

# Knowledge On-Demand

Future Legal and Policy  
Requirements

Lesley Arnold



**Smart Phone** is our ubiquitous connection to the real world

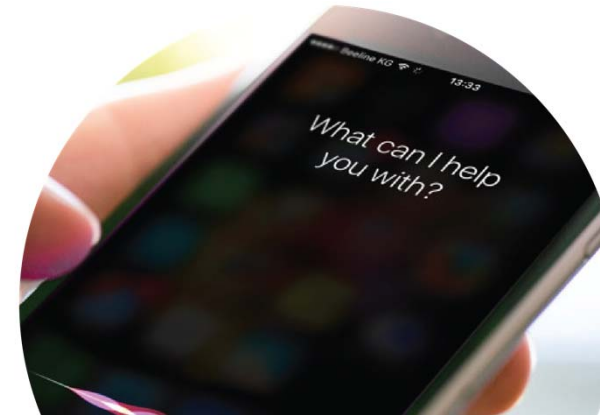


**3.6 Billion  
unique users<sup>1</sup>**

**50% uptake =  
global average**



**Potential to leapfrog  
fixed-line technology**



1. <https://www.statista.com/topics>

# Questions and Answers

Questions unpredictable

Leave the data where it is  
and let the analytics do the  
work

Should we  
evacuate now



Is this land likely  
to be flooded

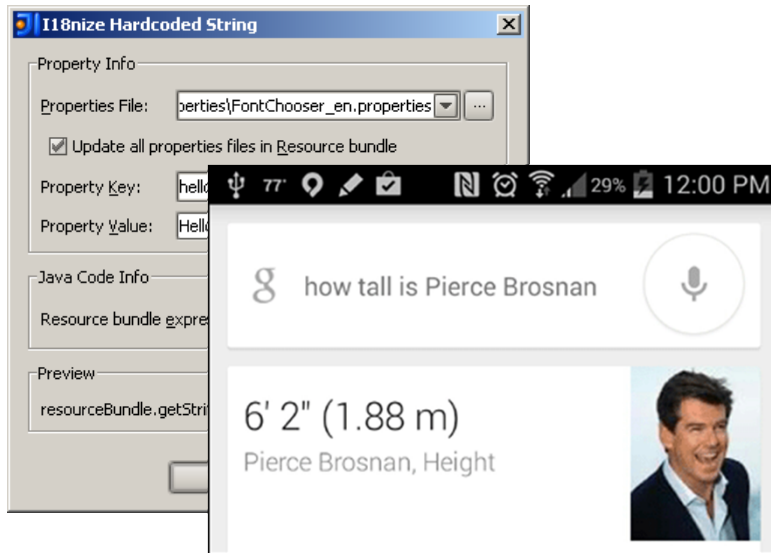


How much land was  
cleared illegally in  
last 5 years



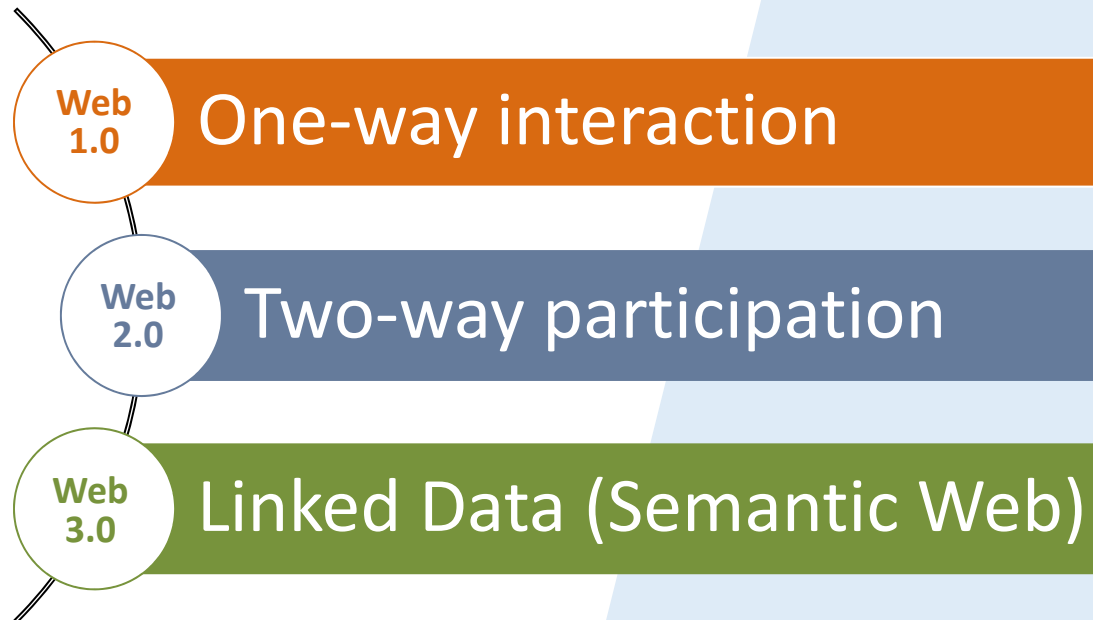
# On-Demand Knowledge

## Road Block 1 – Hardcoded Analytics



# Semantic Web – Making Data Smart

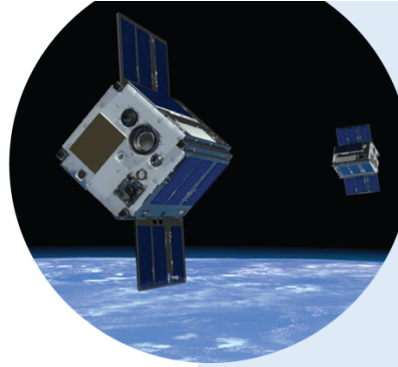
Third stage in the Evolution of the Web





50 billion IoT devices by 2020<sup>1</sup>

Capacity to generate and infer new Knowledge



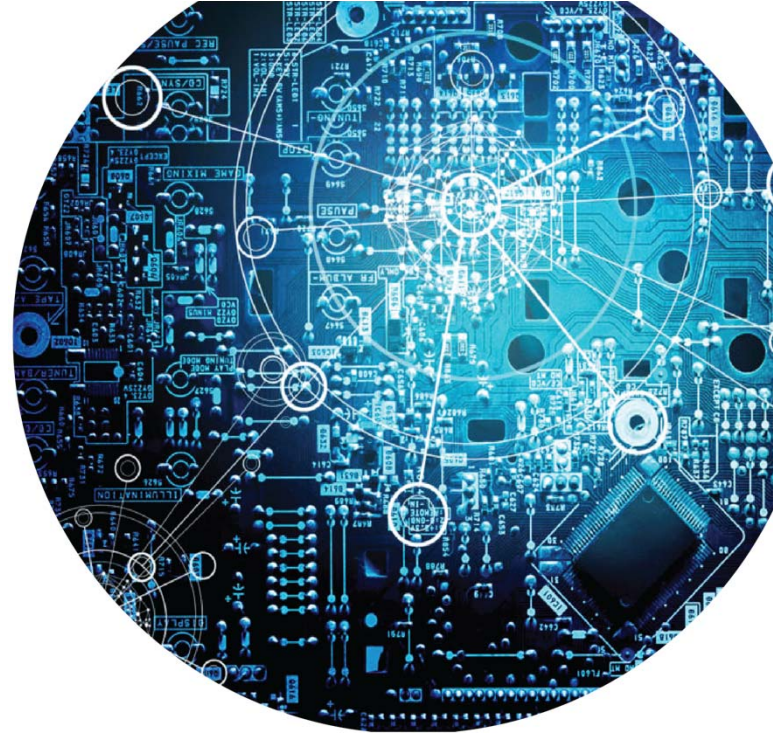
Unprecedented sources of machine-readable data



1. <https://www.statista.com/topics>

# AI Landscape for Knowledge On-demand

- Speech Recognition
- Natural Language Processing
- Machine-learning
- Deep-learning
- Predictive Apps
- Image Recognition
- Knowledge Representation
  - Ontologies
  - Vocabularies



New tools for next-generation spatial infrastructures

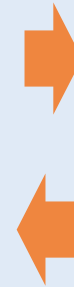
# The Traditional Query Process



Query



Process

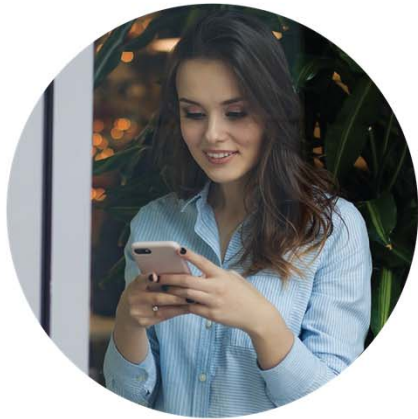


Data

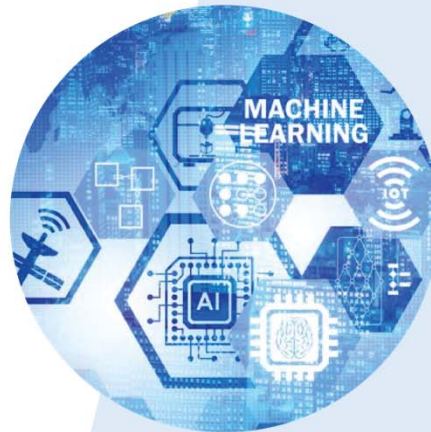
Time consuming manual process



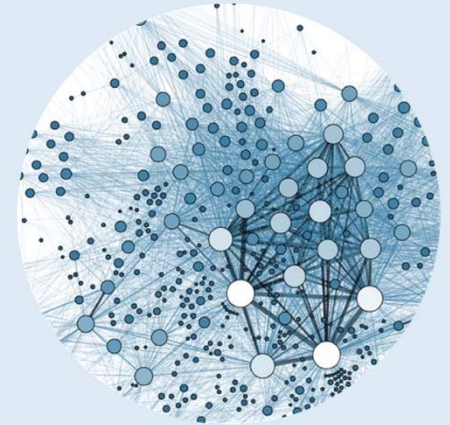
# Knowledge On-Demand Query Process



Query



Process



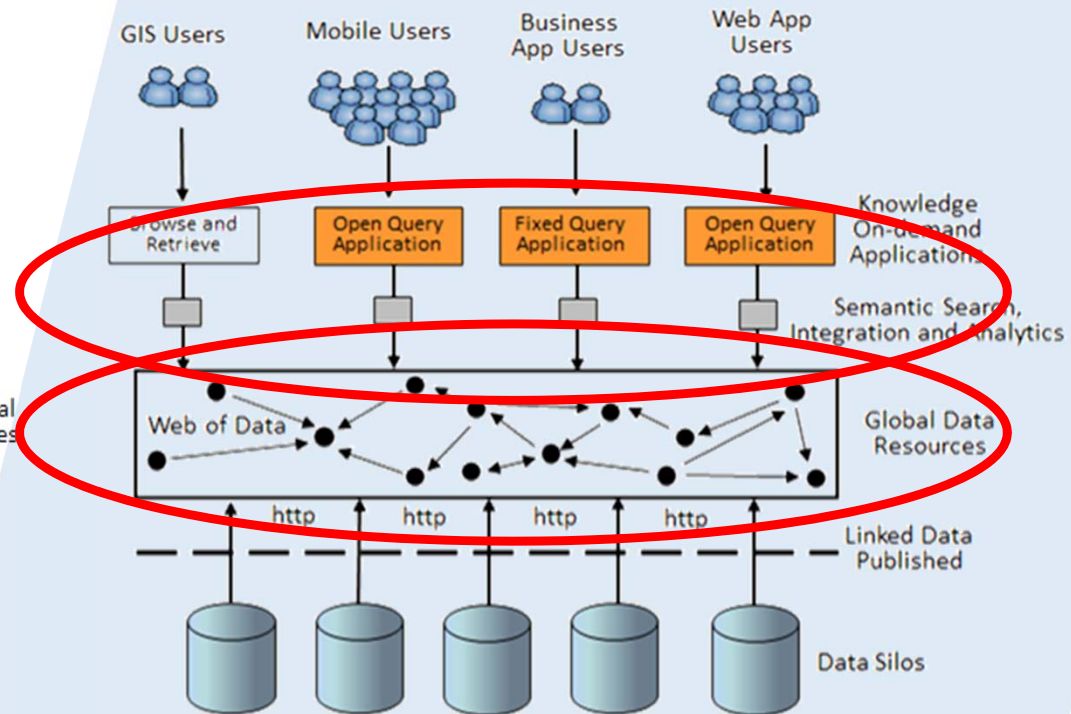
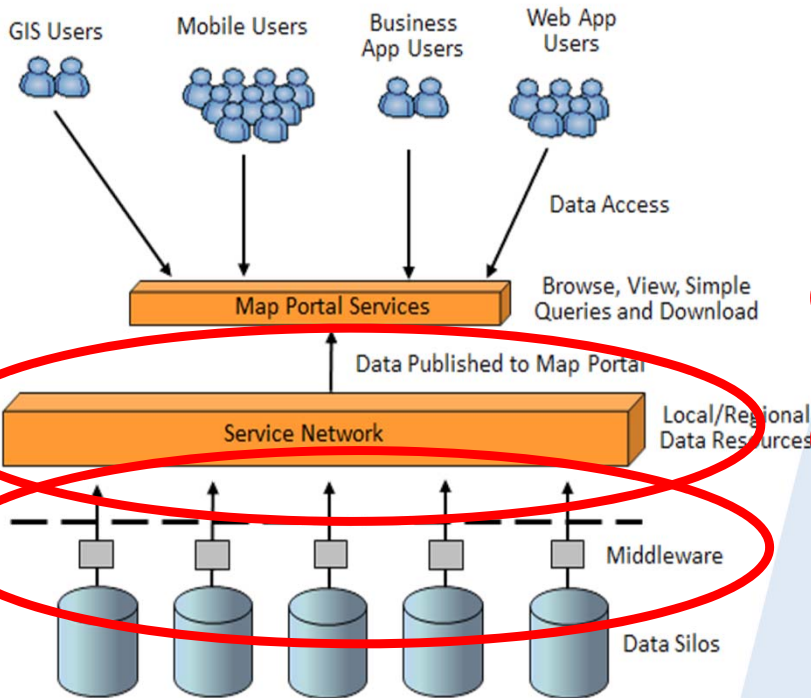
Linked Data

Ability to infer knowledge Automatically

Government can support innovative  
query applications by publishing  
machine-readable data

The market will establish new business  
models

# Major Differences



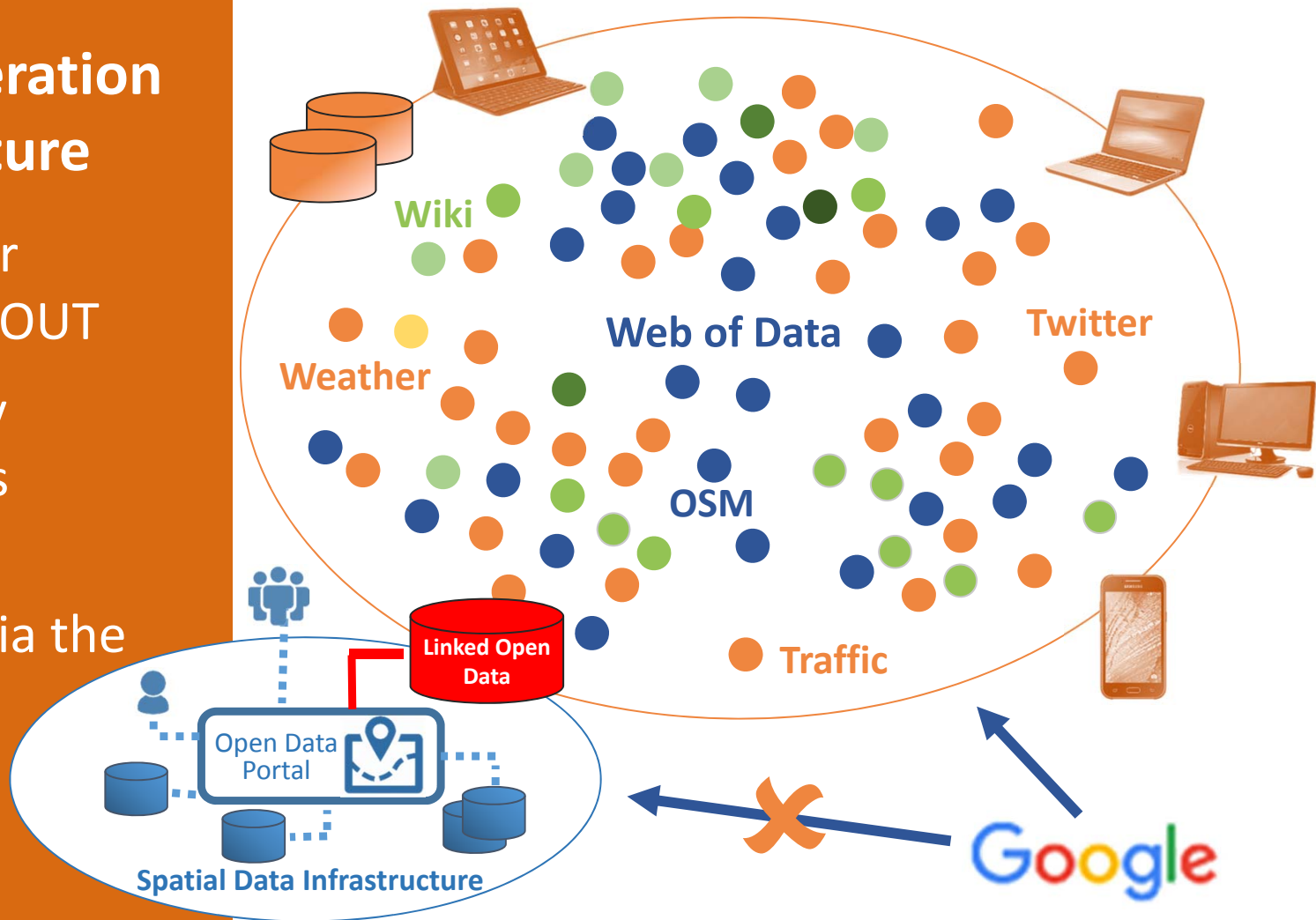
# Next Generation Infrastructure

Designed for Knowledge-OUT

Open Query Applications

Linked Data accessible via the Web

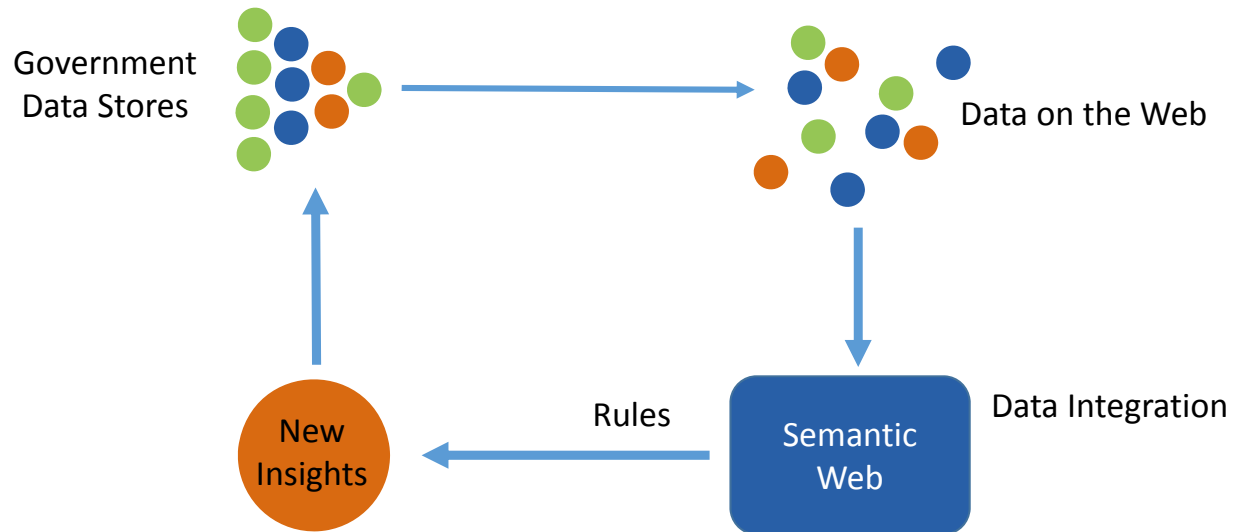
Global data integration



# Semantic Web Future

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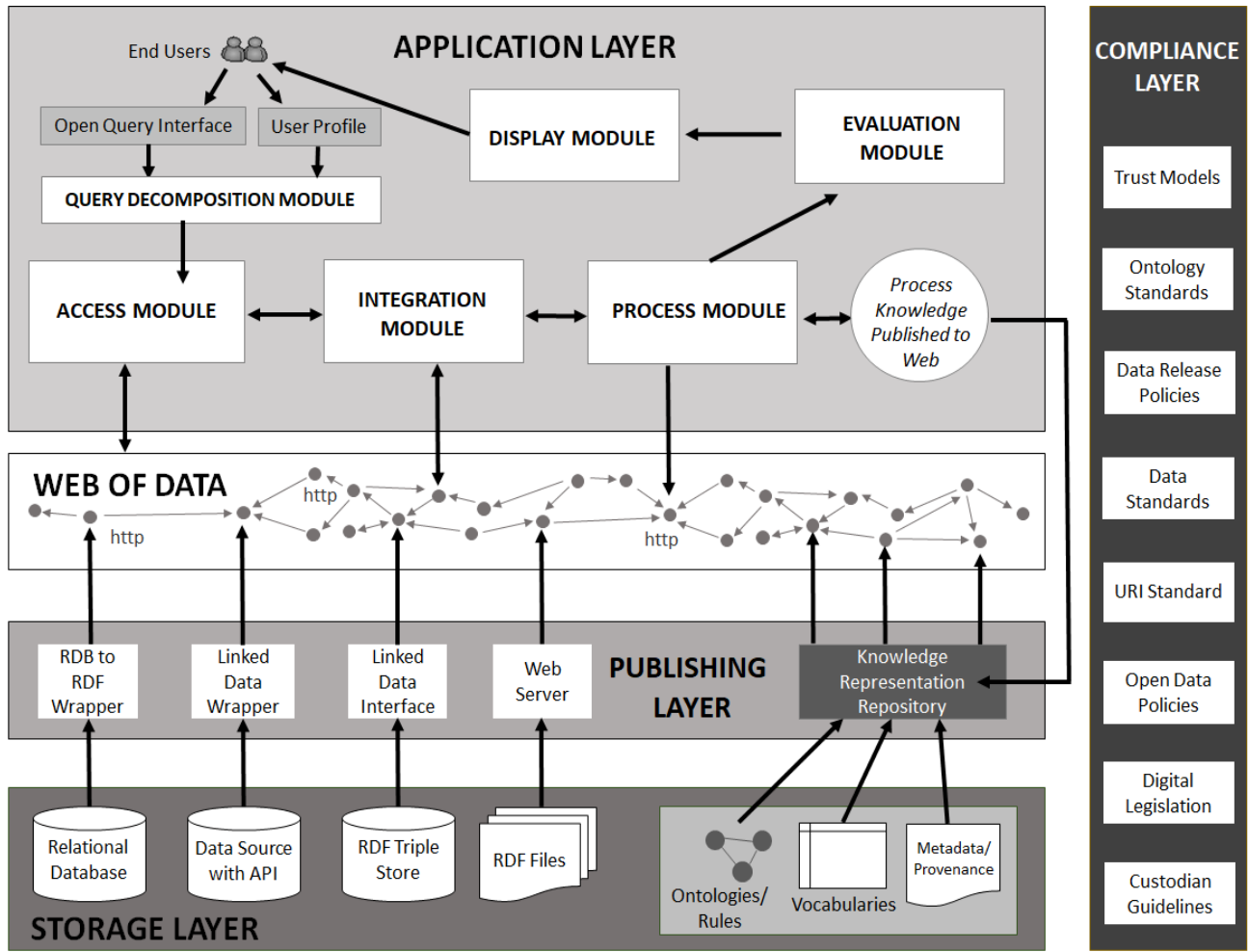
## Linked Data



Who owns the new insights.

Will inferencing/auto  
aggregation reveal national  
security

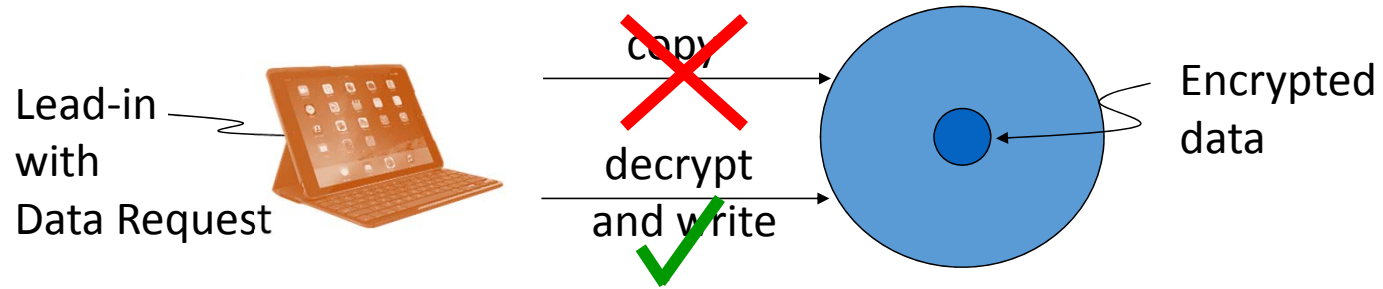
Intellectual property rights do not generally apply to facts and “information” per se, but rather the maps, images and datasets





# Data Release - Self descriptive

# Digital Rights Management



Knowledge On-demand  
requires a rethink and  
redesign in the way data and  
supporting services are  
structured  
(Digital handling)

# Next Generation Systems



**Answers to questions NOT access to data**



Emergency Responder



Insurance Broker



Urban Planner



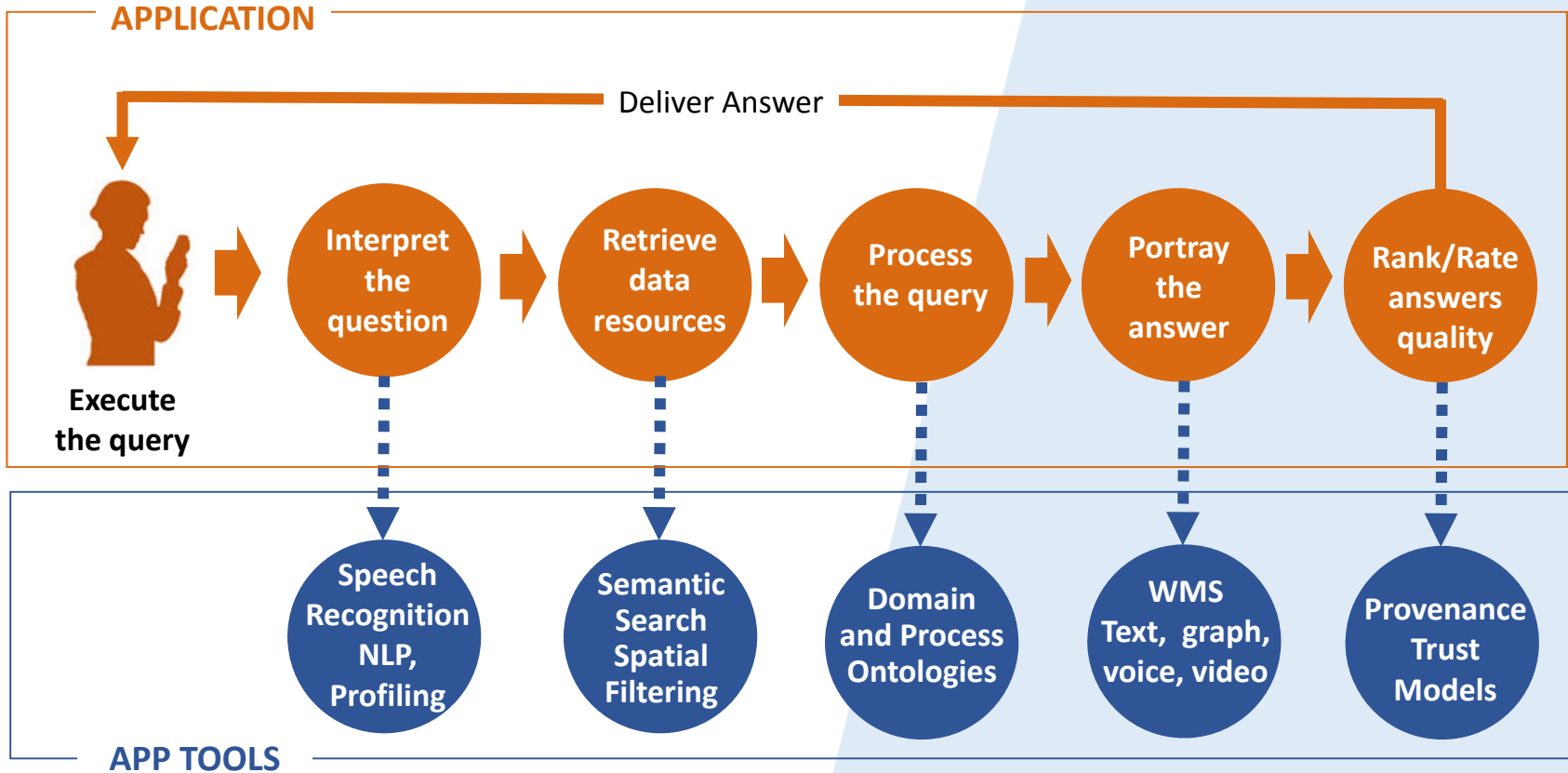
Home Buyer

Will this home be flooded?

Queries need to be context dependent

Information Privacy?

# Open Query Process



# Natural Language Processing

Used to decompose a human query.

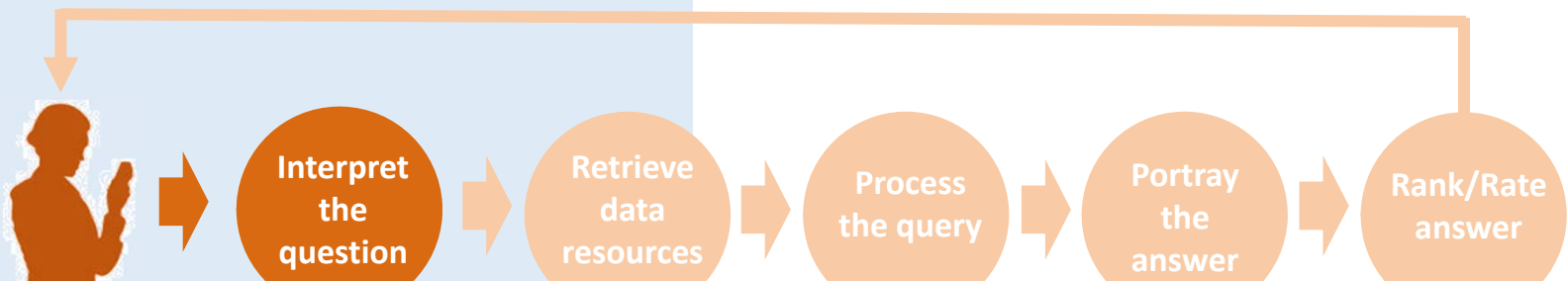
Machine learning used to infer meaning

Will my home ever be flooded?

Future Time

Place/area

Submerged by water



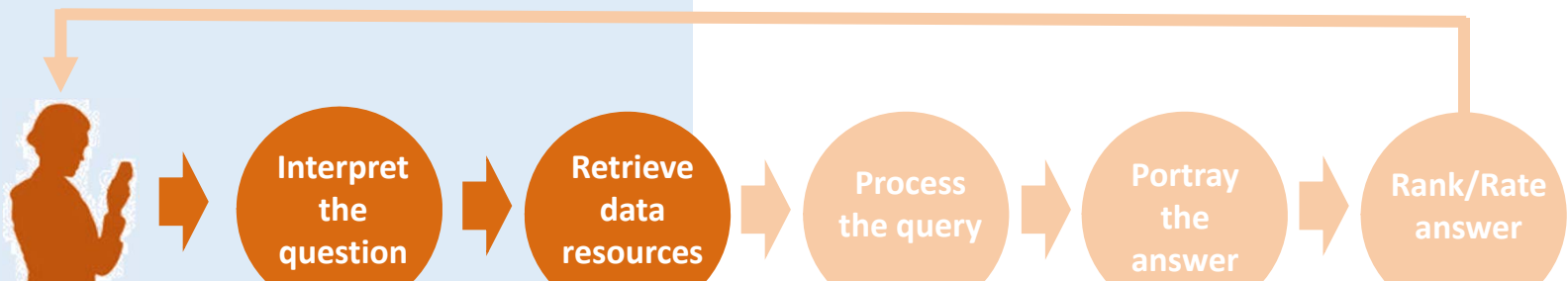
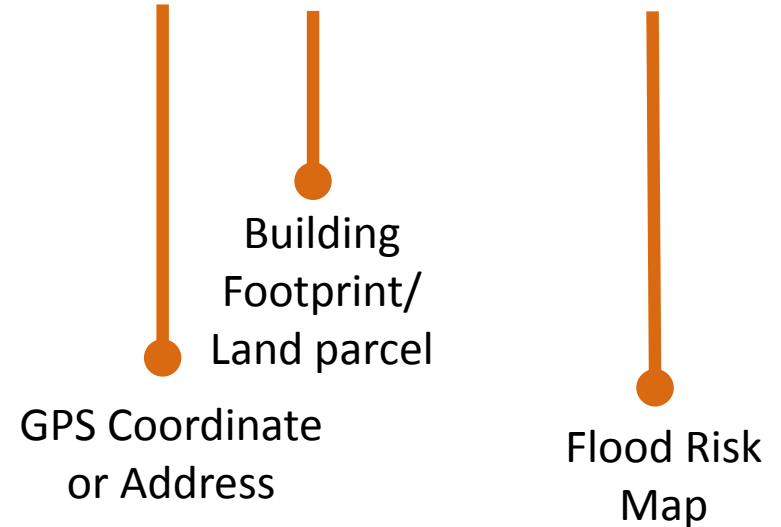


## Semantic Search and Spatial Filtering

Identifies and filters data relevant to a users query and context

Improves simple metadata searches

Will my home ever be flooded?

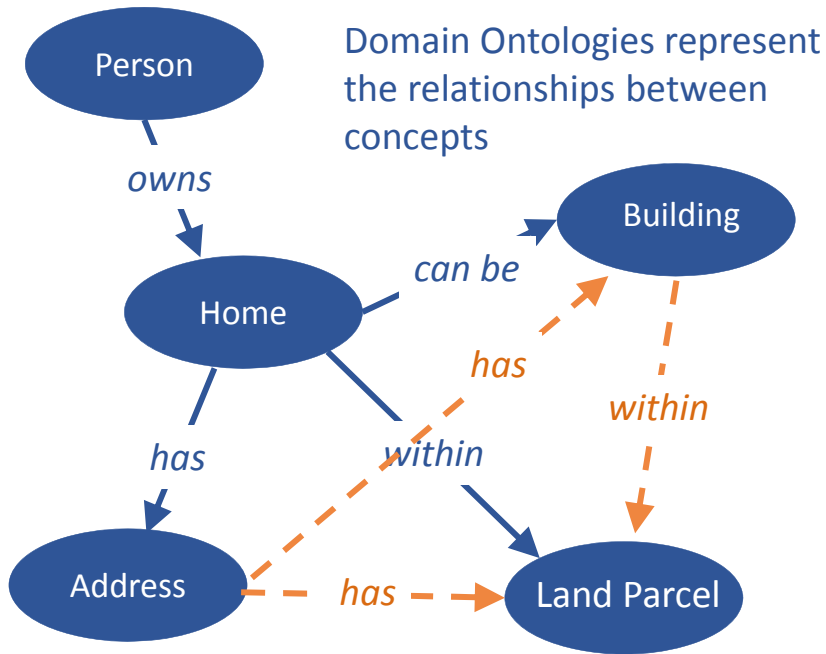


The knowledge to answer a question initially comes from humans.

What, Where, Why, When, and How.

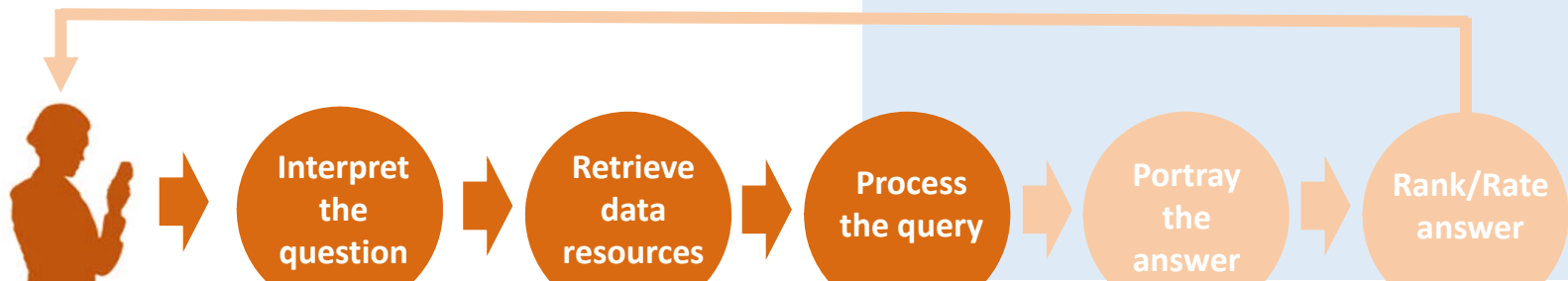
Machines learn from this knowledge.





**Domain Ontologies** are used to represent knowledge in a particular domain.

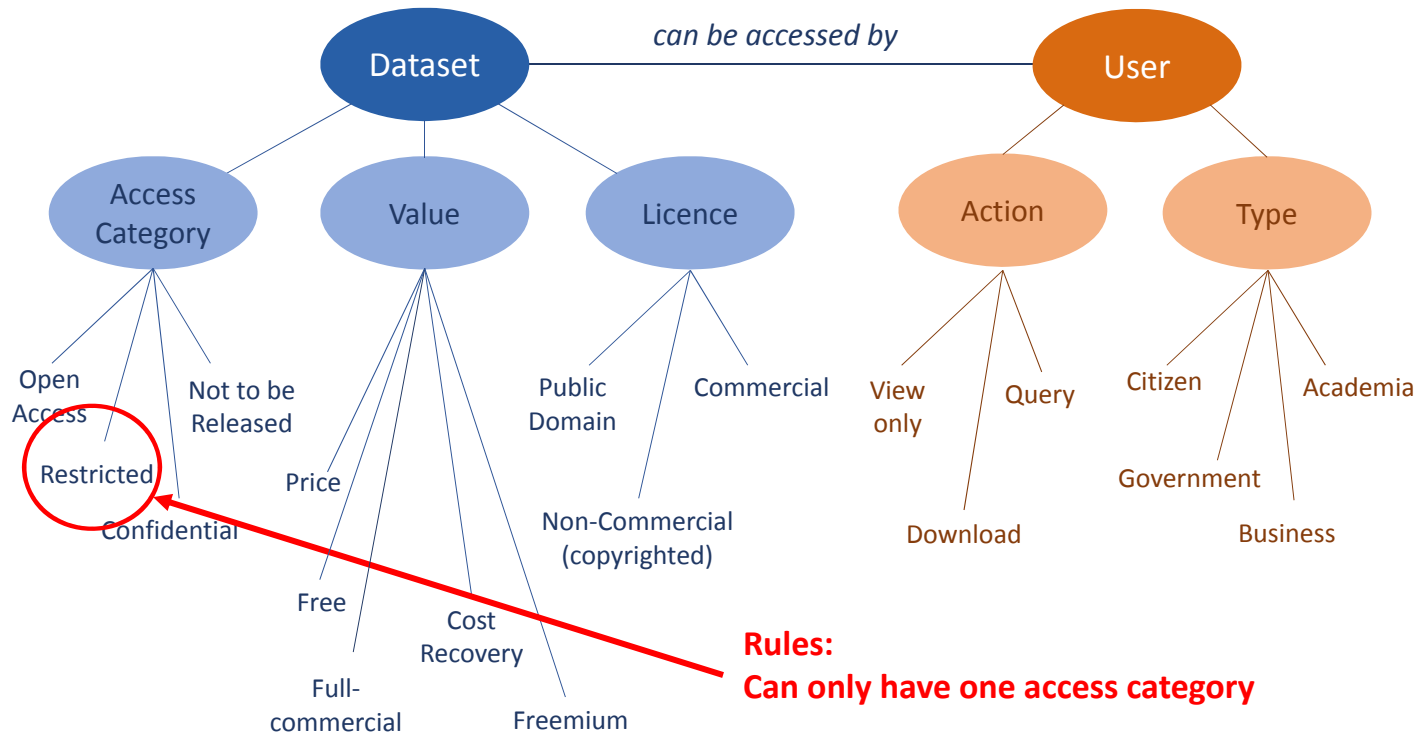
They are shareable and reusable.



Need for ontology for data  
licensing and use

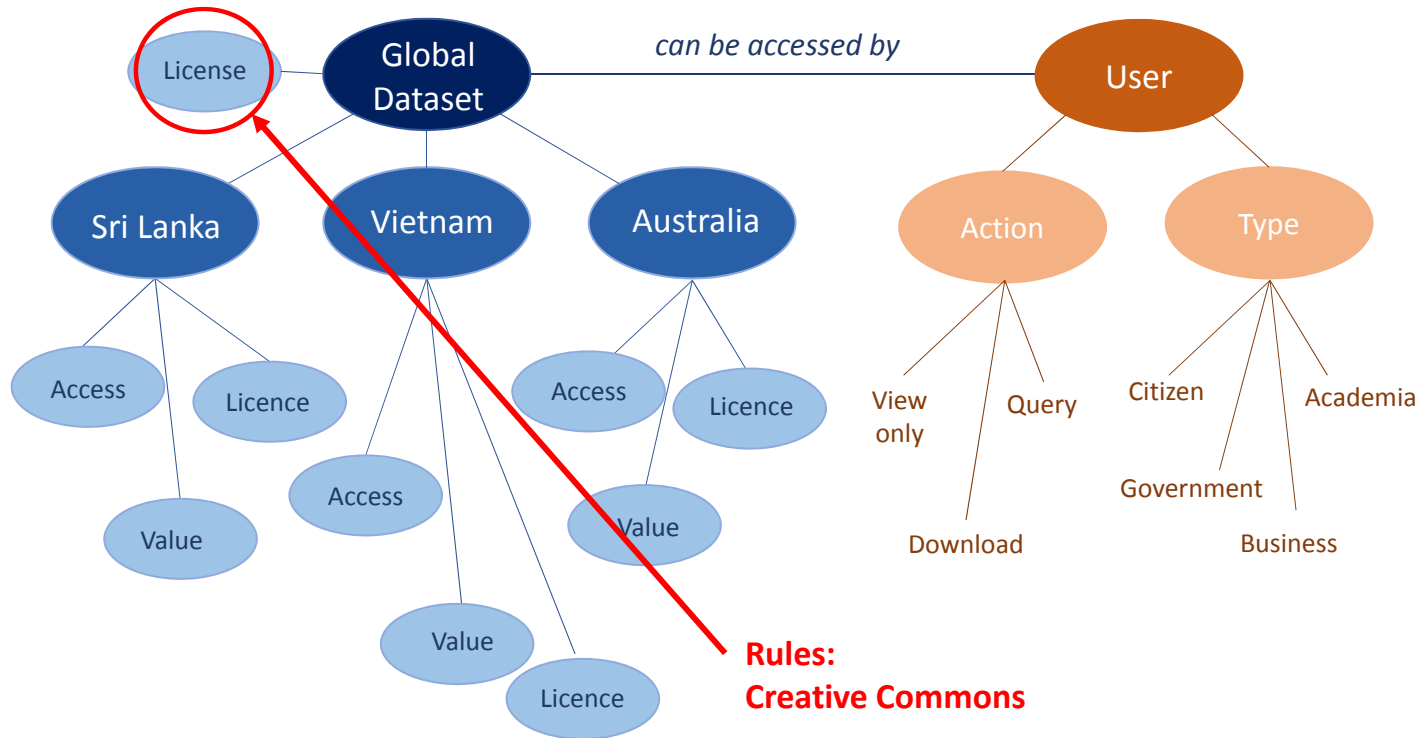
# Data Release Ontology

Understand what elements exist and how they relate



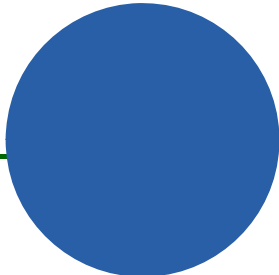
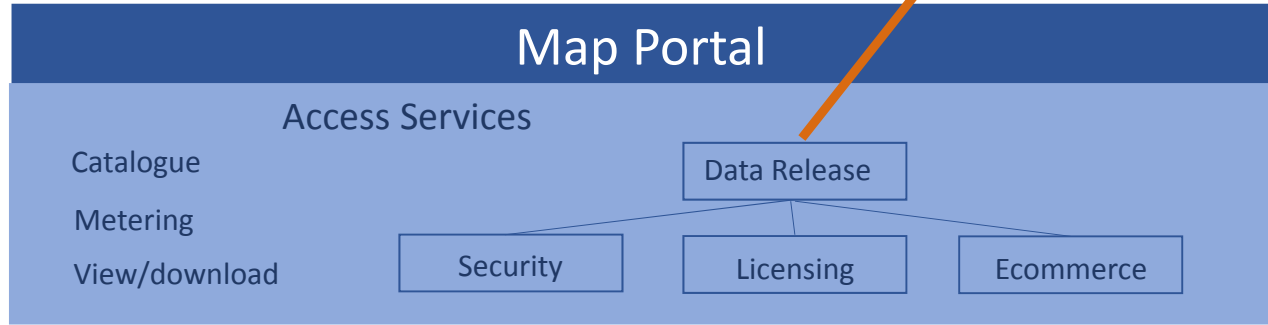
# Data Release Ontology

Can Manage Intellectual Property



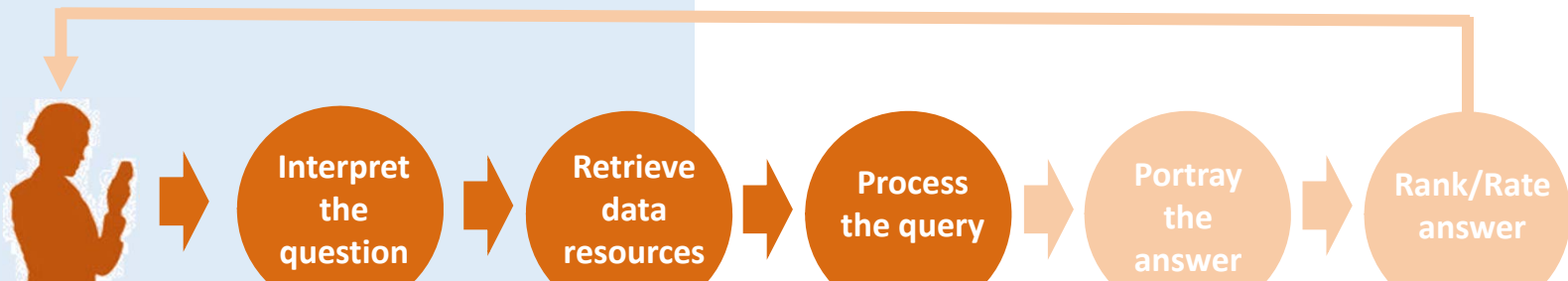
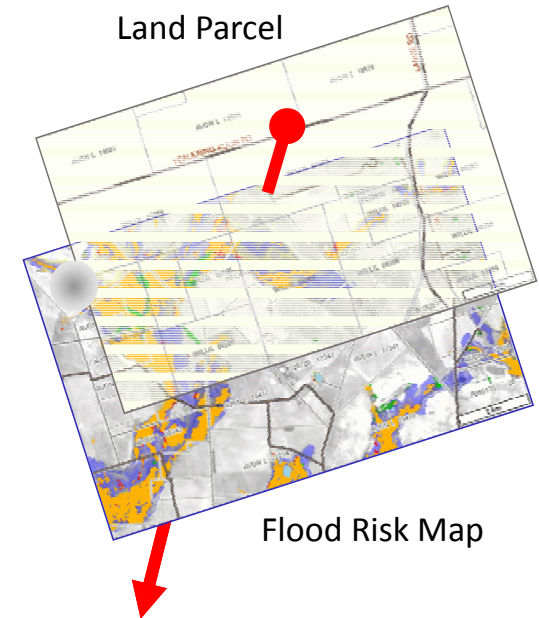
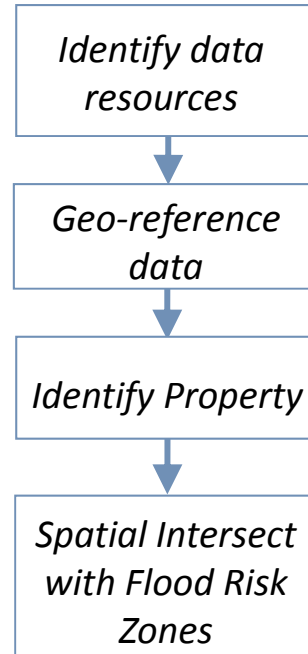
# Data Release Ontology

Can be Shared



**Process Ontologies** are used to compile, coordinate and run a series of processes to answer a query.

They are shareable and reusable.





Global Geospatial  
Community Issue – who  
owns the ontologies

Policies for sharing  
Knowledge Representation

# Ontology Libraries Exist

Developers need not  
start from scratch



**Linked Open Vocabularies (LOV)**

# Ontology Libraries Exist

Developers need not start from scratch

There is a need to coordinate these knowledge repositories



## Linked Open Vocabularies (LOV)

### **frappe** - FraPPE: Frame, Pixel, Place, Event vocabulary

<http://streamreasoning.org/ontologies/frappe#>

FraPPE is a vocabulary to enable Visual Analytics operations on geo-spatial time varying data. By enabling Visual Analytics instruments FraPPE ease the capture, correlation and comparison operations on geo-spatial data from different sources evolving over time [@en](#)

### **g50k** - 50K Gazetteer Vocabulary

<http://data.ordnancesurvey.co.uk/ontology/50kGazetteer/>

A vocabulary developed to describe the Ordnance Survey 50k Gazetteer linked data [@en](#)

### **geo** - WGS84 Geo Positioning

[http://www.w3.org/2003/01/geo/wgs84\\_pos](http://www.w3.org/2003/01/geo/wgs84_pos)

A vocabulary for representing latitude, longitude and altitude information in the WGS84 geodetic reference datum. [@en](#)

### **geod** - Administrative vocabulary for Norway

<http://vocab.lenka.no/geo-deling>

Vocabulary describing the administrative subdivision of Norway [@en](#)

### **geof** - Geo Features

<http://www.mindswap.org/2003/owl/geo/geoFeatures20040307.owl>

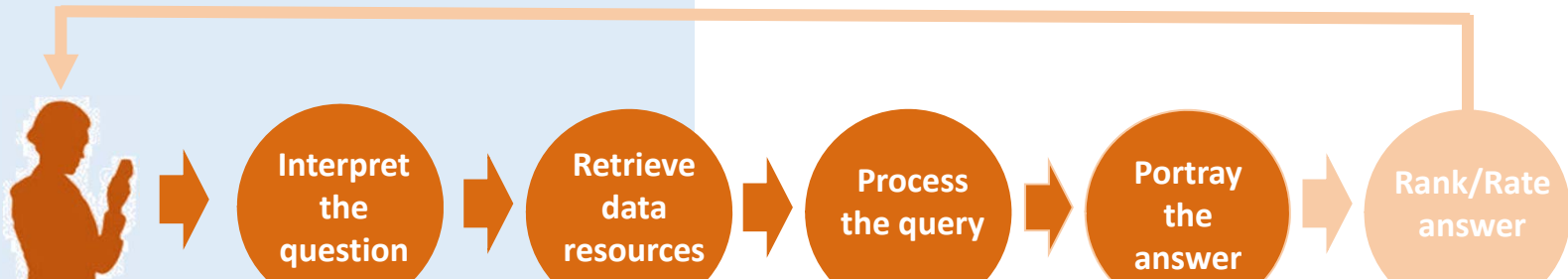
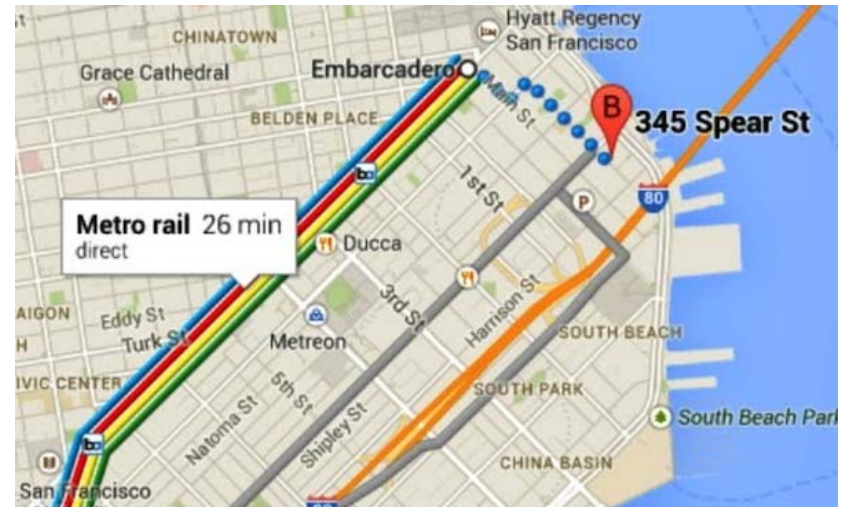
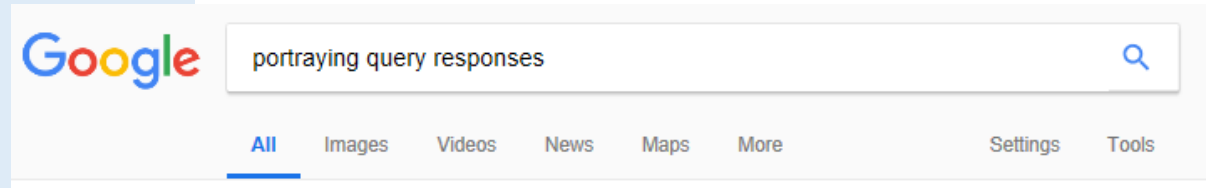
This ontology contains geographic feature classes and associated properties including classes and properties for describing the spatial location of the geographic feature. The classes and properties have been defined based on an ESRI dataset. [@en](#)

# Portray Answers

Query dependent

Application dependent

User preference dependent e.g. Google™



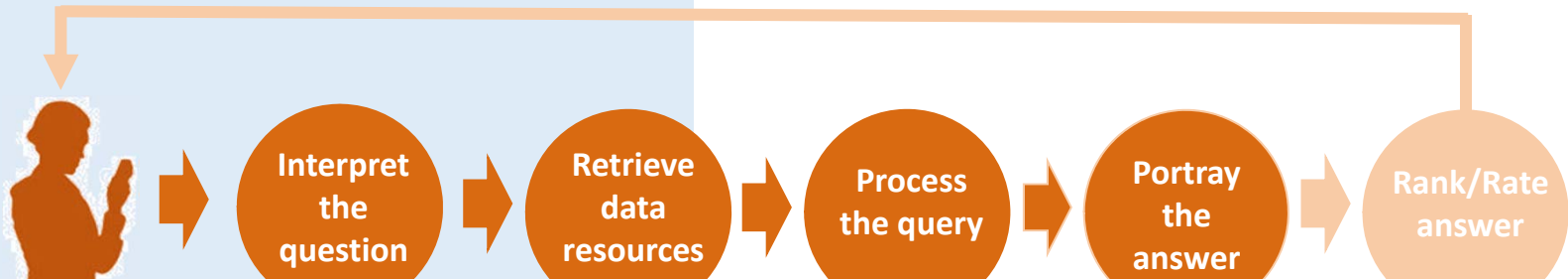
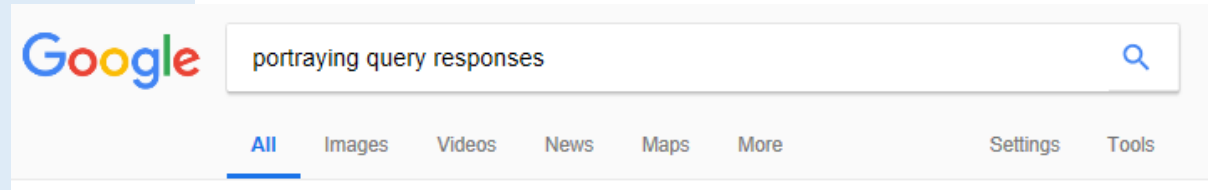
Who owns the visualisation  
of a query response

# Portray Answers

Query dependent

Application dependent

User preference dependent e.g. Google™



Ranking according to accuracy

Rating according to relevance

No models currently exist for geospatial analytics/queries

**G** Suitable for all

WATER NOT SUITABLE FOR DRINKING

Certified System  
TM  
TS 16949

**Nutrition Facts**  
Serving Size 1 cup (85g) (3 oz.)  
Servings per container 2.5  
Amount per serving  
Calories 45 Calories from Fat 0

	% Daily Value*
Total Fat 0g	0%
Saturated Fat 0g	0%
Cholesterol 0mg	0%
Sodium 55 mg	2%
Total Carbohydrate 10g	3%
Dietary Fiber 3g	12%
Sugars 5g	
Protein 1g	

Vitamin A 360% • Vitamin C 8% • Calcium 2% • Iron 0%

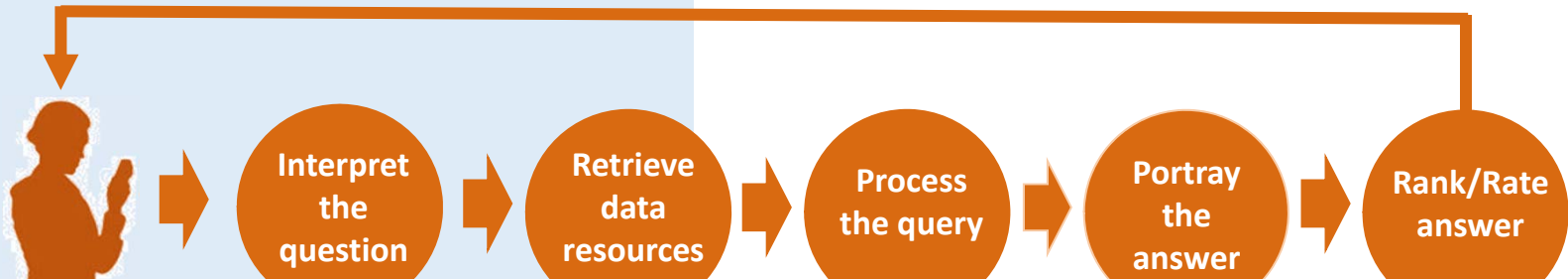
\*Percent Daily Values are based on a diet of 2,000 calories. Your daily value may be higher or lower depending on your calorie needs.

CAUTION! Unappetizing! Laughing Inside Your Mouth!

NUROFEN for Children  
FEN  
1-5 years

enjoyEngland.com  
BED & BREAKFAST  
enjoyEngland.com  
HOTEL  
AA  
Highly Commended  
★★★★★  
Restaurant with Rooms  
2011-2012

60°



# Provenance



New level for Warrantability

Legal/policy issues  
Publishing data  
Third party  
DRM

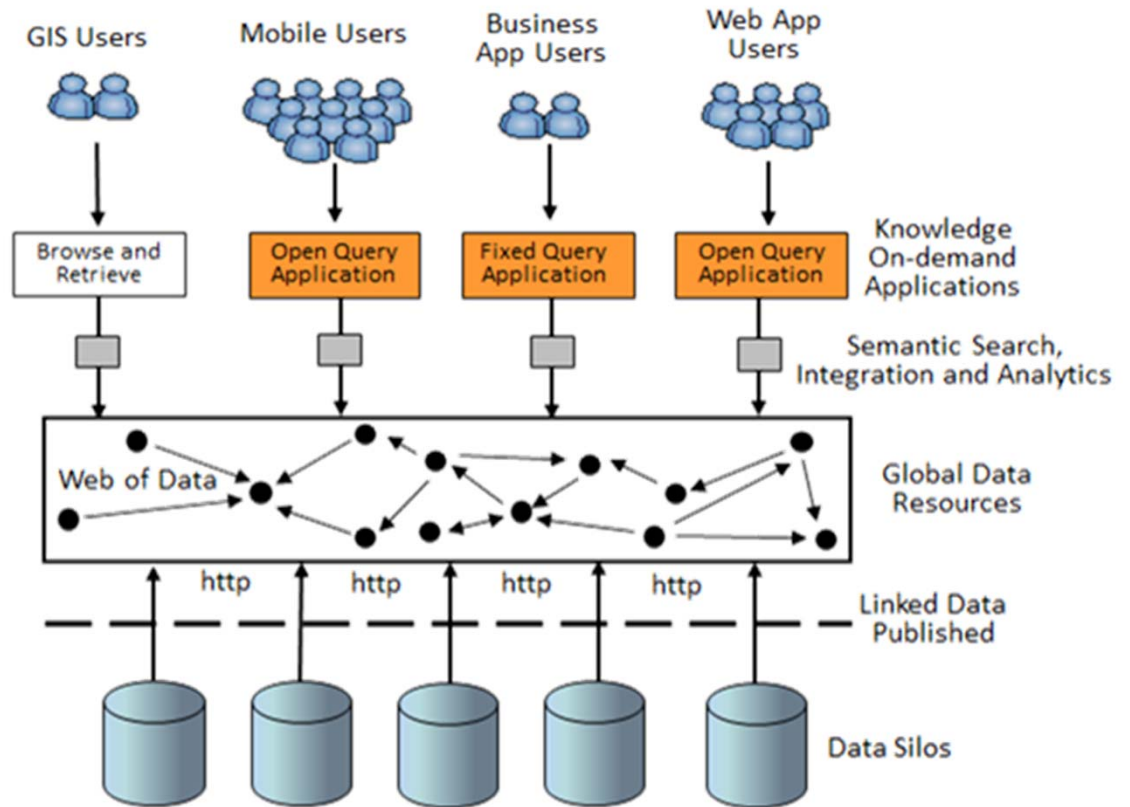
# Next Generation infrastructure

Designed for Knowledge -OUT

Open Query Applications

Linked Data accessible via the Web

Global data integration



**Problems**    **PEST**

Data Custodians do not understand their responsibility

**Consequences**    **Rationale**

Information Not shared, not usable  
No obligation about open data  
Uncertainty – what should be open  
Priority – no mandatory obligation  
Accountability – better safe than sorry

**Goals and  
Activities for  
working groups**

**Solutions**    **IGIF Part 2**

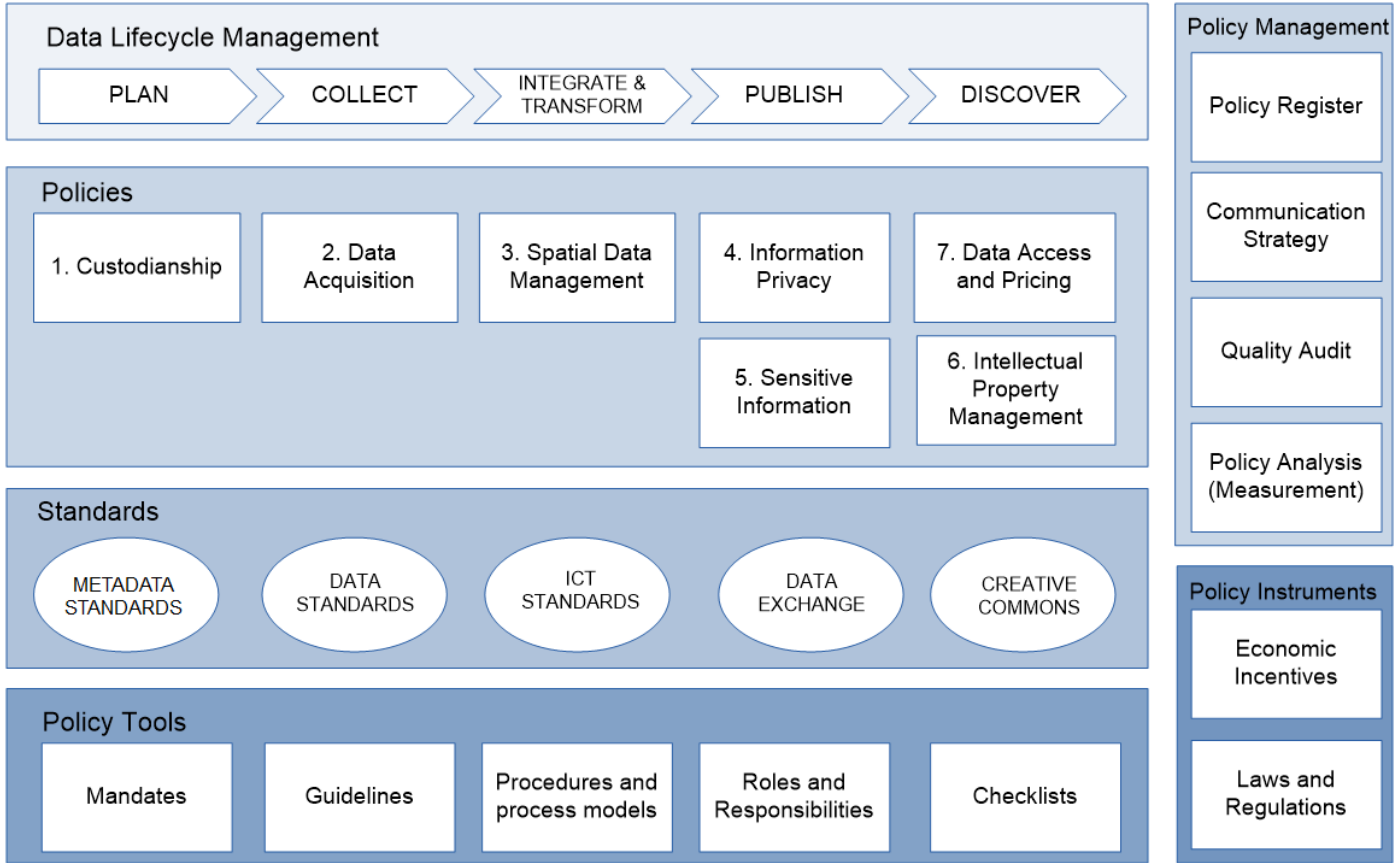
Data Custodianship policy and guidelines  
Mandates  
Data Framework  
Data Sharing and Release Act  
National Geospatial Strategy (datasets recognised as being of national importance)

**Measures**

Increase in use of standards – thus interoperability  
Increase in accessible data  
Increase in use of data  
Increase in applications developed using data  
Economic growth

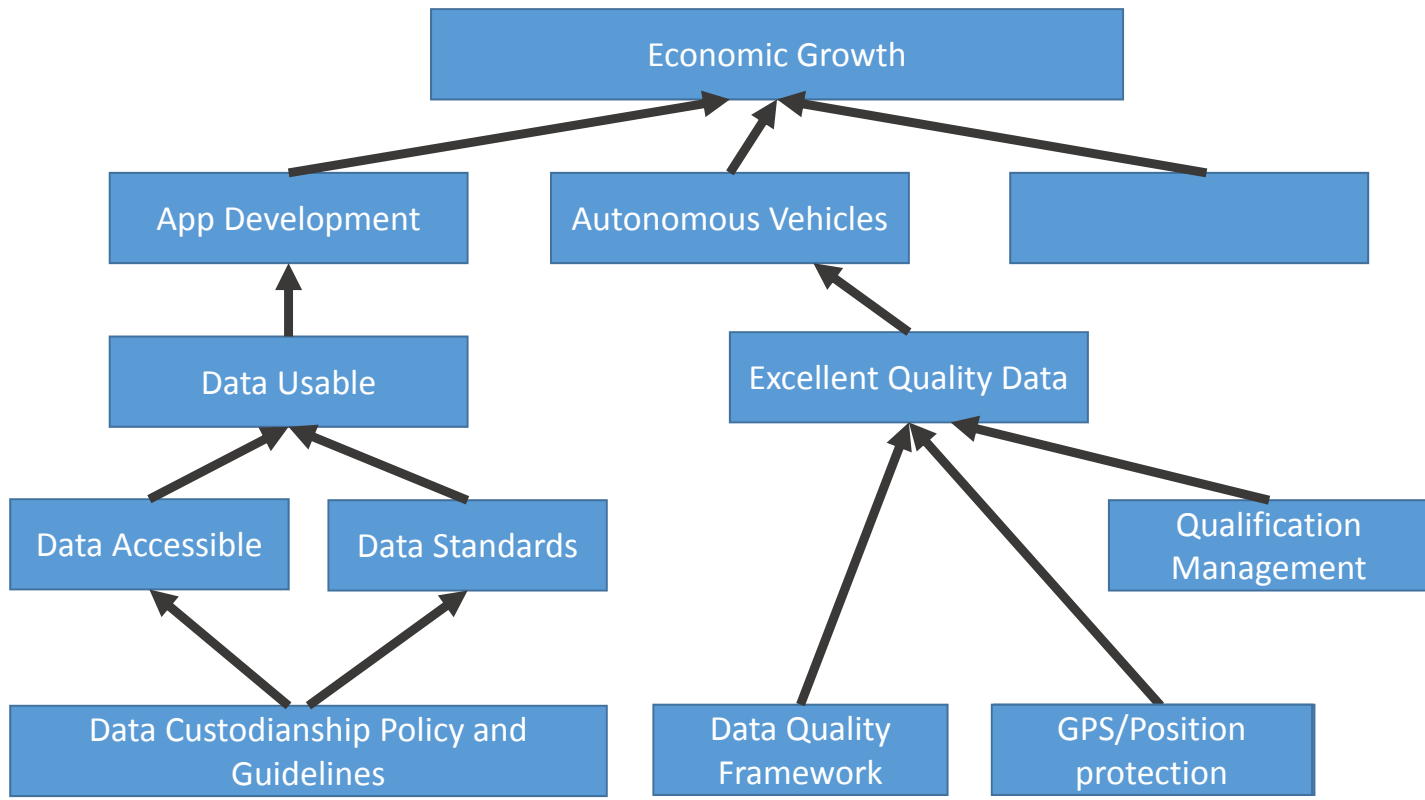
# Goals

- Legal and Policy Strategic Pathway (Achieving IGIF Goals)
  - Establish practise examples, implementation approaches,
  - Licensing and pricing frameworks
  - Coherent legal, data and technical infrastructure
- Privacy, Digital Rights Management and Data Security
  - Data protection laws
  - Balance access and privacy
  - Data release classifications
- New Technologies (Risk, new laws, vehicle/phone tracking)
  - Drones
  - Digitalisation first choice (linked data?)
  - Autonomous vehicles
  - The U.S. government works to minimize human sources of GPS interference through spectrum regulations (domestic and international), interference detection and mitigation efforts, and law enforcement.
  - Legislation needs updating re new technologies
- Data Usability (Increase Digital Maturity) (Open data, sharing, standards)
  - SDGs – integrated geostatistical data
- Legal Interoperability, Collaboration, Multidisciplinary Approaches, Global Networks
  - Communication tools for policy development but also recognise L & P documents are a tool for communication
  - Mandates
  - The part L and P places in sustainable digitisation
  - Working in a legal and ethical environment
  - Support innovation
  - Alignment across Ministries
  - Policy for Supply chain alignment (Process as well as alignment to government strategy and initiatives)



# Benefits of legislative reforms to ensure geospatial programs progress

- Improves business competitiveness
- Better services for citizens
- Supports preparedness and comprehensive security
- Maintains and develops efficient administrations
- Improve Digital Maturity
- Tools for Stakeholder engagement

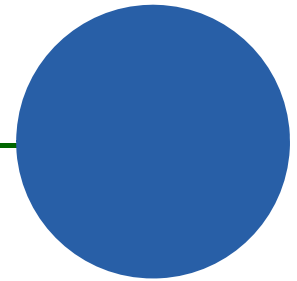




# Why Policy Fails!

# Get the Order right

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1 **S**trategy

GOAL = Reduce  
number of deaths  
on roads



Delivers

2 **P**olicy

Bring in speed  
limits



Enforces  
Policy

3 **L**egislation

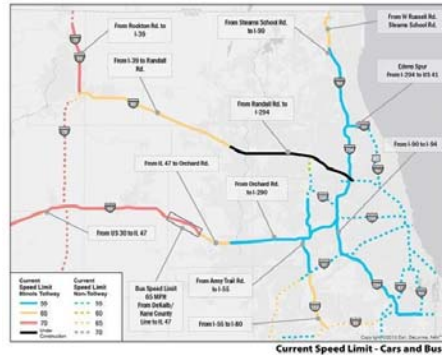
Fines for driving over  
the speed limit



# Get the Timing right

Allow for Transition

**P**olicy

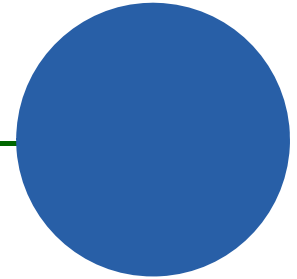


Planning

Communication



Signage



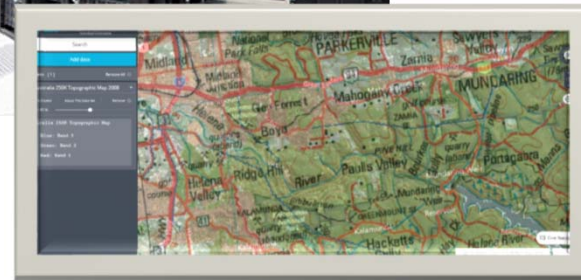
# Get the Timing right

Allow for Transition

Policy



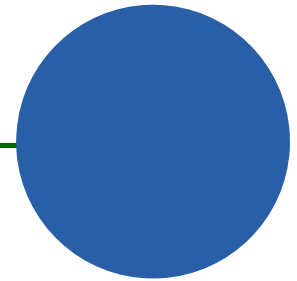
Capability



Communication

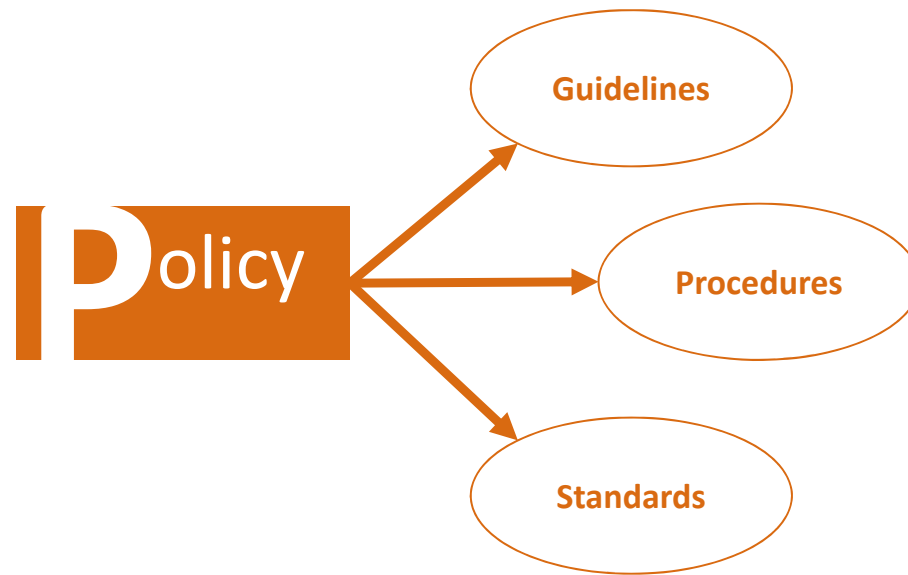
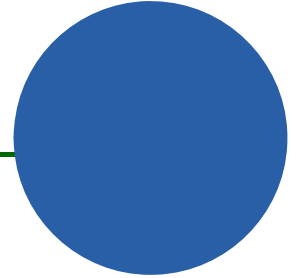


Processes



# Communicate How

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# Tonga

- People. Business, land
- Land = social political and environmental connotations
- No Survey Act
- Climate Change is significant issue
- Sufficiently resourced to achieve strategy for sustainable development
- Strategy – With National Action Plans
- Pacific Geospatial and surveying Council strategy 2017-2020.
- Challenge not to lose momentum
- Partners NZ Surveyors (LINZ) and Australia
- Building blocks are not there – modern geodetic reference framework