crc•si Spatially Enabling Australia and New Zealand

Spatial Analytics

# Reducing Consumer Uncertainty

## Eliciting User and Producer Views on Geospatial Data Quality

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Australian Government
Department of Industry, Innovation and Science
Business Cooperative Research Centres Programme

# Introduction

- Cooperative Research Centre for Spatial Information (CRCSI) in Australia
- Communicate fitness for use of spatial data sources to users in spatial and other domains
- Capture and represent users' requirements and implicit knowledge of spatial data sources
- Adopt a "user-centric" approach to geospatial metadata
- Create a vocabulary to communicate fitness for use of spatial data sources in the context of various application domains

## Research partners…

Curtin University

University of New England

UC University of Canterbury

QUT

RMIT University

UNSW

SWINBURNE

The University of Melbourne

University of Canberra

## Government partners…

Landgate

Queensland Government

Victoria State Government — Environment, Land, Water and Planning

NSW Government — Spatial Services

Australian Government — Geoscience Australia

Australian Government — Department of Defence

energex

Government of Western Australia — Department of Health

Land Information New Zealand — Toitū te whenua

Murray–Darling Basin Authority

Northern Territory Government

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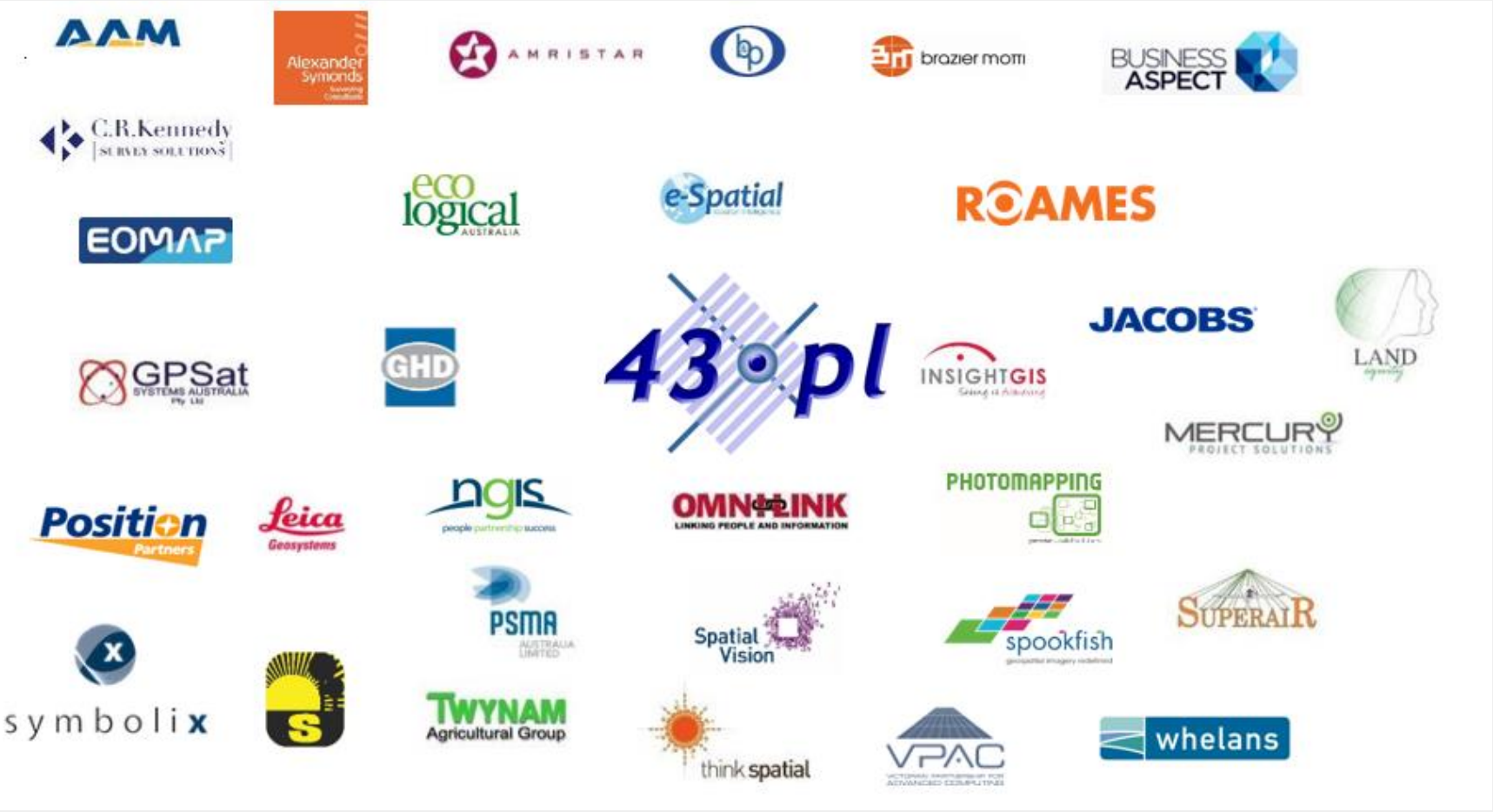
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Agricultural Group
think spatial
VPAC
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# Evaluating Geospatial Data Quality

- Geospatial data sources are being used across various user groups and domains
- Users are presented with an increasing choice of data from various data portals, repositories, and clearinghouses
- Comparing the quality of different data sources and evaluating a data source's fitness for use, is essential
- Quality and fitness for use are dependent on the use case

# Communicating Fitness for Use - Challenges

- Metadata standards are mostly focused on data production rather than potential data use and application
- Datasets are used for purposes other than what they were initially created for
- Datasets used by users with different levels of expertise
- Datasets used in various applications and domains
- End products are often derived from a variety of sources
  - difficult to issue simple statements about a product's quality
  - impossible to label a particular dataset as "the best"

# Standards and Related Initiatives

- Geospatial standards
  - ISO 19115-1:2014 - Geographic info metadata fundamentals
  - ISO 19115-2:2010 - Extensions for imagery and gridded data
  - ISO 19115-3:2016 - XML schema implementation for fundamental concepts
  - ISO 19157:2013 - Geographic information – Data quality
  - ISO 19157-2:2016 - Geographic information – Data Quality – XML schema implementation
  - ISO/TS 19158:2012 - Geographic information - QA of data supply
  - ISO 19150-1:2012 - Geographic Information – Ontology Framework
  - ISO 19150-2:2015 - Geographic Information – Ontology – Rules for developing ontologies in the Web Ontology Language (OWL)

# Standards and Related Initiatives

- Geospatial Standards - continued
  - ISO 19109:2015 Geographic information — Rules for application schema
  - 19110:2016 Geographic information — Methodology for feature cataloguing
- Dublin Core Metadata Initiative (DCMI)
  - an open organization supporting innovation in metadata design and best practices across the metadata ecology
- DCAT
  - Vocabulary designed to facilitate interoperability between data catalogues published on the Web

# Standards and Related Initiatives

- Schema.org
  - In 2011, the major search engines Google, Bing ,Yahoo, and (later) Yandex created Schema.org
  - Single vocabulary (ontology) across a wide range of topics
  - Includes classes/properties for people, places, events, products, offers
- ANZLIC Metadata Profile
  - Australian/New Zealand Profile of AS/NZS ISO 19115:2005, Geographic information — Metadata (implemented using ISO/TS 19139:2007, Geographic information — Metadata — XML schema implementation)
- Foundation Spatial Data Framework (FSDF)
  - an ANZLIC initiative that aims to deliver national coverage of standardized and quality controlled foundation spatial data for Australia and New Zealand

# Increasing Choice of Metadata Standards

- Which standards should be used ?
- How much metadata should be provided?
- What quality information should be provided?
- How should quality and fitness for use be communicated in a consistent and standardized way?
- How to enable geospatial data users to determine fitness for use of spatial data sources in the context of their application and domain?

# Reducing Consumer Uncertainty

*Progress to Date*

- Elicit user and producer views on geospatial data quality
  - in the context of various domains and applications
  - through a series of informal and semi-structured interviews
  - discussion was guided by a set of high-level questions or prompts
- Investigate the *internal quality* of geospatial data sources
  - identify producers' perceptions of geospatial data quality
  - identify the objective quality measures and elements of geospatial data quality that are used to describe the internal quality of data sources

# Reducing Consumer Uncertainty

*Progress to Date*

- Investigate the external quality of geospatial data sources
  - identify key informational aspects of geospatial data sources that are influential to users from different domains, for evaluating quality and fitness for use
  - elicit high-level user requirements for making informed data source selection decisions

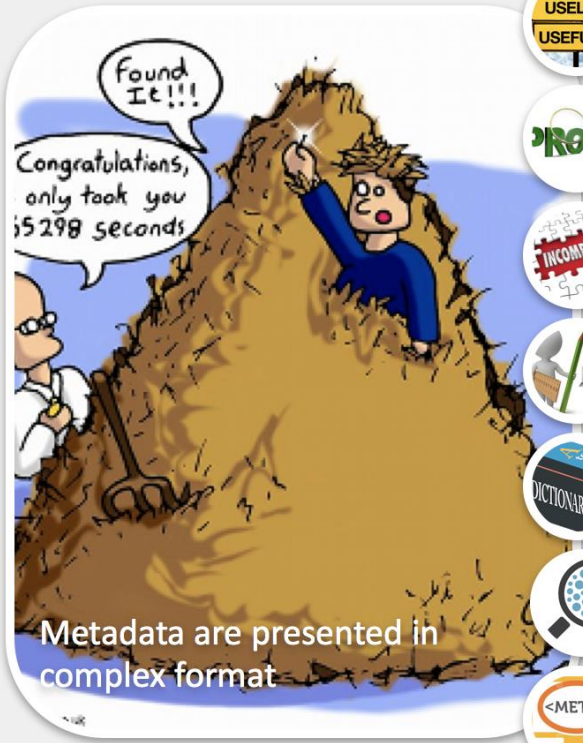
# Reducing Consumer Uncertainty

*Engagement Outcomes*

- Initial Evaluation
  - Extent of coverage
  - Currency of data
  - Frequency of updates
  - Licensing
  - Attribution–specification, format, accuracy statement, supplier reputation, cost, methods of maintenance/capture, scale
- Geographic and temporal extent
- Summary information – record count per feature

# Reducing Consumer Uncertainty

## *Engagement Outcomes*





Can't determine fitness for use



What are the problems/issues/limitations of a dataset?




Metadata records are incomplete with essential data omitted



How is data captured, calculated and updated?




Data dictionary, describing data in detail

Describe a dataset at various levels of granularity


User-centric metadata will enable users to assess fitness for use

# Reducing Consumer Uncertainty

*Engagement Outcomes*

- There is no single format to cover all data and metadata
- Dynamic/timeliness of information–metadata often outdated
- Fitness for purpose is use case dependent
- Information on dataset updates
- Communicating fitness for purpose at an international level
- Metadata are descriptive-can’t be included with the data
- Spatial Software development
- Product or dataset with mixed heritage

# Reducing Consumer Uncertainty

*Engagement Outcomes*

- Provenance and lineage
- QA involves test driving the data
- How to interpret certain values
- Discussion forum
- Number of downloads
- Examples of what the data represents and how to use it

# Reducing Consumer Uncertainty

*Data Quality Survey*

- Comprehensive online questionnaire-based survey
- Covers various aspects of spatial data quality; i.e., internal and external quality
- Enables data collection from a large number of geospatial data users and producers from diverse GIS communities across Australia and New Zealand
- Confirm the outcome of engagements

# Reducing Consumer Uncertainty

*Data Quality Survey*

- Background information, data sources used, and the importance of quality metadata and other supporting information in the assessment of dataset quality and fitness for use
- Internal data quality – indicators that typically come from the metadata transmitted with datasets by data producers
- External quality - specific factors, which are less easily measured
- Perceptions and expectations of a vocabulary for capturing and representing user-centric metadata, to complement producer metadata

# Reducing Consumer Uncertainty

## *Data Quality Survey Aims and Objectives*

- Determine how users and producers of geospatial data *evaluate* the *quality* of spatial data sources within *representative application areas*
- Identify key informational aspects of geospatial data sources that are influential to users from different domains, for evaluating quality and fitness for use
- Elicit high-level user requirements for making informed data source selection decisions
- Elicit producers' and users' views on the concept of a *vocabulary* for *communicating* geospatial *data quality* to consumers of spatial data

# Geospatial Data Quality Surveys

*Aims and Objectives*

- Participants' involvement in standardization and use of geographic standards
- Motivators for implementing geographic information quality standards
- Barriers to implementing geographic information quality standards
- Perceived benefits of implementing geographic information quality standards
- Use of ISO 19100 Geographic information quality standards

# Geospatial Data Quality Survey

*OGC Data Quality DWG 2008*

- Data gathering technique
- Participants' demographics
- Represented industries
- Consumer/supplier
- Data accuracy: the most important aspect of data quality
- Metadata and spatial definition missing or incomplete
- A large percentage of participants don't follow any standards for maintaining SDQ

# Future Work

- Analysis of the data quality survey results to confirm and validate the outcome of the semi-formal interviews conducted so far
- Comparative analysis of various informational aspects of quality, for evaluating the fitness for use of geospatial datasets
- Conduct a survey on the effectiveness of the vocabulary for communicating fitness for use of spatial data sources in the context of various application domains
- Comparative analysis of the vocabulary survey results and the data quality survey results, to determine the extent to which the vocabulary satisfies users' requirements for making informed data source selection decisions