TIB | TECHNISCHE INFORMATIONSBIBLIOTHEK

TIB's action for research data management as a national library's strategy - in the “Big Data” era

Peter Loewe
Tokyo
February 5 , 2013

Scope

1. Introducing the TIB
2. The State of Research Data Management – DataCite
3. The GOPORTIS network
4. The RADAR project
5. Libraries in the “Big Data” era

TIB Hannover – The facts

= **German National Library of Science and Technology**

- Engineering, architecture, chemistry, information technology, mathematics and physics
- Founded in 1959
- Financed by Federal Government and all Federal States

TIB German National Library of Science and Technology

3

Main Building

TIB German National Library of Science and Technology

4

Reading Room

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5

The Marstall Building – the former royal horse stables

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6

Main Stacks

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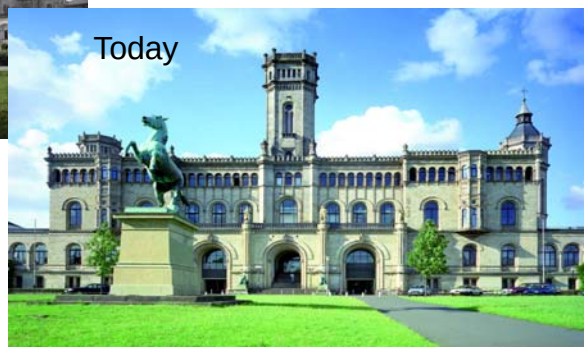
7

Guelph Castle / Leibniz University

Ca. 1900

Leibniz Universität Hannover

Today



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TIB Hannover – Additional facts

- € 14,7m annual acquisition budget

- 52,700 journal subscriptions (16,800 print; 35,900 digital)
- 9m items

- Staff: ca. 400 people

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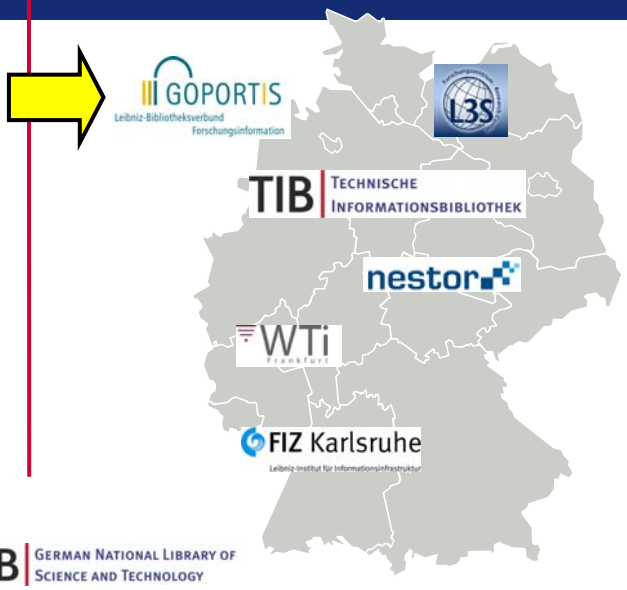
TIB Networks in Germany



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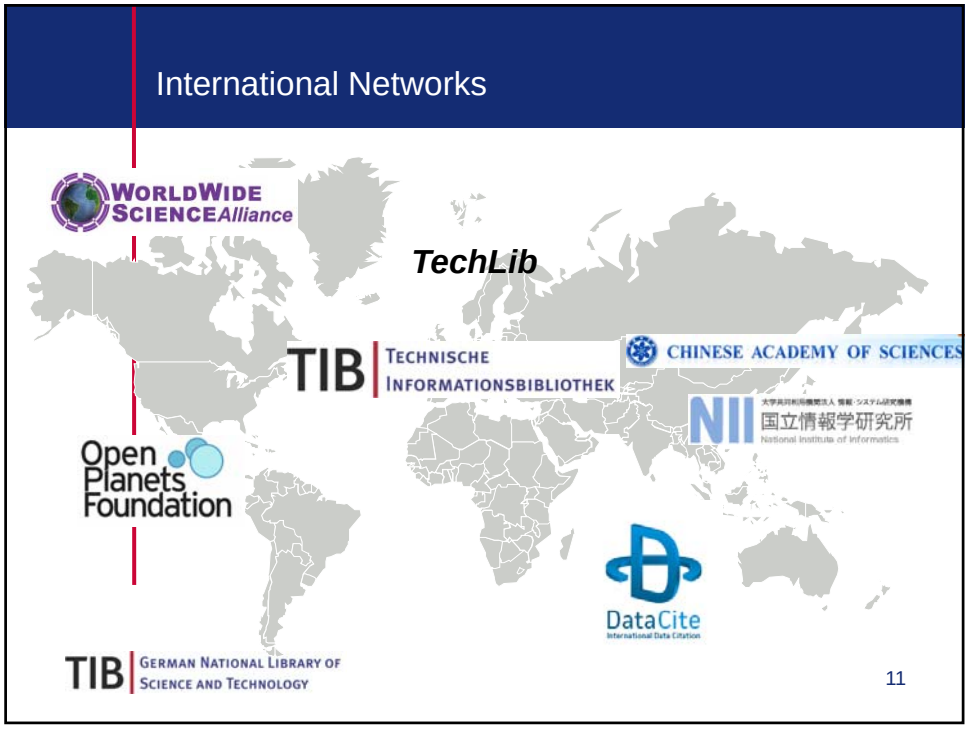
International Networks
WORLDWIDE SCIENCE Alliance
TechLib
TIB TECHNISCHE INFORMATIONSBIBLIOTHEK
CHINESE ACADEMY OF SCIENCES
NII 国立情報学研究所
National Institute of Informatics
Open Planets Foundation
DataCite
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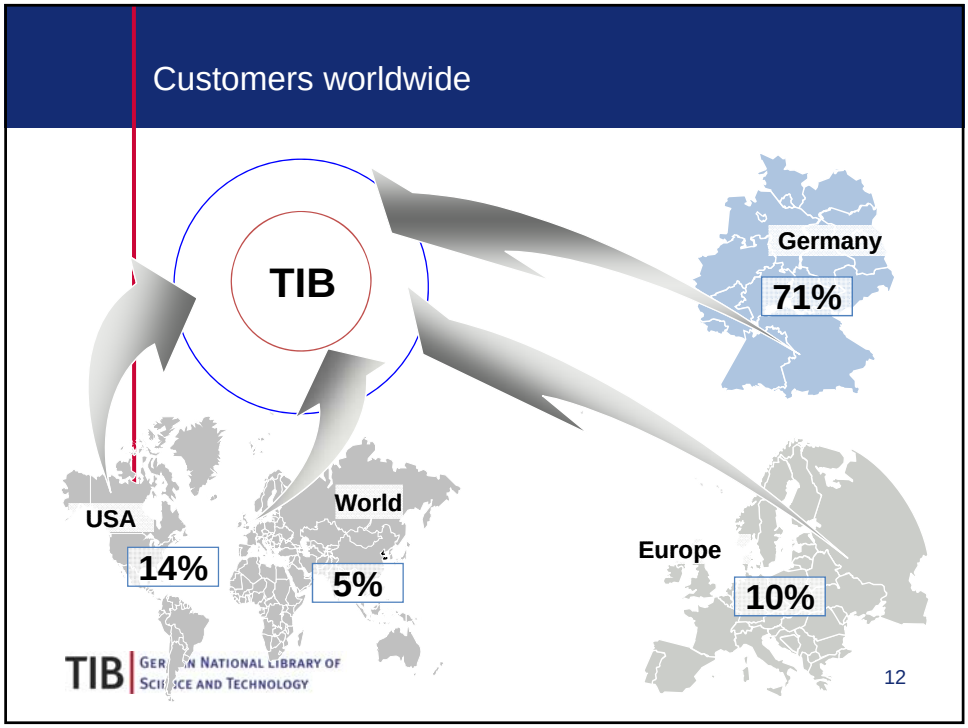
Customers worldwide
TIB
Germany
71%
USA
14%
World
5%
Europe
10%
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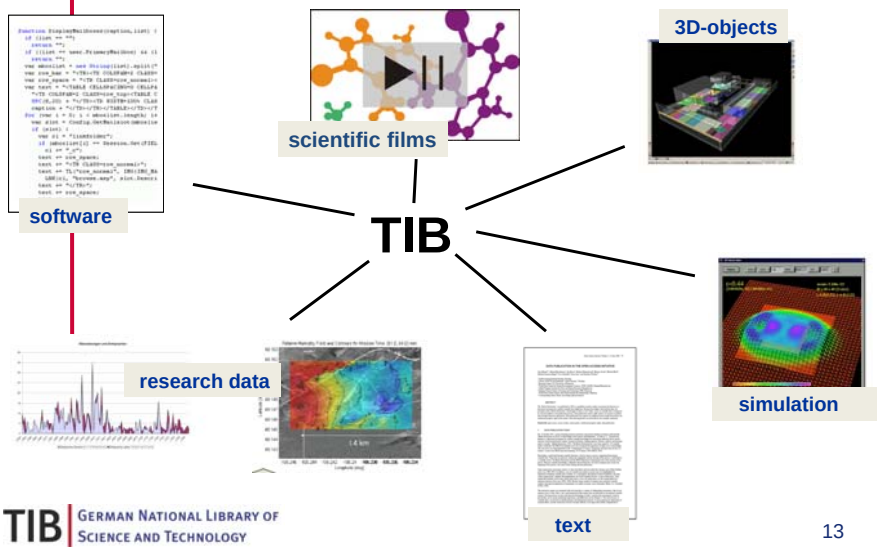
Vision and Strategy



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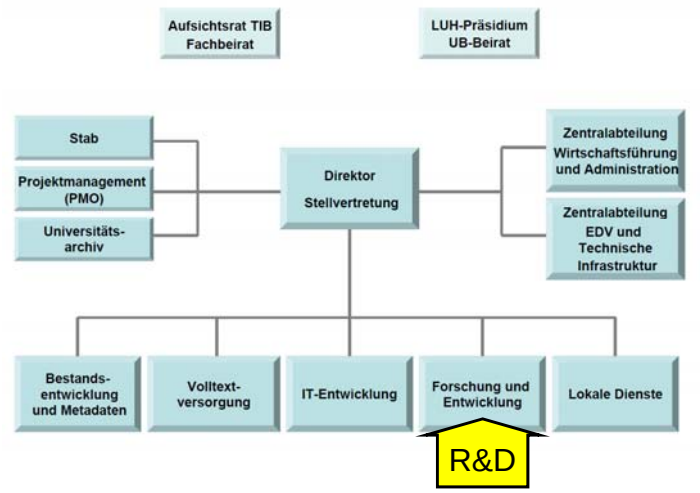
2013: Launch of the Research & Development Department



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Research data Management

What is the general problem with research data?

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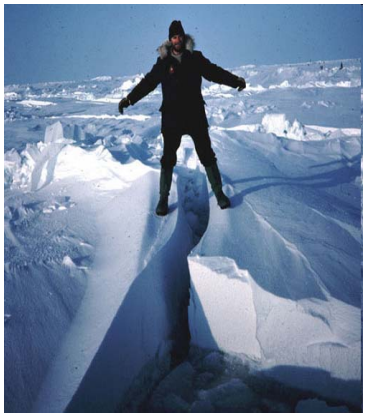
A Gap

- **A widening gap in the scientific record** between published research in a **text** document and the **data** that underlies it
- **As a result, datasets are**
  - Difficult to discover
  - Difficult to access
- **Scientific information gets lost**



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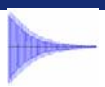
The Research Trajectory

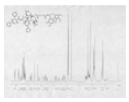
Data



... is lost!

analysed
interpreted

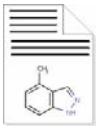
Information



... is traceable

published

Knowledge



... is accessible

Publication

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Solution

- Creation of new and strenghtening of existing data centres
- Global access to data sets and their metadata through existing catalogues
- By the use of persistent identifiers for data
- Monitoring of new technology trends in Science

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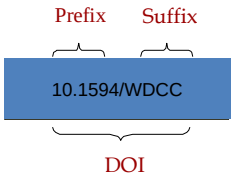
Digital Object Identifier (DOI) - a persistent identifier

- The DOI system is a worldwide system for persistent and actionable identification and interoperable exchange of intellectual property on digital networks
- A DOI name is made up of two components, the prefix and the suffix



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DOI names for citations

- **URLs are not persistent**
- (e.g. Wren JD: **URL decay in MEDLINE- a 4-year follow-up study**. Bioinformatics. 2008, Jun 1;24(11):1381-5).

- **Digital Object Identifiers (DOI names) offer a solution**
- Mostly widely used identifier for scientific articles
- Researchers, authors, publishers know how to use them
- Put datasets on the same playing field as articles

Dataset
Yancheva et al (2007). Analyses on sediment of Lake Maar. PANGAEA.
doi:10.1594/PANGAEA.587840

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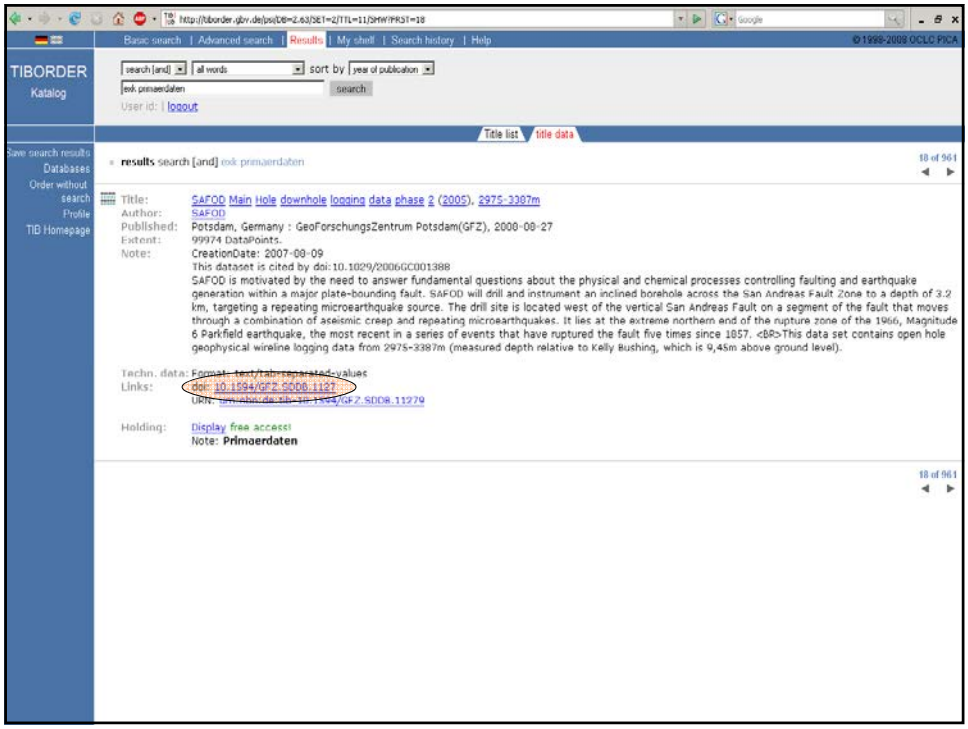
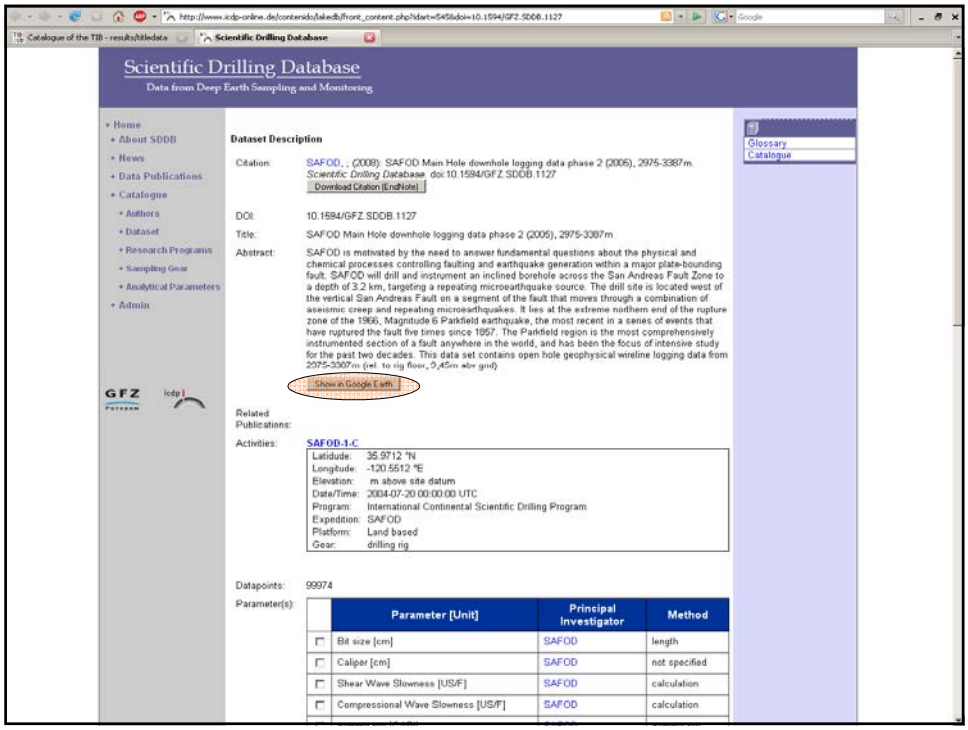
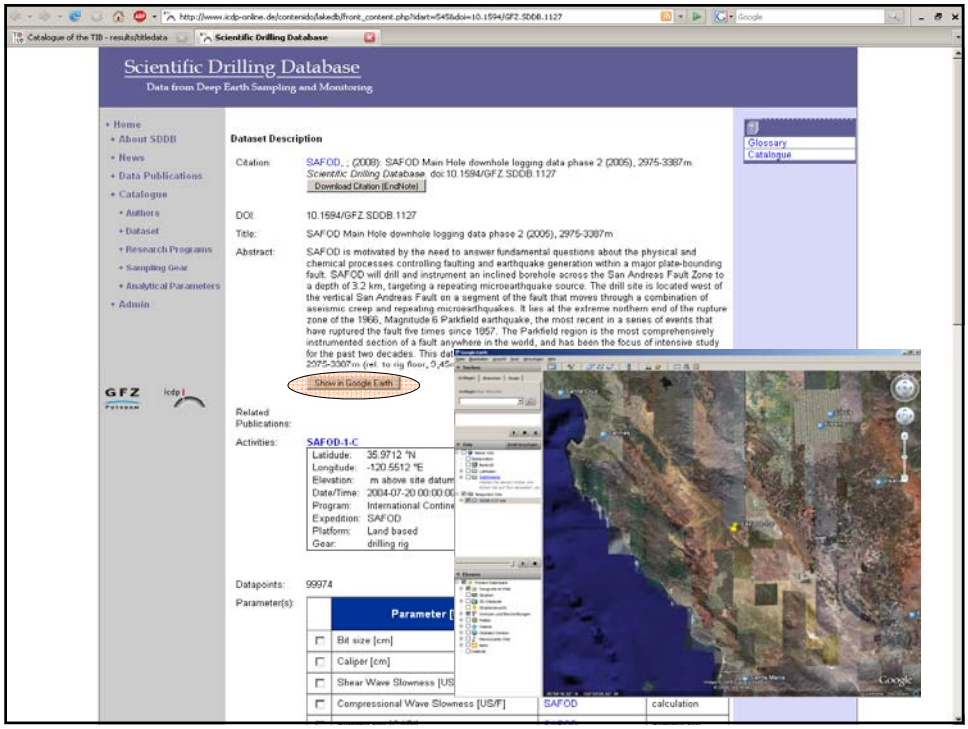
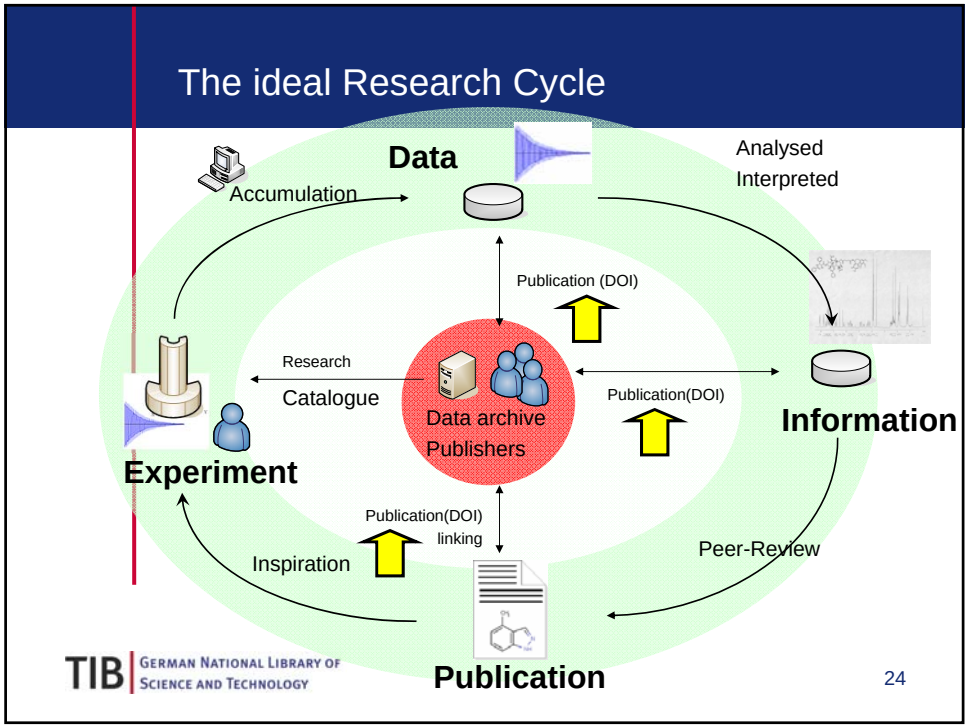

TIBORDER
Katalog
Basic search | Advanced search | Results | My shelf | Search history | Help
Title list | title data
Save search results
Databases
Order without search
Profile
TIB Homepage
Title: SAFOD Main Hole downhole logging data phase 2 (2005), 2975-3387m
Author: SAFOD
Published: Potsdam, Germany : GeoForschungsZentrum Potsdam(GFZ), 2008-08-27
Extent: 99974 DataPoints
Note: CreationDate: 2007-08-09
This dataset is cited by doi:10.1029/2006GC001388
SAFOD is motivated by the need to answer fundamental questions about the physical and chemical processes controlling faulting and earthquake generation within a major plate-bounding fault. SAFOD will drill and instrument an inclined borehole across the San Andreas Fault Zone to a depth of 3.2 km, targeting a repeating microearthquake source. The drill site is located west of the vertical San Andreas Fault on a segment of the fault that moves through a combination of aseismic creep and repeating microearthquakes. It lies at the extreme northern end of the rupture zone of the 1966, Magnitude 6 Parkfield earthquake, the most recent in a series of events that have ruptured the fault five times since 1857.
This data set contains open hole geophysical wireline logging data from 2975-3387m (measured depth relative to Kelly Bushing, which is 9,45m above ground level).
Techn. data: Format: text/tab-separated-values
Links: doi: 10.1594/GFZ.SDDB.1127
Holding: Display free access!
Note: Primaerdaten


Scientific Drilling Database
Data from Deep Earth Sampling and Monitoring
Home
About SDDB
News
Data Publications
Catalogue
Authors
Dataset
Research Programs
Sampling Gear
Analytical Parameters
Admin
Dataset Description
Citation: SAFOD, , (2008): SAFOD Main Hole downhole logging data phase 2 (2005), 2975-3387m. Scientific Drilling Database. doi:10.1594/GFZ.SDDB.1127
Download Citation [EndNote]
DOI: 10.1594/GFZ.SDDB.1127
Title: SAFOD Main Hole downhole logging data phase 2 (2005), 2975-3387m
Abstract: SAFOD is motivated by the need to answer fundamental questions about the physical and chemical processes controlling faulting and earthquake generation within a major plate-bounding fault. SAFOD will drill and instrument an inclined borehole across the San Andreas Fault Zone to a depth of 3.2 km, targeting a repeating microearthquake source. The drill site is located west of the vertical San Andreas Fault on a segment of the fault that moves through a combination of aseismic creep and repeating microearthquakes. It lies at the extreme northern end of the rupture zone of the 1966, Magnitude 6 Parkfield earthquake, the most recent in a series of events that have ruptured the fault five times since 1857. The Parkfield region is the most comprehensively instrumented section of a fault anywhere in the world, and has been the focus of intensive study for the past two decades. This data set contains open hole geophysical wireline logging data from 2975-3387m (rel. to rig floor, 9,45m abv grd).
Show in Google Earth
Related Publications:
Activities: SAFOD-1-C
Latidude: 35.9712 °N
Longitude: -120.5512 °E
Elevation: m above site datum
Date/Time: 2004-07-20 00:00:00 UTC
Program: International Continental Scientific Drilling Program
Expedition: SAFOD
Platform: Land based
Gear: drilling rig
Datapoints: 99974
Parameter(s):
Parameter [Unit] | Principal Investigator | Method
Bit size [cm] | SAFOD | length
Caliper [cm] | SAFOD | not specified
Shear Wave Slowness [US/F] | SAFOD | calculation
Compressional Wave Slowness [US/F] | SAFOD | calculation
Glossary
Catalogue


Scientific Drilling Database
Data from Deep Earth Sampling and Monitoring
Dataset Description
Glossary
Catalogue


The ideal Research Cycle
Data
Accumulation
Analysed
Interpreted
Publication (DOI)
Research
Catalogue
Data archive
Publishers
Publication(DOI)
Information
Experiment
Publication(DOI)
linking
Inspiration
Peer-Review
Publication
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DOI Timeline

- **1999**: Publishers funded their independent DOI agency CrossRef
- **2005**: The TIB became a **DOI registration agency for primary data** (and other non-commercial scientific information)
- **2009:** TIB transited the DOI registration to a new worldwide agency, named **DataCite**.
- **2015**: Upcoming **tenth years anniversary** celebration of TIB as a DOI registration entity

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DataCite – DOI registration worldwide

- DataCite supports researchers by enabling them to locate, identify, and cite research datasets with confidence
- DataCite supports data centres by providing workflows and standards for data publication
- DataCite supports publisher by enabling linking from articles to the underlying data

http://www.datacite.org

DataCite

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DataCite

- Global consortium carried by local institutions
- focused on improving the scholarly infrastructure around datasets and other non-textual information
- focused on working with data centres and organisations that hold content
- Providing standards, workflows and best-practice
- Founded December 1st 2009 in London

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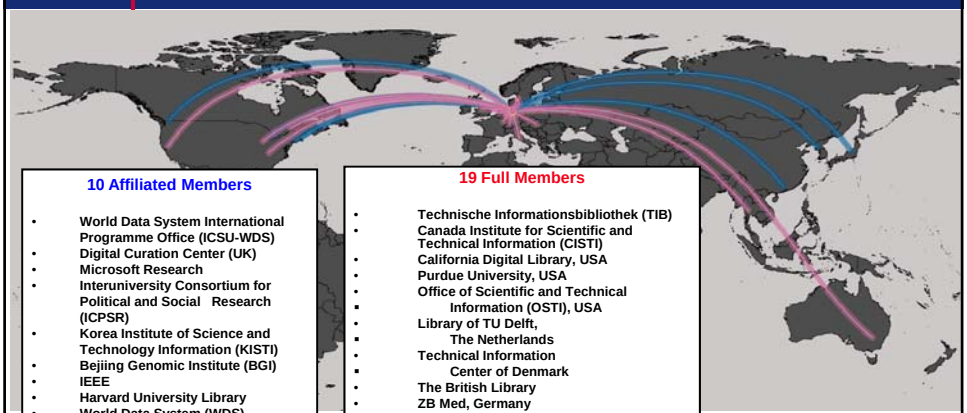
Global Network of DataCite members



10 Affiliated Members

- World Data System International Programme Office (ICSU-WDS)
- Digital Curation Center (UK)
- Microsoft Research
- Interuniversity Consortium for Political and Social Research (ICPSR)
- Korea Institute of Science and Technology Information (KISTI)
- Bejiing Genomic Institute (BGI)
- IEEE
- Harvard University Library
- World Data System (WDS)
- GWDG

19 Full Members

- Technische Informationsbibliothek (TIB)
- Canada Institute for Scientific and Technical Information (CISTI)
- California Digital Library, USA
- Purdue University, USA
- Office of Scientific and Technical Information (OSTI), USA
- Library of TU Delft, The Netherlands
- Technical Information Center of Denmark
- The British Library
- ZB Med, Germany
- ZBW, Germany
- Gesis, Germany
- Library of ETH Zürich
- L'Institut de l'Information Scientifique et Technique (INIST), France
- Swedish National Data Service (SND)
- Australian National Data Service (ANDS)
- Conferenza dei Rettori delle Università Italiane (CRUI)
- National Research Council of Thailand (NRCT)
- The Hungarian Academy of Sciences

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DataCite in 2014

- Over 2,500,000 DOI names registered so far.
- 272 data centers.
- 8,000,000 resolutions in 2013.
- DataCite Metadata schema published (in cooperation with all members) http://schema.datacite.org
- DataCite MetadataStore
- http://search.datacite.org

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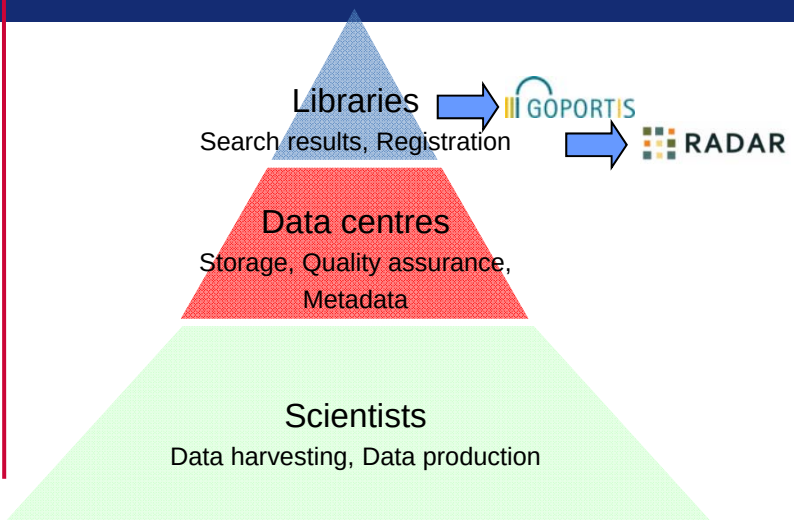
Data Infrastructures: High Level View



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GOPORTIS –
Leibniz Library Network for Research Information

GOPORTIS
Leibniz-Bibliotheksverbund
Forschungsinformation

GOPORTIS - aims, tasks and organisation

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GOPORTIS – Mission statement

GOPORTIS

GOPORTIS is a strategic network of the German National Libraries (ZB MED, ZBW and TIB)

GOPORTIS supports individual scholarly working processes to ensure excellence in research.

GOPORTIS conducts application-oriented research in information science, provides information infrastructures and develops them continuously.

The GOPORTIS network protects the interests of science and supports political decision-making.

GOPORTIS maintains and expands strategic cooperations with national and international partners.

GOPORTIS actively participates in the change of scholarly working processes to strengthen Germany as a location for science.

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The National German Libraries

- National and public institutions
- Financed by german federal government and states
- Responsibilities: collection, providing access and archival storage of scientific information, literature and other media in the relevant disciplines
- Providing literature and information for the special interests of science and research
- Almost full collection inclusive grey literature
- Archiving

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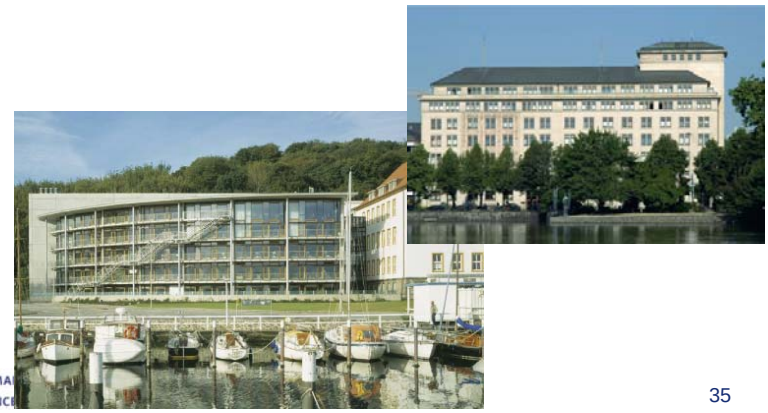
German National Library of Medicine (ZB MED)

- Second largest European Library in the fields of Medicine, Nutrition, Environment and Agriculture
- Located in Cologne and Bonn

TIB German National Library of Science and Technology

German National Library of Economics (ZBW)

- The world's largest library for economics
- Located in Kiel and Hamburg



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Cooperation and Collaboration

There are **three fields of cooperation** in GOPORTIS:

- **Provision of scientific content**
- **Research and Innovation**
- **Political work**

This includes collaborations on the **operative level**. The citeria for a collaboration field are:

- **All partners work in the field**
- **There is a strategic relevance for all partners**

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Subject areas GOPORTIS

- Agricultural Science
- Architecture
- Economics, Business and Practice
- Chemistry
- Computer Science
- Environmental Science
- Mathematics
- Medicine
- Nutrition
- Physics
- Technology

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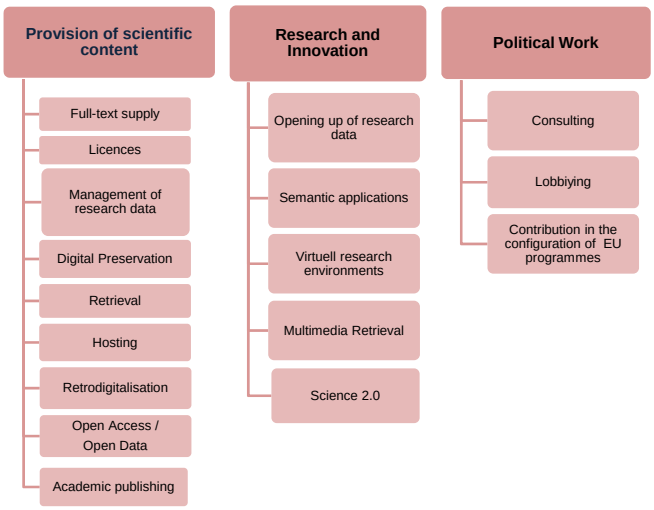
Cooperation and competence



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RADAR

The RADAR project

Research Data Repositorium

www.radar-projekt.org

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Research Data Repositorium (RADAR)

Details

Target groups: research projects, scientific institutions, libraries, publishers

Extension of renowned, discipline-specific data repositories; cross-platform data sharing is possible via appropriate APIs

Project duration: 01.09.2013 - 30.08.2015; possible extension until 30.08.2016

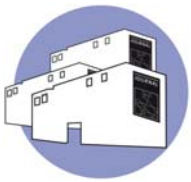
funded by DFG

Repository Services

Two-stage approach:
a) **starter package** (discipline-agnostic) **for preserving research data**
and
b) **superior package for preserving data with integrated data publication**

Including:
bitstream preservation

Sustainable cost model
→ ‚pay to publish'



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Project Partners

RADAR

- **FIZ Karlsruhe – Leibniz-Institute for Information Infrastruktur (FIZ)**
- **Karlsruher Institute for Technology (KIT)**
  - **Steinbuch Centre for Computing (SCC)**
- **Leibniz-Institute für Plant Biochemistry (IPB)**
- **Ludwig-Maximilians-Universität München (LMU)**
  - **Faculty of Chemistry und Pharmacy**
- **German National Library of Science and technology (TIB)**

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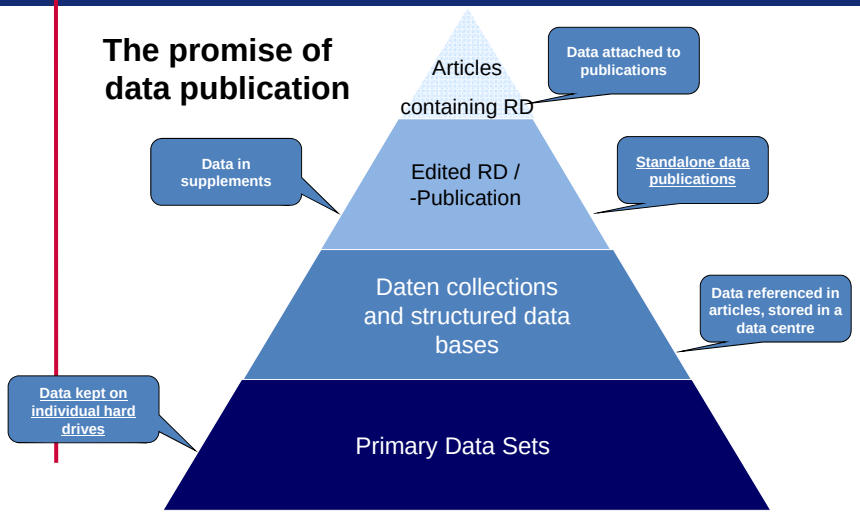
Motivation
Research Data Landscape (RD)

RADAR

The promise of data publication



Modifiziert nach Dallmeier-Tiessen S. et al. 2012. ODE - Opportunities for Data Exchange. D6.1 Summary of the studies, thematic publications and recommendations. ODE-WP6-DEL-0001-1_0

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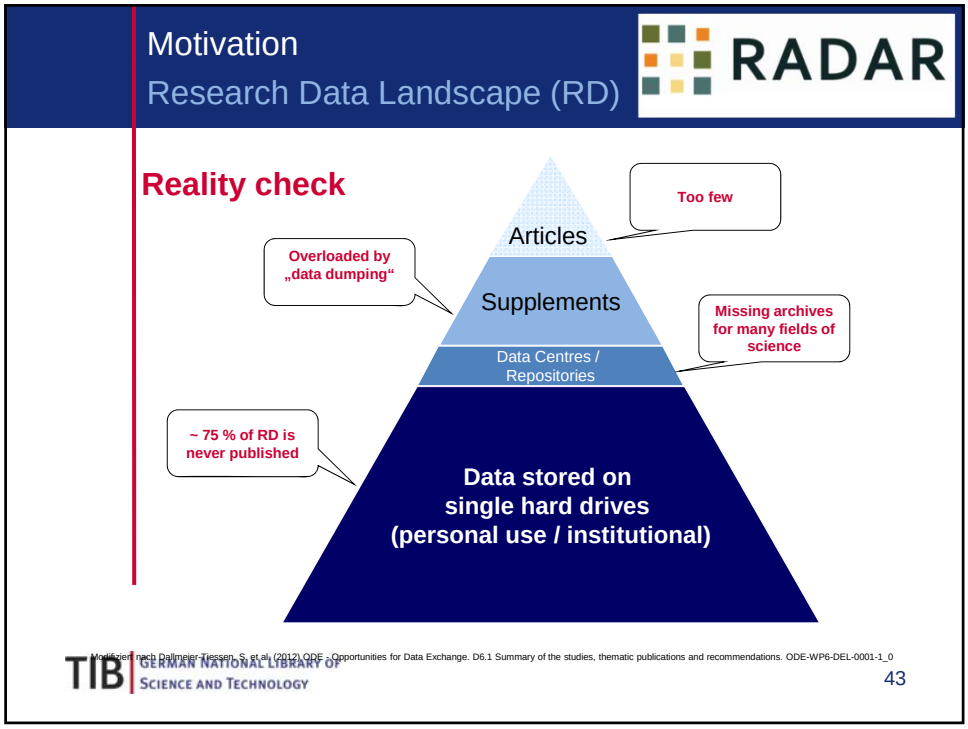
Motivation
Research Data Landscape (RD)
RADAR
Reality check
Too few
Articles
Overloaded by „data dumping“
Supplements
Missing archives for many fields of science
Data Centres / Repositories
~ 75 % of RD is never published
Data stored on single hard drives (personal use / institutional)
Modifiziert nach Dallmeier-Tiessen, S. et al. (2012) ODE - Opportunities for Data Exchange. D6.1 Summary of the studies, thematic publications and recommendations. ODE-WP6-DEL-0001-1_0
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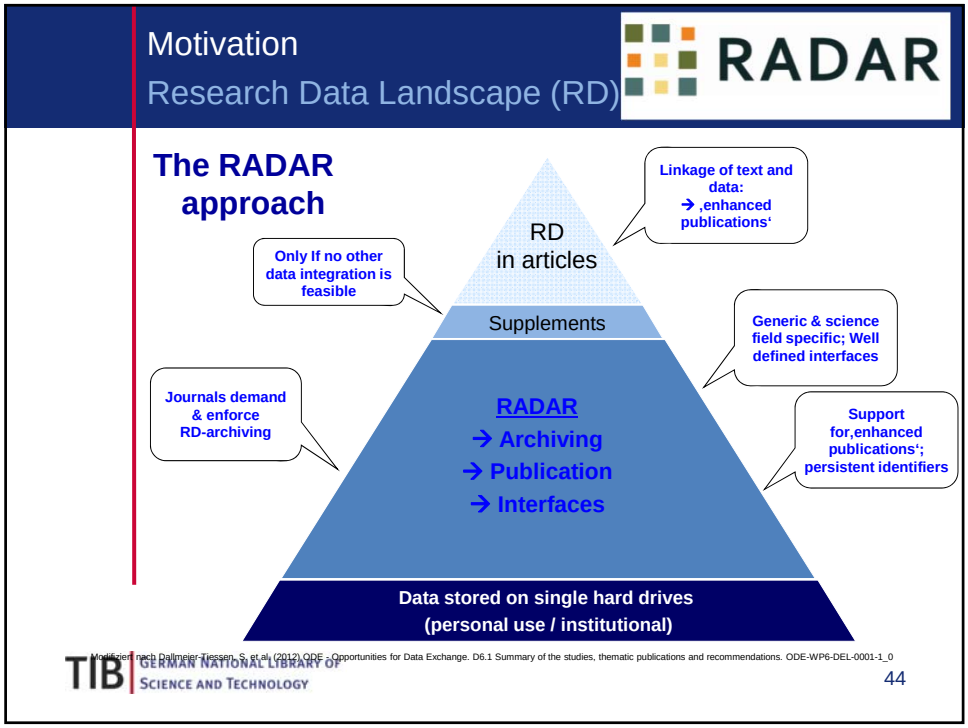
Motivation
Research Data Landscape (RD)
RADAR
The RADAR approach
Linkage of text and data:
→ ‚enhanced publications‘
RD in articles
Only If no other data integration is feasible
Supplements
Generic & science field specific; Well defined interfaces
Journals demand & enforce RD-archiving
RADAR
→ Archiving
→ Publication
→ Interfaces
Support for‚enhanced publications‘; persistent identifiers
Data stored on single hard drives (personal use / institutional)
Modifiziert nach Dallmeier-Tiessen, S. et al. (2012) ODE - Opportunities for Data Exchange. D6.1 Summary of the studies, thematic publications and recommendations. ODE-WP6-DEL-0001-1_0
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Research Context

RADAR

- Digital data production has increased rapidly in recent years with no end in sight.
- To **ensure** that the **growing data volumes** will be **available for re-use**, appropriate **infrastructures for preserving and publishing** research data must be **established** and expanded.
- The aim of the RADAR project is **to set up and establish** a **research data infrastructure** that **facilitates research data management**, which is currently lacking in many fields of Science.
- As such, RADAR makes **a key contribution to ensure a better availability, sustainable preservation and publishability of research data.**

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Workflow - Benefits

RADAR

Steps of data preservation & publication

1. Registration / Sign In: user account setup

2. Data Selection: e.g. primary data, pre-processed data, analysis and final research results

3. Service Types:

a) starter package: **data preservation in compliance with specified storage periods**; closed-access, non-public data storage

b) superior package: **data preservation with integrated data publication**; the use of Digital Object Identifiers (DOI) ensures visibility and citability of data sets

4. Data Ingest: provision of data preparation & submission services

5. Licence: data provider chooses licencing framework which sets terms and conditions for re-use of submitted data

6. Conversion & Validation: automated technical pre-processing ensures data integrity

7. Data Transfer & Preservation: transmission of validated data sets

8. Persistent Identifier: assignment of Handle or DOI to submitted data

9. Feedback for Data Provider: upload status and reference to ‚Landing Page' with assigned metadata information and possibility for cross-platform sharing via API are provided

Benefits

- visibility, publishability, and citability of (independent) research data using **persistent identifiers (Handle & DOI)**
- sustainable preservation via multiple redundant, **distributed data storage mechanisms**
- regular checks of **data consistency** incl. reporting and provision of access copies
- **preservation of research data in compliance with specified storage periods** (e.g. 10 years according to DFG recommendations) or unlimited storage
- flexible cost management with possibility of one-off payments or annual rates depending on data volumes and storage periods
- **ability to consider costs** for data preservation & publication **in research proposals**
- **obviates** the **operating expenditures** of institutional **research data infrastructures**

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Research Data Domains Where does RADAR stand ?

RADAR

1. Private Domain	2. Collaborative Domain	3. Public Domain → Archive	4. Dissemi-nation Domain
→ Scientists workplace	→ Research Institute Infrastructure	**RADAR – 2 Services:** **1. Archiving** **2. Publication & Archiving**	→ Portals, Scientists

Data selection (good scientific practice & adhering to local workflows)
Data documentation (Metadata profiles)
Data types / Data formats

Business Modell
Infrastructure
Software
Metadata standards
DOI-Registration
Contracts
Interfaces

Re-use via Metadata profiles

Modifiziert nach Treloar, A., Harboe-Ree, C. (2008) Data management and the curation continuum. How the Monash experience is informing repository relationships. VALA2008 14th Biennial Conference, Melbourne
und
Klump, J. (2009) Managing the Data Continuum.
Online: http://ga.helmholtz.de/fileadmin/user_upload/Data_Continuum/klump.pdf

Linked to:
DataCite
Publishers

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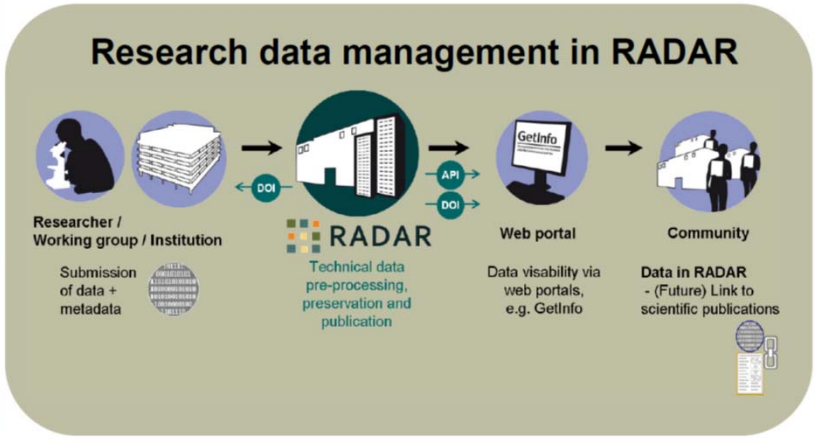
Research Context

RADAR



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Libraries in the "Big Data" era:
Strategies and Challenges in Archiving and Sharing Research Data

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Libraries in the "Big Data" era:
Strategies and Challenges in Archiving and Sharing Research Data

“You must understand
that there is more
than one path
to the top of the mountain”

The Book of Five Rings
Miyamoto Musashi
[1584 - 1645]

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Libraries in the "Big Data" era:
Strategies and Challenges in Archiving and Sharing Research Data

Laying out paths to the “top of the mountain”:

- EU-Level: **„Riding the Wave“** EC-Report

- Germany: **„Radieschen“** Research Proje

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Approach: Future Scenarios

Scenarios are used in Innovation Management:

- **Thinking ahead**, to
- **describe upcoming chances and threats**,
- instead trying to predict a likely future

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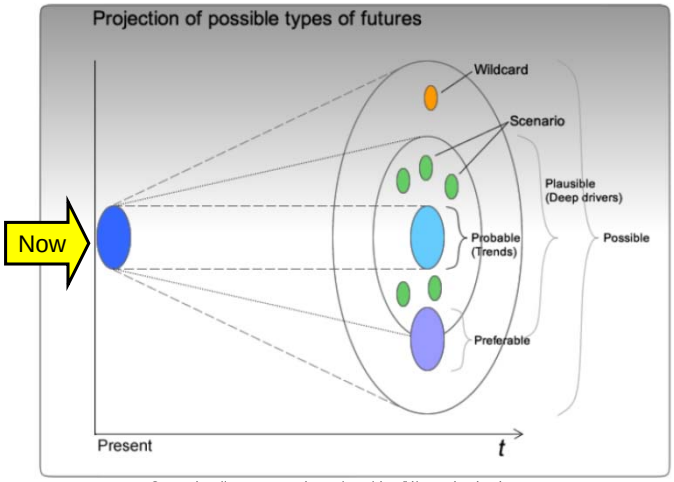
Projecting Future Scenarios



Source: http://www.quesucede.com/page/show/id/scenario_planning

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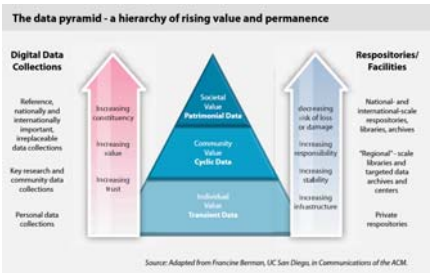
Libraries in the "Big Data" era: The European Perspective



Knowledge is power:

Europe must manage the digital assets its researchers create

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Scenarios for Europe

- I: Science and data management
- II: Science and the citizen
- III: Science and the data set
- IV: Science and the student
- V: Science and data sharing incentives

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Milestones for Europe towards 2030 (1)

- **All stakeholders** (…) are aware of the **critical importance of conserving and sharing reliable data produced during the scientific process**.
- **Researchers** (…) are able to **find, access and process** the **data** they need. They can be confident in their ability to **use and understand data**, they can **evaluate the degree** to which that data can be **trusted**.
- **Producers of data** benefit from **opening it** to broad access, and to prefer to deposit their data with confidence in **reliable repositories**. A **framework of repositiories** is guided by **international standards**, to ensure they are **trustworthy**.
- **Public funding rises** (…) through **increased use and re-use** of **publicly generated data.**

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Milestones for Europe towards 2030 (2)

- The **innovative power** of **industry and enterprise** is harnessed by clear and efficient arrangements for **exchange of data** between **private and public sectors**, allowing appropriate returns for both.
- **The public** has access to and make **creative use** of the **huge amount of data available**; it can also **contribute to the data** store and enrich it. Citizens can be adequately educated and prepared to benefit from this abundance of information.
- **Policy makers** are able to make **decisions** based on **solid evidence**, and can **monitor the impact of these decisions**. Government becomes more trustworthy.
- Global governance promotes **international trust and interoperability**.

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Libraries in the "Big Data" era: Germany
Insights from the Radieschen Project

Radieschen: Requirements for a multi-disciplinary research data infrastructure

- „**Ra**hmenbedingungen einer **di**sziplinübergr**ei**fenden For**sch**ungsdat**en**infrastruktur“
- Acronym: **Radieschen** („**little radish**“)
- **Future Scenarios for Science in Germany in 2020**
- **Based on community polls in Germany and the EC**
- Conducted by GFZ Potsdam (2012-2013)

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funded by DFG

GFZ Helmholtz-Zentrum Potsdam

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Open questions –the library perspective

- Libraries provide access to digital media, support the publication of research data and enable their long term preservation.
- **How will the library of the future be like ?**
  - Libraries as interfaces to Computation Centers ?
  - Will Libraries and Computation Centers merge into new service units ?
  - What will become of scientific publishers ?

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Possible Future Scenarios for Science in Germany in 2020

- **Five future scenarios** describe **possible developments of Science in Germany by 2020** (or later).
- The scenarios are **over-simplified** and describe extreme cases.
- This is **to emphasize trends** and to allow **to infer development steps**.

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Scenario I
New performance indicators for Science

- The simple tallying of publications and quotes to judge academic performance is replaced by **a combination of publications of articles, research data and software**.
- An **international scoring system** becomes established and provides access to research ressources.

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Scenario II
Libraries are the Future

- **Libraries evolve into innovative, interlinked centers for information and competence**.
- **Data Scientists**, highly qualified experts in the use of data, **work in libraries** in fields like **curation, quality assurance or archiving.**
- **Libraries replace the scientific publishers of today.**

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Scenario III
The Rise of the Data Scientists

- **The profession „Data Scientist“ becomes established in Academia.**
- Data Scientists work for **modern information providers** for Academia, **which have evolved from the former Science Libraries.**
- The tasks of Data Scientists include Ingest and Archiving, but also Research regarding Data Analysis.

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Scenario IV
Data Centres take on new Roles

- **Computation Centres evolve into Data Centres**.
- They are the **primary points of access for researchers** both for data management, software services and all kinds of publications.
- Data Scientists work in the new Data Centers to provide a range of services to the communities.

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Scenario V
Steady State

- The striving for innovation is blocked for various reasons.
- Scientists in Germany are cut off from the international community.

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Guidelines for Action

- Science is dynamic and continuously changing.
- The stakeholders need to take the necessary steps to enable a mutually positive way ahead.
- For an optimal result **the involved parties must interact while being willing to reevaluate and change their current positions.**

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The Rise and Fall of Innovations – and Wording

- The history of Technology shows that **innovations**, which are ĩnitially ranked very low, **can gain the potential to replace established technologies** over time.
- Example: **„Grid“** and **„Cloud“.**

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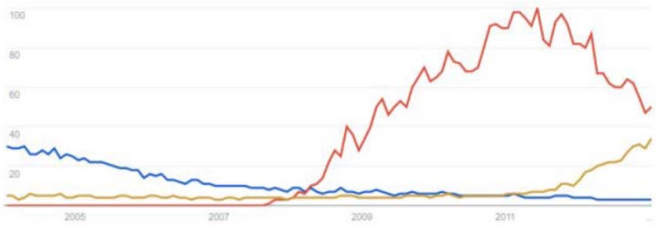
Google Trends: „Cloud“ replaces „Grid“



Histogram of Google queries for the terms „Grid computing“ (blue), „Cloud Computing“ (red) and „Big Data“ (yellow) in January 2013.
Source: Google Trends

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Consequences for the handling of research data

It is impossible to predict which technological solutions will become available or reach maturity.

Trends can only be identified on a limited scale:

disruptive innovation patterns affect the development, **which by itself is a new trend**.

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Disruptive Innovations

- **Disruptive Innovation** can be traced in **many examples** in the **history of technology**.
- A Disruptive Innovation can consist of a **new technology**, a **new product** or a **new service**.
- **Common pattern**: Innovation starts in a niche market, undetected and ignored by the industry leaders.
- Not all innovations are necessarily disruptive.
- For the field of **research data infrastructures**, one should be open for **innovations by monitoring trends and supporting new developments.**

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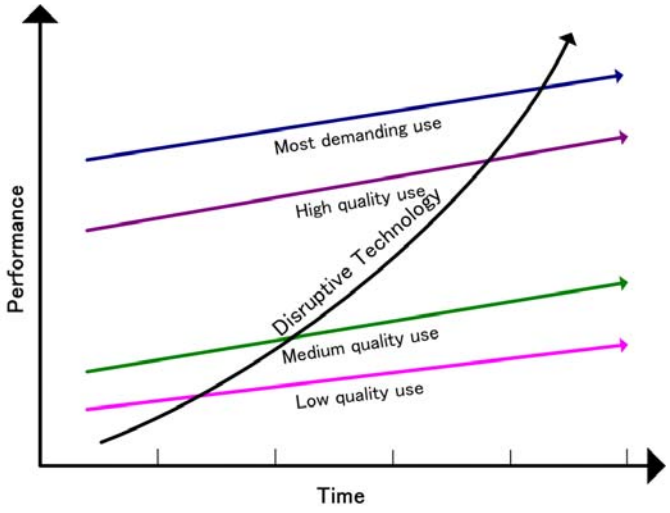
Plotting Disruptive Innovations



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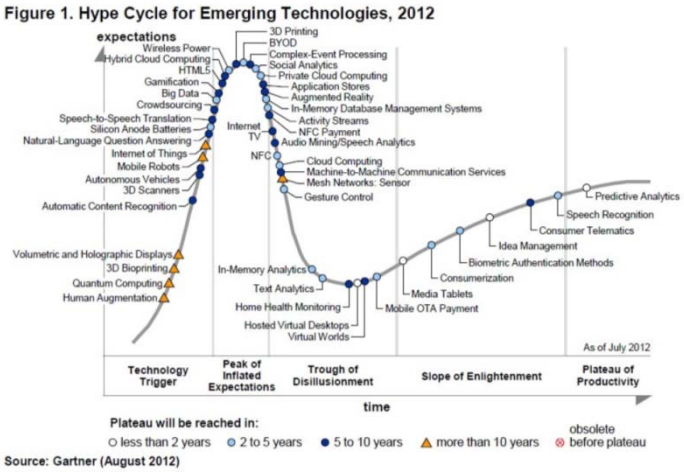
http://upload.wikimedia.org/wikipedia/commons/thumb/8/8e/Disruptivetechnology.gif/1014px-Disruptivetechnology.gif

Gartner Hype Cycle



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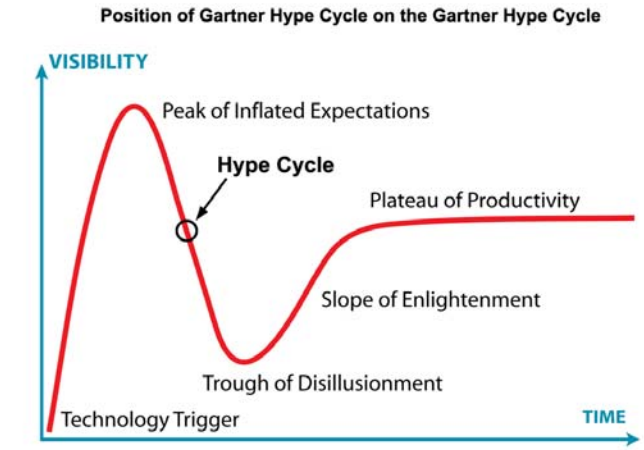
The hype cycle‘s self-similiar hype cycle



https://twitter.com/philgyford/status/427840025544650753/photo/1

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Summary

DataCite The State of Research Data Management

GOPORTIS The German Library Network

RADAR Repositories for small Science

 Possible futures … for the EU and in Germany

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The path ahead:
A Service Portfolio for flexibility and stability

▪A likely **success strategy** for the provision of **research infrastructures** could be **to develop a modularized service portfolio**, based **on a common platform.**

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The path ahead:
A Service Portfolio for flexibility and stability

▪A likely **success strategy** for the provision of **research infrastructures** could be **to develop a modularized service portfolio**, based **on a common platform.**

▪This would enable the stakeholders, **to adapt the services flexibly** according the changing requirements of Science, while **allowing for the long term evolving of the underlying platform**.

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The path ahead:
A Service Portfolio for flexibility and stability

- A likely **success strategy** for the provision of **research infrastructures** could be **to develop a modularized service portfolio**, based **on a common platform.**

- This would enable the stakeholders, **to adapt the services flexibly** according the changing requirements of Science, while **allowing for the long term evolving of the underlying platform**.

- This will **bridge the gap between infrastructure's need for stability while allowing for the required flexible**, yet potentially short-lived, **applications for science**.

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TIB | Technische Informationsbibliothek

Thank you for your attention