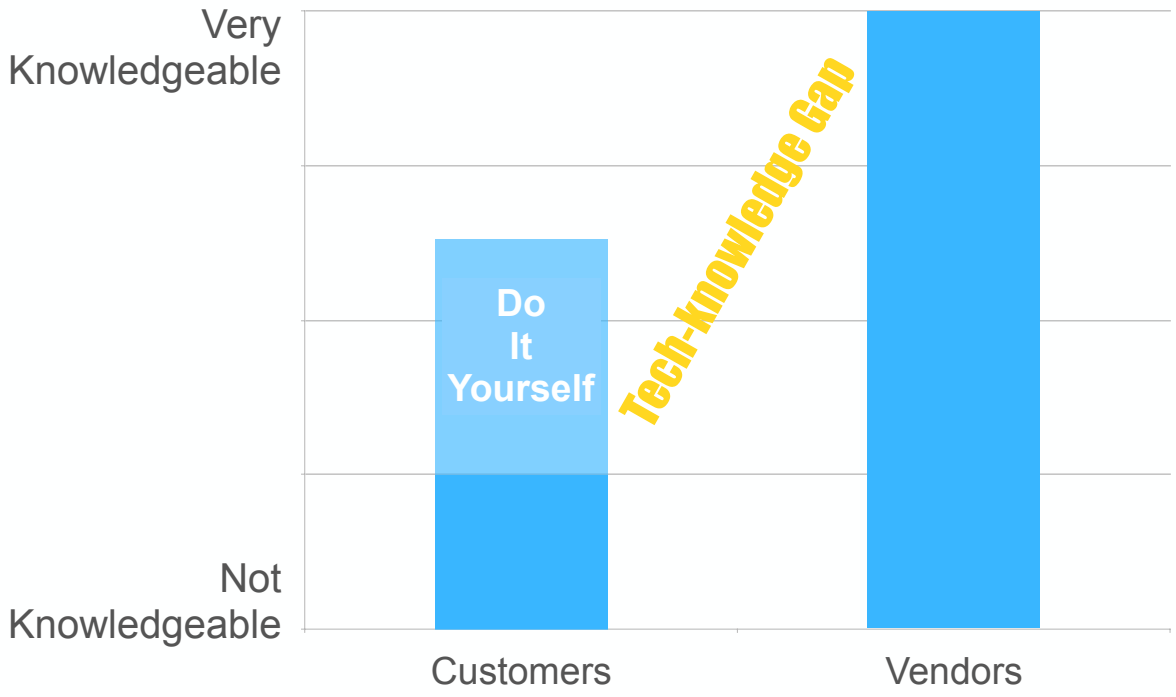
- Tires, rubber products
- Consumer electronics
- Mobile phones
  - Finns are bilingual (2% of population speaks Swedish)
  - Nokia wanted to play internationally
  - English mandated in all business settings
  - Lots of words were unknown
  - Culturally: Bad to not ask questions
  - Culturally: Good to build common vocabulary



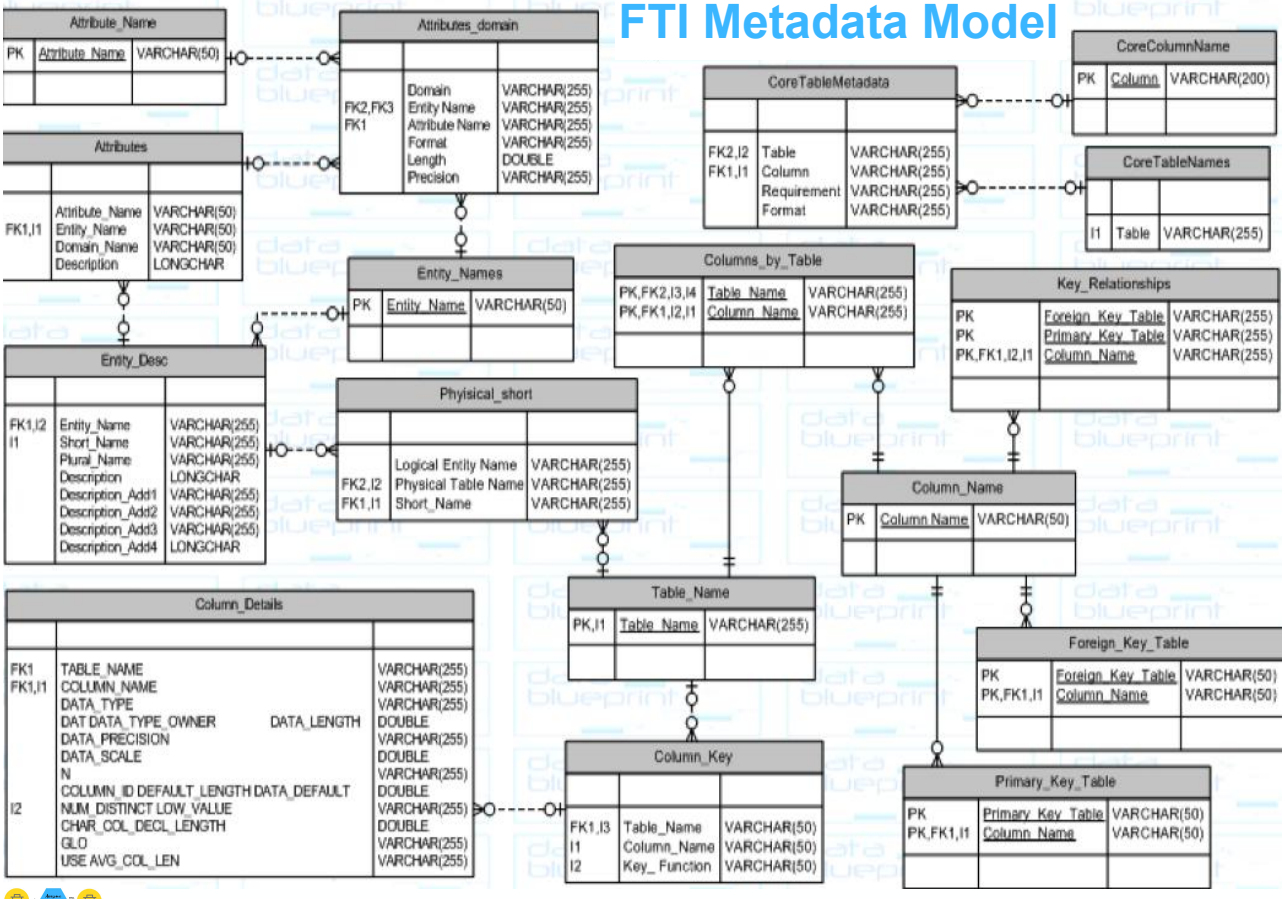
- When an unfamiliar term was used
  - Group: Access NTB to see if there existed a golden definition
  - Group: If not, vote whether to submit it for inclusion in the NTB
  - Weekly: the NTB group reviewed submissions
  - Weekly: the NTB group published new versions of the NTB
  - NTB = Nokia Term Bank

NTB = Trusted Catalog

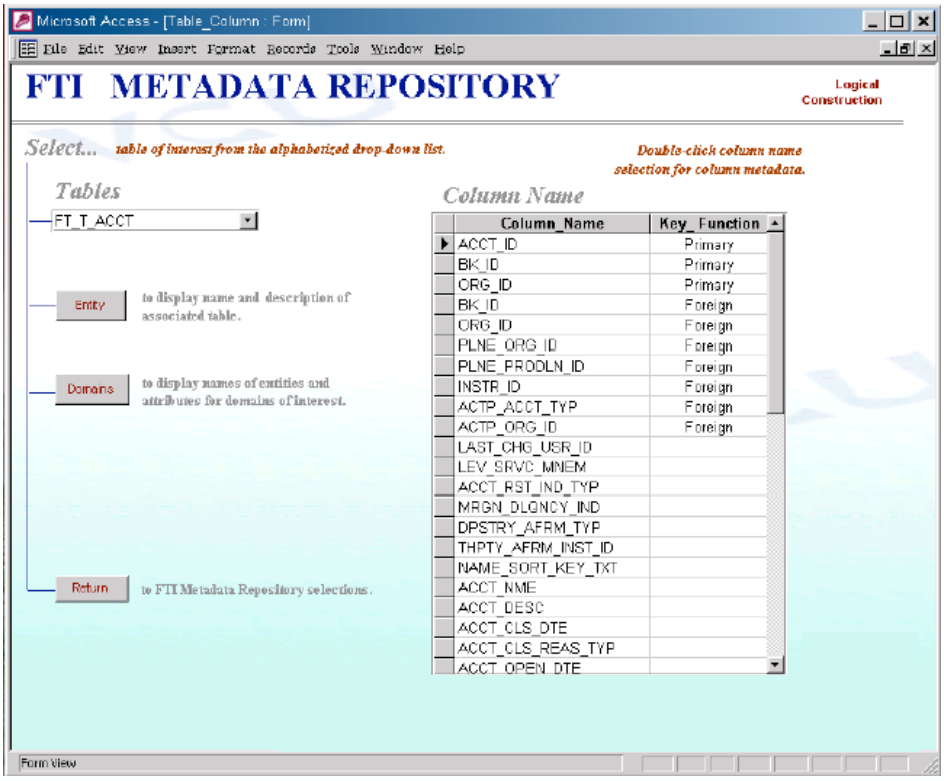
Unequal Conversations



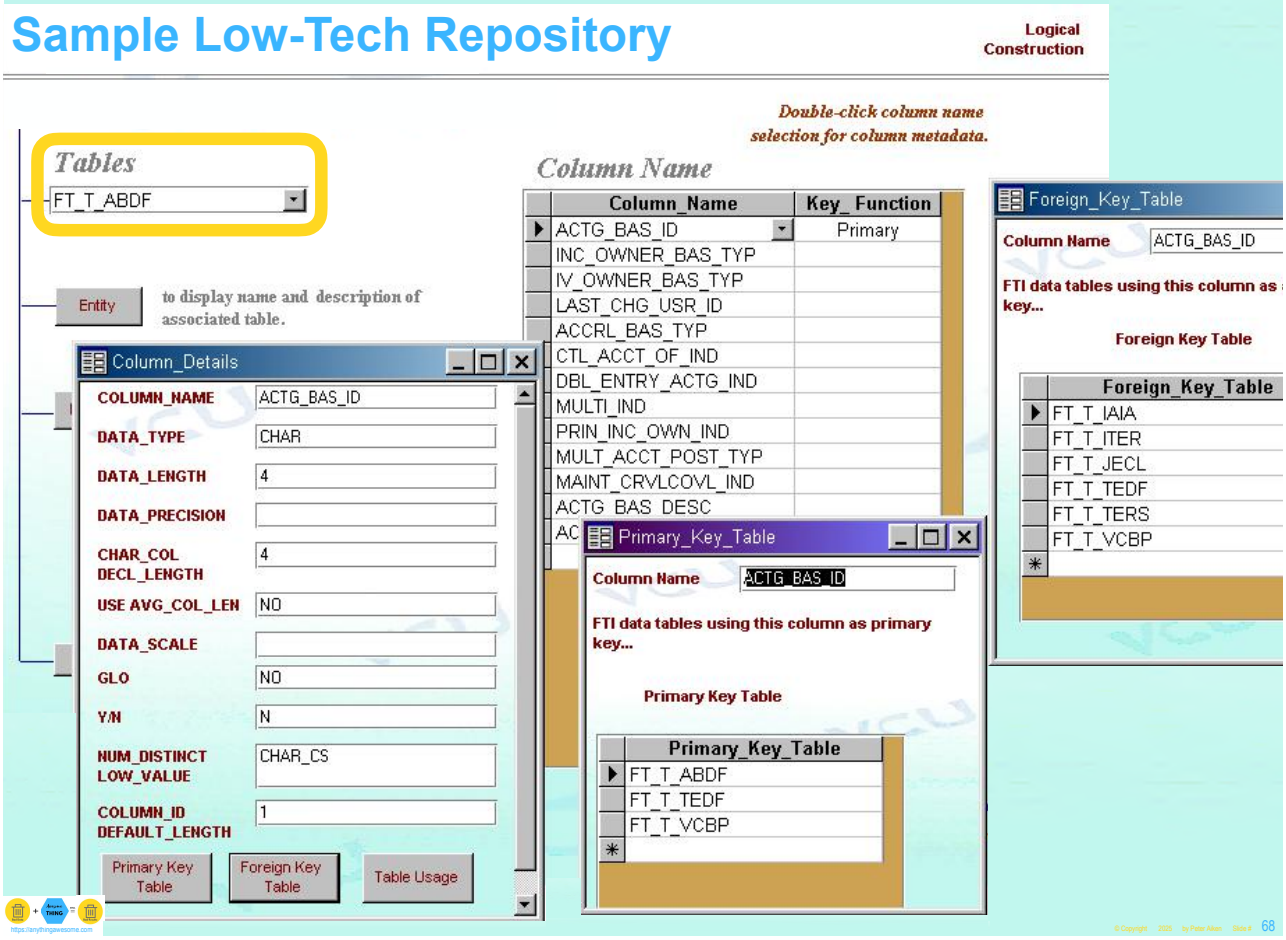
FTI Metadata Model



Build Your Own Metadata Repository

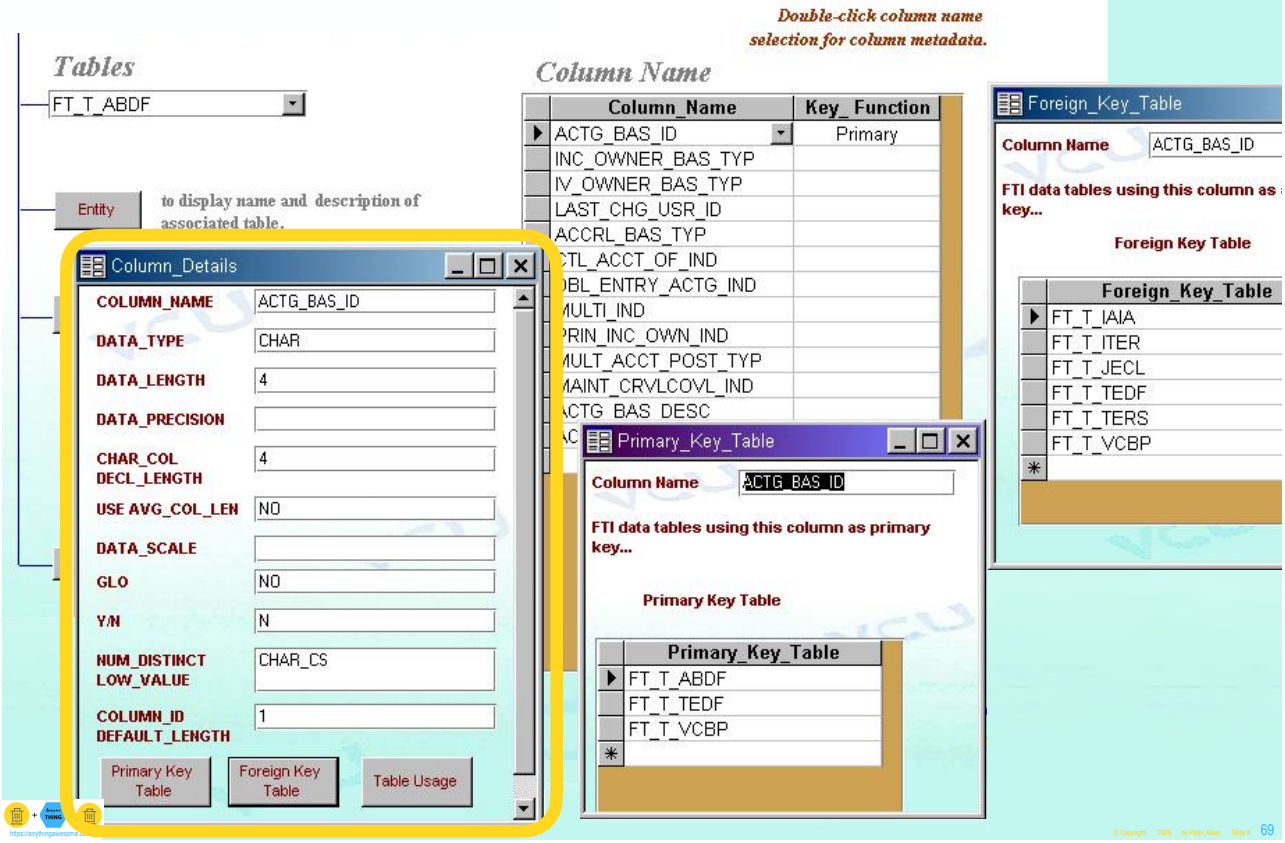


Sample Low-Tech Repository



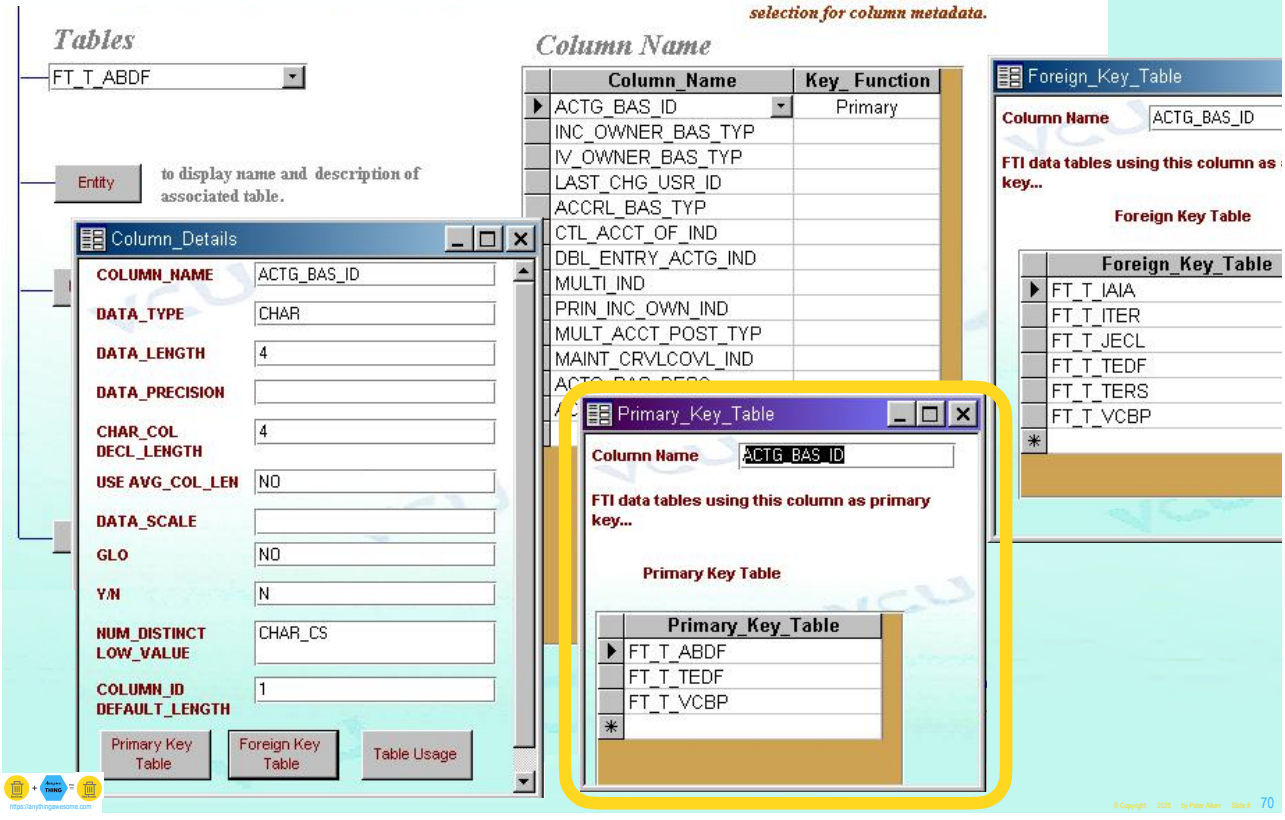
For Each Column …

Logical Construction



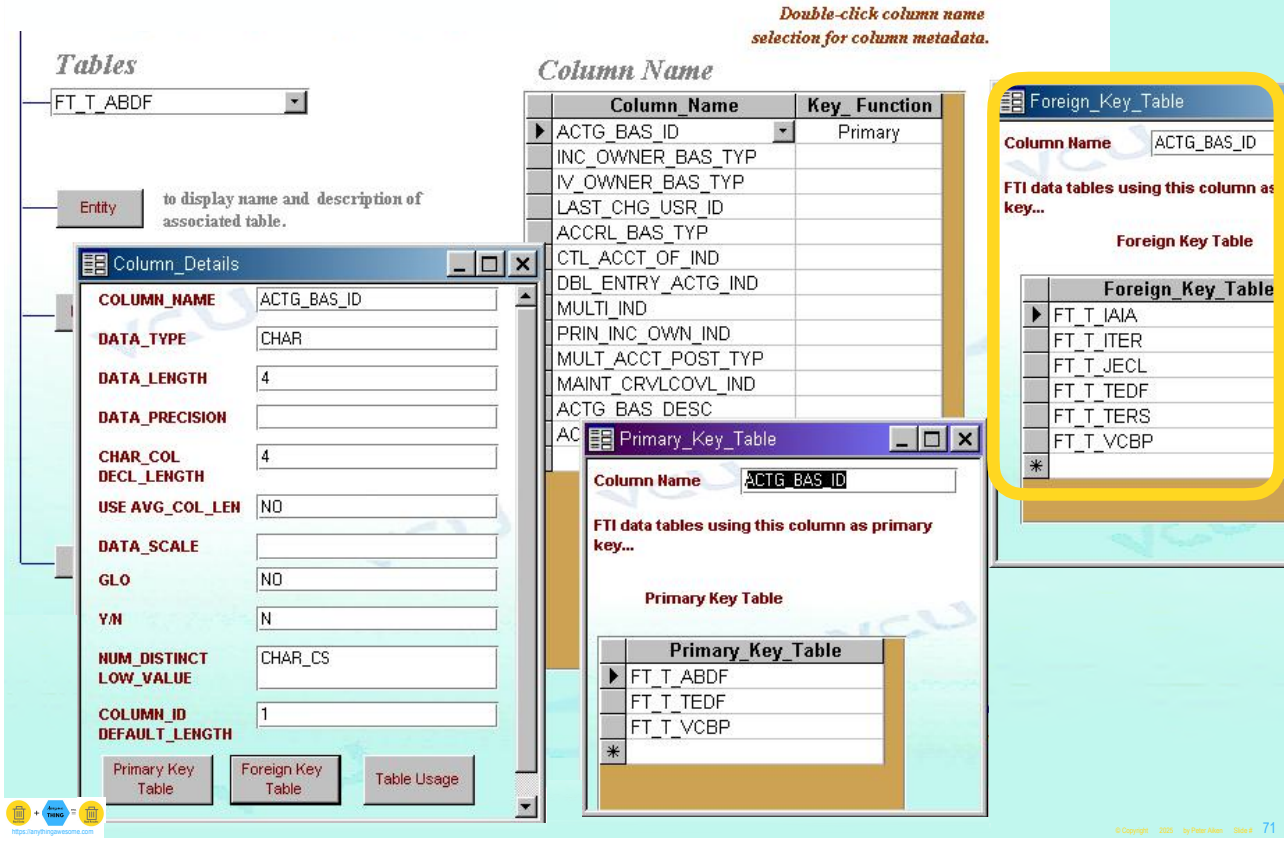
Where Does This Key Function as a Primary Key?

Logical Construction



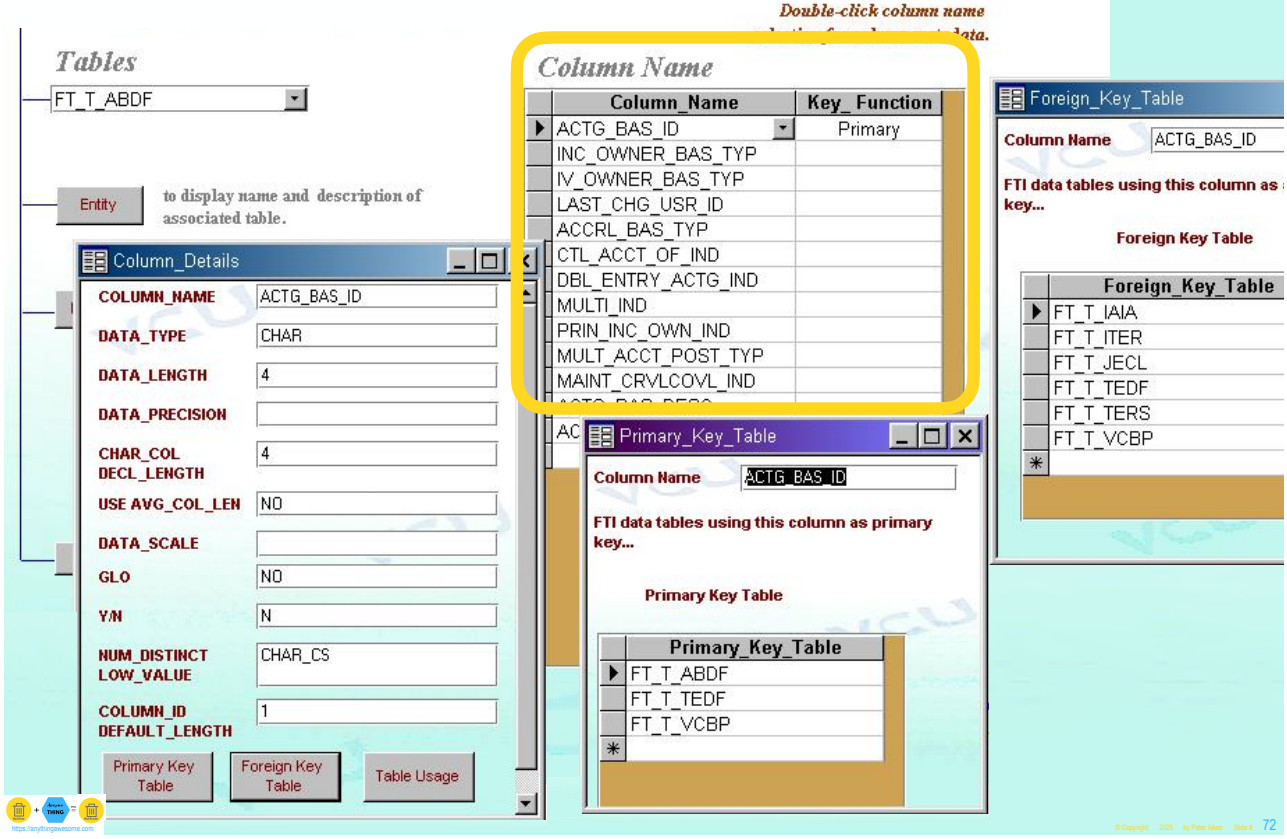
Where Does This Key Function as a Foreign Key?

Logical Construction



Where Does This Key Function as an Attribute?

Logical Construction



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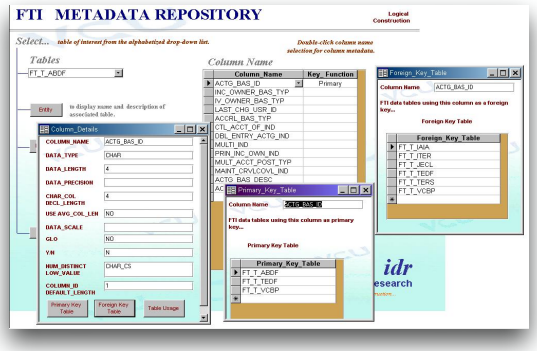

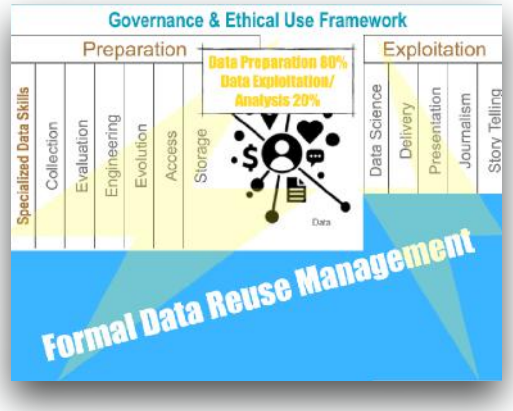

Valuable information about your data assets:

- Do we have these specific (or this class of) data assets? **Yes!**
- Is this data item used elsewhere? **Nowhere!**
- What did cost to acquired this set of assets? **35¢/apiece**
- Can these data assets be share securely? **Not easily!**
- … (a model for how your information should be managed)

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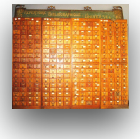
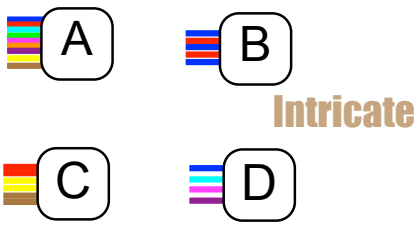


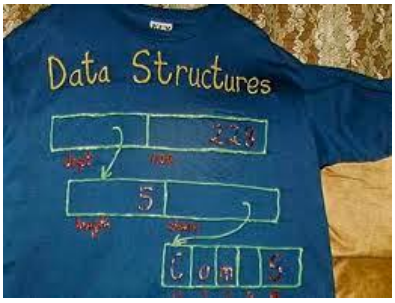
Architecture

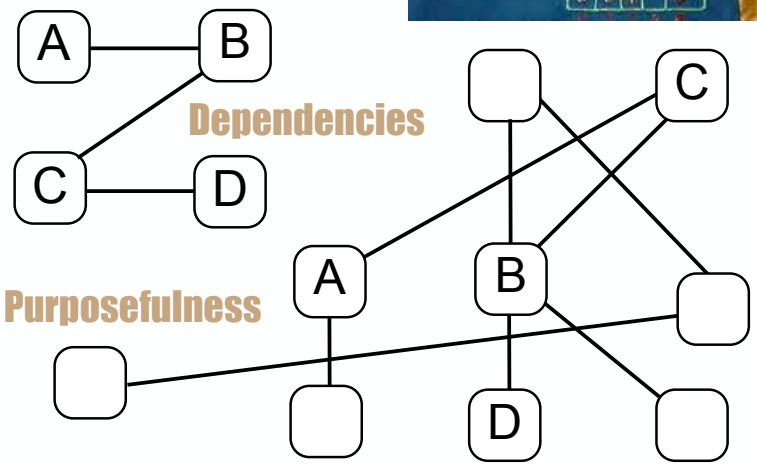
- Things
  - (components)
    data structures
- The functions of the things
  - (individually)
    sources and uses of data
- How the things interact
  - (as a system, towards a goal)
    Efficiencies/effectiveness

How Are Components Expressed as Architectures?

- Details are organized into larger components
- Larger components are organized into models
- Models are organized into architectures (composed of architectural components)







How Are Data Structures Expressed as Architectures?

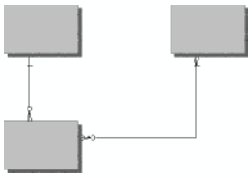
- Attributes are organized into entities/objects
  - Attributes are characteristics of "things"
  - Entitles/objects are "things" whose information is managed in support of strategy
  - Example(s)

Intricate

THING
Club.Id #
Club.Description
Club.Status
Club.Sex.To.Be.Assigned
Club.Reserve.Reason

- Entities/objects are organized into models
  - Combinations of attributes and entities are structured to represent information requirements
  - Poorly structured data, constrains organizational information delivery capabilities
  - Example(s)

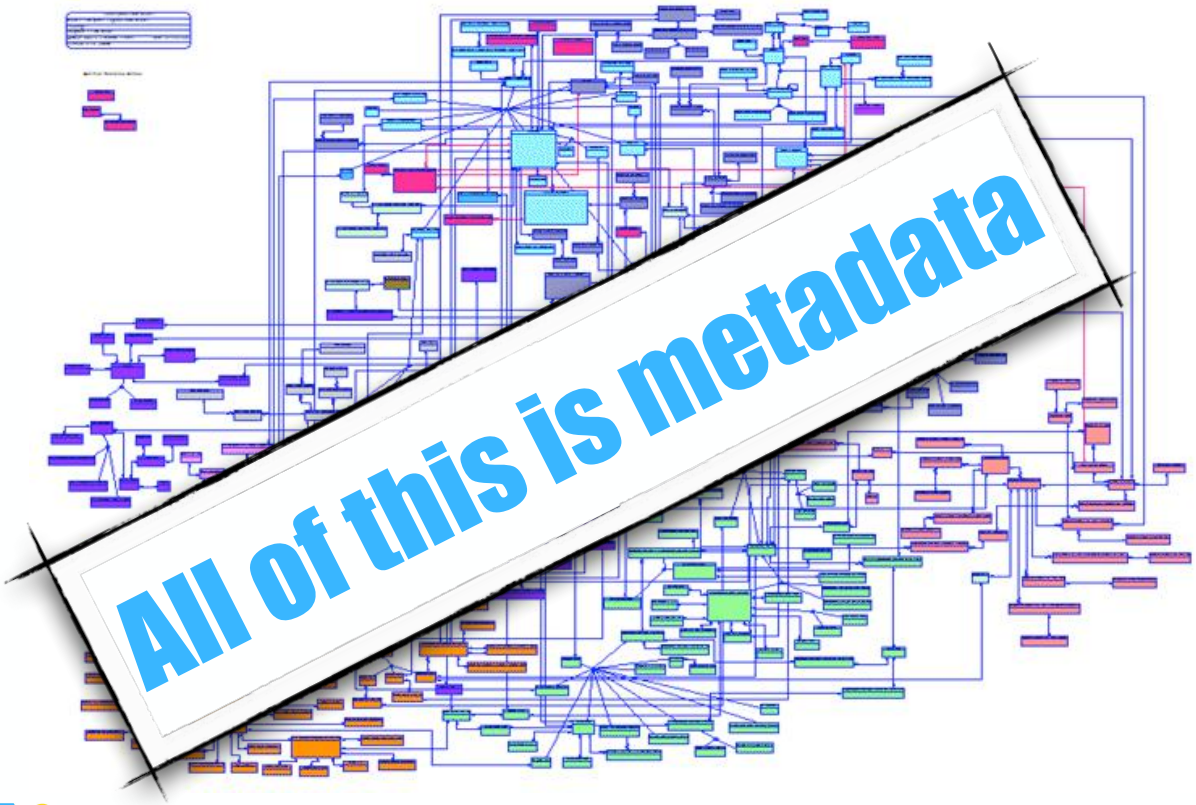
Dependencies



- Models are organized into architectures
  - When building new systems, architectures are used to plan development
  - More often, data managers do not know what existing architectures are and - therefore - cannot make use of them in support of strategy implementation
  - *Why no examples?*

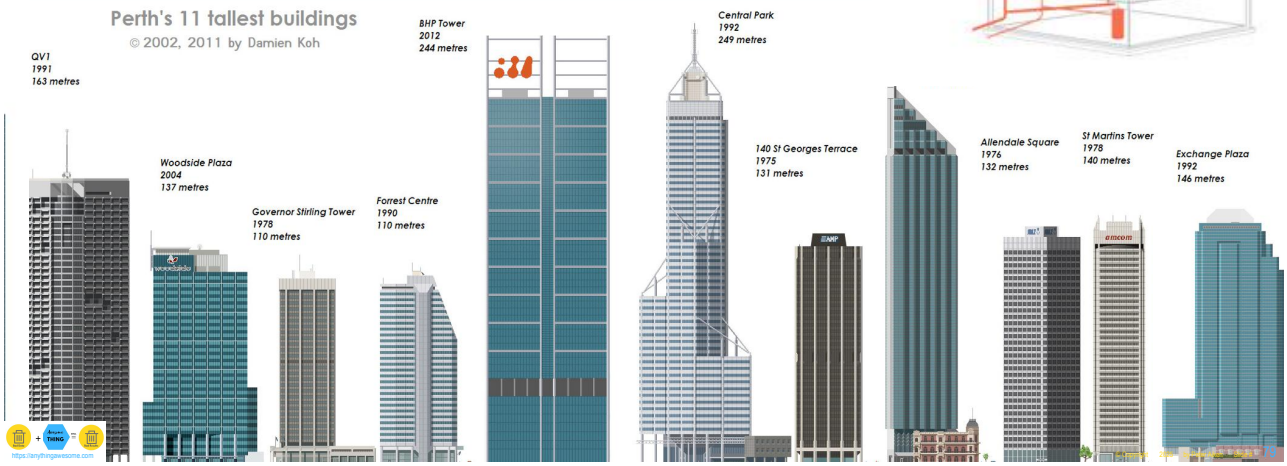
Purposefulness

Data Architectures Are Composed of Data Models

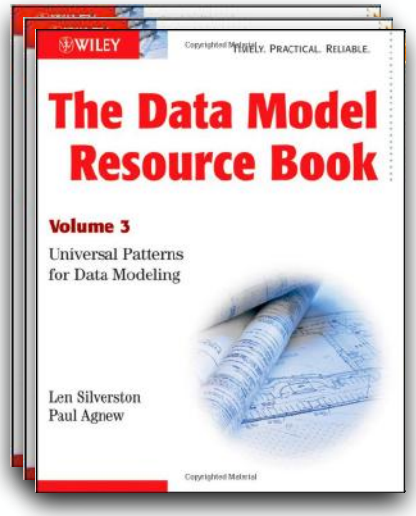


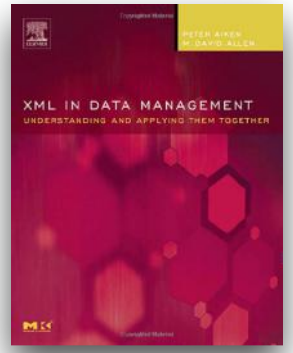
Metadata Specifies Design Patterns

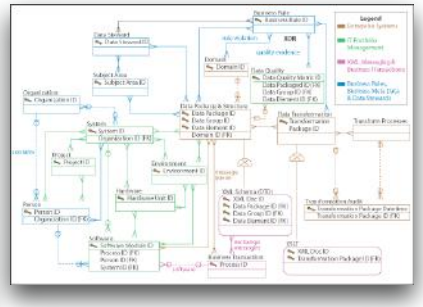
- Why are the restrooms in the same place on each floor?
- What about the electrical wiring?
- HVAC? Floorplans? ...
- Architecture design patterns (spoke and hub, hub of hubs, warehouse, cloud, MDM, changing tires, portal)

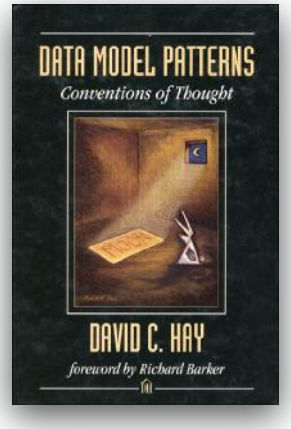


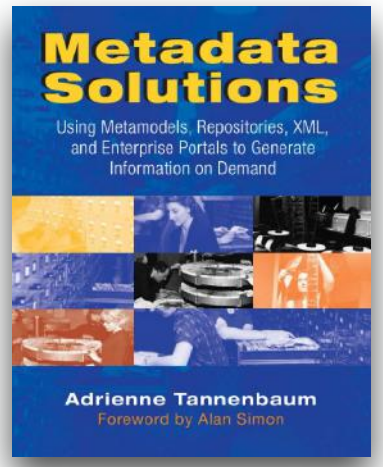
Purchasable Metadata Models



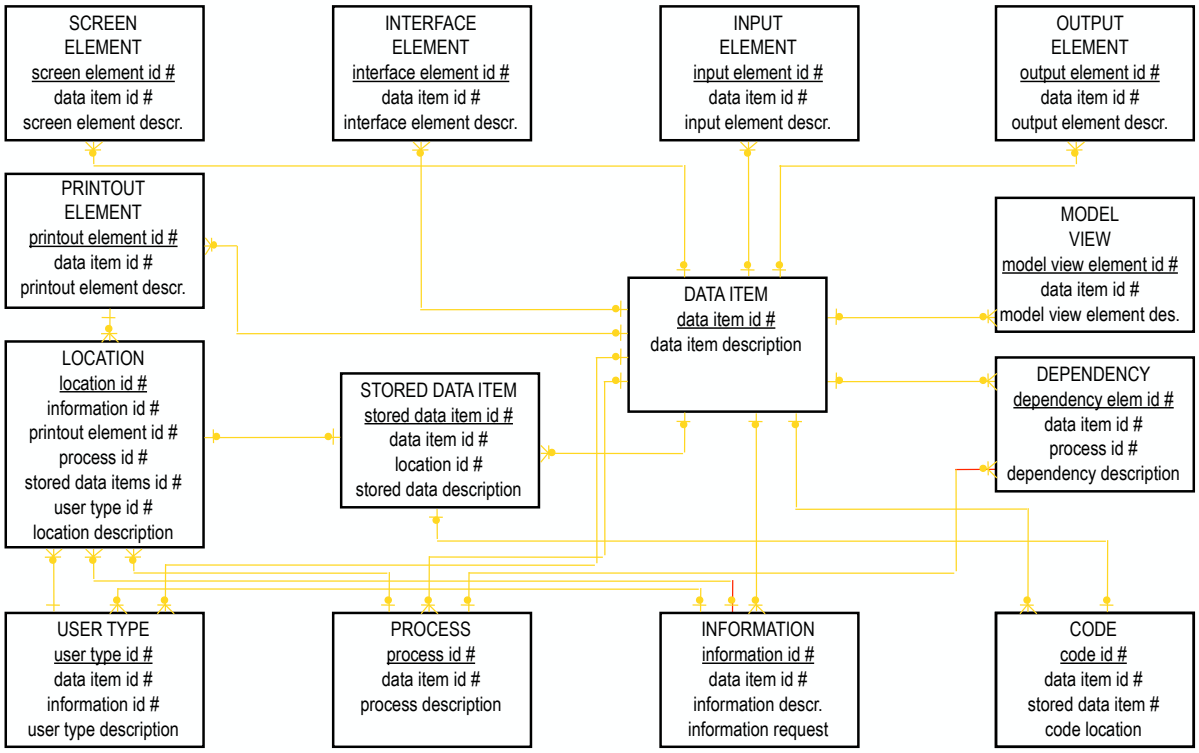








A Generalized Model for Maintaining Metadata



https://anythingawesome.com/reverseengineeringofdata.html

Application Build Model
Defines the tools, parameters and environment required to build an automated Business Application.

Applications Structure Model
Defines the overall scope of an automated Business Application, the components of the application and how they fit together.

Business Goals Model
Defines the mission of the enterprise, its long-range goals, and the business policies and assumptions that affect its operations.

Business Rules Model
Records rules that govern the operation of the business and the Business Events that trigger execution of Business Processes.

Data Structures Model
Defines the data structures and their elements used in an automated Business Application.

DB2 Model
Refines the definition of a Relational Database design to a DB2-specific design.

Derivations/Constraints Model
Records the rules for deriving legal values for instances of Entity-Relationship Model components, and for controlling the use or existence of E-R instance.

Enterprise Structure Model
Defines the scope of the enterprise to be modeled. Assigns a name to the model that serves to qualify each component of the model.

Entity-Relationship Model
Defines the Business Entities, their properties (attributes) and the relationships they have with other Business Entities.

Extension Support Model
Provides for tactical Information Model extensions to support special tool needs.

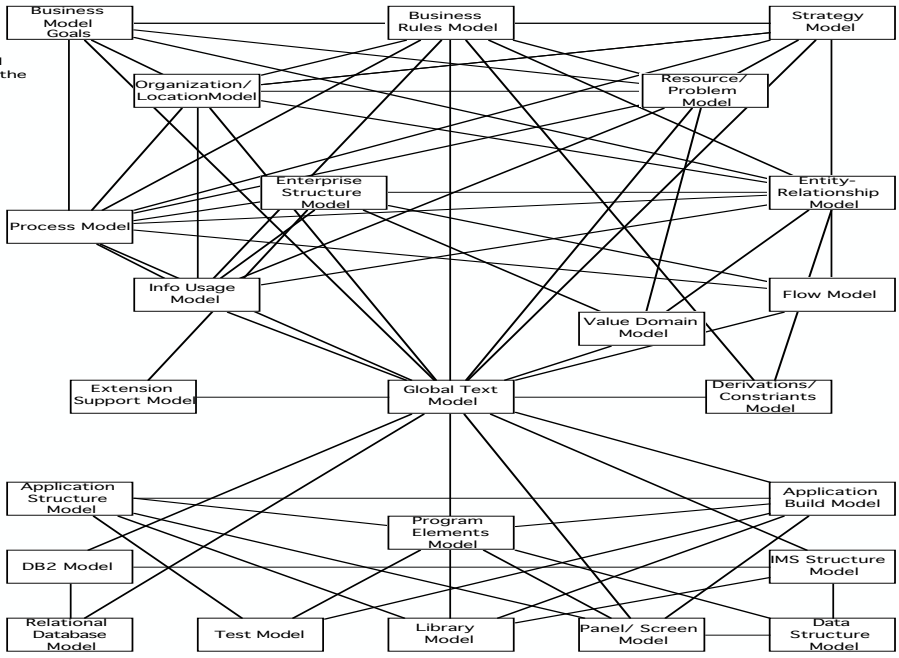
Flow Model
Specifies which of the Entity Relationship Model component instances are passed between Process Model components.

Global Text Model
Supports recording of extended descriptive text for many of the Information Model components.

IMS Structures Model
Defines the component structures and elements and the application program views of an IMS Database.

Info Usage Model
Specifies which of the Entity-Relationship Model component instances are used by other Information Model components.

IBM's AD/Cycle Information Model



Library Model
Records the existence of non-repository files and the role they play in defining and building an automated Business Application.

Organization/Location Model
Records the organization structure and location definitions for use in describing the enterprise.

Panel/Screen Model
Identifies the Panels and Screens and the fields they contain as elements used in an automated Business Application.

Process Model
Defines Business Processes, their sub processes and components.

Program Elements Model
Identifies the various pieces and elements of application program source that serve as input to the application build process.

Resource/Problem Model
Identifies the problems and needs of the enterprise, the projects designed to address those needs, and the resources required.

Relational Database Model
Describes the components of a Relational Database design in terms common to all SAA relational DBMSs.

Strategy Model
Records business strategies to resolve problems, address goals, and take advantage of business opportunities. It also records the actions and steps to be taken.

Test Model
Identifies the various file (test procedures, test cases, etc.) affiliated with an automated business Application for use in testing that application.

Value Domain Model
Defines the data characteristics and allowed values for information items.

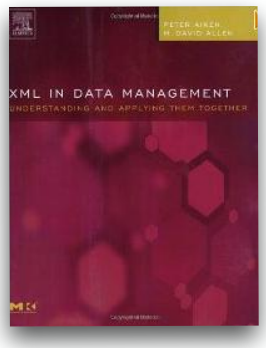
Montgomery, S. L. (1991). AD/Cycle: IBM's Framework for Application Development and CASE. Van Nostrand Reinhold https://books.google.com/books/about/AD_Cycle.html?id=UR-zAAAAIAAJ

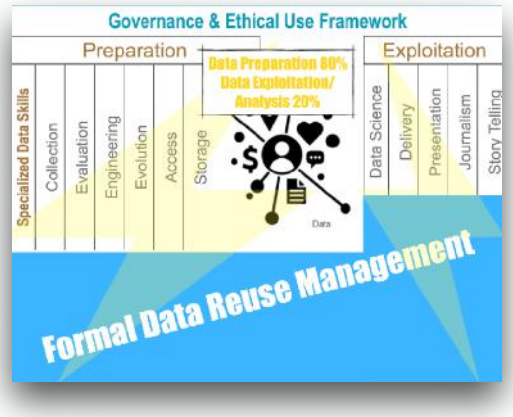
Metadata for Semistructured Data

- Metadata describes both structured and semi-structured data
  - You cannot convert unstructured data into structured data
- Better description
  - Non-tabular data ➜ tabular data
- Semi-structured data
  - Any data that is not in a database or data file, including documents or other media data
- Metadata for semi-structured data exists in many formats, responding to a variety of different requirements
- Examples of metadata repositories describing unstructured data:
  - Content management applications
  - University websites
  - Company intranet sites
  - Data archives
  - Electronic journals collections
  - Community resource lists

- Common method for classifying Metadata in unstructured sources is to describe them as descriptive metadata, structural metadata, or administrative metadata
- Examples of descriptive metadata:
  - Catalog information
  - Thesauri keyword terms
- Examples of structural metadata
  - Dublin Core
  - Field structures
  - Format (audio/visual, booklet)
  - Thesauri keyword labels
  - XML schemas
- Examples of administrative metadata
  - Source(s)
  - Integration/update schedule
  - Access rights
  - Page relationships (e.g. site navigational design)

Metadata Patterns Yield …





Valuable comparisons and 'starting foundations':

- Do we have to create a pharmacy billing system from scratch? **No!**
- Will the proposed software 'fit'? **Yes!**
- Do industry best practices exist? **Yes**
- Has anyone published a model implementing GPDR? **Not yet!**

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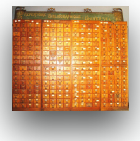


ELECTRONIC FRONTIER FOUNDATION
DEFENDING YOUR RIGHTS IN THE DIGITAL WORLD

Why Metadata Matters SEARCH

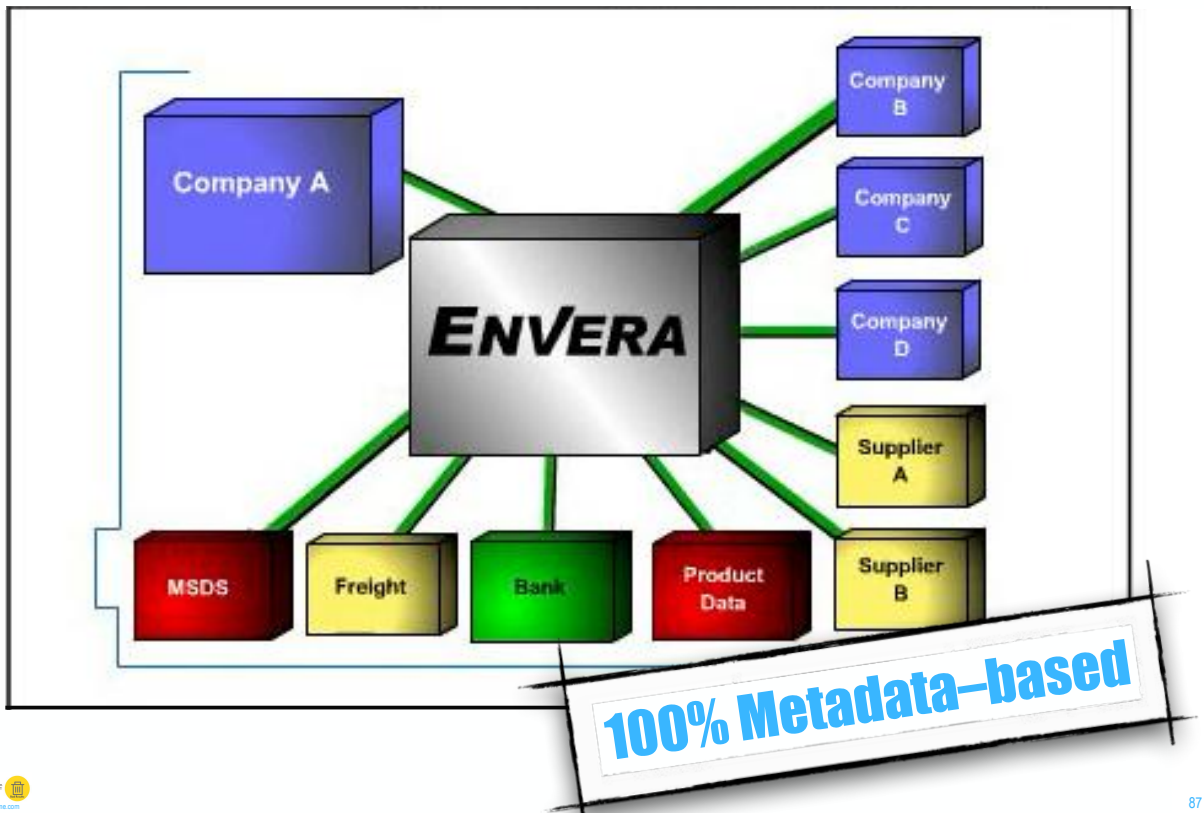
HOME | ABOUT | OUR WORK | DEEPLINKS BLOG | PRESS ROOM | TAKE ACTION | SHOP

- **They** know you rang a phone sex service at 2:24 am and spoke for 18 minutes. But they don't know what you talked about.
- **They** know you called the suicide prevention hotline from the Golden Gate Bridge. But the topic of the call remains a secret.
- **They** know you spoke with an HIV testing service, then your doctor, then your health insurance company in the same hour. But they don't know what was discussed.
- **They** know you received a call from the local NRA office while it was having a campaign against legislation, and the call your senators and congressional representatives immediately after. But the content of those calls remains safe from government intrusion.
- **They** know you called a gynecologist, spoke for a half hour, and then called the local Planned Parenthood's number later that day. But nobody knows what you spoke about.

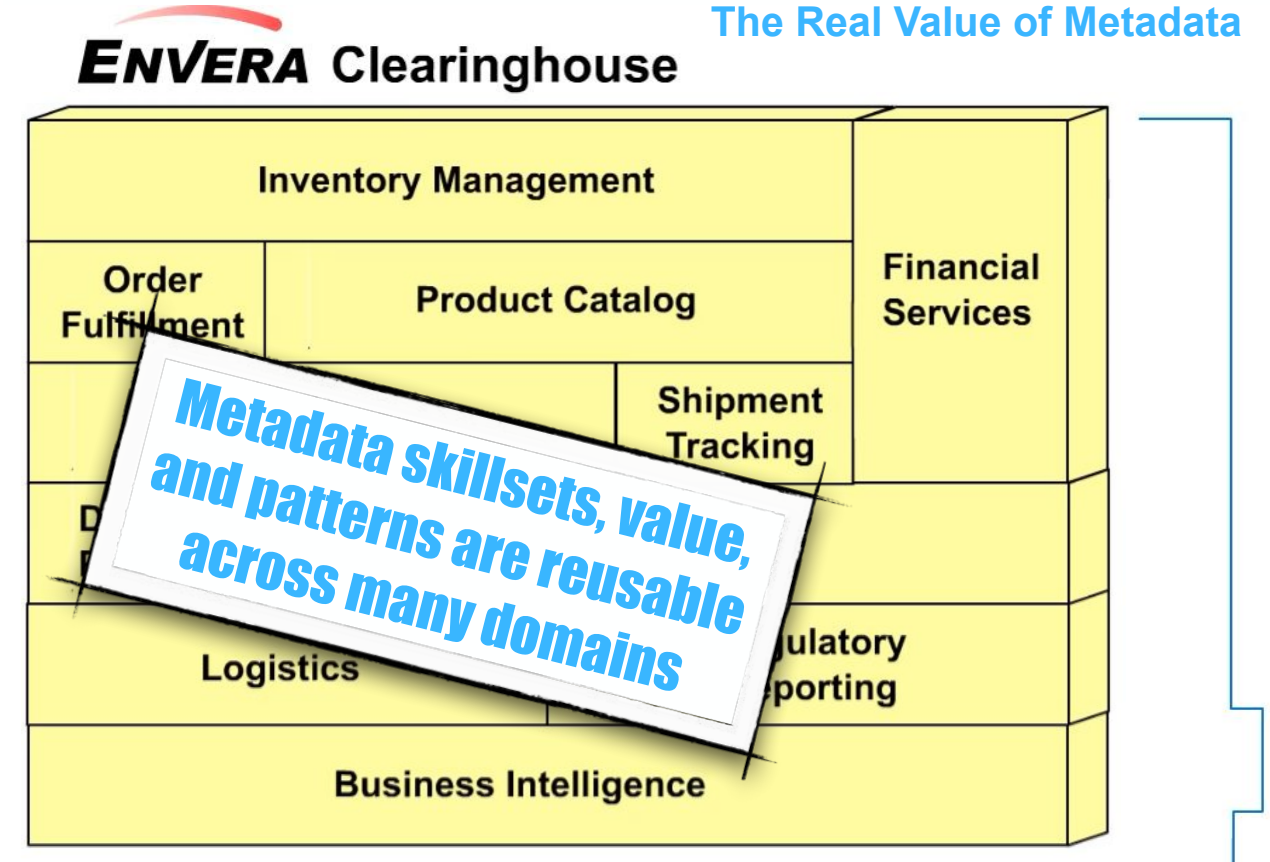
"It's just metadata"

– https://www.eff.org/deeplinks/2013/06/why-metadata-matters

Envera Business Value Proposition



The Real Value of Metadata

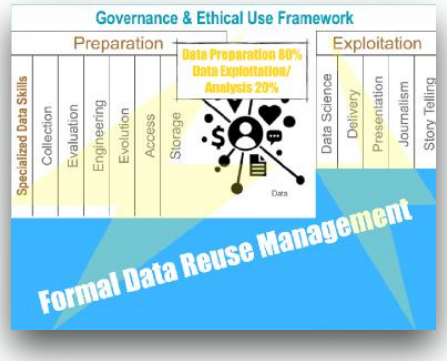


FEPA/OPEN Government Data Act

- Signed on 1/14/19
- **F**oundations for **E**vidence-Based **P**olicymaking (FEBP) **A**ct (H.R._4174,_S._2046)
- Title II, which includes the Open, Public, Electronic, and Necessary (OPEN) Government Data Act
  - All federal data is open by default
  - Non-political CDOs are required
  - Use of open data and open models required in policy evolution
  - Penalties are higher than HIPPA

https://www.congress.gov/bill/115th-congress/house-bill/4174/text

Metadata Benefits …



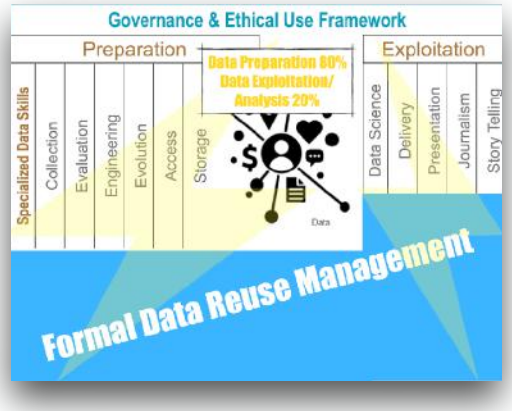
- Increase the value of strategic information (e.g. data warehousing, CRM, SCM, etc.) by providing context for the data, thus aiding analysts in making more effective decisions.
- Reduce training costs and lower the impact of staff turnover through thorough documentation of data context, history, and origin.
- Reduce data-oriented research time by assisting business analysts in finding the information they need in a timely manner.
- Improve communication by bridging the gap between business users and IT professionals, leveraging work done by other teams and increasing confidence in IT system data.
- Increased speed of system development's time-to-market by reducing system development life-cycle time.
- Reduce risk of project failure through better impact analysis at various levels during change management.
- Identify and reduce redundant data and processes, thereby reducing rework and use of redundant, out-of-data, or incorrect data.

Program Overview

Four Effective Metadata Strategies

- Defining metadata in the context of data management
  - Defining data management
  - What do we mean by the term 'using data as metadata' and why is this important? (Hint: leverage)
  - Specific teachable example using iTunes/Music™
  1. Metadata is a gerund–do not treat it as a noun
     - Metadata is a use of data, not a type of data
  2. Enforce metadata to be the language of data governance
     - Make metadata the language of data governance
  3. Treat glossaries/repositories as capabilities not technology
     - Cyclic approaches do not start with technologies
  4. Build from metadata building blocks
     - Many many many resources are available to jump-start metadata efforts
- Benefits, application & sources
  - Understand that metadata defines organizational interoperability
- Take Aways, References and Q&A

Metadata Program Take Aways



- 'Data about your data'
- Metadata is not a type of data
- Metadata unlocks the value of data, and therefore requires management attention [Gartner]
- Metadata is less about what and more about how
- Metadata must be the language of data governance in order to keep it focused
- Metadata definitions the essence of correctly specifying most organizational challenges
- Should we include this data item within the scope of our metadata practices?

References & Recommended Reading

11.4.1 General Reading

Brathwaite, Ken S. Analysis, Design, and Implementation of Data Dictionaries. McGraw-Hill Inc., 1988. ISBN 0-07-007248-5. 214 pages.

Collier, Ken. Executive Report, Business Intelligence Advisory Service, *Finding the Value in Metadata Management* (Vol. 4, No. 1), 2004. Available only to Cutter Consortium Clients, http://www.cutter.com/bia/fulltext/reports/2004/01/index.html.

Hay, David C. Data Model Patterns: A Metadata Map. Morgan Kaufmann, 2006. ISBN 0-120-88798-3. 432 pages.

Hillmann, Diane I. and Elaine L. Westbrooks, editors. Metadata in Practice. American Library Association, 2004. ISBN 0-838-90882-9. 285 pages.

Inmon, William H., Bonnie O'Neil and Lowell Fryman. Business Metadata: Capturing Enterprise Knowledge. 2008. Morgan Kaufmann ISBN 978-0-12-373726-7. 314 pages.

Marco, David, Building and Managing the Meta Data Repository: A Full Life-Cycle Guide. John Wiley & Sons, 2000. ISBN 0-471-35523-2. 416 pages.

Marco, David and Michael Jennings. Universal Meta Data Models. John Wiley & Sons, 2004. ISBN 0-471-08177-9. 478 pages.

Poole, John, Dan Change, Douglas Tolbert and David Mellor. Common Warehouse Metamodel: An Introduction to the Standard for Data Warehouse Integration. John Wiley & Sons, 2001. ISBN 0-471-20052-2. 208 pages.

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Poole, John, Dan Change, Douglas Tolbert and David Mellor. Common Warehouse Metamodel Developer's Guide. John Wiley & Sons, 2003. ISBN 0-471-20243-6. 704 pages.

Ross, Ronald. Data Dictionaries And Data Administration: Concepts and Practices for Data Resource Management. New York: AMACOM Books, 1981. ISN 0-814-45596-4. 454 pages.

Tannenbaum, Adrienne. Implementing a Corporate Repository, John Wiley & Sons, 1994. ISBN 0-471-58537-8. 441 pages.

Tannenbaum, Adrienne. Metadata Solutions: Using Metamodels, Repositories, XML, And Enterprise Portals to Generate Information on Demand. Addison Wesley, 2001. ISBN 0-201-71976-2. 528 pages.

Wertz, Charles J. The Data Dictionary: Concepts and Uses, 2nd edition. John Wiley & Sons, 1993. ISBN 0-471-60308-2. 390 pages.

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11.4.2 Meta-data in Library Science

Baca, Murtha, editor. Introduction to Metadata: Pathways to Digital Information. Getty Information Institute, 2000. ISBN 0-892-36533-1. 48 pages.

Hillmann, Diane I., and Elaine L. Westbrooks. Metadata in Practice. American Library Association, 2004. ISBN 0-838-90882-9. 285 pages.

Karpuk, Deborah. METADATA: From Resource Discovery to Knowledge Management. Libraries Unlimited, 2007. ISBN 1-591-58070-6. 275 pages.

Liu, Jia. Metadata and Its Applications in the Digital Library. Libraries Unlimited, 2007. ISBN 1-291-58306-6. 250 pages.

11.4.3 Geospatial Meta-data Standards

http://www.fgdc.gov/metadata/geospatial-metadata-standards.

References, Cont'd

11.4.4 ISO Meta-data Standards

ISO Standards Handbook 10, Data Processing—Vocabulary, 1982.

ISO 704:1987, Principles and methods of terminology.

ISO 1087, Terminology—Vocabulary.

ISO 2382-4:1987, Information processing systems—Vocabulary part 4.

ISO/IEC 10241:1992, International Terminology Standards—Preparation and layout.

FCD 11179-2, Information technology—Specification and standardization of data elements - Part 2: Classification for data elements.

ISO/IEC 11179-3:1994, Information technology—Specification and standardization of data elements - Part 3: Basic attributes of data elements.

ISO/IEC 11179-4:1995, Information technology—Specification and standardization of data elements - Part 4: Rules and guidelines for the formulation of data definitions.

ISO/IEC 11179-5:1995, Information technology—Specification and standardization of data elements - Part 5: Naming and identification principles for data elements.

ISO/IEC 11179-6:1997, Information technology—Specification and standardization of data elements - Part 6: Registration of data elements.

Upcoming Events

Time: 19:00 UTC (2:00 PM NYC) | Presented by: Peter Aiken, PhD

Engineering Data Quality: A Framework for Effective Data Management

9 September 2025

Data Strategy: Where Data Architecture and Data Governance Collide

14 October 2025

Maximizing the Value of Your Data Warehouse: A Strategic Approach to Business Inteligence and Innovation

11 November 2025

Brought to you by:

[Clicking any webinar title will link directly to the registration page]

DATAVERSITY

Critical Design Review?

Collaboration?

Executive Data Literacy Training?

Independent Verification & Validation

Peter.Aiken@AnythingAwesome.com +1.804.382.5957

Mentoring?

Reverse Engineering Expertise?

Hiring Assistance?

Thank You!

Use your data more strategically?

Tool/automation evaluation?

Book a call with Peter to discuss anything - https://anythingawesome.com/OfficeHours.html