Resourcing Standards Development

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Document Purpose

The Australian and New Zealand community has participated heavily in standards development in ISO, OGC and W3C standards. Whilst organisations like CSIRO and LINZ have provided significant contribution and effort in the past, many of them have recently been reviewing their investment in standards development. In order to ensure that investment in standards development continues, this paper:

1. Explains the viability and benefits of resourcing standards development.
2. Explains the role of government and industry in standards development.
3. Describes steps required to participate and win from standards development.

Why Standards?

UN GGIM

In May 2011, a UN Report of the Secretary-General [E/2011/89 - https://documents-dds-ny.un.org/doc/UNDOC/GEN/N11/335/32/PDF/N1133532.pdf?OpenElement] recommended the creation of a UN Committee of Experts on Global Geospatial Information Management (UN-GGIM), recognising the importance of geospatial information and related technologies as an invaluable tool in research, policy and business planning and implementation. A central theme in this document is the importance of bringing "countries together to cooperate with and learn from each other and to promote collaboration on the development of regional and global spatial data infrastructure standards." [p.2]. In July 2011, the UN's Economic and Social Council (ECOSOC) considered and adopted the report's resolution to create UN-GGIM.

The work programmes include:

4. Adoption and implementation of standards by the global geospatial information management community
6. Identification of trends in national institutional arrangements in geospatial information management
9. Development of shared statement of principles on the management of geospatial information
10. Determining fundamental data sets

The documents cover geospatial standards from a range of Standards Development Organisations (SDOs) and was developed as a collaboration between OGC, ISO/TC211 and International Hydrographic Organization (IHO). The two documents presented are:

Guide to the Role of Geospatial Standards (http://ggim.un.org/docs/Standards%20Guide%20for%20UNGGIM%20-%20Final.pdf), and its associated Technical Companion Document (http://ggim.un.org/docs/Standards%20Companion%20Document%20UN-GGIM%20-%20Final.pdf) which were adopted "as the international geospatial standards best practice for spatial data infrastructure". In 2015, the Committee of Experts "encouraged all Member

States to adopt and implement the recommended standards appropriate to their countries' level of spatial data infrastructure (SDI) maturity" [resolution 5/108]
Australia and New Zealand have taken significant steps toward determining fundamental data sets through ANZLIC's Foundation Spatial Data Framework (http://www.anzlic.gov.au/foundation-spatial-data-framework)

The Australian Government Public Data Policy Statement

The Australian Government Public Data Policy Statement (https://www.dpmc.gov.au/sites/default/files/publications/aust_govt_public_data_policy_statement_1.pdf) outlines the commitments of the Australian Government "to optimise the use and reuse of public data". The document states most relevantly that "[a]t a minimum, Australian Government entities will publish appropriately anonymised government data by default:

1. On or linked through data.gov.au for discoverability and availability;
2. In a machine-readable, spatially-enabled format;
3. With high quality, easy to use and freely available API access;
4. With descriptive metadata; and
5. Using agreed open standards.

The Productivity Commission Report on Data Availability and Use

The Productivity Commission Report on Data Availability and Use (Overview found here http://www.pc.gov.au/inquiries/completed/data-access/report/data-access-overview.pdf) was undertaken to determine "the benefits and costs of options for increasing availability of and improving the use of public and private sector data by individuals and organisations" in order to "boost innovation and competition in Australia".
The report goes on to set the expectation that standards also will be used in the publication of data, where Figure 4 of the overview states, listed under immediate start, that "Government agencies [are] to commence implementation of data standards". Another critical issue across all government policy and portfolio areas/domains is the development of national datasets through the aggregation, integration and harmonisation of heterogeneous data from states and territories. Information content (e.g., WaterML or CityGML) and technology interface standards (e.g., WMS, WFS, and SensorThings API) play a critical role in enabling National Interest Datasets to be compiled from state and territory data.

The Commonwealth Procurement Rules

The Commonwealth Procurement Rules, or CPRs, can be found at the following web location: https://www.finance.gov.au/sites/default/files/commonwealth-procurement-rules.pdf. They "set out the rules that officials **must** comply with when they procure goods and services". They have been created with the core purpose of achieving value for money, and lists a number of rules "that **must** be complied with in undertaking procurement". Paragraph 2.13 of the CPRs states "Non-compliance with the requirements of the resource management framework, including in relation to procurement [CPRs being a component of its Procurement framework], may attract a range of criminal, civil, or administrative remedies including under the Public Service Act 1999 and the Crimes Act 1914." This makes compliance with the CPRs a major consideration to any commonwealth employee. Paragraph 10.10 states "Where an Australian standard is applicable for goods and services being

procured, tender responses **must** demonstrate the capability to meet the Australian standard, and contracts **must** contain evidence of the applicable standards". This paragraph further makes reference to paragraph 10.3 which states "Where applying a standard (Australian, or in its absence, international) for goods or services, relevant entities **must** make reasonable enquiries to determine compliance with that standard: a. this includes gathering evidence of relevant certifications; and b. periodic auditing of compliance by an independent assessor." If the core intent of the CRPs is to obtain value for money, the inclusion of the Commonwealth's preference to procure goods and services that comply with standards implies a belief that the use of standards is key to obtaining value for money.

Business value of using standards

A 2014 Standards Australia report (http://www.standards.org.au/OurOrganisation/News/Documents/Economic%20Benefits%20of%20Standardisation.pdf) suggested that "standards have been shown to exhibit a positive relationship with GDP such that a 1% increase in the production of standards is associated with a 0.17% increase in GDP, which translates to approximately $2.78 billion in 2009." Standards Australia outlined the benefits it believes underpin the increase in GDP quoted above on their website (http://www.standards.org.au/StandardsDevelopment/What_is_a_Standard/Pages/Benefits-of-Standards.aspx). These include:

1. Standards give businesses and consumers confidence that the goods and services they are developing or using are safe, reliable and will do the job they were intended for.
2. Standards provide a platform on which to innovate and explore new methods of data sharing. As our world changes, new Standards are introduced to reflect the latest technologies, innovations and community needs - redundant Standards are discarded.
3. Products that comply with Australian Standards have a competitive edge over products that don't - consumers know the difference. Australian exporters using international Standards have a head start when they move into overseas markets and those companies that participate in international standards development become recognised as world leaders in the technology.
4. Standards ensure products manufactured in one country can be sold and used in another. Standards reduce technical barriers to international trade, increase the size of potential markets and position Australian firms to compete in the world economy.
5. Standards help make laws and regulations consistent across Australia. Standards offer an alternative to regulation, with less red tape and business costs, while still providing security for families and small business consumers.
6. Standards are part of Australia's technical infrastructure that enable businesses and trade to function. Everyday commercial transactions can only take place with accurate units of measurement and a robust Standards and conformance system.

Detailed reports outlining return on investment of using standards can be found below:

7. NASA's Geospatial Interoperability Return on Investment Study: http://www.ec-gis.org/sdi/ws/costbenefit2006/reference/ROI_Study.pdf

The argument for investment in standards development

The above sections provide a compelling case for the use of standards, not necessarily development of standards. For standards to remain relevant and promote innovation over and above interoperability, they regularly undergo change, with new standards being developed and existing standards evolving to meet the needs of the industries they serve. In any given context, a "stack" of standards is generally used.

Efforts to simply to stay abreast of changes to various standards is considerable, though highly justifiable. Developers and architects are required to regularly review changes to standards to stay abreast of the changes necessary to maintain compliance to derive the benefits.

The primary argument for investment in standards development is that it is a reasonably small additional investment to derive a far greater set of benefits. The following constitute these additional benefits:

1. The ability to jointly design interoperable componentry with other similar organisations that have an interest in building an ecosystem, resulting in potentially rapid development of interfaces and data models.
2. Benefit (1) further provides the welcome side effect of developing products that are consumable off the shelf by other companies that are also involved in the development of the standards so that the time to market and profitability is reduced.
3. Benefit (1) also introduces the ability to share the costs of prototyping to bridge the gap in use case coverage. This is seen most clearly through the OGC's Innovation Program where sponsors see up to a $3 ROI for every $1 invested, as they did in the OWS-9 Testbed where sponsorship totalled "$2.65 million USD and attracted an in-kind contribution of 2 times that amount" (http://www.opengeospatial.org/ogc/OWS9_Demo_Page)
4. The opportunity to develop social license. Businesses that are commercially driven can leverage social capital through provision of public good in terms of developing standards for the good of the economy, and through it social license.
5. The ability to influence the use cases that result in changes to off-the-shelf solutions based on standards compliance. This is particularly relevant to those companies that are late adopters (early majority, late majority, or laggards) of technology, in contrast with 1, 2, and 3 above which are typically only benefits to early adopters. Terms defined here: https://ewthoff.home.xs4all.nl/Weppage%20documents/Summary%20Crossing%20the%20Chasm.pdf
6. The ability to develop relationships and collaboration with international organisations that conduct similar or complimentary business. This is a huge benefit driven by the capability for knowledge sharing, lowering the cost of continuous improvement and exploration. Whilst an organisation can develop these on its own, collaboration on standards is non-threatening and provides a bootstrap for additional collaboration. This provides the capability to fulfil (6) and (9) of the UN-GGIM work programmes. This includes providing input into product requirements through exposure to the market, access to expose thinking internationally and providing a platform for feedback.

7. The ability to influence the direction of, and have early access to, the activities and thinking within the standards community mitigates risks associated with costly development of bespoke interfaces and data models independently and in parallel by multiple players, that are later addressed by standards. The cost to later redevelop interfaces and data models for interoperability, and thus market adoption, can be high. Australia's adoption of LandXML for electronic conveyancing, rather than the emerging LandInfra standard, is likely to prove an example of this.
8. Involvement during the development of standards presents an opportunity to increase understanding in preparation for implementation, lowering the cost of use. This leads to the development of first mover advantage at Australian individual business, spatial industry and whole of economy scales.

The additional cost to access these benefits is estimated below:

1. Sending a staff member to participate in various technical committees, like OGC and ISO for three months of the year might be $65K.
2. The staff members time to attend these conferences is approximate ¼ FTE
3. The additional reading to participate can be written off as minor owing to being involved in the standards process which results in the capacity to ask questions of the group in real time, and presents benefit (8) above. As such, the marginal cost of this item is assumed to be $0.
4. The cost of SDO membership. This is only required if the SDO operates using a fee for membership. For example, OGC membership fees can be found here: http://www.opengeospatial.org/ogc/join/levels.

Even assuming a generous salary of $200K, the cost of involvement in standards development could be as low as $115Kpa per resource. The potential benefits easily outweigh this cost, which could further be reduced by collaboration in terms of attendance at technical committee meetings. Forums such as the OGC's regional forums (e.g., ANZ Forum) provide this capability.

Open Geospatial Consortium (OGC)

"The OGC (Open Geospatial Consortium) is an international not for profit organisation committed to making quality open standards for the global geospatial community". (http://www.opengeospatial.org) The OGC also serves as a global forum for the collaboration of geospatial data/solution providers and users. OGC membership is equally comprised of private sector, government and academic and research organisations. All standards developed in OGC are made freely and publicly available for use by all.

Innovation Program

The OGC Innovation Program (IP) is a means through which technology users and vendors "work collaboratively in an agile development environment to develop, evolve, test, demonstrate and validate candidate geospatial standards under marketplace conditions" (http://www.opengeospatial.org/ogc/programs/ip). There are several different categories for IP activities, based on the level of maturity of the standard(s) under study:

1. "Test beds are fast-paced, multi-vendor collaborative efforts to define, design, develop, and test candidate interface and encoding specifications. These draft

specifications then move into the OGC Standards Program where they are reviewed, revised and potentially approved as new international standards. OGC Testbed 13 is currently underway (http://www.opengeospatial.org/pressroom/pressreleases/2562)

2. Pilot projects apply and test OGC standards in real world applications using Standards Based Commercial Off-The-Shelf (SCOTS) products that implement OGC standards." The Arctic Spatial Data Pilot (http://www.opengeospatial.org/projects/initiatives/arcticsdp) and the Future Cities Pilot (https://www.geospatialworld.net/article/future-cities-pilot-ogc-standards/) are both examples of OGC pilot projects.
3. "Interoperability experiments are brief, low-overhead, formally structured and approved initiatives led and executed by OGC members to achieve specific technical objectives that further the OGC Technical Baseline." These are often used to test fledgling or more mature standards against use cases that are different to or extend those they were originally intended for, establishing the gaps and recommending change to the standards so that they may address the gaps. The Environmental Linked Features Interoperability Experiment (http://www.opengeospatial.org/projects/initiatives/elfie) is an example of an OGC interoperability experiment.

The ANZ Forum

The OGC ANZ Forum is a vehicle through which the activities of OGC are given local significance to the Australian and New Zealand region. The forum provides a capability to share the effort and costs associated with the development of standards by:

1. Obtaining updates from active OGC participants, and the OGC itself, for interested parties;
2. Obtaining feedback from interested parties in terms of the activities of OGC, including, but not limited to, the review of standards currently under development;
3. Providing the environment within which regional members and interested parties can regularly share knowledge and accelerate learning; and
4. Providing the environment within which regional members and interested parties can collaborate on IP activities. This is very important as many test beds and interoperability experiments focus on European and North American problems.

International Standards Organisation (ISO)

"ISO is an independent, non-governmental international organization with a membership of 163 national standards bodies. Through its members, it brings together experts to share knowledge and develop voluntary, consensus-based, market relevant International Standards that support innovation and provide solutions to global challenges." (https://www.iso.org/about-us.html)

Technical Committee 211– Geographic Information/Geomatics

ISO/TC 211 is the ISO technical committee responsible for the standardization of geographic information. "Its work aims at establishing a structured set of standards for information concerning objects or phenomena that are directly or indirectly associated with a location

relative to the Earth." (https://www.iso.org/committee/54904.html) More specifically, it covers semantic, syntactic and service issues, as well as procedural standards, at various levels of abstraction (e.g. geographic feature definition, spatial and temporal objects, coordinate reference systems, metadata, quality, web services, etc.).
ISO/TC 211 currently has 39 participating members, 29 observing members and liaison relationships with more than 30 international organizations and more than 15 other ISO/TCs. Australia and New Zealand is a member of ISO/TC 211 via its mirror committee IT-004 Geographical Information/Geomatics managed by Standards Australia.
ISO/TC 211's current program covers the following themes:

1. Developing Strategic Framework
2. Establish Institutional Arrangements
3. Building Capacity Arrangements
4. Quality Assurance
5. Sharing, Accessing, Dissemination
6. Embracing Trends

Standards Australia

"Standards Australia is the nation's peak non-government, not-for-profit Standards organisation. [Their] expertise and main responsibility is the development and adoption of standards in Australia. [They] also facilitate Australian participation in international standards development."
(http://www.standards.org.au/ourorganisation/aboutus/Pages/default.aspx) Standards Australia is the Australian member body of ISO.

IT-004: Geographical Information/Geomatics

Standards Australia IT-004 membership comes from government, industry and academia and is the mirror group of ISO/TC 211. Australia & New Zealand has adopted all ISO/TC 211 standards as Australian and New Zealand standards. A number of these standards are being used for a number of national spatial infrastructure projects and initiatives. Possible models for engagement

Private sector led

An entirely private sector led approach to standards development leaves the responsibility of standards development to industry and research. In this model, Governments publicise its intention to use solutions that comply with standards known, with the hope that industry will actively engage in the development of standards to compete for the governments' business.
Requirements for effectiveness:

1. Government must alter its procurement practices to ensure that industry is properly incentivised.

Advantages of this approach:

1. This approach results in a lower government investment in standards development.
2. May help ensure that research is grounded in reality by requiring it to consider implementation issues, such as standards.

Disadvantages of this approach:

1. This approach limits incentives for industry to actively maintain standards as industry participants are incentivised to compete and interoperability standards may be counterproductive toward that goal due to reduction of vendor lock.
2. Governments will incur the cost of developing standards where they enhance the needs of governments, and where there are gaps in the standards baseline. The cost of developing these standards is likely to be higher if there is not an active standards development environment within which to conduct the activity.

Government coordinated approach

The government coordinated approach could take two possible forms:

1. Government takes the lead on standards development; and
2. Government coordinates and incentivises industry participation in standards development.

Following this approach, the cost of retaining staff capable of leading standards development activities rests with governments. USA, UK, and New Zealand follow this approach with respect to the OGC.

Requirements for effectiveness:

1. Needs to be funded and resourced appropriately

Advantages of this approach:

1. Directly resourcing the effort will provide greater control over the standards that are developed.

Disadvantages of this approach:

1. Government must fund a fairly large investment in the staff necessary to resource this responsibility.
2. Government will likely find it difficult to attract and retain staff with the requisite skills to fulfil this responsibility.

Alternatively, the governments could employ an approach similar to what is described in Box 2 of the Productivity Commission report on Data Availability and Use:

1. Organisations are identified as leads for a particular standards domain based on demonstrated expertise, in much the same way as the Accredited Release Authority demonstrates competency to release data;
2. Standards are similar to a National Interest Dataset;
3. Governance, compliance, and advice is provided by a lead agency, which could indeed be the proposed National Data Custodian.

This approach may involve incentives being provided to those organisations that lead the development of standards of interest to governments, reducing the impost of attracting and retaining the staff capable of leading standards development to support those organisations that already have them.

Requirements for effectiveness:

1. Responsible department must accept the accountability for standards development. This means being funded and appropriately resourced to manage the relationships with specialists.

Advantages of this approach:

1. Transfers responsibility to appropriately resource standards development to specialist organisations with staff that have the requisite skills, in exchange for financial compensation.

Disadvantages of this approach:

1. Control of standards development is vested in trusted advisors.

Because of its fit with the governments evolving thoughts, as demonstrated in the Productivity Commission report, the latter approach is perhaps the most logical.

Next steps

The following steps are recommended in order to achieve appropriate investment in standards development.

1. Gather support from a range of organisations to add weight and credibility to the proposal, which in turn should help potential sponsors be confident their sponsorship will be impactful and well targeted.
2. Find suitable sponsors and participants in the standards development process.
3. Determine the most logical model for implementation.
4. Refine the proposal, resource, and put into action.

Glossary

Acronym	Expansion
ANZ	Australia and New Zealand
ANZLIC	Australian and New Zealand Spatial Information Council
API	Application Programming Interface
CSIRO	Commonwealth Scientific and Industrial Research Organisation
ECOSOC	UN Economic and Social Council
FTE	Full Time Employee
GDP	Gross Domestic Product
GGIM	Global Geospatial Information Management
IHO	International Hydrographic Organization
IP	Innovation Program
ISO	International Organization for Standardization
LINZ	Land Information New Zealand
OGC	Open Geospatial Consortium
OWS	OGC Web Services
ROI	Return on Investment
SCOTS	Standards-based Commercial Off The Shelf
SDI	Spatial Data Infrastructure
SDO	Standards Development Organisation
TC211	Technical Committee 211 – Standardization in the field of digital geographic information
UK	United Kingdom
UN	United Nations
USA	United States of America
USD	US Dollars
W3C	World Wide Web Consortium
WFS	Web Feature Service
WMS	Web Map Service

Document Details

Endorsements

This proposal has been endorsed by the following organisations:

Open Geospatial Consortium (OGC)

http://www.opengeospatial.org/

Appendix A: Business Case Template

The following table can be used to perform a cost/benefit analysis of resourcing standards development, based on the determinants discussed in this document:

BENEFITS

#	Item	Value
1	Savings from jointly designing interoperable componentry with other similar organisations that have an interest in building an ecosystem, resulting in potentially rapid development of interfaces and data models	
2	Benefit from developing products that are consumable off the shelf by other companies that are also involved in the development of the standards so that the time to market and profitability is reduced.	
3	Savings resulting from the ability to share the costs of prototyping to bridge the gap in use case coverage.	
4	Benefit from developing social license.	
5	Benefit from the ability to influence use cases that result in changes to off-the-shelf solutions based on standards compliance.	
6	Benefits from the ability to develop relationships and collaboration with international organisations that conduct similar or complimentary business.	
7	Benefits from the risk mitigation associated with costly development of bespoke interfaces and data models independently and in parallel by multiple players, that are later addressed by standards.	
8	Benefit from first mover advantage resulting from involvement during the development of standards.	
TOTAL		

COSTS

#	Item	Quantity	Value	Total
1	Travel and living expenses for three months			
2	¼ FTE			
3	Preparation time to participate in standards development as opposed to standards use	0	0	0
4	Standards Development Organisation memberships			
TOTAL				

BENEFITS – COSTS: $

Document History

Version	Comment	Author(s)	Date
0.1	Initial Draft	Joseph Abhayaratna (PSMA)	31 May 2017
0.2	Incorporate feedback from Paul Box (CSIRO)	Joseph Abhayaratna (PSMA)	05 June 2017
0.3	Incorporate feedback from Denise McKenzie (OGC)	Joseph Abhayaratna (PSMA)	09 June 2017
1.0	Addition of Glossary in preparation for distribution	Joseph Abhayaratna (PSMA)	09 June 2017
1.1	Incorporate feedback from third parties	Joseph Abhayaratna (PSMA)	22 June 2017
1.2	Incorporated feedback from PM&C Added Business Case Template as appendix Added section describing context from Commonwealth Procurement Rules	Joseph Abhayaratna (PSMA)	27 September 2017