

Data ecosystems

Concepts and Examples

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Concepts

a selection of conceptual frameworks that may be useful



CONCEPT – socio-technical solutions

Generating value and impact from data and infrastructures needs an integrated approach



Integrated approach to address a range of inter-related concerns:

- Social privacy, ethics, social licence, culture, attitudes, behaviours, incentives
- Institutional legislation, policy, sovereignty, standards, governance, KPIs and to realign incentives
- Economics value of data & business models



CONCEPT – information supply chains

Example in an environmental information context



CONCEPT – social architecture

- A functioning information supply chain and information infrastructure

 needs a holistic and integrated approach
- Recognising the need to address the social, information and technical architectures for a successful and sustainable information supply chain



INFORMATION

CONCEPT – transaction costs – who pays?



formation, reporting standards)



Adaption of : Understanding and unlocking the value of public research data - CSIRO: Sanderson et al 2017 https://publications.csiro.au/rpr/download?pid=csiro:EP168075&dsid=DS2

CONCEPT – data market

Markets bring together providers and consumers of data and services, facilitated by digital platforms that lower the transaction cost of interactions around discovery, access and (re)use.

Institutions regulate markets and incentivize market participants

Build (refine) platforms

Set (tweak) institutional arrangements

To incentivise behaviours (data deposition)

Baseline attitudes & behaviours (data providers)

Press 'go'

Monitor:

- usage (data and services in and out) for RoI;
- change in behaviours and attitudes (surveys)

Determine appropriate levels of investment in platform & sustainability of supply

Monitor and refine

Create a healthy data ecosystem for providers and consumers of data & services (info. products and apps)





CONCEPT – multi-sided data market

Data and services use & exchange value



Multi-sided markets for service provision

Two-sided markets facilitate interaction between providers and users engaged in mutually beneficial exchange of one type of goods e.g. data. **Multi-sided markets** are platforms that facilitate exchange between data providers, users and value adding service providers. In a data market, service providers are able to access data and create services for data-service users.

Enabling value adding service providers to access data and develop services that deliver value back to farmers is the primary goal of the market place.

Data - a key raw material for services. Service providers access data from providers via the marketplace. Data may be public private or club goods. Service providers may need to pay for access to individual's private goods or collective (club) goods.

Services – a diversity of services could be offered ranging from basic access services (e.g. discovery services) to 'value add' services (e.g. water availability forecasts) drawing together multiple sources of data. Services could be offered for free (public goods) or for fee (private goods)

Transactions - given the range of exchange transactions and benefit flows between providers in public, club and private goods space, there is a need to track provision and consumption.



CONCEPT – data market evolution

Three phases of establishment, growth and interconnection

 A broad pattern of market evolution is hypothesized based on other work and anecdotal evidence. Market evolution can be characterised as three phases:
 - Priming the pump - establishing the market institutions and incentives to drive participation; growing the (data and services) pot - evolving institutions and exploiting economies of scale and scope to establish conditions to form critical mass of data

providers, service providers and users; and **networked market** where data markets merge or interconnect. As the market progresses through these phases, and the pot of data and services grows, the rules of the game will need to be adjusted to reflect the changing nature of incentives.



infrastructure investment decision making

 Business decisions about market control and conditions for sharing data across markets are made

Box, P., Sanderson, T., & Wilson, P. (2017). National Soil Data Project - recommendation for a farmers' data market. Eveleigh: CSIRO; 2017. csiro:EP177870. <u>https://doi.org/10.4225/08/59fcaea8169bb</u>



Example

intellectual property in the information supply chain



EXAMPLE – Atlas of Living Australia





AUD \$55 million investment

over 10 years



A leading-edge collaborative e-infrastructure integral to advancing biodiversity knowledge







Data types

- specimens
- occurrence
- images, sounds
- literature
- sequences
- more
- >84 million records
- 9,110 data sets
- 495 spatial layers
- >47,000 registered users
- >17 billion records downloaded from over 1.7 million events



System

- data capture & aggregation
- data management
- data discovery
- data visualisation
- data analysis & reporting



National Research infrastructure



NCRIS

National Research Infrastructure for Australia

An Australian Government Initiative





Open data, open source, open access, open services, open infrastructure

EXAMPLE – open infrastructure





https://www.ala.org.au/

CONCEPT – information supply chain



Looking at information / data as part of a "supply chain" to improve the seamless flow of information and therefore deliver strategic outcomes and impact



CONCEPT – information supply chain



If, and how Indigenous knowledge and approaches might fit into the supply chain?



EXAMPLE – responsibility of an infrastructure



- IEK as a legitimate body of knowledge about Australian biodiversity
- Avoid the perpetuation of colonialism in the emergence (& convergence) of digital platforms
- Responsibility to address these issues as a national infrastructure



EXAMPLE – ALA IEK intent and workplan



Indigenous ecological knowledge

- Yugul Mangi two-way project
- Kamilaroi language names
- Tracks App CLC
- BioCollect



https://www.ala.org.au/ala-and-indigenous-ecological-knowledge-iek/



- Olkola: decision & risk matrix
- Traditional Knowledge Labels
- ICIP principles/protocols
- Language, spatial layers/place



Information platforms (two-way/private)

Prototype information platforms:

- Seasonal calendar
- Profiles cross-cultural collections



EXAMPLE – ALA IEK intent and workplan



Vision

• Improved social and ecological sustainability through enabling two-way biodiversity knowledge

Goals

- *respect and recognise* the value and ownership of Indigenous Ecological Knowledge (IEK) and give prominence to it alongside western science biodiversity knowledge
- *support and invigorate* IEK and its ongoing **application and revitalisation** in biodiversity conservation, environmental management and socio-cultural, land rights and economic goals
- *support* Indigenous people to realise their goals in Indigenous knowledge maintenance, management and application
- empower two-way participation in biodiversity information collection, management and access
- *support* **intergenerational** transmission of IEK
- *ensure* **ethical practice** through informed consent, equitable sharing of benefits arising from access to IEK, and other established principles of engagement

EXAMPLE – ALA IEK intent and workplan



Output Areas

- *Engagement* building best practice engagement approaches and protocols
- Awareness raising the profile of IEK and ALA and synergies between knowledge systems
- *Education* facilitating skill-sharing and learning and intergenerational transfer of IEK
- *Capacity* building capacity and opportunities within communities and individuals to apply their knowledge
- Data/Knowledge Indigenous people recording, managing, controlling and mobilising data/knowledge
- **Platforms** platform/s, services and interfaces specifically for IEK that support traditional knowledge systems
- Science Indigenous driven research/science outputs or goals/ priorities including knowledge co-production
- Application the practice & use of knowledge, systems and capability for recognition and management of country

CONTEXT – "deep time"



Billy Griffiths 2018 - Deep Time Dreaming. Black Inc Publishing



240 years (Emu – ALA records)

28,000-40,000 years (Arnhem Land) ©Ben Gunn

CONTEXT – "worldview" "knowledge systems"



Fiona Walsh, Perrurle Dobson, Josie Douglas 2013 - Anpernirrentye: a Framework for Enhanced Application of Indigenous Ecological Knowledge in Natural Resource Management – Ecology & Society



CONTEXT – structural/classificatory "colonialism"



Terri Janke 2018 – Indigenous Knowledge – issues for protection & management - <u>http://www.terrijanke.com.au/indigenous-knowledge</u> Jane Anderson 2015 - Intellectual Property and Indigenous Knowledge Greg Younging 2010 – Gnaritas Nullius (No One's Knowledge): public domain & colonialization of Indigenous knowledge



Banduk Marika - Djanda and sacred waterhole Photo: Flinders University



GOVERNANCE – digital governance - ICIP



- Indigenous Knowledge Protocols
 - worked with Terri Janke & Co
 - Indigenous Cultural & Intellectual Property (ICIP)
- Guiding Principles
 - key areas to address:
- Approach
 - how to embed in a "open" platform & approach
 - framework for practical pathways & understanding e.g. options, visual narrative,
 • •
 - the digital, administrative, legal, and contractual responses – e.g. terms & conditions

Trying to intersect IK and ICIP with western concepts of IP law – what is the "in-between" space? eg Yolgna concept of Ganma



GOVERNANCE – digital governance - ICIP

"open" infrastructure based on



FRUIDED / FRUIDEDL	DIGITAL response	ADMINISTRATIVE response	LAW	CONTRACT	
Outward facing/statement. Perhaps also framed as questions or FAQs - What worries, concerns, pains etc that addressing	practical/physical actions within the ALA platforms	Inward & examples of actions to implement protocol concepts			
RESPECT, RECOGNITION & PROTECTI	ON				
 ALA acknowledges and respects the rights of Indigenous people, communities and groups to protect, maintain, control and benefit from their Indigenous Knowledge (IK) and Indigenous Cultural & Intellectual Property (ICIP). ALA acknowledges that ownership of any IP, IK or ICIP it collects, aggregates, manages or accesses will remain with the Indigenous people, communities and groups that speak for that material, and recognises that that ownership may be communal and not individual or legal entity based. ALA will be clear about IP and ICIP arrangements. ALA will use and respect where applicable relevant legal measures such as copyright and confidential information which assist in the control and protection of ICIP. ALA respects the right of Indigenous people, communities and groups to 	 Protocol shared, made prominent on website (and relevant ALA platforms ALA Terms of Use include ICIP principles Develop and embed TK notices and labels as a protection and control mechanism into ALA infrastructure Check in ALA platform workflows where reference needs to be made (e.g. upload/download/ licence selection, metadata) ALA as an open does not provide tools and platforms that can protect culturally restricted information and to some extent confidential information, although some platforms (BioCollect and Profiles) are developing access tools. The ALA sensitive data tools are able to	 (educate) Workshop with ALA team members, supported by checklists, guides etc Use of Welcome to /Acknowledgement of Country Share the Protocol with other digital infrastructures to evolve and adapt – e.g. GBIF (international) Ask/check whether there are local/regional Indigenous organisation protocols Portfolio of work that encourages and promotes a diversity of Indigenous cultures and IK Provide risk / benefit framework as a guide for Indigenous partners to determine whether and how to share their ICIP or IK. When IK is being collected and shared via the ALA, project personnel should explicitly ask whether the information is culturally restricted and explain the consequences 	 Use of copyright protections where ICIP can be covered by this – © protection, ownership Are the any legal requirements and regulations that need to sign up to / take note of – note limitations as a Cmth agency (archives, public sector data policy, etc) Use of certain Creative Commons licences e.g. SA or ND (e.g. Yolngu not mix concept). 	 ALA Terms of Use include ICIP references ALA contracts with brokers and Indigenous collaborators include ICIP clauses – see standard clauses/proforma agreement agreement 	oncep

GOVERNANCE – decision to share & risk



- Work of Olkola & CSIRO
 - completed, needs translation
 - Profiles to be added NB contractual limitations
- Decisions to share
 - two-way sharing
 - consent through collaborative decision making
 - operating in western legal framework
 - key areas to address:
- Risks and benefits
 - what are the implications of sharing and sharing in different ways?
 - balancing risk and benefit

A Guide to Assessing t Does customary law allow the knowledge on be named with others (ask the Elders!) Yet.	he Risks in Sharing Traditional Knowledge	NAME	S	Language name: Common names: Scientific name:
Does the public know about the knowledge (search internet and books)?	Yes. Share agan?	Wha smel	t it looks, Ils, feels like	
ent		Whe	re it is found	
Daes the knowledge		What it loo smells, feel Where it is Food, medi and other t Connection people Connection country Management issues	l, medicine other uses	
describe a use for source that glea, a use for for a plan or animal?	Yes. Property law specialist before sharing?	Conr peop	nections with ple	
Does the knowledge	Yes.	Conr coun	nections with htry	
sc mething?	before sharing?	Mana issue	agement es	
TT	Keep secret?	IP st	atement	

GOVERNANCE – Traditional knowledge labels



This project will embed **ICIP** principles and protocols in a digital platform

supporting the recognition & visibility of Indigenous ecological knowledge through the co-development of knowledge labels

ensuring more equitable and culturally respectful terms for the sharing of IEK





TK Seasonal (TK S)



TK Community use Only (TK CO)

TK Secret / Sacred (TK SS)

TK Men Restricted (TK MR)





TK Culturally Sensitive (TK



S'ÍWES (literally education, teachings)

This website is intended to share who we are as Sq'éwlets people, and particularly to educate. The outreach label means 'educating' and 'teaching' in our language, s'iwes. We ask that outsiders respect our culture by not using the content out of context. If you use content on this website, please be respectful. We also encourage you to contact our Band to learn more about us and to create opportunities to learn more about us and our culture and history.



SKWIX QAS TE TÉMÉXW (literally name and place)

This website represents the true knowledge and history of Sq'éwlets people. The attribution label literally means 'name' and 'place' in our language, skwix gas te Téméxw. We ask everyone that visits this website to attribute our knowledge and histories to us, the Sq'éwlets people, a tribe of Stó:lo. Our history has not always been respected or told correctly. Here we tell our own story in our own words. We are both holders and caretakers of our own lands, resources, and histories. It is the responsibility of our families and communities as Stó:lo people to take care of these things in a respectful way. Please feel free to contact us with further questions about attribution.

Jane Anderson – Local Contexts Terri Janke

TK Women Restricted (TK

WR)

TK Attribution (TK A)



TK Men General (TK MG)





TK Community Voice (TK CV)





TK Verified (TK V)

TK Women General (TK WG)

TK Non-Commercial (TK

NC)

GOVERNANCE – TK labels – proposal & BD





Consultation & Collaboration Scope and focus of the project, and ongoing collaboration and co-creation



Integration of TK labels Integrating into einfrastructure and metadata standards, including search function

ТК

New TK labels & TK Notice Environmental and ecological specific labels, including identifying notice



Tools

co-curation of labels via GitHub, workshops, educational materials, training



Adapt to local context

Local community adaption of labels



Broader application

Contributing to national & international dialogue on rights and responsibilities for IEK recognition



- Seek feedback & input into research plan and refine
- Further discussion with other potential research & industry collaborators
- Build consortium of investors



PLATFORMS – developing digital seasonal calendars

Atlas of Living Australia ala.org.au

- Seasonal calendars as a desirable form/tool for representing knowledge
 - An intergenerational knowledge sharing tool
 - A tool for clearly articulating connection, understanding and use of lands and waters and its resources
 - Planning processes
 - Broader public awareness and appreciation
 - Broader promotion of IK system complexity:
 - hydrology; weather patterns; seasonal events; seasonal indicators; resource use; coupled biological events; phenological understanding etc
- Community pride in displaying IEK for others to appreciate
- Need for dynamic and digital form beyond paper/poster:
 - Content limited by space on the paper
 - Static nature infers static nature of IEK which is dynamic and adapting
 - Limits to engaging youth



http://www.larrakia.csiro.au

https://www.csiro.au/en/Research/Environment/Landmanagement/Indigenous/Indigenous-calendars



LANGUAGE - Species Pages



• The Species Pages give an overview of all the different types of information available in the ALA about a species. Names form the backbone of how ALA works.



LANGUAGE – Lists



- The Lists tool is a way to bring together extra information about a group or list of species, and use it other parts of the ALA (e.g. the Tracks App).
- We are using an International Standard (Darwin Core) to also test how to include language names

Species List: The Tracks App - animal species Number of Taxa 58 Distinct Species 51 Refine results family Macropodidae (8) Gould, *		List info Author (matched) Gould, 1840	info Download View occurrence records View in spatial portal Search by Supplied Name Search (matched) Common Name (matched) vernacular name Warlpiri name Gurindji name A 1840 Malleefowl Malleefowl Malleefowl		View in spatial portal Search Gurindji name	\square	We are exploring how and where we can show Indigenous language names in the ALA			A spreadsheet using the Darwin Core Vernacular name standard to add language names and other information					
Varanidae (6) Dasyuridae (5) Agamidae (4) IC choose more vernacular name		(Stirling & Zietz, 1893)	Great Desert Skink	Great Desert Skink	warrana								\frown		
Goannas (2) Echidna (2) Thorny devil (2) Common Brushtail Possum (1) I& choose more		(Sternfeld, 1919)	Nocturnal Desert-Skink	Night skink	jalupa		Names - Indige important to hav each vernacula	nous - Darwin Core Verna ve <u>useful to have</u> r name (even if for same spe	cular name standard - if you have it ecies) needs to have a sep	arate line					
Warlpiri name jajina / kana-karlurmpayi (3) pujarr-pujarrpa (3) warna (3)		(Reid, 1837)	Bilby	Bilby	walpajirri / 🔺 ninu / 🚽		scientificName preferably use t	vernacularName (english) he common name	vernacularName	anguage (Al. ISO 639 8 the	aguage sour ATSIS) Bibli	irce i	isPreferredName This term is true if the	tixonRemarks	organismPart The part of the
Wardapi (2) IC=choose more Vernacular taxon group Lizard (14)	×	Gray, 1841	Thorny Devil	Thorny devil	mirnirri		scientificName than vernacular (english) as the common name sometimes brin	rather Name can g up	Indigenous language name	vertical and the second of the	no ISO639 a so de) - see the v p://austlang.aiat nam c.gov.au/ cited	vernacular t ne refers to the d species.	source ching the use of this vernacular name indicates the usage has some preference or specific standing over other possible	quality set specific usage of the vernacular name.	the ennacular name refers. Best practice is to utilise a controlled
Carnivores Marsupials (5) Snake (4) C≎ choose more	50 5	(Gould, 1842)	Agile Wallaby	Agile Wallaby	Agile Wallaby		e.g Phascolarcte	os cinereu Koala	3 3 wurupil	r1.sii.org/iso639- 3/iso-639- 3_Name_Index.t E8	(Banbai)	1	vernacular names used for the species.		vocabulary for this term although it is likely that multiple
laxon common Predators (8) Lizard (7) Wallabies (6) Goanna (6)		Thomas, 1922		Spinifex Hopping Mouse	jungunypa										
iC₂ choose more		Lesson. 1842		Hopping Mouse	Hopping										- 20

LANGUAGE – transcription



• Living Archive of Aboriginal Languages using Digivol (crowdsourcing) to digitise and transcribe difficult to OCR texts



http://laal.cdu.edu.au/

LANGUAGE – transcription



• Living Archive of Aboriginal Languages using Digivol (crowdsourcing) to digitise and transcribe difficult to OCR texts



Kutuu7

Yedi-nyanu yimaKa nyampu ina, MoKenzie