Linked Data View of Australia

*Emphasis on concepts (as opposed to enabling technologies)
with some semantics and sentinel events.*

AGLDWG Plenary Presentation
4 December 2025

Alastair Paton
AGLDWG Co-chair
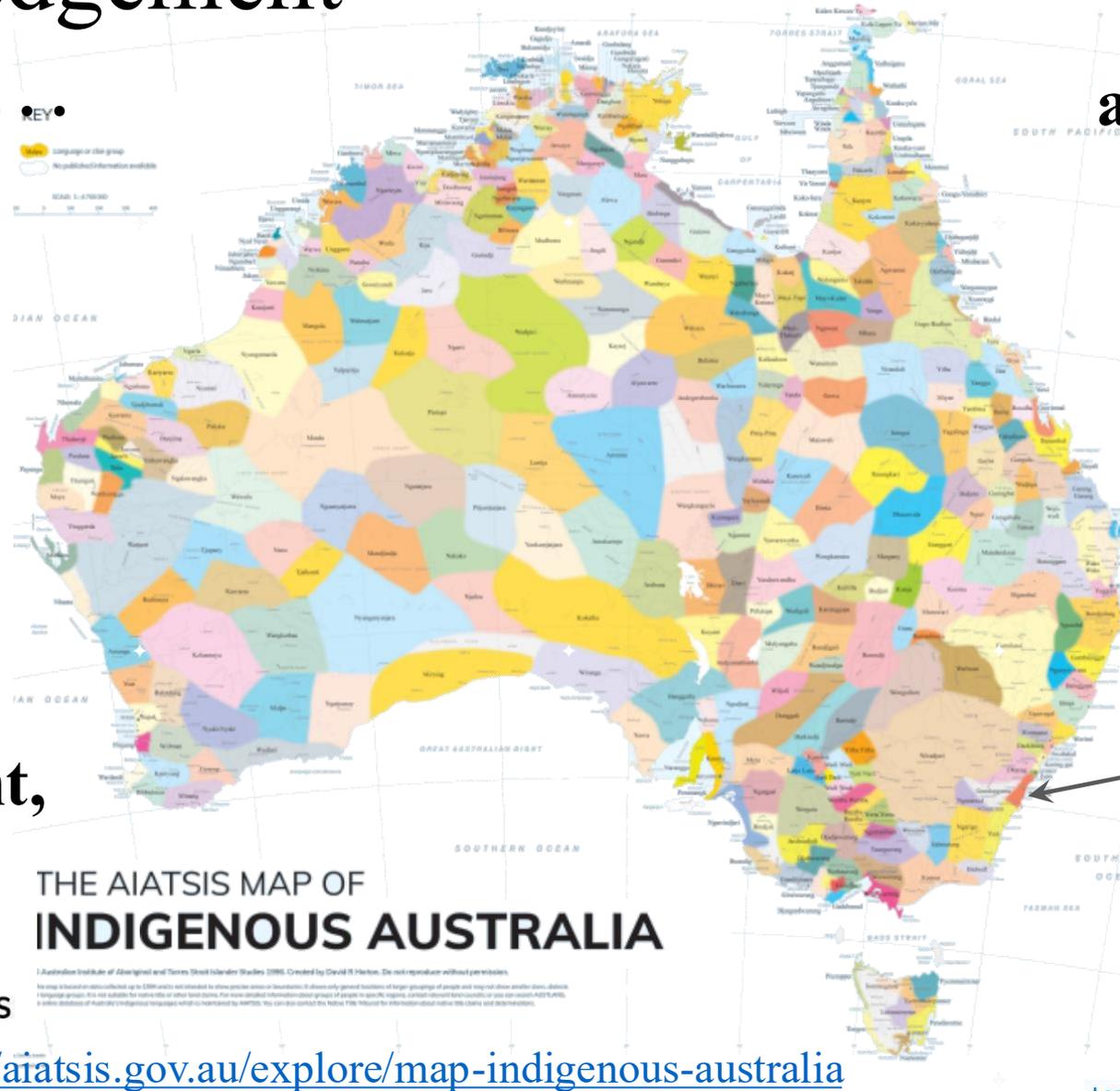(e) taxles@bigpond.com

Acknowledgement of . . .

People,

the Land,

and Environment,

and Water,

and Communities,

and Events.

THE AIATSIS MAP OF
INDIGENOUS AUSTRALIA

AIATSIS

CAPTAIN COOK
LANDED HERE
28TH APRIL, A.D. 1770.
THIS MONUMENT
WAS ERECTED A.D. 1870,
BY THE HONORABLE THOMAS HOLT, M.L.C
VICTORIA REGINA. THE EARL OF BELMORE, GOVERNOR &c

Plaque on Captain Cook
Memorial Obelisk, Botany Bay
National Park, Sydney.

Presentation Outline

- Sentinel Events
- Semantics & Ontologies
- Q. What is Linked Data?
- Australian Government
- Infrastructure Development Process inc. Large IT Systems
- structure.gov.au and The Finance Knowledge Graph
- Other .gov.au examples
- AGLDWG
- Upcoming AGLDWG Presentations
- Questions / Discussion

Sentinel Events

- First Australian Sentinel Warning recorded by the British
- Sentinel events in Australian healthcare
- Australian Healthcare & Linked Data

First Australian Sentinel Warning recorded by the British

A sketch of two Indigenous men waving spears at Captain Cook's arriving ship. Source: "James Cook: founder of 'modern Australia', or the embodiment of dispossession?" by Mark McKenna published 17 March 2018, Sydney Morning Herald.

Sun 29Apr1770, Kurnell, Botany Bay, NSW
Local men made threatening gestures with spears and yelled the words "**warra warra wai**".

The British *interpreted* as "Go Away!" Source. Journal of Sydney Parkinson, a young artist employed on the ship Endeavour.

Actual Meaning: When the Dharawal men ashore saw the Endeavour coming, they thought it was low-lying cloud because all they could see was whiteness. They had no experience of ships, and in Dharawal culture, low-lying cloud means the spirits of the dead have returned. So when the two men opposed the landing, they were warning others, and protecting the country in a spiritual way, from ghosts.

Source: Telling our stories our way > Misunderstood words

national museum australia

Sentinel Events in Australian Healthcare

Ten sentinel events are specified under four categories including:

- Surgical or other procedures,
- Mental health,
- Medication, and
- Care management.

Australian Commission on
Safety and Quality in Health Care

Australian Healthcare & Linked Data

digitalhealth.gov.au

Initiatives   Programs   Training and support   N

For everyone   **For healthcare providers**   Careers   Co

Home > Initiatives and programs > Interoperability > Council for Connected Care

Council for Connected Care

Providing strategic advice on interoperability and supporting the implementation of the National Healthcare Interoperability Plan.

Interoperability

Interoperability enables a connected healthcare system which shares health information securely, safely and without any special effort from the people and organisations involved.

Standards

The Digital Health Standards program focuses on developing a dynamic, comprehensive and collaborative digital health standards environment in Australia to enable a greater level of connected care for all Australians.

HL7 FHIR

Fast Healthcare Interoperability Resources
https://www.hl7.org/fhir/

GS1

Multiple GS1 Standards in Healthcare
https://www.gs1.org/industries/healthcare/standards

Semantics & Ontologies

- Concept of Event
- Ontological Design
- Things in the Real World
- Invalid Things
- A Little Semantics Goes a Long Way
- A Little Provenance Goes a Long Way

Concept of Event

Event is a concept defined in numerous vocabularies, Top-Level (Upper) Ontologies, and Mid-level Ontologies including:

Dublin Core:
 http://purl.org/dc/dcmitype/Event

Basic Formal Ontology (BFO):
 http://purl.obolibrary.org/obo/BFO_0000015
  Ontology of Adverse Events
  Ontology of Vaccine Adverse Events
  Ontology of Cardiovascular Drug Adverse Events
  Ontology of Drug Adverse Events
  Ontologyof Drug Neuropathy Adverse Events

Industrial Data Ontology (IDO):
 http://rds.posccaesar.org/ontology/lis14/rdl/Event

schema.org:
 https://schema.org/Event

Ontological Design

Ontological design is fundamentally about knowledge representation. That is, formally describing relationships between things.

The process of ontological design is basically getting a consensus on how to view the world so they can they build systems that work together.

Ontologies encode human knowledge.
Encode = Convert into a coded form.
IT machines need coded forms.

Things in the Real World

These are real things we know.

Q1. In our IT systems, how are these things modelled?

Q2. What trust do we have in these things before we use or consume them?

Apples & Oranges

See upcoming (Thu 2Apr2026) AGLDWG presentation by Harley Thomas
https://www.trustprovenance.com/

Trust Provenance™
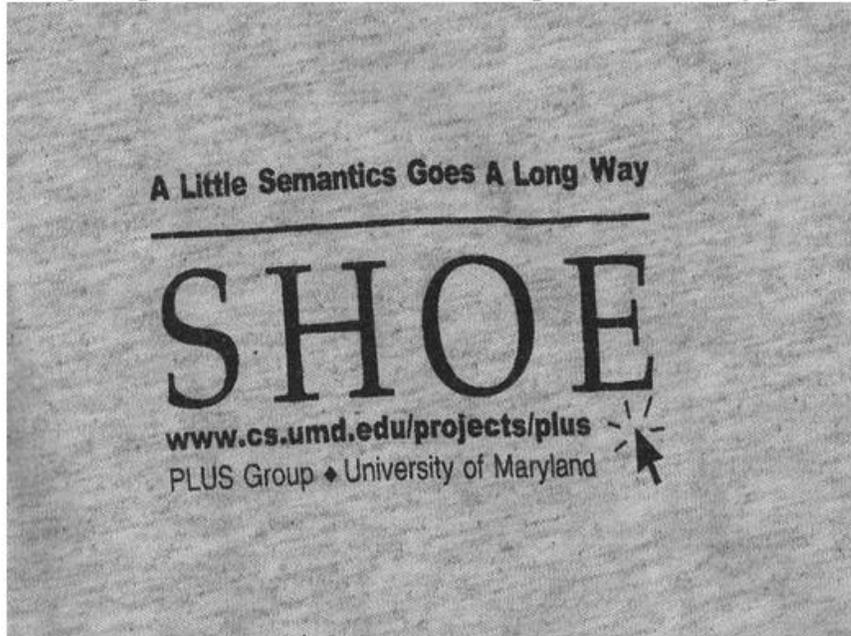
Q. Are these valid things in the real world?

Ontologies ensure model validity.

A Little Semantics Goes a Long Way

It is a bit humbling to me as a scientist that my most quoted line ever does not come from a paper I have written. This line is "A little semantics goes a long way" and it has become one of the slogan's of the Semantic Web movement. Here's a few different ways that this term has been used and come around -- so I can help set the record straight.

- My original use of the term was on the group shirts we made for the SHOE project back in '97 or '98. My then student, Sean Luke designed a very nice logo for the shirt, but we needed a catch phrase. I suggested this phrase, as it captured the idea that SHOE was less expressive than most KR languages, but that this was by design as we were proposing AI for the Web. We ended up using the phrase on the shirts -- so the phrase definitely predates the Semantic Web effort.

A Little Semantics Goes A Long Way

SHOE

www.cs.umd.edu/projects/plus
PLUS Group ◆ University of Maryland

Source: Jeff Heflin
https://www.cs.rpi.edu/~hendler/LittleSemanticsWeb.html

Note: A little is not none.

- When I got to DARPA (1999), I started pushing that for agents on the web we needed a KR language that was very scalable and easily learned by non-AI experts. Since I was using SHOE as a demonstrator within the government, I kept wearing the T-shirt, and I also used the "A little semantics goes a long way" phrase in many of my talks. While I was at DARPA I started the

Luc's Blog

Oct 11

A Little Provenance Goes a Long Way

PROV is a rich vocabulary that was designed to tackle a variety of use cases.   The Provenance Working Group worked really hard to design PROV to facilitate its adoption. In our book, Paul and I provide many recipes to design, deploy, and use provenance in the context of a complex data journalism scenario.

Source: Paul Groth and Luc Moreau
https://lucmoreau.wordpress.com/2013/10/11/a-little-provenance-goes-a-long-way/

Once again: A little is not none.

Q. What is Linked Data?

- Some Events on Interest
- World Wide Web (WWW)
- Two Concerns with Linked Data
- Value Proposition with Linked Data

In two centuries, the world population has grown 7 billion

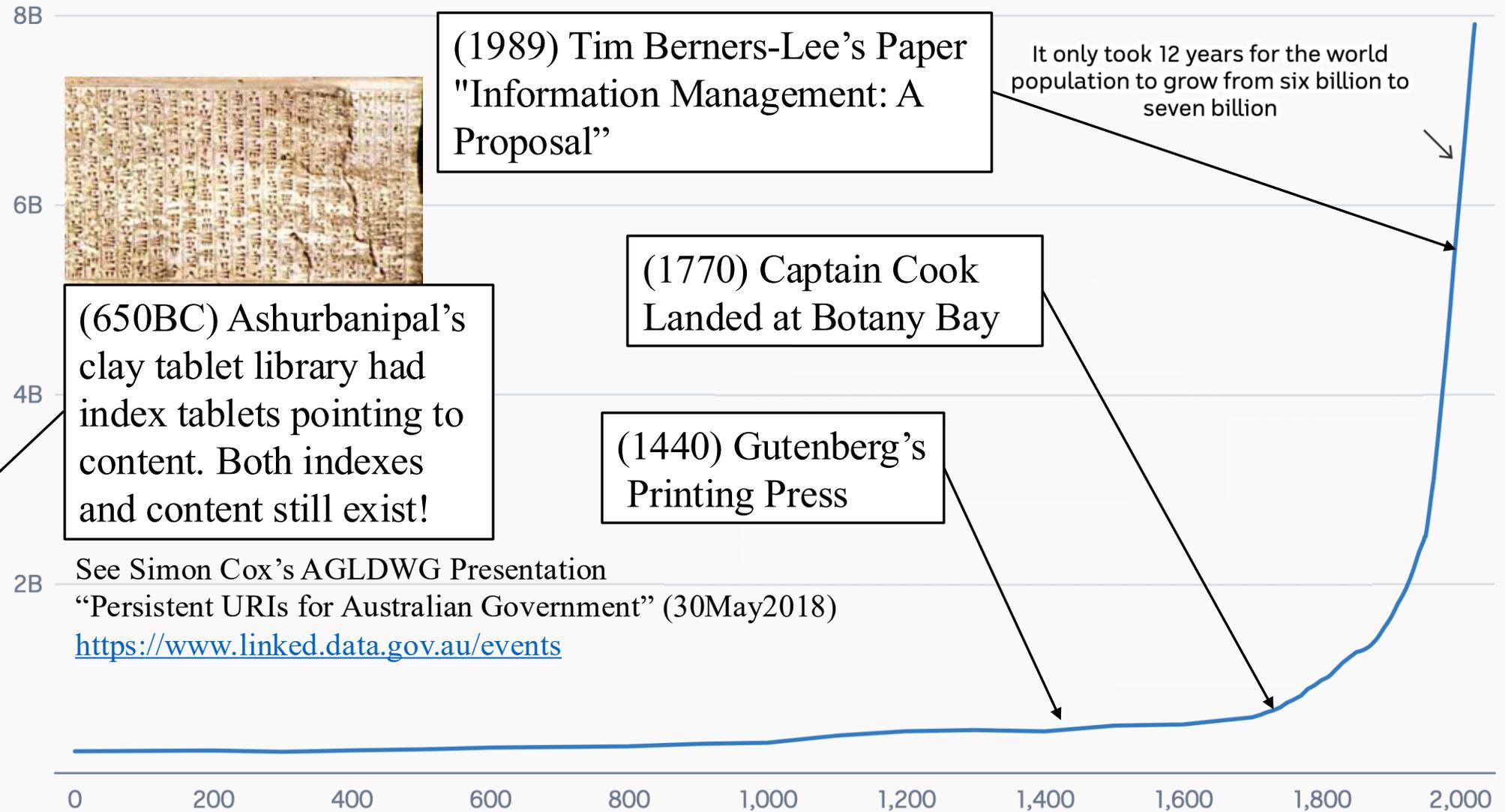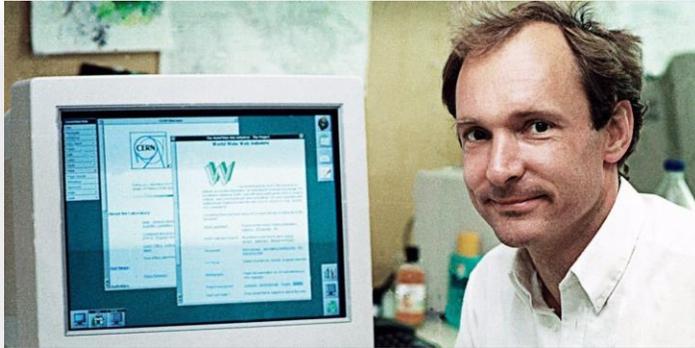Estimated global population from 10,000 BCE to 2021

(1989) Tim Berners-Lee's Paper "Information Management: A Proposal"

It only took 12 years for the world population to grow from six billion to seven billion

(650BC) Ashurbanipal's clay tablet library had index tablets pointing to content. Both indexes and content still exist!

(1770) Captain Cook Landed at Botany Bay

(1440) Gutenberg's Printing Press

See Simon Cox's AGLDWG Presentation "Persistent URIs for Australian Government" (30May2018) https://www.linked.data.gov.au/events

Source

WORLD WIDE WEB (WWW)

Sir Tim Berners-Lee's original Proposal of the World Wide Web in 1989 included "link relations" …

Slide Source: AGLDWG Presentation by Armin Haller
"Open Data - Link It!" (15Aug2017)
https://www.linked.data.gov.au/events
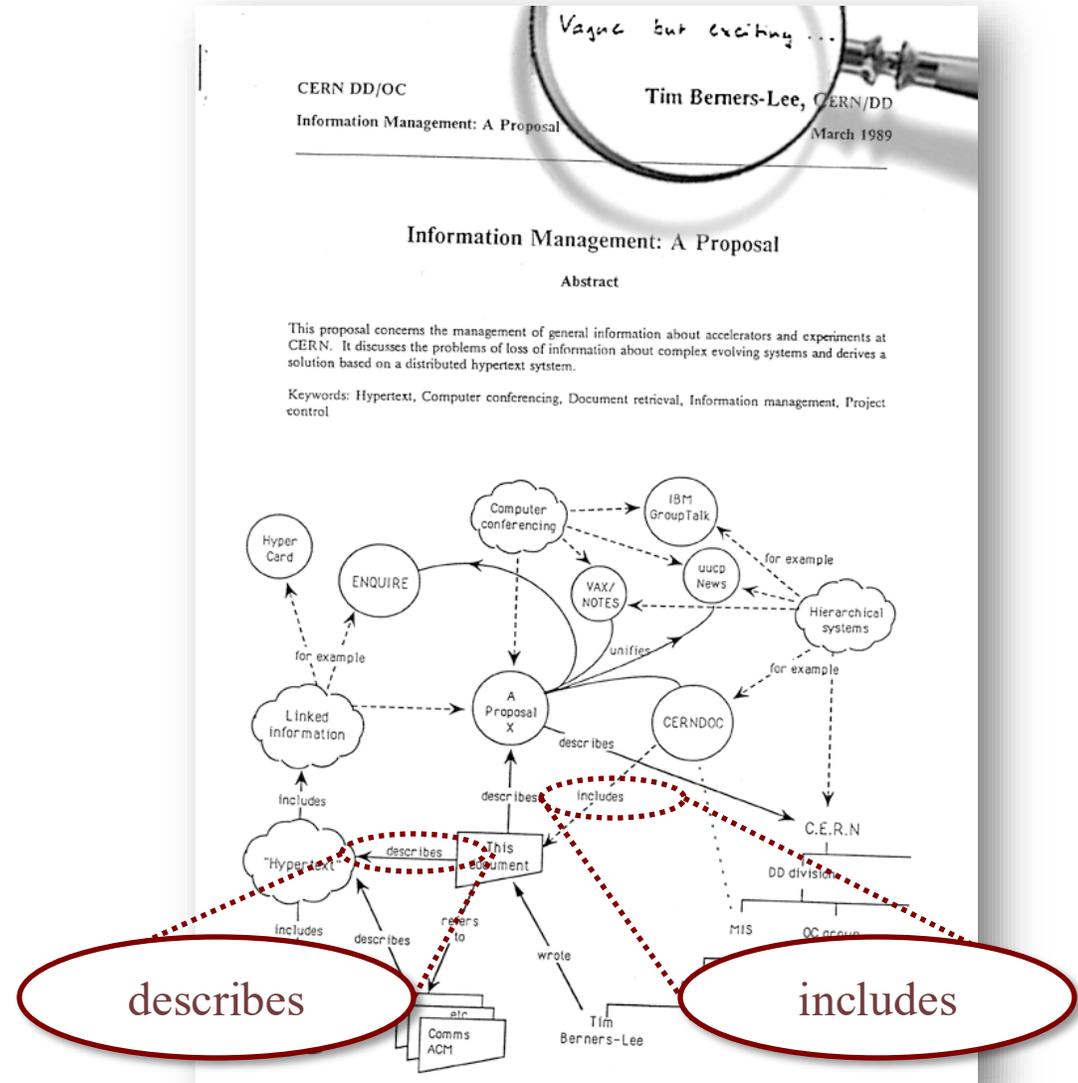
… but the WWW used only one type of link relation (hyperlinks) for years …

… until LINKED DATA

- Sir Tim Berners-Lee (again) published a design-note in 2006 on Linked Data

Machine-readable data now
Machine-understandable data

Two Concerns with Linked Data

Concern 1: It's too technical
    Yes, it's technical, but it has very solid foundations & clear principles.
    Solution: Use your technical experts & avoid proprietary solutions
    which result in vendor lock-in.

Concern 2: Linked Data = Open Data which erodes privacy.
    Not true as Access controls & Permissions are integrated with LD.

Value Proposition with Linked Data

1. Enables single source of truth.

2. Substantially reduces cost and risk in large developments by:
    - creating a more comprehensive and reliable evidence base,
which leads to:
        - more effective decision-making,
        - improved system performance insights,
        - a higher degree of accuracy in analysis, and
        - more predictable outcomes.

3. Has potential to be a catalyst for National productivity uplift.

Australian Government

- Three levels of Australia's Government
- Government & Money

All three levels of Australia's Government are involved
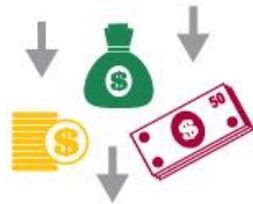
1. Federal

2. State & Territory

3. Local Councils,
Shires, & Municipalities

Government & Money

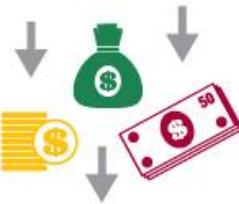The **FEDERAL GOVERNMENT** raises money through taxing incomes, spending and businesses.

FEDERAL MATTERS SUCH AS

MEDICARE   DEFENCE

IMMIGRATION

FOREIGN POLICY

STATE/TERRITORY GOVERNMENTS receive more than half their money from the federal government and also collect taxes.
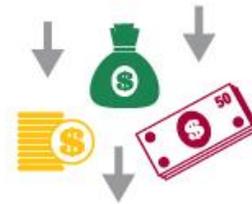
STATE MATTERS SUCH AS

ROADS   HOUSING   PRISONS

PUBLIC TRANSPORT

POLICE and AMBULANCE SERVICES

LOCAL COUNCILS collect taxes (rates) from all local property owners and receives money from the federal and state governments.

LOCAL MATTERS SUCH AS

TOWN PLANNING

SEWERAGE   LOCAL ROADS

RUBBISH COLLECTION

PARLIAMENTARY **EDUCATION** OFFICE

Source: https://peo.gov.au/understand-our-parliament/how-parliament-works/three-levels-of-government/three-levels-of-government-governing-australia

Infrastructure Development Process inc. Large IT Systems

- Infrastructure Development Process
- Transition from:
  - Document Based Development, to
  - Information Based Development
- structure.gov.au and The Finance Knowledge Graph

Infrastructure Development Process

To "*strengthen governance and assurance practices and to assist non-corporate Commonwealth entities to successfully deliver major projects and programs*", our Department of Finance defines these Decision Gates (DG) in Australia's Gateway Reviews Process https://www.finance.gov.au/government/assurance-reviews-and-risk-assessment/gateway-reviews-process This is a standard toll-gate process also known as two-pass, multi-pass, etc.
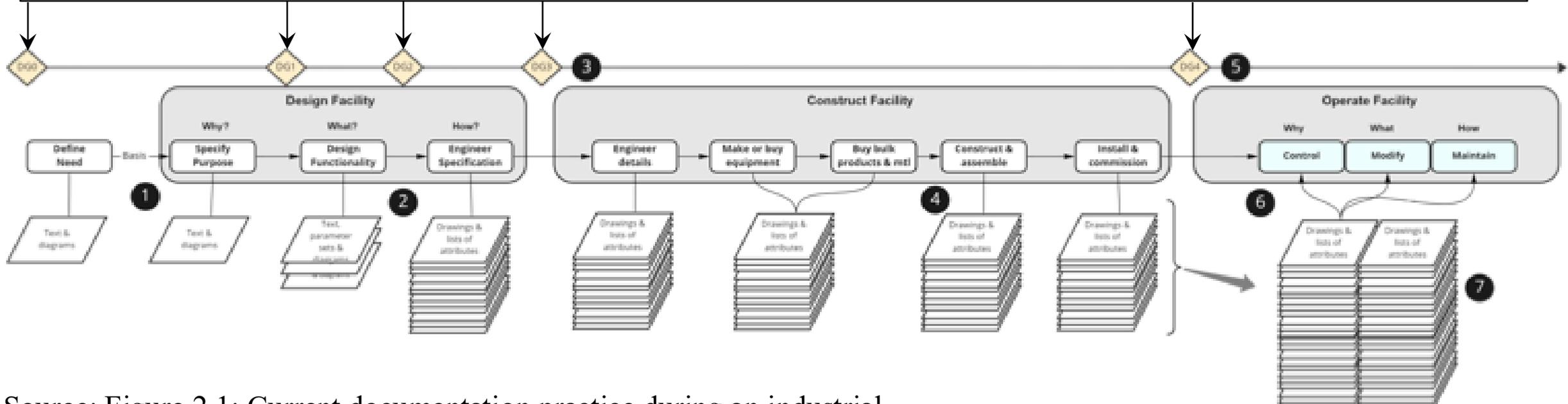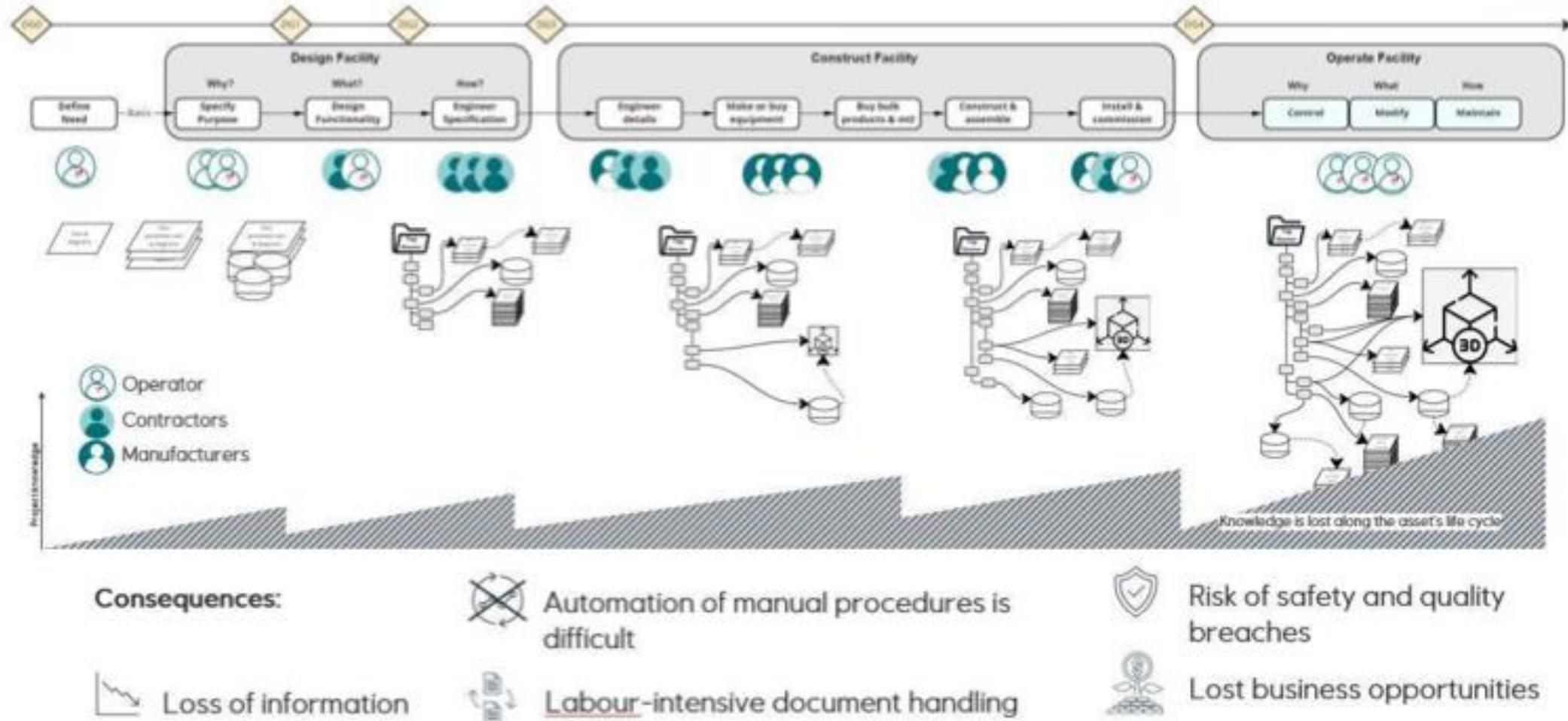

Source: Figure 2.1: Current documentation practice during an industrial investment and development project. Information Modelling Framework (IMF) Manual v.0.3.0 (29May2024) https://www.imfid.org/#orgd34ab30
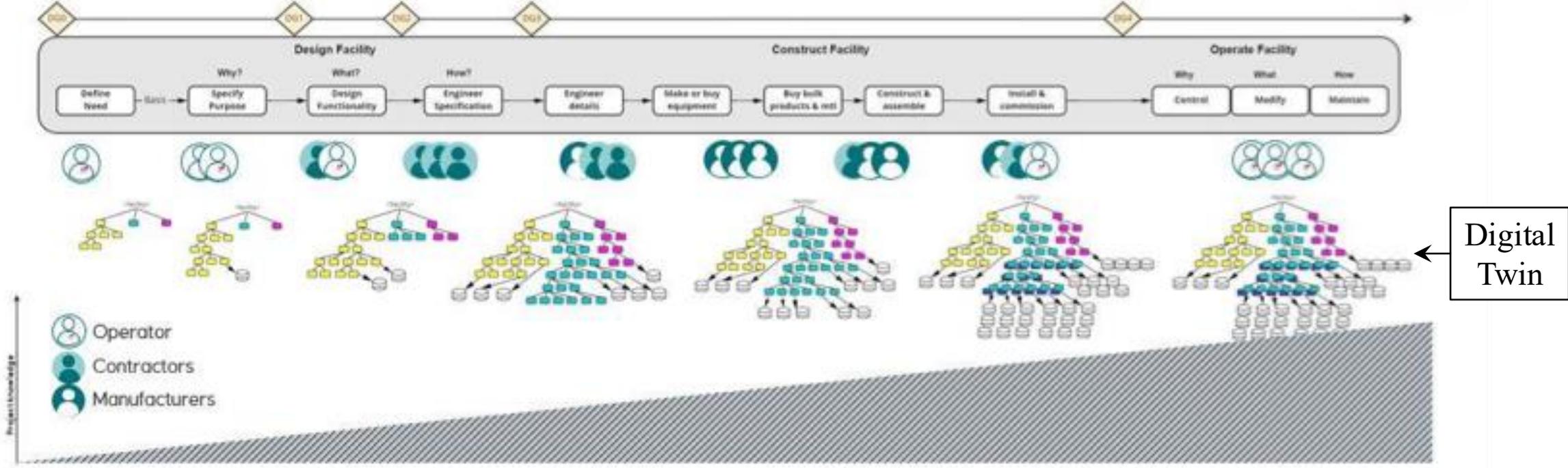
Creating a common understanding of what things are

From documents-based approach ....

Consequences:

- Automation of manual procedures is difficult
- Loss of information
- Labour-intensive document handling
- Risk of safety and quality breaches
- Lost business opportunities

Source: Magnus Oanes Knædal, Equinor

12

Source: Melinda Hodkiewicz "On-shoring engineering design – enabling cost effective design and quality control checks – at scale" (May 2024)
https://www.fenex.org.au/wp-content/uploads/2024/06/Hodkiewicz-Melinda-On-Shoring-Engineering-Design-Enabling-Cost-Effective-Design-Quality-Control-Checks-At-Scale.pdf#page=12

...to information model-based approach

Added values:

Become more effective by hindering loss of information during handovers

Automation of manual procedures possible using machine integrable information models

Reduce cost and time spent by the possibility of building in smartness

Improved safety and quality by better control of technical information

New business opportunities by combing information in new ways

Source: Magnus Oanes Knædal, Equinor

Source: Melinda Hodkiewicz "On-shoring engineering design – enabling cost effective design and quality control checks – at scale" (May 2024)
https://www.fenex.org.au/wp-content/uploads/2024/06/Hodkiewicz-Melinda-On-Shoring-Engineering-Design-Enabling-Cost-Effective-Design-Quality-Control-Checks-At-Scale.pdf - page=13

structure.gov.au and The Finance Knowledge Graph

See AGLDWG Presentation (Thu 6 Nov 2025) where Andrew Fitzgerald & John Machin spoke of structure.gov.au and The Finance Knowledge Graph with "*Everything you always wanted to know about developing a linked data capability in government but were too afraid to ask*".

structure.gov.au was developed & hosted by the Department of Finance who are an authoritative source on the structure of Australian Government and Public Sector bodies, their types, mandate, types to support public sector governance

Other .gov.au examples

- Geosciences Australia (GA)
- Bureau of Meteorology

Source: https://vocabs.ga.gov.au/catalogs/catalogue:ga-vocabs/collections

GA Vocabulary Register

Communities

IRI https://pid.geoscience.gov.au/def/voc/ga/HazardAndRisk/communities 🔗 📋

Type Concept 🔗

definition 🔗

A community, like a family, can contribute to a person's wellbeing e.g. support and care for individuals or by helping give a sense of identity and security. Like 'family', a definition of 'community' can vary greatly. A community can be based on:
location
where you live or work
those who you have immediate family ties with (by blood and/or marriage)
shared values
traditions
interests
lifestyles
religious groups
school communities
The boundary of a community extends beyond a physical location.

is in scheme 🔗   GA Hazard and Risk Glossary 🔗

Further metadata	^
alternative label 🔗	Community
citation 🔗	
	Family and Community - Frameworks for Australian Social Statistics
is defined by 🔗	GA Hazard and Risk Glossary 🔗
is top concept in scheme 🔗	GA Hazard and Risk Glossary 🔗
preferred label 🔗	Communities
type 🔗	Concept 🔗

Source: https://vocabs.ga.gov.au/catalogs/catalogue:ga-vocabs/collections/ns4:HazardAndRisk/items/hazardandrisk:communities

![Australian Government — Bureau of Meteorology]

Australian Hydrological Geospatial Fabric (Geofabric)
Topographic Drainage Divisions and River Regions

LAKE EYRE BASIN LEB
1. Cooper Creek–Bulloo River
2. Diamantina–Georgina rivers
3. Lake Eyre

CARPENTARIA COAST CC
1. Koolatong River
2. Walker River
3. Groote Eylandt
4. Roper River
5. Towns River
6. Limmen Bight River
7. Rosie River
8. McArthur River
9. Robinson River
10. Calvert River
11. Settlement Creek
12. Mornington Island
13. Nicholson–Leichhardt rivers
14. Morning Inlet
15. Flinders–Norman rivers
16. Mitchell–Coleman rivers (Qld)
17. Holroyd River
18. Archer–Watson rivers
19. Ward River
20. Embley River
21. Wenlock River
22. Ducie River
23. Jardine River
24. Torres Strait Islands

TANAMI–TIMOR SEA COAST TTS
1. Cape Leveque Coast
2. Fitzroy River (WA)
3. Lennard River
4. Isdell River
5. Prince Regent River
6. King Edward River
7. Drysdale River
8. Ord–Pentecost rivers
9. Keep River
10. Victoria River–Wiso
11. Fitzmaurice River
12. Moyle River
13. Daly River
14. Finniss River
15. Bathurst–Melville islands
16. Adelaide River
17. Mary River (NT)
18. Wildman River
19. South Alligator River
20. East Alligator River
21. Goomadeer River
22. Liverpool River
23. Blyth River
24. Goyder River
25. Buckingham River

NORTH EAST COAST NEC
1. Jacky Jacky Creek
2. Olive–Pascoe rivers
3. Lockhart River
4. Stewart River
5. Normanby River
6. Jeannie River
7. Endeavour River
8. Daintree River
9. Mossman River
10. Barron River
11. Mulgrave–Russell rivers
12. Johnstone River
13. Tully–Murray rivers
14. Cardwell Coast
15. Hinchinbrook Island
16. Herbert River
17. Black River
18. Ross River
19. Haughton River
20. Burdekin River
21. Don River
22. Proserpine River
23. Whitsunday Islands
24. O'Connell River
25. Pioneer River
26. Plane Creek
27. Styx River
28. Shoalwater Creek
29. Water Park Creek
30. Fitzroy River (Qld)
31. Calliope River
32. Curtis Island
33. Boyne River
34. Baffle Creek
35. Kolan River
36. Burnett River
37. Burrum River
38. Mary River (Qld)
39. Fraser Island
40. Noosa River
41. Maroochy River
42. Pine River
43. Brisbane River
44. Stradbroke Island
45. Logan–Albert rivers
46. South Coast

NORTH WESTERN PLATEAU NWP
1. De Grey River
2. Sandy Desert

PILBARA–GASCOYNE PG
1. Greenough River
2. Murchison River
3. Wooramel River
4. Gascoyne River
5. Yannarie River
6. Ashburton River
7. Onslow Coast
8. Fortescue River
9. Port Hedland Coast

MURRAY–DARLING BASIN MDB
1. Upper Murray River
2. Kiewa River
3. Ovens River
4. Broken River
5. Goulburn River
6. Campaspe River
7. Loddon River
8. Avoca River
9. Avon River–Tyrell Lake
10. Murray Riverina
11. Billabong–Yanco creeks
12. Murrumbidgee River
13. Lachlan River
14. Benanee–Willandra Creek
15. Wimmera River
16. Upper Mallee
17. Border rivers
18. Moonie River
19. Gwydir River
20. Namoi River
21. Castlereagh River
22. Macquarie–Bogan rivers
23. Condamine–Culgoa rivers
24. Warrego River
25. Paroo River
26. Darling River
27. Lower Mallee
28. Lower Murray River

SOUTH WEST COAST SWC
1. Esperance Coast
2. Albany Coast
3. Denmark River
4. Kent River
5. Frankland–Deep rivers
6. Shannon River
7. Warren River
8. Donnelly River
9. Blackwood River
10. Busselton Coast
11. Collie–Preston rivers
12. Murray River (WA)
13. Swan Coast–Avon River
14. Moore–Hill rivers

SOUTH EAST COAST (NSW) SEN
1. Tweed River
2. Brunswick River
3. Richmond River
4. Clarence River
5. Bellinger River
6. Macleay River
7. Hastings River
8. Manning River
9. Karuah River
10. Hunter River
11. Macquarie–Tuggerah lakes
12. Hawkesbury River
13. Sydney Coast–Georges River
14. Wollongong Coast
15. Shoalhaven River
16. Clyde River–Jervis Bay
17. Moruya River
18. Tuross River
19. Bega River
20. Towamba River

SOUTH WESTERN PLATEAU SWP
1. Gairdner
2. Nullarbor
3. Salt Lake

SOUTH AUSTRALIAN GULF SAG
1. Fleurieu Peninsula
2. Myponga River
3. Onkaparinga River
4. Torrens River
5. Gawler River
6. Wakefield River
7. Broughton River
8. Lake Torrens–Mambray Coast
9. Spencer Gulf
10. Eyre Peninsula
11. Kangaroo Island

SOUTH EAST COAST (VICTORIA) SEV
1. East Gippsland
2. Snowy River
3. Mitchell–Thomson rivers
4. South Gippsland
5. Bunyip River
6. Yarra River
7. Werribee River
8. Moorabool River
9. Barwon River–Lake Corangamite
10. Otway Coast
11. Hopkins River
12. Portland Coast
13. Glenelg River
14. Millicent Coast

TASMANIA TAS
1. Flinders–Cape Barren islands
2. East Coast
3. Coal River
4. Derwent River
5. Kingston Coast
6. Huon River
7. South–West Coast
8. Gordon River
9. King–Henty rivers
10. Pieman River
11. Sandy Cape Coast
12. Arthur River
13. King Island
14. Smithton–Burnie Coast
15. Forth River
16. Mersey River
17. Rubicon River
18. Tamar River
19. Piper–Ringarooma rivers

![Water Information logo]

www.bom.gov.au/water

Source: https://www.waterquality.gov.au/anz-guidelines/your-location/australia-inland
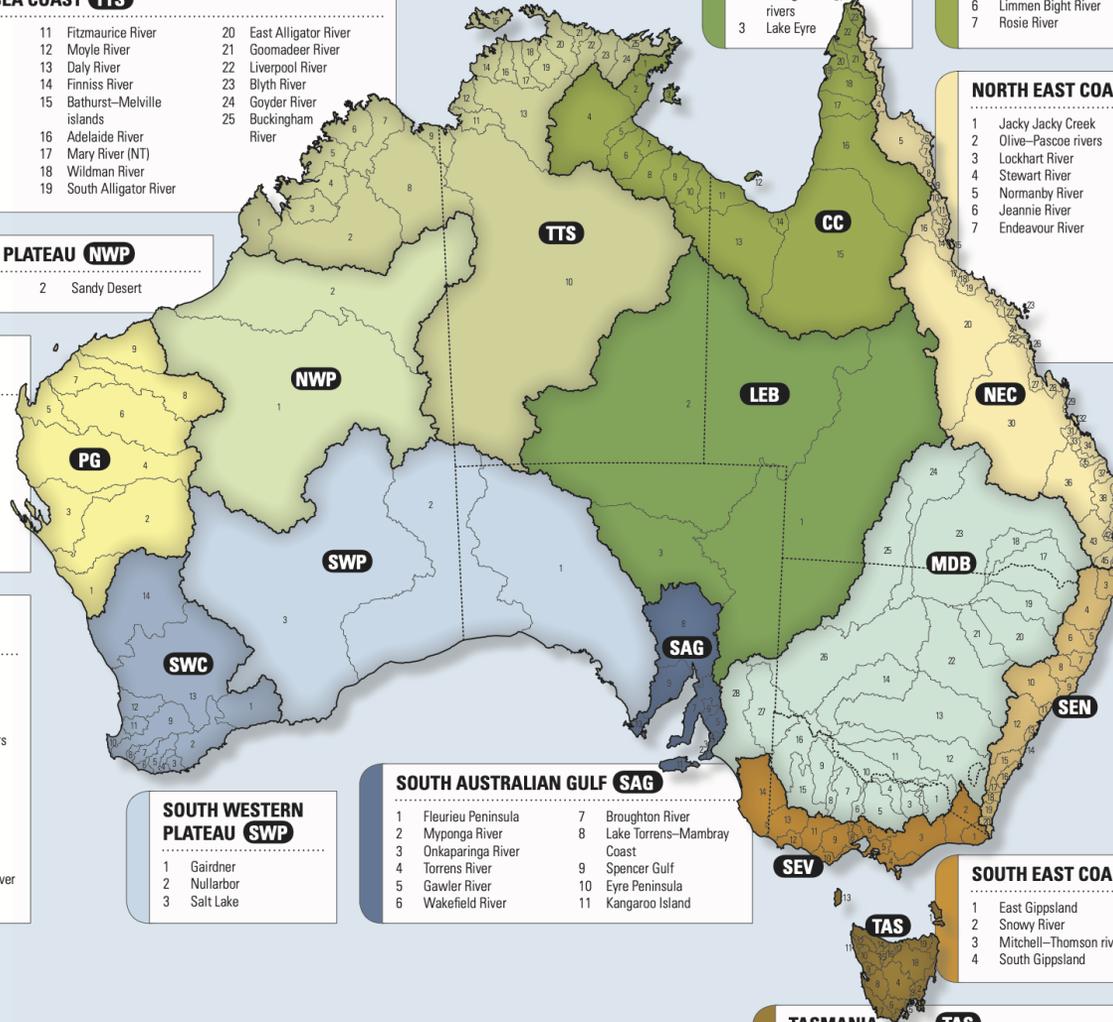
Water Information   Regulations   Standards   About

Get data

To use the Geofabric please download or access the data.

Data formats

The Geofabric is available in an [Esri](#) File Geodatabase format.
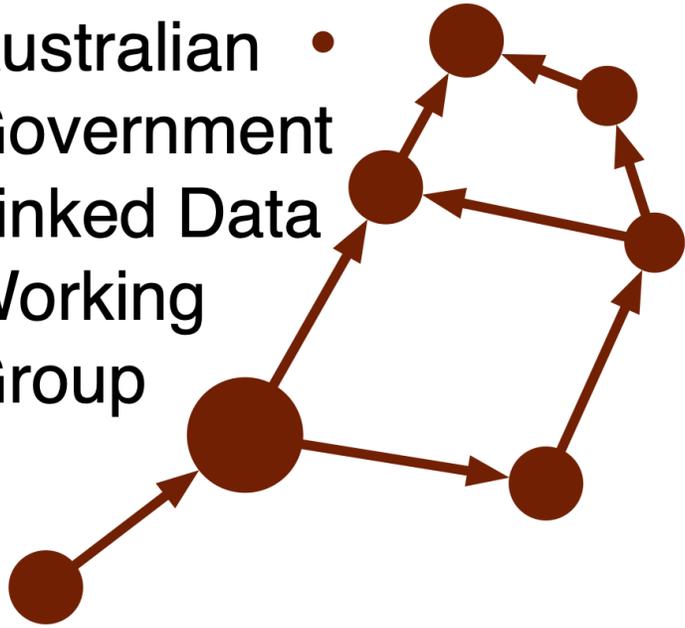
Systems must be compatible with [Esri](#) ArcGIS 10.3 or above.

[Download the Geofabric data](#) from the Geofabric FTP site. Version 2.1.1 products are still available from the [version2](#) subfolder.

Web services

Version 3x web services are available and can be accessed through the [Australian Water Data Service](#) (AWDS).

AGLDWG

- Goal: Increase AGLDWG relevance for Australia's benefit.
- AGLDWG in 2018
- data.gov.au vs. data.gov.uk

AUSTRALIAN GOVERNMENT LINKED DATA WORKING GROUP

Community of Commonwealth Government experts and champions, with invited non-voting participation of individuals, corporations and other entities.

- Established in August 2012, with strong growth in membership since the Government released the outcomes of an inquiry on Data Availability and Use in the Australian Government.

- No official Government mandate or related legislation, but a community of practice that promotes and represents a series of federal Government entities who seek to implement and use Linked Data technologies for the betterment of Australian Government data sharing.

- Several members have signed an MoU to support the use and persistence of linked.data.gov.au URIs.

Data.gov.au

https://data.gov.au/

.gov

Data.gov.uk

https://www.data.gov.uk/

.au

.uk

?

https://theodi.org/

ODI are building LD API's for OpenActive (funded by Dept. of Culture, Media and Sport) in addition to similar projects for Volunteering and Social Finance.
Focus inc. publishing data via LD Standards using schema.org vocabulary with extensions relevant to the domain, such as volunteering, sport activity.

.org

Upcoming AGLDWG Presentations

Next AGLDWG Presentation (Thu 5 Feb 2026)

Jesse Wright: **Perceptions of LD sentiment in Aust v. the UK**

Subsequent Presentations:

- Royal Melbourne Institute of Technology (RMIT) & Spatial Linked Data
- United Nations Transparency Protocol (UNTP) and related LD work
- Finnish National Research Infrastructure initiative
- Dutch Linked Data community
- LD at Dutch Ministry of Finance

Questions / Discussion