圖書館員如何開拓研究數據管理服務新領域

Developing Data Services to Support Research Data Management

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ADLS, Qingdao, China 2014-06-25

Types of data services

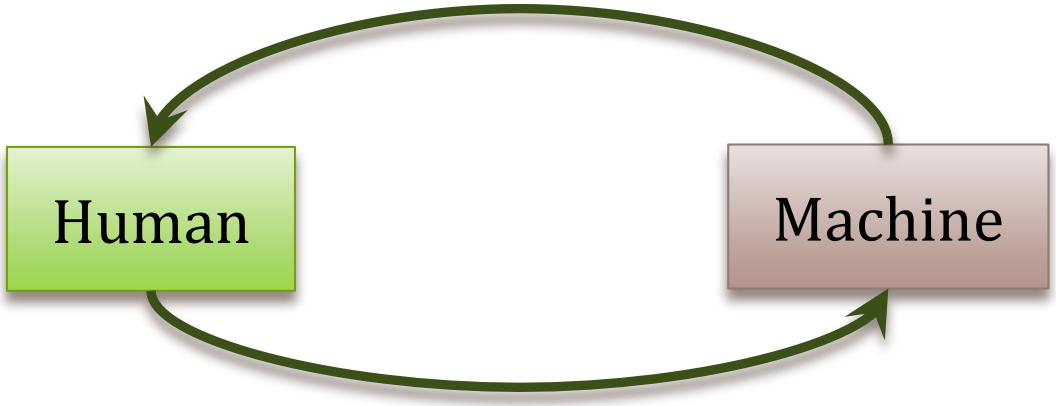
Characteristics of data services

A quick introduction of scientific data management

WHAT ARE DATA SERVICES?

Types of data services (1)

For whom?



Infrastructure type of services:

- National
- Institutional

What data services?

ARL survey report 2010
Finding relevant data 83%
Developing data management plans 79%
Finding and using available technology infrastructure and tools 76%
Developing tools to assist researchers 76%
Archiving and curating relevant data and curating it for long-term preservation and integration across datasets
Providing curatorial and data Stewardship services
Raising awareness and user training

ARL Survey report 2013 (N=72)	
Providing an institutional repository	89%
Locating & using existing data sources	94%
GIS and geospatial analysis, support	85%
Dataset purchase, acquisition, subscriptions	81%
Copyright & patent advising	75%
General statistical software support	58%
Data visualization support	36%
Data analysis support	39%
Data mining	28%
Database design & management	28%
Programing/software development	24%
Other data support services	29%

(Fearon et al., 2013)

Data Management Plan (DMP) services

- Online DMP services:
  - Explanation of DMP requirements by different funding agencies and/or NSF directorates
  - Guidelines for creating DMPs
  - Template examples of DMPs
  - A tool or resource for DMP creation
  - A data planning checklist
  - Copyright considerations, data citation guidelines, metadata examples, info about digital repository services
  - …

What data services? (2)

- Submission of data
- Data export
- Data format conversion /transformation
- Access to data (discovering and obtaining data)
- IP protection and management
- Educational offerings
- Technical assistance including data management and manipulation services
  - Access to computing facilities
  - Curation
  - Archive and preservation tools
  - Information
- Print and publication services
- Marketing
- Publicity
- Software development services

Source: Marcial & Hemminger, 2010

Data providers, managers, and users

Data center

Research center

Library

Who best suits for which services?

Acquiring, processing
Conversion /Transforming
Metadata tagging
Discovering and obtaining
Analyzing, visualization
Archiving, curating, preservation
Training, outreaching
Marketing, publicizing
Distributing, publishing

What is considered as good data services?

- Repeatable
- Sustainable financially and technically
- A community of practice
- Institutionalization
- Collaboration and coordination
- Conformance to regulations and laws

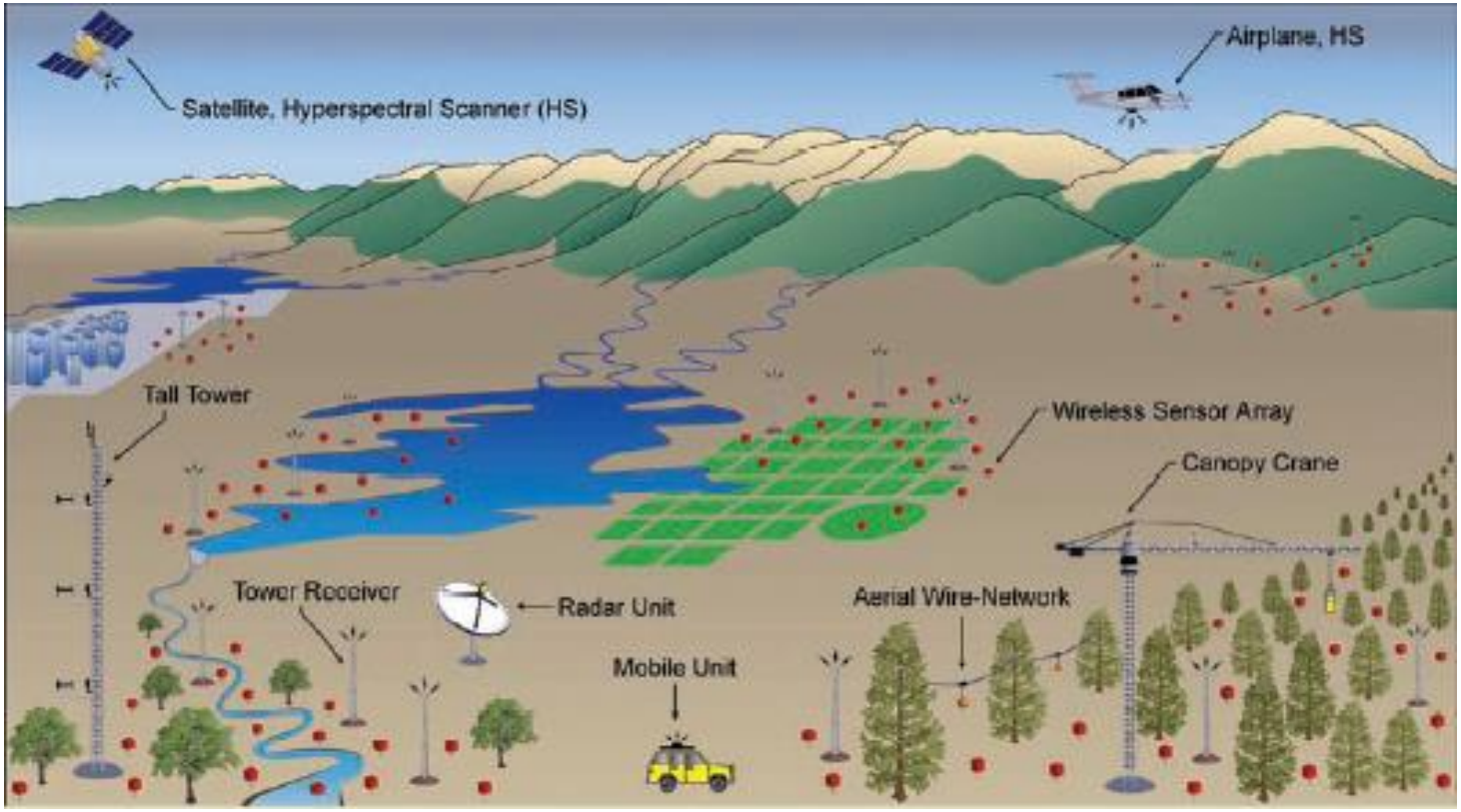
What are data?

What are some of the major data formats?

Why data formats?

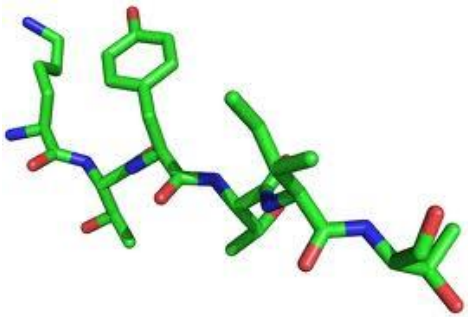
FUNDAMENTALS OF DATA

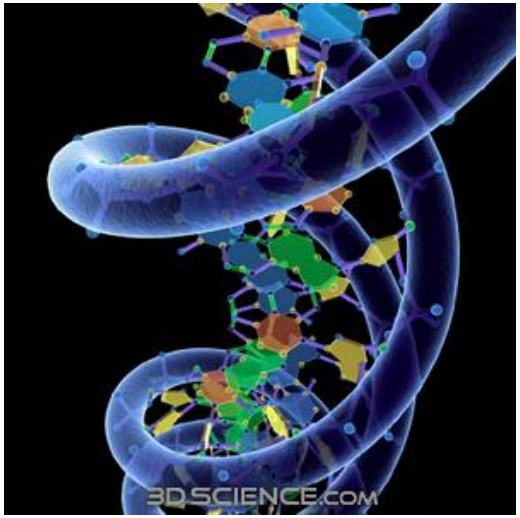
What are data? (1)



An artist's conception (above) depicts fundamental NEON observatory instrumentation and systems as well as potential spatial organization of the environmental measurements made by these instruments and systems.
http://www.nsf.gov/pubs/2007/nsf0728/nsf0728_4.pdf

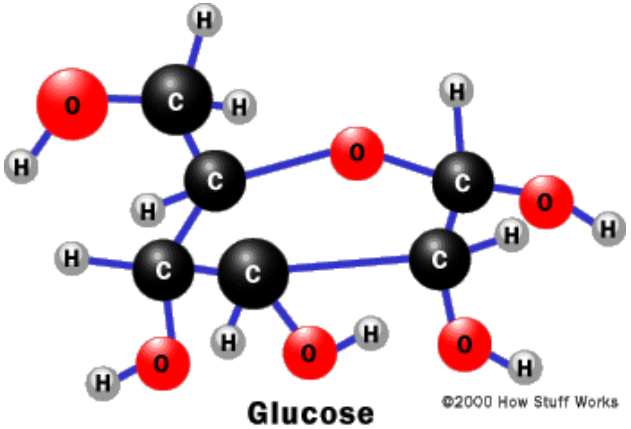
What are data? (2)

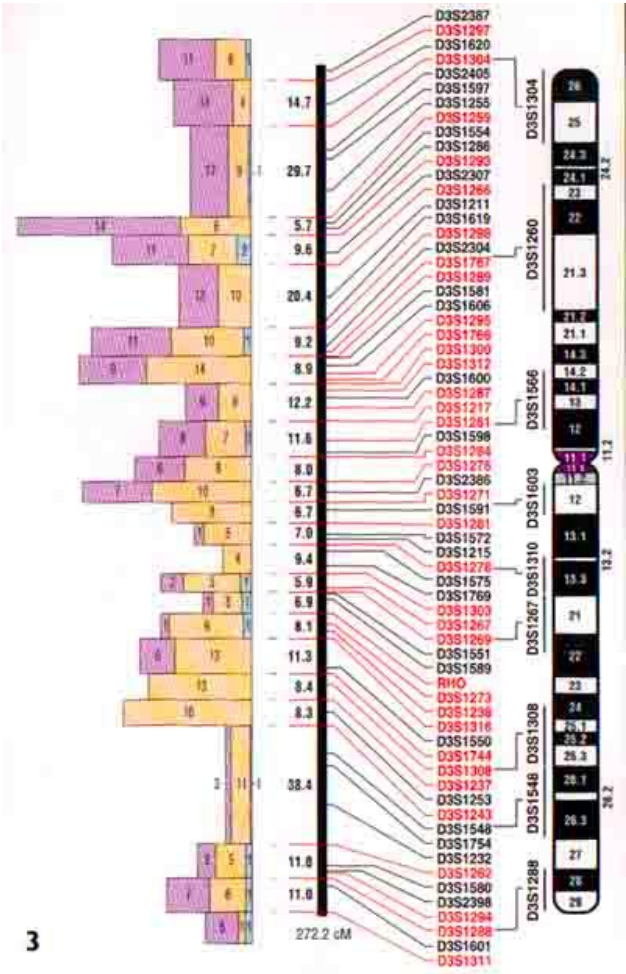




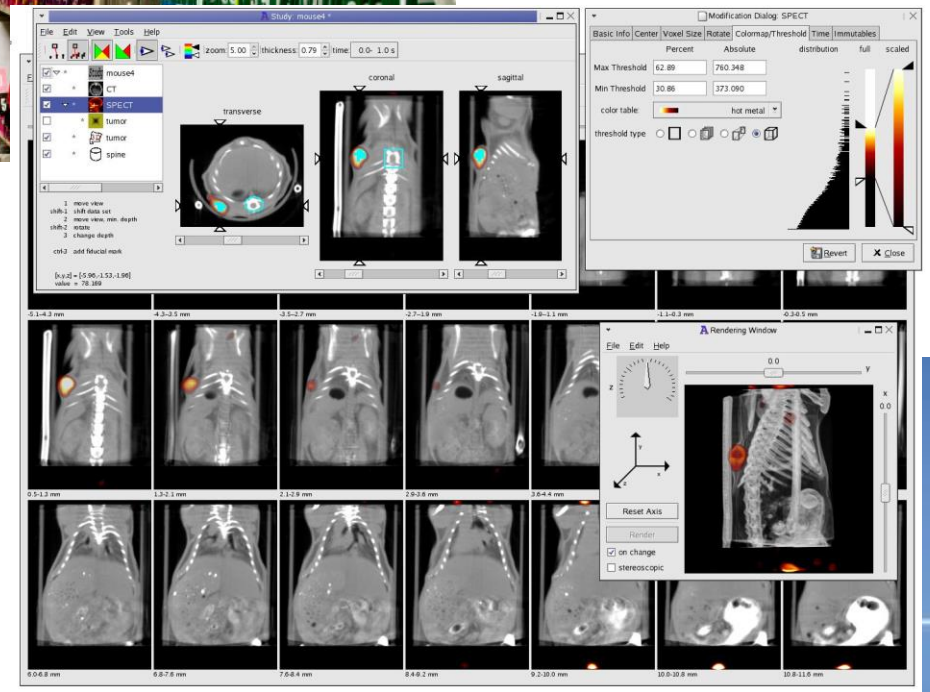
second base in codon

first base in codon	T	C	A	G	third base in codon
T	TTT Phe	TCT Ser	TAT Tyr	TGT Cys	T
	TTC Phe	TCC Ser	TAC Tyr	TGC Cys	C
	TTA Leu	TCA Ser	TAA stop	TGA stop	A
	TTG Leu	TCG Ser	TAG stop	TGG Trp	G
C	CTT Leu	CCT Pro	CAT His	CGT Arg	T
	CTC Leu	CCC Pro	CAC His	CGC Arg	C
	CTA Leu	CCA Pro	CAA Gln	CGA Arg	A
	CTG Leu	CCG Pro	CAG Gln	CGG Arg	G
A	ATT Ile	ACT Thr	AAT Asn	AGT Ser	T
	ATC Ile	ACC Thr	AAC Asn	AGC Ser	C
	ATA Ile	ACA Thr	AAA Lys	AGA Arg	A
	ATG Met	ACG Thr	AAG Lys	AGG Arg	G
G	GTT Val	GCT Ala	GAT Asp	GGT Gly	T
	GTC Val	GCC Ala	GAC Asp	GGC Gly	C
	GTA Val	GCA Ala	GAA Glu	GGA Gly	A
	GTG Val	GCG Ala	GAG Glu	GGG Gly	G





What are data? (3)

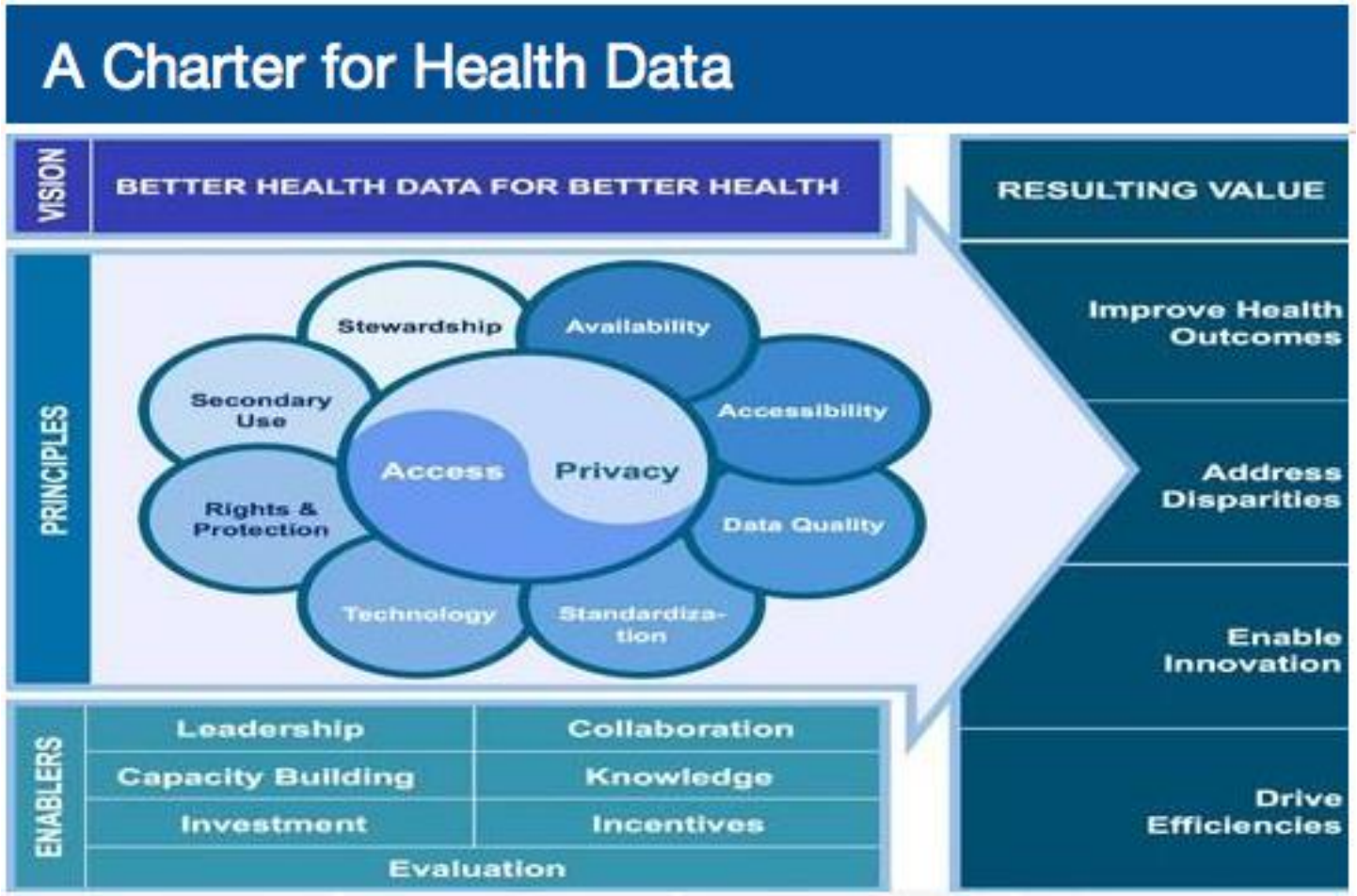


Medical and health data

Standardization

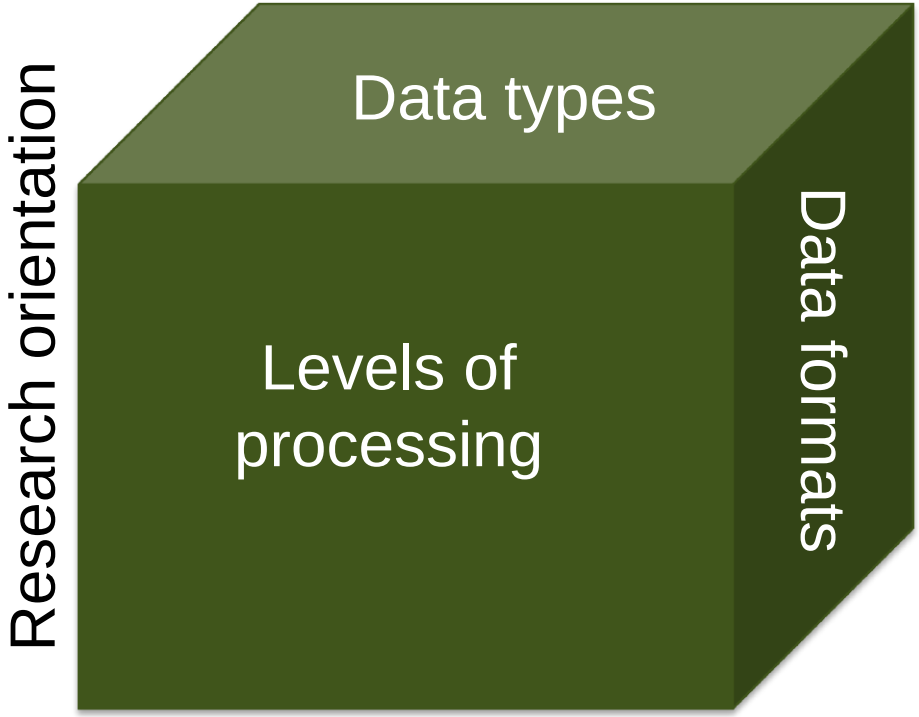
Compliance

Security



http://www.weforum.org/issues/charter-health-data

The multi-dimensions of data



Scientific data formats

Scientific data formats

Common data format
Image formats
Matrix formats
Microarray file formats
Communication protocols

Metaformats

DSV | CSV | XML

Data structures

Tuple Set List Array Tree

Physical data

Bits···Bytes···characters···strings

Data model

Hierarchical

Relational

Object-oriented

Network

Software specific data formats

Quantitative data analysis

SPSS SAS R

Qualitative data analysis

NVivo QDA Atlas.ti

Microsoft Office

Open Office

Scientific & medical data formats

- Medical and Physiological Data Formats
  - BDF — BioSemi data format (.bdf)
  - EDF — European data format (.edf)
- Molecular Biology data Formats
  - PDB — Protein Data Bank format (.pdb)
  - MMCIF — MMCIF 3D molecular model format (.cif)
- Medical Imaging
  - DICOM — DICOM annotated medical images (.dcm, .dic)

- Chemical Formats
  - XYZ — XYZ molecule geometry file (.xyz)
  - MOL — MDL MOL format (.mol)
  - MOL2 — Tripos MOL2 format (.mol2)
  - SDF — MDL SDF format (.sdf)
  - SMILES — SMILES chemical format (.smi)
- Bioinformatics Formats
  - GenBank — NCBI GenBank sequence format (.gb, .gbk)
  - FASTA — bioinformatics sequence format (.fasta, .fa, .fsa, .mpfa)
  - NEXUS — NEXUS phylogenetic data format (.nex, .ndk)

Summary

- Scientific data formats are closely tied to scientific computing
  - Data structure, model, and attributes
  - Self-descriptive with header/metadata
  - API for manipulating the data
  - Interoperability: conversion between different formats
- No one-format-fits-all standard
- Each standard has one or more tools for creating, editing, and annotating dataset

What is a dataset?

What are some of the metadata standards for describing datasets?

What is data management?

DATASETS, METADATA, AND DATA MANAGEMENT

Dataset classification

Volume
Large-volume
Small-volume

Collection source type

Discipline

Level of interpretation
Measurements
Observations
Derived observations
Synthetic observations
Interpretations

Data structure

Ecological data example: Instantaneous streamflow by watershed

http://www.hubbardbrook.org/data/dataset.php?id=1

DATASET

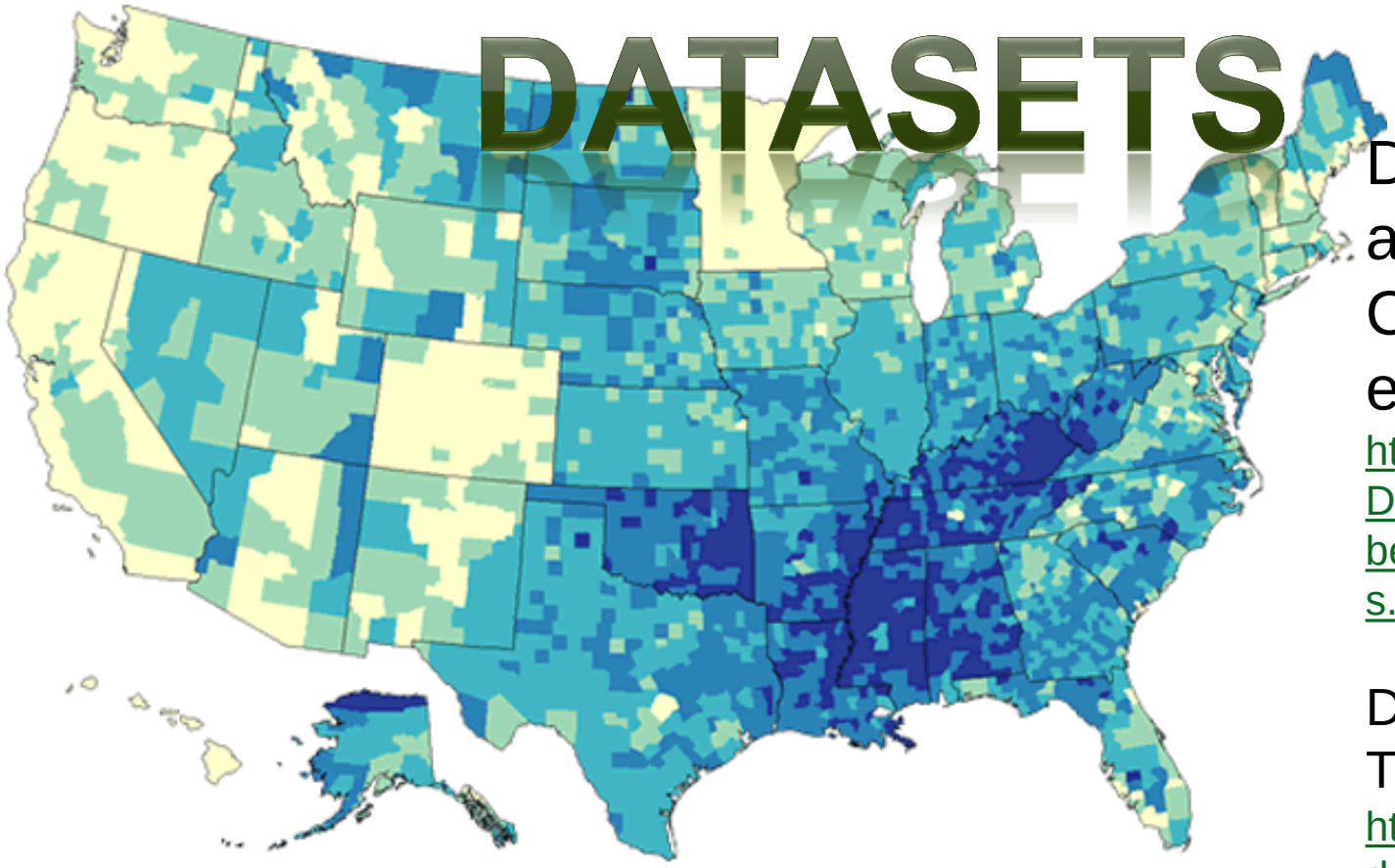
WS	MO	DA	YR	TIME	GAGE FT.	GAGE CM.	DISCH. C.F.S.	DISCH L\S.	INTERV. INCH
1	1	1	08	455	0.240	7.370	0.0700	2.0100	0.01000
1	1	1	08	1022	0.240	7.370	0.0700	2.0100	0.01000
1	1	1	08	595	0.240	7.460	0.0700	2.0700	0.01000
1	1	1	08	1[illegible]	0.240	7.430	0.0700	2.0500	0.01000
1	1	1	08	2400	0.240	7.400	0.0700	2.0300	0.00643
1	1	2	08	645	0.230	7.280	0.0600	1.9500	0.01000
1	1	2	08	1357	0.230	7.250	0.0600	1.9300	0.01000
1	1	2	08	2004	0.220	6.980	0.0600	1.7500	0.01000
1	1	2	08	2400	0.230	7.010	0.0600	1.7700	0.00841
1	1	3	08	447	0.220	6.790	0.0500	1.6600	0.00922
1	1	3	08	1195	0.220	6.700	0.0500	1.6300	0.01000
1	1	3	08	1822	0.220	6.730	0.0500	1.6400	0.01000
1	1	3	08	2384	0.210	6.670	0.0500	1.6100	0.01000
1	1	3	08	2400	0.220	6.730	0.0500	1.6400	0.00033
1	1	4	08	573	0.220	6.790	0.0500	1.6600	0.01000
1	1	4	08	1184	0.220	6.730	0.0500	1.6400	0.01000
1	1	4	08	1725	0.220	6.880	0.0600	1.7000	0.01000
1	1	4	08	2227	0.220	6.820	0.0500	1.6700	0.01000
1	1	4	08	2383	0.220	6.850	0.0500	1.6900	0.00316

County Level Estimates of Leisure-Time Physical Inactivity — U.S. Maps

Indicator	Year	Data Type	Classification	
Physical Inactivity	2008	Age-Adjusted % of Adults	Trends	GO

2008 Age-Adjusted Estimates of the Percentage of Adults† Who Are Physically Inactive

DATASETS



Download data: Excel | PPT

Download all maps: PPT

Data Dictionary

Methodology

- 0 - 19.9
- 20.0 - 24.1
- 24.2 - 27.9
- 28.0 - 32.5

Diabetes data and trends—Country level estimates: http://apps.nccd.cdc.gov/DDT_STRS2/NationalDiabetesPrevalenceEstimates.aspx?mode=PHY ;

Diabetes Data & Trends home page: http://apps.nccd.cdc.gov/ddtstrs/default.aspx

Clinical trials data management:

http://www.clinicaltrials.gov/ct2/show/NCT00006286?term=TADS+NIMH&rank=1

A service of the U.S. National Institutes of Health

Study 1 of 1 for search of: TADS NIMH

Previous Study | Return to Search Results | Next Study

Full Text View | Tabular View | No Study Results Posted | Related Studies

Treatment for Adolescents With Depression Study (TADS)

This study has been completed.

First Received on September 14, 2000. Last Updated on January 18, 2008 History of Changes

Sponsor:	National Institute of Mental Health (NIMH)
Information provided by:	National Institute of Mental Health (NIMH)
ClinicalTrials.gov Identifier:	NCT00006286

Purpose

TADS is designed to compare the effectiveness of established treatments for teenagers suffering from major depressive disorder (MDD). Treatment are: psychotherapy ("talking therapy"); medication; and the combination of psychotherapy and medication. Altogether, 192 teenagers (both males and females) ages 12 to 17, will take part in this study at 12 sites in the United States.

The **TADS** design will provide answers to the following questions: What is the long-term effectiveness of medication treatment of teenagers who have major depression? What is the long-term effectiveness of a specific psychotherapy ("talking therapy) in the treatment of teenagers who have major depression? How does medication treatment compare with psychotherapy in terms of effectiveness, tolerability and teenager and family acceptance? And, What is the cost-effectiveness of medication, psychotherapy and combined treatments?

The medication being used in this study is called fluoxetine. Fluoxetine is also known as Prozac. Research has shown that medications like Prozac help depression in young persons. Fluoxetine has been approved by the FDA for use in the treatment of child and adolescent (ages 7 to 17 years) depression.

The psychotherapy or "talking therapy" being used in this study is called Cognitive Behavioral Therapy (CBT). CBT is a talking therapy that will teach both the teenager and his or her family member (e.g., parent) new skills to cope better with depression. Specific topics include education about depression and the causes of depression, setting goals, monitoring mood, increasing pleasant activities, social problem-solving, correcting negative thinking, negotiation, compromise and assertiveness. CBT sessions may also help with resolving disagreements as they affect families.

DATASETS

Common in the examples

- Attributes of a dataset tell users/managers:
  - What the dataset is about
  - How data was collected
  - To which project the data is related
  - Who were responsible for data collection
  - Who you may contact to obtain the data
  - What publications the data have generated
  - ??

Metadata standards in medical & health sciences

Structure

Healthcare

Medical images

Bioinfomatics

HL7

DICOM

GenBank

Semantics

NCBI Taxonomy

NCBO Bioportal

UMLS

MeSH (Medical Subject Headings)

SNOMED CT (Systematized Nomenclature of Medicine--Clinical Terms)

Datasets are the objects in data collections…

Research data collections

	Size	Metadata Standards	Management
Reference collection	Larger, discipline-based	Multiple, comprehensive	Organized Institutionalized,
Resource collection			
Research collection	Smaller, team-based	None or random	Heroic individual inside the team

Datasets, data collections, and data repositories

- ***Data collections*** are built for larger segments of science and engineering
- ***Datasets***
  - typically centered around an event or a study
  - contain a single file or multiple files in various formats
  - coupled with documentation about the background of data collection and processing

System for storing, managing, preserving, and providing access to datasets

Data repository

A repository may contain one or more data collections

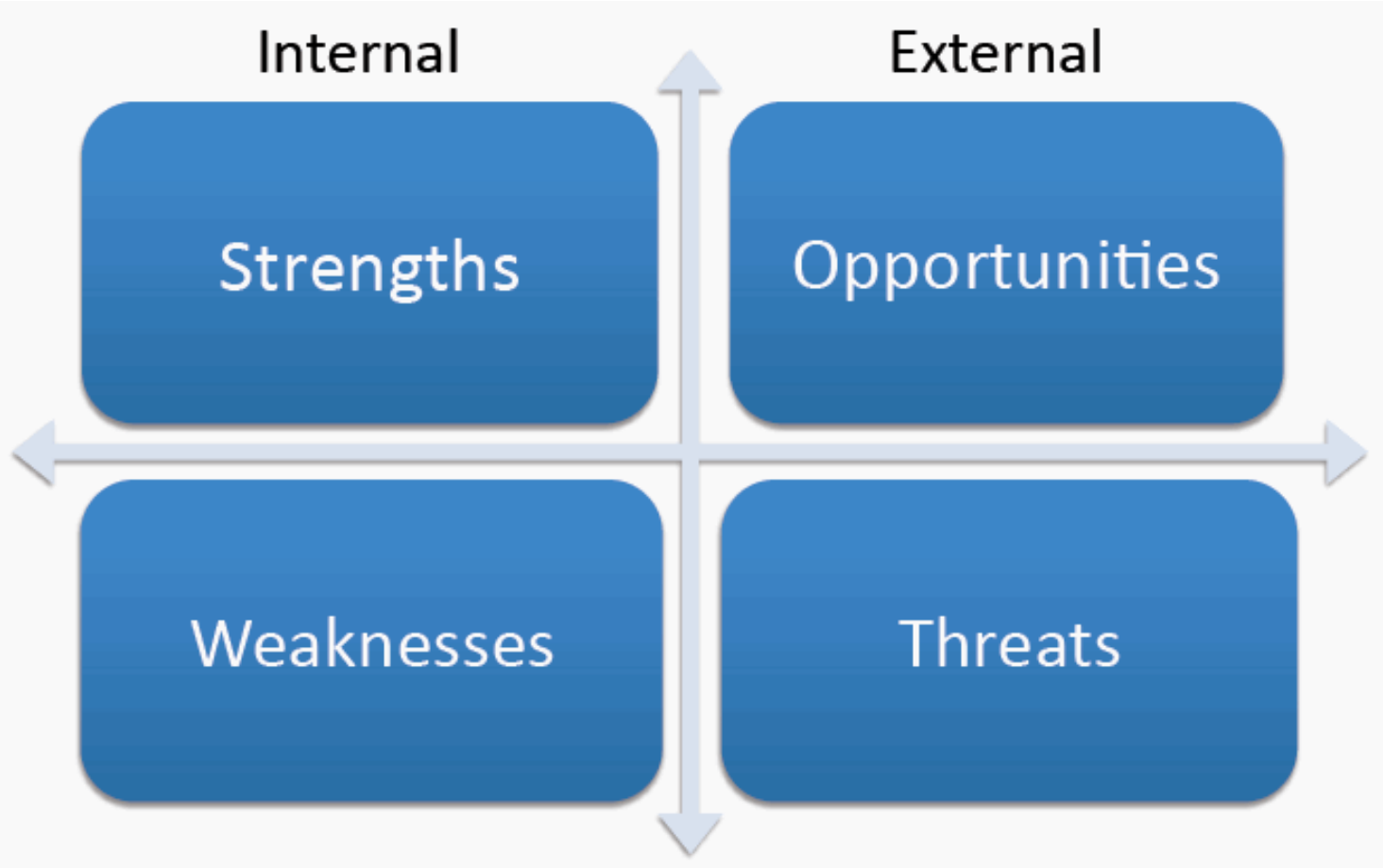
A data collection may contain one or more datasets

A dataset may contain one or more data files

Exciting opportunities,

Practical challenges

Planning tool: SWOT analysis



Example of SWOT analysis: ARL/DLF's E-Science Institute

- Baseline module: develop a basic understanding of eResearch
- Context module: environment scan
- Building blocks module: SWOT analysis of organizational change, collaboration, sustainability, policy

This example is based on Gail Steinhart's guest lecture to the Data Services course at Syracuse iSchool, February, 2012.

ARL/DLF's E-Science Institute: Baseline module

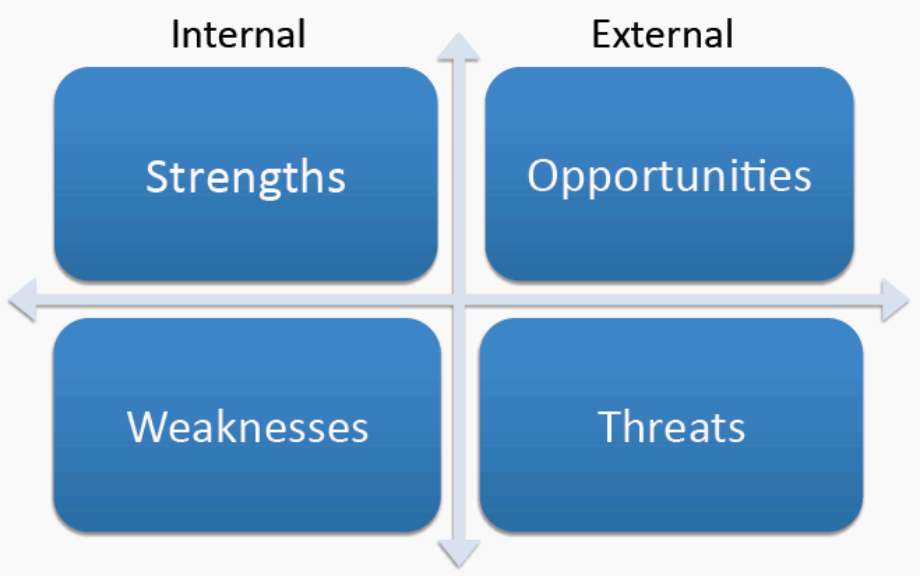
- Self-assessment:
  - Organization of research, IT, cyberinfrastructure at your institution
  - Major sources of funding, research areas
  - Key research centers, individuals, partnerships
- Identifying interview candidates: university administration, IT leaders, key faculty/researchers

ARL/DLF's E-Science Institute: Context module

- Self-assessment:
  - Institutional culture & priorities
  - Current infrastructure and staffing
  - Library & change
  - Sustainability and assessment of initiatives
  - Other activities

ARL/DLF's E-Science Institute: Building blocks module

- Turn interview transcripts and self-assessments into "statements"
- Classify statements as Strength, Weakness, Opportunity, Threat



Starting the Conversation: University-wide Research Data Management Policy

Ricky Erway
Senior Program Officer
OCLC Research

http://oclc.org/content/dam/research/publications/library/2013/2013-08.pdf

Contents

Key issue 1: Staffing

- ARL survey report (2013):
  - Subject librarian or liaison (50%)
  - Digital (38%)
  - Data librarian (18%)
  - Metadata (17%)
  - Data services (13%)
  - GIS or Geospatial (12%)
  - Research data (11%)
  - Curation (11%)
  - Repository (10%)
  - Software or systems (9%)
  - Data management (9%)

Key issue 2: funding

- Internal library regular budget 98%
- Direct administrative funding (separate from library funds) 11%
- External grant funding 11%
- Internal library temporary or special project budget 9%
- Department or research institute/project group funds 6%
- Endowment fund 6%
- Fee to researcher or researcher's grant 4%
- Facilities and administrative (F&A) funding 2%
- Other source of funding 9%

(N=57, from Fearon et al., 2013)

Key issue 3: training

- Training / Experience most important to RDM:
  - Subject domain expertise
  - Digital/data curation training
  - IT technology or services experience
  - Library MLS/MLIS training
- Particularly important:
  - Research methods and data analysis
  - Research data management
  - Data curation
  - Scholarly communication
- Other skills and training:
  - Identifying and applying metadata standards
  - Digital preservation
  - Data ownership policies
  - Ethical and legal issues
  - Data security
  - Data sharing and access
  - Data storage and backup planning
  - Data retention policy
  - Data citation

Key issue 4: data policies

- Institutional data policies
- Project data policies

Data policies are a major component of the institutionalization of research data management

Cornell University

Search Cornell

RESEARCH
Data Management
SERVICE GROUP

comprehensive data management planning and services

Home | Writing a Data Plan | Services | Contact | About | Printable View | Search

Cornell Research Data Management Services

Services and expertise related to the management of research data are distributed throughout multiple units at Cornell University. This is meant to serve as a directory to research data services at Cornell.

- Data Management Planning Overview - resources for meeting funding requirements, and general planning guidance
- Storage and backup
- Metadata
- Data analysis
- Collaboration tools
- High performance computing
- Privacy and confidentiality
- Intellectual property and copyright
- Data publication

See a list of all service providers listed in these pages.

https://confluence.cornell.edu/display/rdmsgweb/services

CMM for RDM: Guidelines for research data management

WIKI: xwiki ▼ » SPACE: Main ▼ » PAGE: WebHome REGISTER LOG IN

CMM for RDM A Capability Maturity Model for Research Data Management

http://rdm.ischool.syr.edu/xwiki/bin/view/Main/

EXPORT ▼ MORE ACTIONS ▼ ANNOTATIONS

Welcome to CMM for RDM

Last modified by Arden Kirkland on 2014/04/20 13:48

The Model

Go straight to the model:

Capability Maturity Model for Research Data Management

About

The broad goals of this project are to document, foster and promulgate best practices in research data management (RDM), practices that support research transparency and the replication of scientific results. We do so in order to cultivate a new generation of researchers and data managers who are both the best practice beneficiaries and contributors. Furthermore, as more organizations invest in RDM, it has become increasingly important for administrators, researchers, and managers to be able to evaluate RDM process for sustainability, efficiency, and effectiveness, which requires a baseline for comparison.

ALFRED P. SLOAN FOUNDATION ICPSR

Latest News

News

CMM4RDM v1.0 is officially launched

We are very pleased to announce the official launch of this wiki for the Capability Maturity Model for Research Data Management, at http://rdm.ischool.syr.edu.

A few of you may already have visited this wiki when we shared it, in draft form, with participants at a workshop for RDAP in March 2014. Now we are opening it up to the wider research data management community.

Is your institution, organization, or project trying to evaluate improvements that are needed for your research data management process? The guidelines and rubrics included in this wiki can help with the evaluation of each individual practice within the overall research data management process. ...

RDAP14 Summit Workshop Information

A workshop on the CMM for RDM will be offered at the Research Data Access and Preservation Summit 2014on March 26-28, 2014, in San Diego, CA, USA ...

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TAG CLOUD

ability to perform access activities performed backup bibliography budget business model Capability maturity levels citation collaboration collection

Case Discussions

Case Study #1: To build or not to build a data repository?

A university library has developed an institutional repository for preserving and providing access to the scholarly output by the researchers in this institution. Now the new challenge arises from e-science research demanding data management plan by the funding agency and the linking between publications and data by the authors and users. You already know that some faculty use their disciplinary data repository for submitting their datasets (e.g., GenBank for microbiology research data). The problem you face now is whether an institutional data repository should be built for those who do “small science” and don’t have funding nor expertise to manage their data.

Questions to be addressed:

- What are the strategies you will use to approach the problem?
- What are the possible solutions for the problem?
- What are some of the tradeoffs for the solutions you will adopt?

Case study #2: Developing a data taxonomy

The concept of research data management is a stranger to many faculty as well as your library staff. What is data? What is a data set? These seemingly simple terms can be very confusing and have different interpretations in different contexts and disciplines. As part of the data management strategies, you decide to develop an authoritative data taxonomy for the campus research community. This data taxonomy will benefit the creation and use of institutional data policies, data repository or repositories, and data management plans required of funding agencies.

Questions to be addressed:

- What should the data taxonomy include?
- What form should it take, a database-driven website or a static HTML page?
- Who should be the constituencies in this process?
- Who will be the maintainer once the taxonomy is released?

Case study #3: Developing a data policy

Data policies play an important role in governing how the data will be managed, shared, and accessed. It is also an instrument that will fend off potential legal problems. Data policies have several types: data access and use, data publishing, and data management. Your university's Office of Sponsored Research has some existing policy on data, but it is neither systematic nor complete. Many of the terms were defined years ago and did not cover the new areas such as the embargo period of data. As the university has decided to build a data repository for managing and preserving datasets, a data policy has become one of the top priorities for both the institution and the data repository.

Questions to be addressed:

- What should the data policy include?
- Who should be the constituencies in this process?
- Who will be the interpretation authority for the data policy?

Case study #4: Cataloging datasets

Describing datasets is the process of creating metadata for datasets. In scientific disciplines, several metadata standards have been developed, e.g., the Content Standard for Digital Geospatial Metadata (CSDGM), Darwin Core, and Ecological Metadata Language (EML). Each of these metadata standards contains hundreds of elements and requires both metadata and subject knowledge training in order to use them. Besides, creating one record using any of these standards will require a tremendous time investment. But you library does not have such specialized personnel nor have the fund to hire new persons for the job. The existing staff has some general metadata skills such as Dublin Core. In deciding the metadata schema for your data repository, you need to address these questions:

- Should I adopt a metadata standard or develop one tailored to our need?
- How can I learn what metadata elements are critical to dataset submitters and searchers?
- What are some of the benefits and disadvantages for adopting a standard or developing a local schema?

Case study #5: Evaluating data repository tools

Research data as a driving force for e-science is inherently a tool-intensive field. Tools related to data management can be divided into two broad categories: those for creating metadata records and those for data repository management. An academic institution decided to build their own data repository as part of the supporting service for researchers to meet the data management plan requirement of funding agencies. This data repository development task was handed down to the library. You the library director have to decide whether to develop an in-house system or use an off-the-shelf software system. As usual, you put together a taskforce to find a solution to this challenge. The questions to be addressed by the taskforce include:

- What are the options available to us?
- What evaluation criteria are the most important to our goal?
- What are the limitations for us to adopt one option or the other?
- How will this option be interoperate with existing institutional repository system? Or, can the existing repository system used for data repository purposes?

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