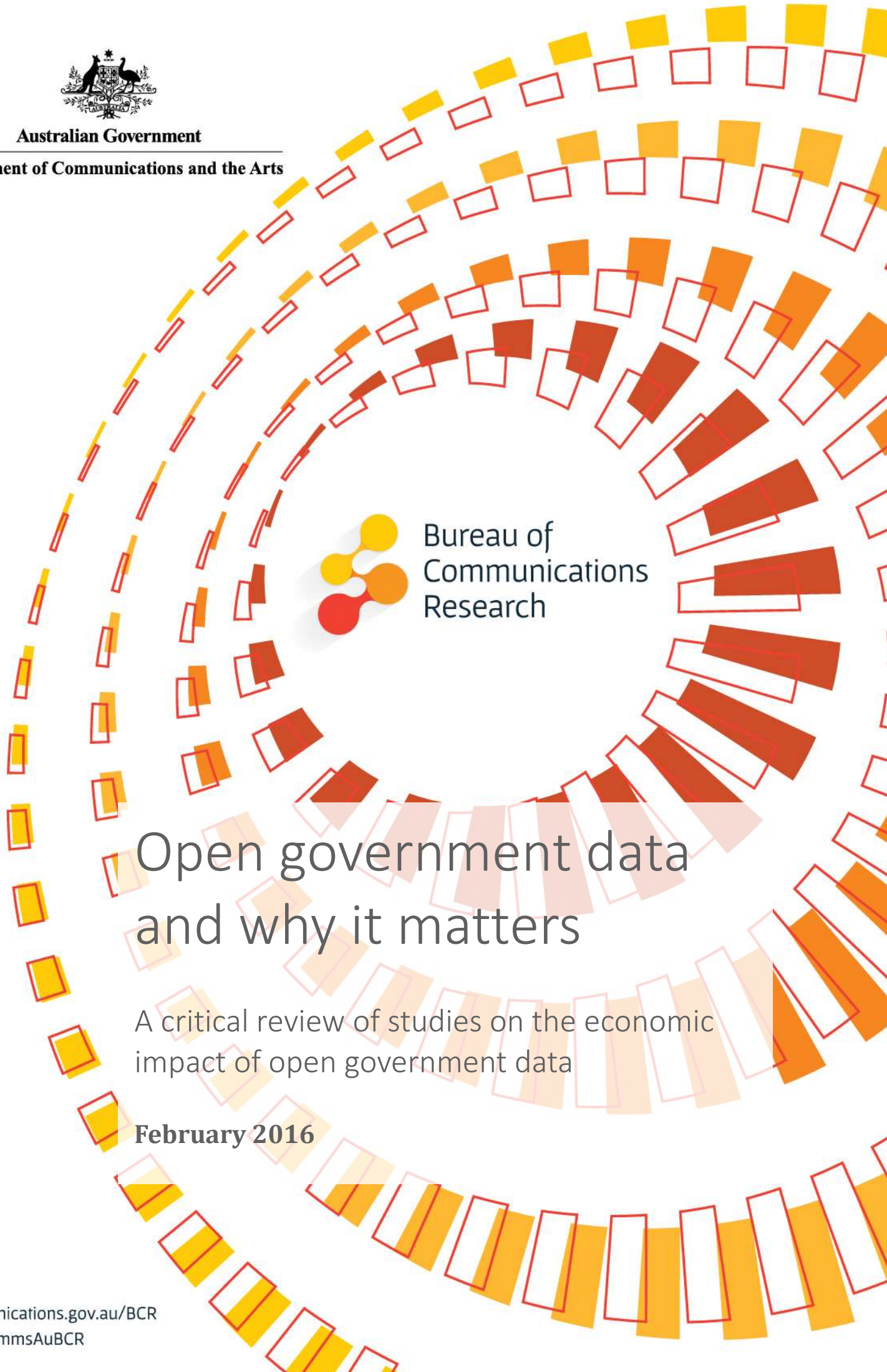
Australian Government
Department of Communications and the Arts



Bureau of Communications Research

Open government data and why it matters

A critical review of studies on the economic impact of open government data

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About this report

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Executive summary

Access to open government data in Australia is economically important, as confirmed by multiple theoretical and empirical studies, with varying estimates of its net positive benefit. Some of these benefits include new data-driven products and services, increased operational efficiency in both the public and private sectors, and improved engagement from the public. Key industry players such as Google, Microsoft and Intel have made significant investments in making government data more accessible. Governments across the world, from the United States to India, are running open government data initiatives.

This report examines, through a critical literature review, the economic nature of government data and its contribution to the economy and society, the methodologies and assumptions used in measuring its economic benefits, and the range of quantitative estimates of its value in Australia and internationally. Fresh industry insights from Google, Sirca and Lateral Economics (Dr Nicholas Gruen) were obtained to ensure that this report's findings will have currency with consumers and the business community.

Raw data collected in the course of usual government operations exhibits strong public good characteristics—it is non-rivalrous (use by one party does not reduce its availability to others) and non-excludable (once available to one party, others cannot be readily excluded from using it). This provides a strong rationale for governments to take a default position of making government data more accessible.

For open government data to provide maximum public benefits through improving welfare and significantly encouraging its use and re-use, it should be provided at no cost, or at the most, priced at the short-run marginal cost of making it publicly available. It should not be generally taken as an opportunity by government agencies to recoup costs that would have been incurred in normal operations.

In measuring the economic value of open government data, two main approaches have been deployed: a top-down approach that measures value based on resources used to generate or use government data, and a bottom-up approach focused on measuring value of open government data by seeking an aggregate figure through business surveys and case studies. Each approach has its own merits and limitations, with appropriateness dependent on the question to be answered and data availability. A top-down approach is appropriate for questions on the gross economic value of open government data and its future importance based on the valuation of the sectors that currently use it. A bottom-up approach is generally better for the question of how much bigger the economy will be as a result of open government data.

There is a wide range of quantitative estimates of the value of open government data in Australia and internationally, due to the differences in what aspect of open government data is measured, methodologies used, and assumptions made. Globally, a recent McKinsey study[1] estimated the economic value that can be enabled through open data (including government and private sources) to be up to $4 trillion[i] per annum.

In Australia, the economy-wide value of government data is estimated to be between $500 million and $25 billion per year.

[1] Manyika, J. Chui, M. Groves, P. Farrell, D. Van Kuiken, S. and Doshi, E, A. (2013). Open data: Unlocking innovation and performance with liquid information, McKinsey Global Institute, New York.

Open government data is reported as contributing a significant net economic benefit. The Australian Government's rationale to unlock this benefit is strongest through providing raw government data in a machine readable format using open standards, especially the high-value data. Some of the high value data sets across governments identified include spatial data, health data, transport data, mining data, environmental data, demographics data, and real-time emergency data. Providing value-added data, such as detailed rainfall forecasts and southern oscillation index for the agriculture sector, could be best left with the private sector, given their more informed insights on what data-driven products and services are needed by users. Why open government data?

A recent study revealed that ready access to government data (or public sector information) in Australia has the potential to generate a value worth **up to $25 billion per year**[2]**,** slightly more than 1.5 per cent of its gross domestic product (GDP, chain volume measures) in 2014, and the same reported value of the microblogging site Twitter in 2014.

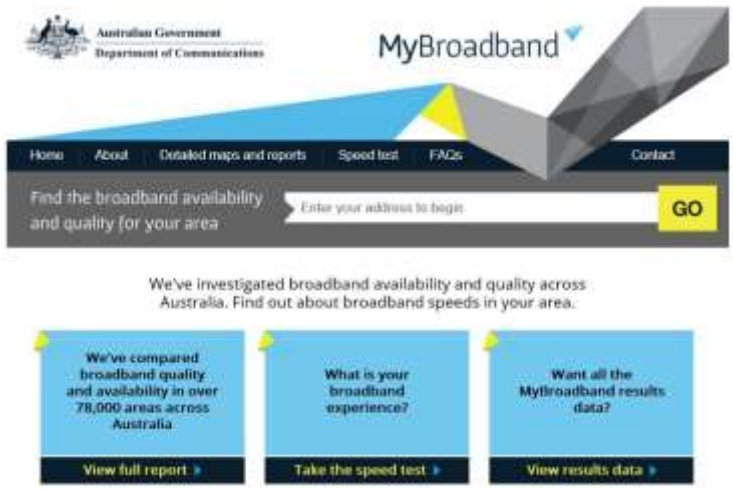
What is open government data and why does it generate economic value? 'Open government data' is generally defined as government-owned data 'that is freely available, easily discoverable, accessible and published in ways and under licences that allow reuse[3]'. Some examples of Australian Government open data include maps of broadband availability and quality (Figure 1; see www.mybroadband.communications.gov.au), Budget 2015–16 figures, overseas arrivals and departures, maps of gold and other minerals; weather data such as rainfall, temperature, and solar exposure, and the various statistical collections compiled by Australian Bureau of Statistics.

Benefits derived from open government data are wide-ranging and include both direct and indirect benefits. For governments, opening data to the public contributes to improvements in operational efficiency (and eventually, savings in overhead expenses) and improved engagement with stakeholders. In the private sector, companies utilising government data to create a new product or improved services are driving business growth and innovation. For citizens and communities, seeing and using government data that matter to them enhances engagement and promotes choice and informed decision-making.

[2] Gruen, N. Houghton, J. & Tooth, R. (2014). Open for Business: How Open Data Can Help Achieve the G20 Growth Target, Lateral Economics for Omidyar Network, Australia. Retrieved from www.omidyar.com/sites/default/files/file_archive/insights/ON%20Report_061114_FNL.pdf

[3] data.gov.au. (2015). *Open data toolkit—Policy*. Retrieved from: https://toolkit.data.gov.au/index.php?title=Policy

Figure 1. The Australian Government's open data on broadband availability and quality.



Source. www.mybroadband.communications.gov.au/

Key industry players have recognised the value of open government data. A number of large digital companies have invested on related initiatives—Google has created a Public Data Explorer, an online platform where large public datasets could be explored, visualised, and communicated. Google donated almost $5 million[4] to programs that support open government data. Microsoft established the Open Government Data Initiative DataLab, a cloud-based open data catalogue that provides citizens access to government data and enables developers to obtain data via open standards Application Programming Interfaces (API). Intel has the Data Services Accelerator, an innovation pipeline for sourcing solutions through the use of open federal data, seeking to support and sustain data-centric start up communities.

Open government data matters—and key to maximising its value is a greater understanding of its economic benefits and how these benefits are conferred to the government and other relevant stakeholders. This will help develop and improve open government data policies that can revolutionise the way we see, receive, and use data-driven goods and services.

[4] www.eweek.com. (2013, January). *Google Donates $3.7 Million to Foster Open Government Data Standards*

1. Snapshot: open government data in Australia

The need for a shift in public culture and practice to make government data more accessible and usable and create a government that is more efficient and consultative has long been identified as a priority by the Australian Government.

One of the key provisions of the current government's[5] commitment on e-government and the digital economy is giving private users and developers access to accumulated government data sets and potentially unlock new value from them. This is further supported by the release of the Australian Government's Public Data Policy Statement[6] on 7 December 2015, which states amongst other things that non-sensitive data will be made **open by default**, and where possible, 'make data available with free, easy to use, high quality and reliable Application Programming Interfaces (APIs)'.

Some of Australia's open government data initiatives and projects to date include:

- data.gov.au—a platform that provides access to and reuse of some 7,000+ government datasets
- Open Data 500 Australia—a Department of Communications' study (in partnership with New York University) of Australian companies and non-government organisations that use open government data in generating new business, developing new products and services, and creating social value
- SODA or Stream of Digital Archives (National Archives of Australia)—a website that provides some digitised physical and photographic records from the agency that is updated daily, and
- GovHack's National Competition: Best Open Government Data Hack—the category covers new approaches to managing data, improving metadata search/aggregation, digitising a major piece of non-machine readable government data, and developing citizen engagement with government data.

A number of federal government agencies are involved in open government data policies and implementation[7], including: Department of Communications and the Arts (spatial policy), Department of Finance (open data and big data policy), Attorney General's Department (copyright, privacy and data licensing), and National Archives of Australia (information policy).

Most state and territory governments have also developed their own open government data policies, initiatives and strategic plans, which can be found in the following websites:

- New South Wales—http://data.nsw.gov.au
- Western Australia—www.data.wa.gov.au
- Queensland—https://data.qld.gov.au

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[5] *The Coalition's Policy on E-Government and the Digital Economy.* (August 2013). www.malcolmturnbull.com.au/assets/Coalitions_Policy_for_E-Government_and_the_Digital_Economy_(2).pdf

[6] Australian Government Public Data Policy Statement (7th December 2015) www.dpmc.gov.au/pmc/publication/australian-government-public-data-policy-statement

[7] Waugh, Pia, Australian Government, Department of Finance, The Australian Government data landscape in Australia (14/01/2014) Pia Waugh www.finance.gov.au/sites/default/files/The_Government_Data_Landscape_in_Australia_Export_2014_1_14.pdf

- Tasmania—www.egovernment.tas.gov.au
- Victoria—www.data.vic.gov.au
- South Australia—https://data.sa.gov.au, and
- Australian Capital Territory—www.data.act.gov.au

The Australian Governments Open Access and Licensing Framework (AusGOAL) has published practices that aim to protect confidential and private information, third-party copyrights, and intellectual property, whilst at the same time managing the risks inherent with opening government-owned data to the public[ii]. Additionally, the Digital Transformation Office has published design guides on improving government services through machine-readable and accessible data[8].

2. Benefits of open government data

In this section, the various benefits of open government data are introduced, with examples of international open government data initiatives and two brief case studies in Australia.

2.1. Direct benefits

Across different sectors, unlocking government data allows for the development of new and customised products and services demanded by business, government and the community, job creation, and improved tax revenues. When weather data was made available by the US Government to the public via free electronic download, entrepreneurs were quick to develop value-added services, which in turn fuelled business growth, created value, and generated more jobs. The Climate Corporation uses weather data across major climate models to provide insurance to farmers, who can potentially protect themselves and their crops against adverse conditions. The creation of weather newscasts, websites, mobile applications, and insurance products generates billions of dollars per year in economic value[9].

A related benefit was realised when the US Government released GPS (global positioning system) in the 1980s. Originally used for military and defence, when the GPS became available to the public, it paved the way for the development of a wide range of innovations from the private sector such as precision crop farming and navigation systems. Fast forward to 2011 and beyond, there are over 3 million jobs now relying on GPS technology. Taking into account equipment sales and commercial applications, the GPS industry has contributed direct economic benefits to the US economy that are estimated to be between $91.2 billion to $165 billion per year[10].

8 Digital Transformation Office. https://www.dto.gov.au/standard/design-guides/

9 https://www.whitehouse.gov/issues/technology

10 NDP Consulting. (2011). The economic benefits of commercial GPS use in the US and the costs of potential disruption

2.2. Indirect benefits

Some of the indirect benefits of open government data include more engaged and empowered citizens and improved government services. Set out below are some of the international experiences on open government data, with some of these initiatives winning local awards and international recognition for advancing open government data in their respective countries.

2.2.1. Blue Button (United States): Improved government services

Open government data has the power to revolutionise government services especially in the digital age where rapid changes in technology are constant. The US Government's **Blue Button** initiative (Figure 2, http://bluebuttonconnector.healthit.gov/) provides millions of Americans access to their own health information by downloading it electronically, for use and re-use.

On the Blue Button website visitors can search for a health services provider and will be redirected to a portal where they will be provided log-in directions to be able to access their health records (Figure 2).

The process of accessing medical information in the United States had been previously dominated by paperwork and contacting health insurance companies, hospitals, clinics, pharmacies, and laboratories where health records normally reside.

Figure 2. The Blue Button Connector, a US Government initiative in conjunction with the health industry, allowing Americans to access and use their own health data.

Source. http://bluebuttonconnector.healthit.gov/

Over 600 organisations have committed to advance efforts in increasing patients' access to and use of their own health data for making a more informed decision about their health and improving their healthcare experience.

2.2.2. #OpenDataApps Challenge (India): More efficient operations and improved business practices

Various initiatives have been established by the Government of India's Ministry of Tourism to encourage local and international tourists to visit India. Considering the key challenges posed by the geographic distance, number of tourist destinations and cultural diversity, easily getting local information on food, accommodation, transport and personal safety were some of the concerns potentially discouraging tourists from visiting particular regions.

The GoTourist solution is an application which received the top prize from the government-led initiative #OpenDataApps Challenge. The challenge was launched in August 2013, a partnership between the government's National Informatics Centre and the National Association of Software and Services Company. Operating in a contest-format where individuals, teams and business entities can participate and compete for prizes, #OpenDataApps Challenge is about creating applications using government data sets that will help improve the delivery of government services, promote government transparency and accountability, and strengthen citizen engagement.

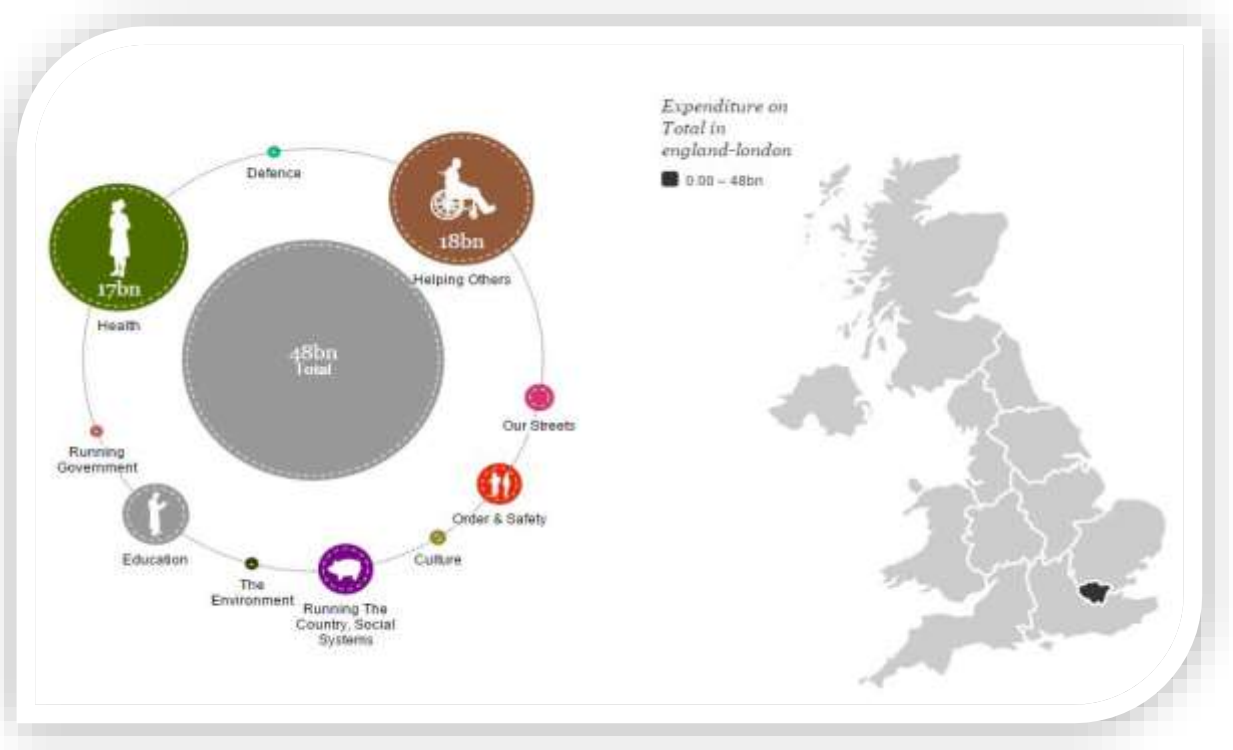
The GoTourist app uses business intelligence analytics to identify trends and predict tourist behaviour, and a feedback mechanism that gathers users view, and provides the government real-time feedback on the quality of service being offered by providers. Data obtained from the platform helps the government develop, improve and implement solutions to tourism-related challenges.

2.2.3. Where Does My Money Go? (United Kingdom): Increased information exchange

Citizens can view, monitor and analyse how their taxes are spent by the UK Government through the Where Does My Money Go? Website platform, available to view at http://wheredoesmymoneygo.org/.

Users can see national as well as regional expenditures on services including health, defence, education, order and safety, environment and general governance (Figure 3). It also features a section called 'The Daily Bread' where users can put in their salary, then the system will generate a visual and numerical representation of what portion of the salary goes into government services.

Figure 3. UK's Where Does My Money Go? Platform—which aims to promote transparency in government spending



Source: http://wheredoesmymoneygo.org

2.2.4. Flood mapping and forest conservation (Australia): Improved decision making and planning

Set out below are two brief case studies on open government data in Australia, and how it helps local governments in improving decision making and planning.

Queensland flood mapping

The Queensland Flood Mapping Program was part of the state government's response to the Queensland Floods Commission of Inquiry. The open data Floodcheck Maps are interactive guides that chart flood lines, imagery, data and the extent of floodplains in Queensland. These guides allow for the identification of high risk, flood prone townships, which allows urban and town planners to avoid dangerous decisions, and insurance products to be re-priced according to the risk residents face.

Melbourne urban forest conservation

The City of Melbourne has begun publishing data on light, humidity and temperature levels online as part of its efforts to study the impact of canopy cover on urban cooling. The Urban Forest Visual open data product aims to 'develop new systems that can help City administrators remotely monitor, understand and interpret real time information on urban environments'. The data can be used to direct local government planning decisions with respect to diversity and urban ecology.

3. Understanding data: nature, pricing, and economic theories

Economic theory for open data rests on the importance of information to the economy. Information drives innovation and informed choice, which in turn produces benefits ranging from improved productivity, efficiency and reduced production costs to improved product timeliness, quality and performance[11].

Information can be costly to acquire[12]. For example, imperfections in capital markets can be linked to the transaction costs associated with acquiring information. Markets for information as a good are themselves characterised by imperfect information. A buyer often cannot ascertain the properties and quality of the information for sale to the extent they generally could with a physical good, and therefore only purchase information in an 'ad hoc' manner.

Given the unique characteristics of information and the challenges around it, economic theory suggests government has a responsibility to provide information and data that bring broader societal benefits including empowering and engaging citizens and communities, improving the efficiency of markets, and encouraging competition and innovation.

[11] Hayek, F. A. (1945). The Use of Knowledge in Society. *American Economic Review, 35*(4), 519–530.

[12] Stigler, G. J. (1961). The economics of information. *Journal of Political Economy, 69*(3), 213–225.

Key economic concepts associated with open government data that are drawn on in studies reviewed in this report include:

- imperfect information
- public goods and market failures
- short-run marginal costs and fixed costs
- economies of scope
- externalities and spill-overs
- public and private benefits
- value added
- non-linearity of returns
- willingness to pay, and
- technical efficiency.

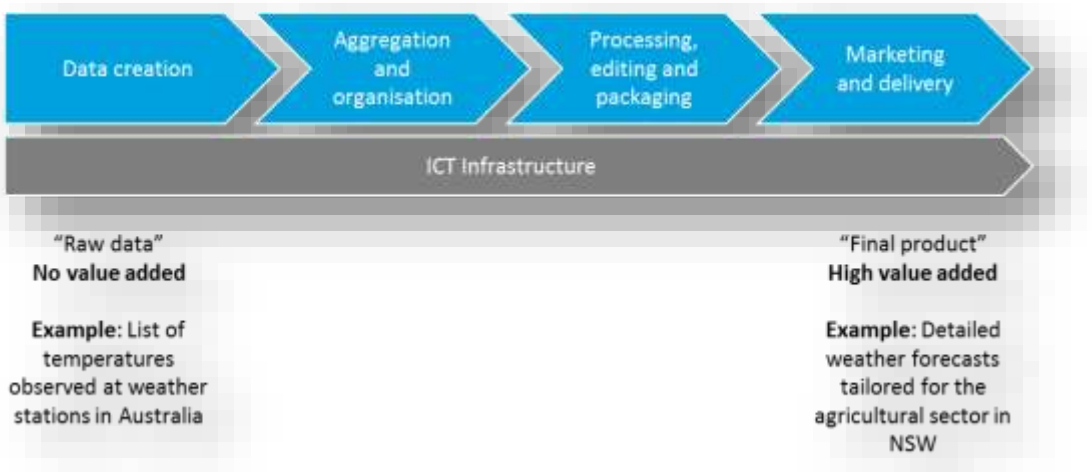
The definitions and explanations of these concepts can be found in the glossary at the end of this report (Appendix B).

This section explores some of these concepts and contains a synthesis of economic views on data generally and open government data in particular, to set the scene for more detailed analysis in subsequent sections.

3.1. Nature and pricing of data

Different kinds of data lie along the continuum of a public sector information (PSI) re-use value chain that comprises four elements—creation, aggregation and organisation, processing, editing and packaging, and marketing and delivery (Figure 4).

Figure 4. Public sector data value chain



Source: Adapted from OECD (2006, Figure 4), examples from Deloitte Access Economics

The first two elements involve the creation and collection of data, and the organisation of that data into a dataset that allows storage and retrieval.[13] This raw data is likely to exhibit public good characteristics.

The third and fourth elements are where data is manipulated or combined to create some value-added product or service that is then promoted and delivered to users. This data can be incremental or commercial in nature[14], and is likely to have more private benefits associated with them. An example of value-added meteorological data is a national weather map that charts high and low pressure systems, while commercial meteorological data could be detailed weather forecasts tailored for the agricultural sector in a particular region.

3.1.1. Raw or basic data

Raw (or basic) data is collected in the course of the government's usual operations or business, regardless of whether it can be re-used by another party. An example is basic meteorological data, such as a list of temperatures observed at weather stations in Australia.

Raw data has strong public good characteristics[15], including its benefits being widely dispersed, meaning it is likely to be under-produced by the private sector in the absence of government intervention. This provides a rationale for governments to make data open, given that it is already collected in the course of operations. If a greater number of users[16] has access to open government data, this could provide economies of scale for government agencies in collecting data.

There is general agreement that raw data should be priced at zero, or at the most at short-run marginal cost[17]. This approach recognises that the potential benefits from the use of raw data (and the fact that the data is already produced for other purposes), while not easily quantifiable, are likely to be broadly spread throughout society[18] and should be freely available.

Arguments for pricing above zero or short-run marginal cost fail to consider that, while this pricing strategy may allow for the recovery of more of the costs related to government data, there are broader benefits from making government data freely available, through greater use of the data.[19]

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[13] OECD. (2006). *Digital Broadband content: Public Sector Information and content*. Retrieved from: www.oecd.org/dataoecd/10/2236481524.pdf

[14] ibid

[15] Stiglitz, J. E. (2000). The contributions of the economics of information to twentieth century economics. *Quarterly Journal of Economics, 115*(4), 1441–1478.

[16] Newbery, D. M., Bently, L., & Pollock, R. (2008). Models of public sector information provision via trading funds.

[17] Davies, JB., & Slivinski, A. (2005). *The public role in provision of scientific information: An economic approach* (No. 20051). University of Western Ontario, Economic Policy Research Institute. Economic Development and Infrastructure Committee. (2008). *Inquiry into improving access to Victoria's public sector information and data: Discussion paper*. Melbourne, Australia: Victorian Government Printer; and Productivity Commission (2001).

[18] Freebairn, J. W., & Zillman, J. W. (2002). Economic benefits of meteorological services. *Meteorological Applications, 9*(01), 33–44.

[19] Ubaldi, B. (2013). Open Government Data: Towards Empirical Analysis of Open Government Data Initiatives. *OECD Working Papers on Public Governance*, No. 22, OECD Publishing; PIRA. (2000*). Commercial exploitation of Europe's public sector information*, European Commission, Brussels. Retrieved from

Case studies found that moving from a full-cost recovery pricing regime to setting prices at zero or marginal cost would be welfare improving, significantly increasing re-use and encouraging use by different types of users (including small and medium enterprises)[20]. It is argued that the real value of open government data is when there is existing interest and capacity in re-using data[21], and hence re-use in terms of processing, editing and packaging of data should be facilitated to continue to unlock value.

3.1.2. Incremental or value-added data: cost recovery pricing

Economies of scope may also make it more efficient for these public sector agencies to provide incremental data (that has some value-added component involving data manipulation, or additional data collection that provides a private benefit to the user), as the same inputs are often required.[22] This data may not have any private sector competitors for provision.[23] The charting of mineral deposits on a map could be considered incremental data, as it has been processed in a way that makes it easier for a user to view.

Pricing incremental data above marginal cost recognises that the benefits are distributed differently to raw data (that is, there are greater private benefits). Cost-recovery pricing (where the beneficiary of the value-added data product pays for its usage) can enhance economic efficiency by ensuring that users recognise the costs associated with value-added production, relative to the private benefits that are gained from government data.[24] That is, while free provision or (at the most) short-run marginal cost pricing holds for raw data given its public good characteristics, it is may be desirable for value-added data to be priced to recover the costs of the value-adding.

A situation where this approach may need to be considered further is where government departments (as users of data) are required to pay other government departments to access data and negotiate contracts for use, creating unnecessary bureaucracy and costs without generating additional government revenue.

> **Private weather services market in the US**
>
> In the US, open government data is generally available without any copyright restrictions (Nilsen, 2010), and may be collected in the course of the government's usual operations. The general release of raw data and permissive licencing that allows the private sector to add value to the data has enabled the development of large commercial re-use markets in some sectors.

ftp://ftp.cordis.europa.eu/pub/econtent/docs/2000_1558_en.pdf; and Weiss, P. (2002). Borders in cyberspace: conflicting public sector information policies and their economic impacts. In *18th International Conference of the Committee on Data for Science and Technology, Montreal, CODATA* (pp. 137–159).

[20] de Vries, M., Kapff, L., Negreiro Achiaga, M., Wauters, P., Osimo, D., Foley, P., Szkuta, K., Osimo, D., O'Connor, J. & Whitehouse, D. (2011). *Pricing of Public Sector Information Study (POPSIS)*. European Commission: Brussels.

[21] Newbery, D. M., Bently, L., & Pollock, R.

[22] Davies, JB., & Slivinski, A.

[23] Productivity Commission. (2001). *Cost recovery by Government*. Commonwealth of Australia, Canberra.

A prominent example is the private weather services market in the US, which has benefited from the freely available meteorological data released by the US National Weather Service. This data has enabled the provision of 15 million weather forecasts and services for the private sector and general consumption (US Economics and Statistics Administration, 2014). Weather forecasts are estimated to have an aggregate value of $31.5 billion annually, relative to annual expenditure of $5.1 billion by the public and private sector to produce those forecasts. Source: Lazo et al., 2009.

The experience of the US contrasts with the European Union, which PIRA (2000) found had, at the time, limited commercial utilisation of government data. This was in part due to inconsistent regimes, copyright restrictions, cost-recovery pricing, and a propensity for governments to mirror private sector products, creating unfair competition. Source: Nilsen, 2010; PIRA, 2000.

Ideally, sharing data across government departments should be as efficient as possible and where operationally and financially feasible, government agencies should not charge each other for providing access to data sets.

3.1.3. Commercial data: price according to competitive neutrality principles

In terms of commercial data (data that could be generated by the public or private sector), the general theory is that commercial products should be priced according to competitive neutrality principles.[25] However, some studies question[26] whether governments should provide commercial data, arguing that this data is not in fact a public good, and that government intervention could lead to unfair competition and market exclusion[27].

The benefits of commercial data are largely private, and if there are competitors in the market for the provision of such data[28], then commercial data should be priced according to competitive neutrality principles to ensure fair competition, and user recognition of the costs of production.

Some examples of Australian government data that is priced at **zero** and **above zero** are provided in Table 1.

[25] Parliament of Victoria, Economic Development and Infrastructure Committee.

[26] Stiglitz, J. E. (2000), 1441–1478.

[27] Weiss, P. (2002). Borders in cyberspace: conflicting public sector information policies and their economic impacts. In *18th International Conference of the Committee on Data for Science and Technology, Montreal, CODATA* (pp. 137–159).

[28] Productivity Commission. And Parliament of Victoria, Economic Development and Infrastructure Committee.

Table 1. Examples of Australian government data

Government data where price = $0	Government data where price > $0
> Geoscience Australia mineral deposits and occurrences	> Australian Securities and Investments Commission (ASIC) company documents
> Bureau of Meteorology weather observations (daily frequency)	> Bureau of Meteorology temperature observations (minute frequency)
> Australian Bureau of Statistics (ABS) Labour Force data	> National Centre for Vocational Education Research (NCVER) unit record student outcomes data

3.2. Potential constraints on open government data

For some government data, legal, security and privacy issues need to be considered. These include licensing conditions which act as a mechanism to balance access to government data and protect intellectual property rights, legislative requirements, accessibility support, and consideration of whether data contains sensitive information (e.g. national security). These factors can limit the extent of, and depth of, data that is made available, and the timely release of data.

There is analysis that highlights such barriers to data re-use, but the costs associated with addressing these constraints, and balancing these costs against the benefits of opening up access to data (which do not necessarily accrue to the parties incurring the costs—that is, the government), have not in general been considered. This mismatch reduces the incentives for governments to devote resources to opening access to data over its core operations, as described in the Google case study in section VII. This highlights one of the challenges faced by the public sector in devoting funds to making data available, despite the wider economic benefits of doing so.

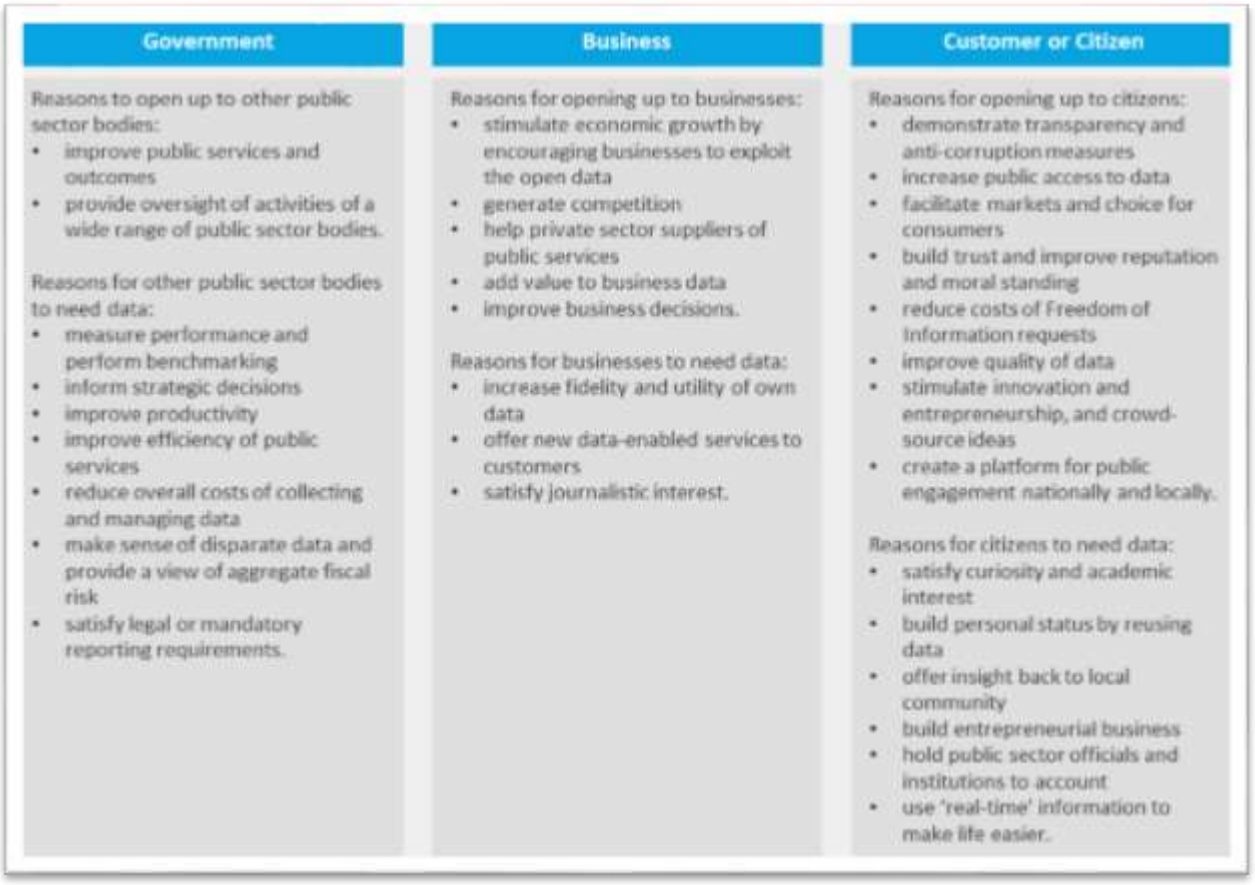
3.3. Reasons for supply and demand of government data

Opening up of government data provides a range of direct and indirect benefits to its users—citizens, communities, non-government organisations and businesses. Government agencies can consider the reasons outlined below (Figure 5; Deloitte, 2012) to justify plans and decisions on open government data policies and initiatives.

An additional consideration is that the rationale for the provision of open government data is driven by the distribution of the benefits between society and the private sector and is not necessarily linked to the value-add to the data.

Conceptually at least, it is possible for raw data with strong private benefits to exist and for there to be a case for charging users for access. It is also possible for highly stylised and value-added data to have strong public benefits, and a rationale for it to be freely available. As such, consideration should be given to who the likely recipients of benefits are, as well as the level of value-add in considering the rationale for the release of data and its pricing. Where data has high public benefits, it should be provided for free to encourage greater re-use of the data. If costs are likely to reduce use of this raw data, they should be avoided.

Figure 5. Benefits and needs: Open Government Data



Source: Adapted from Deloitte (2012)

3.4. Spill overs and externalities

Data is likely to have positive spill overs or externalities, which confer benefits to an unrelated third party. [29] Data sets that are known to have the potential for high use and re-use are expected to pave the way for the creation of new products or services, or improve experience, that have positive externalities, according to a European Union report[30].

[29] Nilsen, K. (2010). Economic theory as it applies to Public Sector Information. Annual Review of Information Science and Technology, 44(1), 419-489.

[30] Leda Bargiotti, Michiel De Keyzer, Stijn Goedertier, and Nikolaos Loutas (2014). European Public Sector Information Platform, Topic Report No. 2014/08, Value-based prioritisation of Open Government Data Investments.

What the report considered as high value data sets are base registers, transport data, geospatial data, and statistics. For example, improved meteorological data and weather forecasting could lead to individuals taking greater precautions when, for instance, a flood or other extreme weather event is expected. This could reduce the deployment of emergency services during the weather event[31]

The private benefits for users of open government data should be considered in tandem with potential spill overs when determining whether data should be free.

4. Measuring the economic benefits

This section highlights some of the methodologies and assumptions employed in key pieces of literature, and quantitative estimates relevant to Australia, the UK, US, Canada and New Zealand. Due to the diverse nature of the studies, detailed conclusions and comparisons cannot be drawn from the sizes of the estimates in each region. The literature does however give a sense of the magnitude of benefits, both current and potential, of open government data.

In terms of the methodologies for assessing the benefits of open data and what assumptions should be made in the process, most literature reviews suggest these areas are underdeveloped. This is mostly due to the inherent difficultly in measuring the benefits, and in part to the diversity in the structure of economies involved. There are significant complications in measuring the economic and social benefits that are considered to be 'downstream' or realised by anyone other than the agency which made the data available. These methodological challenges have led to concerns that governments undervalue and underinvest in government open data.[32]

4.1. Methodologies for assessing economic benefits

There are two main approaches to measuring the economic benefits of open data; those referred to in the literature as **top-down** (macroeconomic) and **bottom-up** (microeconomic). Based on the critical review of different studies on valuing open government data, the appropriateness of each approach will depend on the question that needs to be answered.

A top-down approach can have merits if the question is around the **current significance** of open government data value. A bottom-up approach can be considered if the question is around **the future productivity benefits** that could be derived from open government data.

4.1.1. Top-down approaches

In general, a 'top-down' approach considers the value of open government data through the resources devoted to generating it or using it.

[31] Productivity Commission.

[32] Shakespeare, S. (2013). Shakespeare review: An independent review of public sector information, Department of Business, Innovation and Skills, UK. Retrieved from https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/198752/13-744-shakespeare-review-of-public-sector-information.pdf

PIRA (2000) used a top-down value-added approach to evaluating the size of the open government data 'sector' of the economy in the European Union and the United States of America. The method estimates the economic value added using case studies to calculate both the supply and demand sides of open government data.

- Estimating the **supply side** involves calculating the incremental investment cost to government of collecting and sharing the data.
- Estimating the **demand side** involves calculating any expenditure on the open data by users and re-users, reflecting the value they place on this data. Further value add on the demand side occurs where data has been bought and repackaged by intermediary companies, with the additional value estimated through accounting figures collected from a sample of open government data users (e.g. what is the estimate of the value-added used to transform the value of government data, from supply to intermediate users into a final user figure).

One example of the method is shown for France. The estimated supply side cost is approximately $1.5 billion and the demand side is estimated to be approximately $214.5 million.

The overall estimated benefit to the French economy of open government data a significantly larger number at approximately $15 billion due to the value added by intermediary companies. It is not clear how PIRA (2000) have estimated the value-added element to reach this sum.

Economic value can be defined as the amount an individual or organisation is willing to sacrifice in order to obtain the good in question. As with most of the studies, there is potential for error, and criticisms of the top-down approach suggest the tendency to overstate the economic value by failing to identify reasonable substitutes of open government data that can be made available to users.[33] Another general criticism of top-down approaches is that they over-attribute causality and generate biased estimates.[34]

> Top-down approach is valuable if the aim of research is to identify how important open government data will be in future, as this approach estimates the total values of the current sectors that use open government data as an input, and it provides an indication of the gross value of the open government data to the economy35.

[33] DotEcon. (2006*). The commercial use of public information*, *Report oft861*, Office of Fair Trading, London. Retrieved from www.opsi.gov.uk/advice/poi/oft-cupi.pdf and Graves, A. (2009). *The price of everything but the value of nothing,* in Paul Uhlir (ed.) The socioeconomic effects of public sector information on digital networks: Towards a better understanding of different access and reuse policies, National Academies Press, Washington DC. Retrieved from www.nap.edu/openbook.php?record_id=12687&page=25

[34] DotEcon and Deloitte. (2013). *Market assessment of public sector information*, Deloitte (UK) for Department for Business Innovation and Skills, Retrieved from www.gov.uk/government/uploads/system/uploads/attachment_data/file/198905/bis-13-743-market-assessment-of-public-sector-information.pdf

35 National Research Council of the National Academies. (2009). The socio economic effects of public sector information on digital networks.

Although it is conceptually possible for a top-down approach to be conducted as a productivity analysis, this would be challenging because there is little data currently available and open government data forms a very small part of the economy's productivity improvement.

4.1.2. Bottom-up approaches

Bottom-up approaches to measuring economic value seek to find an aggregate figure by adding up various components using business surveys, local and international case studies and consultations. This approach uses productivity analysis to calculate net economic value by estimating willingness to pay for open government data minus the cost of supplying and producing it.[36]

The major criticism of bottom-up approaches is that they fail to account for wider economic impacts.[37]

In contrast to the top-down value added approach which tells us the overall significance of open government data by detailing the size of the industry, the **bottom-up approach using productivity analysis details how much bigger the economy will be as a result of open government data usage or initiatives.**

Productivity analysis for open government data takes into account outputs produced by individuals and companies using government data and the inputs used to produce the outputs, which makes this type of analysis effective only for the microeconomic bottom-up approach. If a study is considering why the government should be spending money on open government data, the bottom-up methodology would appear the most appropriate option.

A variation of the bottom-up approach is the use of general equilibrium models. Studies specific to spatial data have used detailed sector case studies to inform general equilibrium models—this approach calculates aggregate economic impacts including second and subsequent round effects, and it often incorporates macroeconomic level data such as population and labour market dynamics.[38] The risk of this type of modelling is that if the inputs are not correctly specified, the results are not credible and should not be generalised to the whole economy from individual industry assessments.

4.2. Measuring indirect benefits of open government data

Studies diverge on whether or not the indirect benefits or externalities can be measured. In terms of measuring indirect benefits, many of the methods that can be used are drawn from the field of

[36] Graves, A.

[37] Gruen, N. Houghton, J. & Tooth, R.

[38] ACIL Tasman. (2008). The Value of Spatial Information: The impact of modern spatial information technologies on the Australian economy, ACIL Tasman for CRC for Spatial Information & ANZLIC—the Spatial Information Council, Retrieved from www.crcsi.com.au/assets/Resources/7d60411d-0ab9-45be-8d48-ef8dab5abd4a.pdf; and ACIL Tasman. (2009). Spatial information in the New Zealand economy: Realising productivity gains, ACIL Tasman for Land Information New Zealand, Department of Conservation, and Ministry of Economic Development, Retrieved from http://www.acilallen.com.au/cms_files/ACIL_spatial%20information_NewZealand.pdf

environmental economics. Rather than measuring the financial value of open government data, what can be considered is asking what the cost to society is of not making open government data available[39].

The use of case studies can also give an indication of wider societal value[40], by dividing the economy and types of open government data into sectors and then calculating the benefits. Benefits could include cost savings, time savings, economic value, and non-quantifiable benefits as appropriate. For example, in the area of transport, traffic data can save motorists' time and better coordinated road works can reduce congestion and improve efficiency. There are two other examples of how to measure indirect benefits[41]:

Microeconomic (welfare) approach: Calculates consumer surplus, or the net economic benefit to consumers, through the difference between the price that the consumer is willing to pay and the price actually paid. This method requires an assumption of linear demand and for this reason likely underestimates consumer surplus.

Macroeconomic (returns) approach: Uses a modified Solow-Swan model (also known as an exogenous growth model) viewing the returns to open government data as similar to the returns found for research and development.

While methodologies for measuring indirect benefits including wider societal benefits vary depending on contexts and data types, it is important that efforts are made to include these estimates in the overall valuation of open government data and potential for open government data.

4.3. Assumptions

Given the wide variety of methodologies employed by the various studies, the assumptions made in each are also disparate and not easily comparable. While the literature in the sector continues to grow, there are some key differences in assumptions, which are outlined below.

Measuring costs: Although many government departments and agencies across the world have been collecting, creating and releasing a certain amount of open data for decades, there has not yet been a concerted effort to measure the cost of such activities, including the short-run marginal cost (incremental cost) of making government data publicly available.

As many of the methodologies for quantifying the economic value to open government data need to ascertain the cost of making the data available, assumptions on how much governments spend vary.

Elasticity of demand: The robustness of results can depend significantly on the assumptions made of the elasticity of demand for the good. The elasticity of demand is influenced by the availability of substitutes, the type of open data being measured, and if the data is just one input into the final product, what proportion of the value-add is allocated to the data. The availability of substitutes plays an important role in dictating the elasticity of demand for data.

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[39] Te Velde, R. (2009) 'Public Sector Information: Why Bother?' in Paul Uhlir (ed.) The socioeconomic effects of public sector information on digital networks: Towards a better understanding of different access and reuse policies, National Academies Press, Washington DC. Retrieved from www.nap.edu/openbook.php?record_id=12687&page=25.

[40] Deloitte.

[41] Houghton, J.W. (2011). *Costs and Benefits of Data Provision*, Report to the Australian National Data Services, Canberra. Retrieved from www.ands.org.au/resource/cost-benefit.html

Non-linear growth: The benefits of open data may be increasing at an accelerating rate (in contrast to the assumption of constant returns to scale)[42], which may underestimate the potential benefits. If open data does in fact operate as a complex system there may be critical tipping points, whereby a small input of extra data may transform the network into a different state entirely. This issue has not been widely explored.

When the benefits are realised: To assume that all the benefits of a particular dataset were accrued in the same year that the data was collected is not a realistic or preferred assumption. Even data that is likely to provide the most immediate benefits such as weather or meteorological data could have benefits for years into the future such as for those looking at long-term weather patterns.

Useful life of the data and depreciation rate of the stock of data: The assumption would need to be considered on a case-by-case basis for the various data types. One study[43] for example, assumes a useful life of public sector information to be five years.

In general, studies that adopt conservative assumptions rather than overly optimistic estimates are considered more credible as they are based on defined and realistic assumptions and less likely to overstate the benefits of open government data.

5. Quantitative estimates of the value of open government data

There is a wide range of quantitative estimates of the value of open government data across the world, depending on the aspect of open government data measured, methodologies, and assumptions used.

Globally, the potential economic value to be enabled through open data—including government and private sources—is estimated to be up to $4 trillion per annum.[44] In Australia, a recent study by Lateral Economics based on McKinsey work estimates that the current (rather than potential) aggregate direct and indirect value of open government data is **up to $25 billion per annum**, or slightly over 1.5 per cent of GDP in 2014.[iii]

This section explores the estimates of open government data value in Australia, as well as international estimates in countries like the UK, the US, and New Zealand, and aims to provide an understanding why estimates in each country differ due to a number of factors.

5.1. Australia: Economy-wide quantitative estimates

5.1.1. Gruen, Houghton and Tooth (2014)

An estimation of the size of the economic benefit of open data in Australia has only been undertaken by Gruen, Houghton and Tooth (2014) with a view to illustrating the potential for open data to contribute to the Group of 20's (G20) growth target of 2 per cent agreed during the G20 finance ministers and central bank governors meeting in Sydney in February 2014. They estimate the current aggregate direct and indirect value of government data in Australia at up to $25 billion per annum.

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[42] Gruen, N. Houghton, J. & Tooth, R.

[43] Houghton, J.W.

[44] Manyika, J. Chui, M. Groves, P. Farrell, D. Van Kuiken, S. and Doshi, E, A.

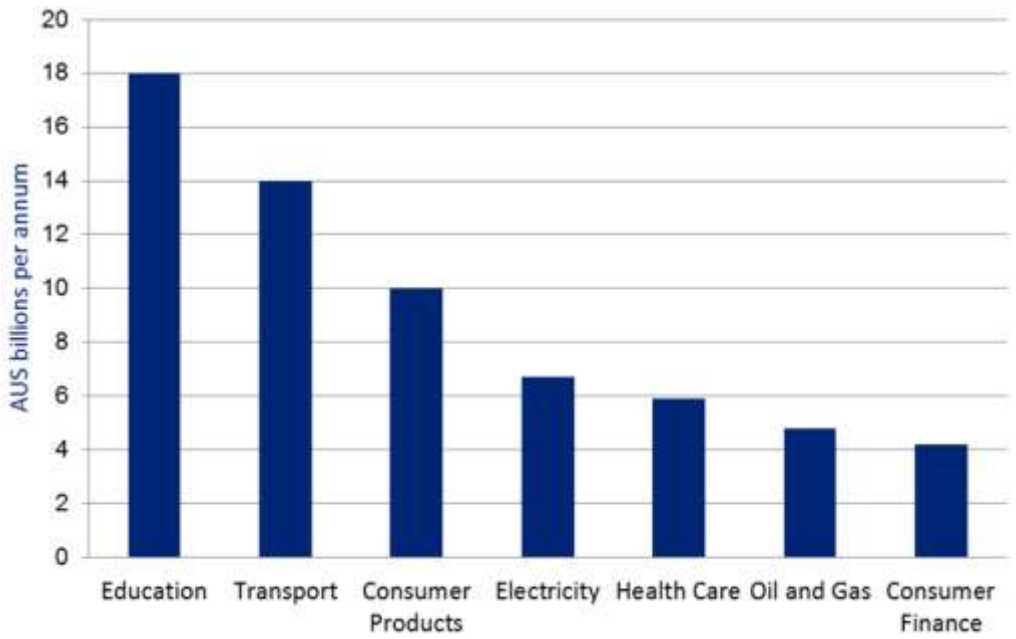
Using the McKinsey Global Institute Study, Gruen et al. (2014) estimate that, given the relative size of the Australian economy, the total potential of open data to Australia is around $64 billion per annum. This estimation is of output rather than value added and includes business data as well as government data. From a policy perspective, Gruen et al. find that by reinvigorating open data policies, there would be a contribution to Australia's cumulative GDP growth of $16 billion per annum or around 1 per cent of GDP over the next five years.

Three considerations for assessing this approach include:

1. The estimate is considered a 'best guess' by the authors rather than a base-line figure estimated using conservative assumptions.
2. As noted in more detail below the specific methodology and assumptions in the underlying McKinsey study are not available for detailed critique.
3. Using Australian GDP to select a proportion of the global estimates is reasonable for providing a 'best guess' estimate but it does not take into account any particularities of Australia's policies or industry contexts.

In order to give an indication of how this value might be divided among sectors, Gruen et al. divide the sector shares from the McKinsey study (without regard for structural differences between economies) from the $64 billion estimate of total potential of open data in Australia (Figure 6).

Figure 6. Estimated potential benefits of open data, by sector, Australia



Source. Gruen et al. analysis of data from McKinsey Global Institute (2013) Open data: Unlocking innovation and performance with liquid information. New York

As shown in Figure 6, if it is assumed that similar opportunities exist within the Australian economy, this would indicate the greatest proportion of value to unlocking open data would come from the education, transport and consumer product sectors with $10 billion or more in value each. This is followed by the electricity, health care, oil and gas and consumer finance sectors with $7 billion or less in value each. This

could be used as an indicator on the potential value of opening up different types of data. To our knowledge, similar analysis focused specifically on sectors of the Australian economy has not been undertaken.

Finally, the authors include a summary table of international reports that have been most widely referenced over the last 10 years (Table 2).

Table 2. Summary of international study findings of the value of government data (or public sector information) in Australia

Value measured	AUD per annum circa 2013
Net value	$625 million to $1.2 billion
Investment value	$3 billion
Market value	$3.9 billion to $4.5 billion
Direct value	$1.9 billion to $7 billion
Use value	$22 billion
Aggregate direct and indirect value	$25 billion

Source: Gruen, Houghton, Tooth (2014). Note: Study results scaled to Australia based on pro rata GDP shares

5.1.2. Data-driven innovation

An additional estimation of the role that data is playing in the Australian economy is provided in the Google Australia commissioned report *Deciding with data: How data-driven innovation is fuelling Australia's economic growth*, undertaken by PricewaterhouseCoopers Australia (PWC). This report looked at the role of all available data in the economy (not limited to government open data) and found that in 2013, data-driven innovation added an estimated $67 billion in new value to the Australian economy, or 4.4 per cent of GDP (PWC, 2014).

The report particularly highlights the importance of the health industry in Australia as a potential driver for future productivity growth. The report argues that increasing the uptake of data-driven innovation by business and public sector organisations using open data is a means to achieving productivity gains. To achieve these benefits and gains, technical and legal barriers to access need to be overcome.

5.1.3. Geospatial data

Geospatial or spatial data is of particular importance because it can be used to produce location maps to find goods and services from a wide range of sectors in a variety of end-using devices, with most added value coming from combinations with other information, such as demographic, traffic or environmental data.[45]

[45] Vickery, G. (2011). Review of recent studies on PSI re-use and related market developments. *Information Economics*, Paris.

According to a World Bank report[46], geospatial reference data—due to its leveraged and highly pervasive nature—is recognised as one of the most important government datasets for enabling delivery of new products and services and driving economic growth. Combined with other government-owned information such as road and transport data, company registers, and weather data, these datasets supply the 'core reference data' for the economy as a whole. These datasets could be used on their own, or can be supplied by the government in their raw form to which other users (e.g. developers / private companies) can add value.

A report by ACIL Tasman (2008) estimated the impact of modern spatial information technologies on the Australian economy in the 2006–07 financial year, finding the following impacts:

- industry (revenue): $1.37 billion annually, and
- industry (gross value added): $682 million.

In addition, constraints on access to data are estimated to have reduced:

- productivity in some sectors by between 5 per cent and 15 per cent, and
- GDP and consumption by 7 per cent (around $0.5 billion).

The study used a value-added methodology because a 'willingness to pay' approach was not possible due to a lack of data and prohibitive costs, nor could direct impacts be studied due to a lack of data. The sectors studied in 22 case studies were: agriculture, fisheries, forestry, mining and resources, property and services, construction, transport and storage, utilities, communications, and government.

Natural disaster resilience solutions

An example of where greater centralisation of key data through the development of a national open source platform would provide more timely and relevant information is Deloitte Access Economics' 2014 project, Building an open platform for natural disaster resilience solutions for the Australian Business Roundtable for Disaster Resilience and Safer Communities.

This project found that a fresh approach to the collation, coordination and analysis of natural disaster information and research is fundamental to the prioritisation of mitigation decisions that will help strengthen and safeguard our communities.

There is currently not a lot of ownership over disparate datasets. Better articulation of the 'why' of open data and the ownership benefits would improve outcomes overall.

[46] World Bank. (2014). *Open data for economic growth.* www.worldbank.org/content/dam/Worldbank/document/Open-Data-for-Economic-Growth.pdf

Geoscience Australia's role to provide pre-competitive geological information on petroleum and minerals

Geoscience Australia (GA) supports the Australian Government and the community to make informed decisions for the management and exploitation of mineral and energy resources. It does this by providing pre-competitive information on the nature and geological characteristics of petroleum and mineral deposits. Pre-competitive information is then used by governments in promoting the exploration potential of Australian territory, either in general terms or for specific areas being offered for exploration permits.

The Australian Government commissioned a strategic review of Geoscience Australia in 2011, and retained ACIL Tasman to report on the economic value of core areas of GA's work.

Public geoscience information such as that openly marketed by GA is considered to meet the definition of public good. The case for GA continuing to play in the pre-competitive space is made on the basis of the positive externalities generated by the information, the reduction of risk in exploration and the harmonisation of data at regional and continental levels all of which might not arise through the private sector if left to its own priorities (HoR Standing Committee, 2003).

Estimates of economic benefit

ACIL Tasman modelled the relationships between: (a) an increase in Australian Government expenditure on offshore pre-competitive geoscience and private offshore petroleum exploration expenditure; and (b) an increase in private offshore exploration expenditure and the value of offshore petroleum production. The modelling produced the following results:

one-off $1 million increase in federal government (GA) expenditure on pre-competitive geoscience is associated with a short-run increase in private offshore petroleum exploration expenditure of $31 million (in 2009–10 dollars), with a three year lag, and a $1 million year-on-year increase in private offshore petroleum exploration expenditure is associated with a contemporaneous $1.6 million year-on-year increase in the value of offshore production of crude, liquid petroleum gas, natural gas and condensate in 2009–10 dollars.

At face value, the modelling has been used by government to demonstrate a correlation between resource development and GA's pre-competitive work, most directly in terms of exploration expenditure, and more indirectly through eventual resources production.

5.1.4. Summary of quantitative estimates of open government data value in Australia

The full range of Australian estimates is summarised in Table 3. Many of these were not specific studies, rather they were international studies that have been applied to Australia given the relative size of the Australian economy and have not accounted for the difference in the Australian context in any meaningful way.

Table 3. Range of Australian quantitative estimates of open government data value

Sector/Agency	Estimate	Year	Source
Economy wide	Current value of open government data of up to $25 billion	2014	Gruen et al. (2014)
Economy wide	Potential for all open data (not restricted to open government data) in Australia to contribute an additional $64 billion per annum	2014	Gruen et al. (2014)
Economy wide	Reinvigorating open data policies could contribute an additional $16 billion per annum	2014	Gruen et al. (2014)
Economy wide	Data-driven innovation added an estimated $67 billion in new value to the Australian economy	2013	PWC (2014) for Google Australia
Economy wide	Assuming similar levels of investment and use in Australia, the PIRA (2000) study would estimate an investment value for open government data in Australia of $2.5 billion and a use value of around $18 billion	2011	Houghton (2011) from PIRA (2000)
Economy wide	Assuming similar levels of activity in Australia, applying the MEPSIR (2006) study to Australia would place the value of open government data at $3.2 billion	2011	Houghton (2011) from MEPSIR (2006)
Economy wide	Assuming similar levels of activity in Australia, the te Velde (2009) study would place the value of the open government data market in Australia at around $500 million	2011	Houghton (2011) from te Velde (2006)
Economy wide	Assuming similar levels of activity in Australia, the DotEcon (2006) study would suggest an open government data value in Australia of approximately $2.4 billion	2011	Houghton (2011) from DotEcon (2006)
Australian Bureau of Statistics	Estimates overall costs associated with free online access to publications and data of $4.6 million per annum and measurable annual benefits of up to $25 million		Houghton (2011)
Office of Spatial Data Management and Geoscience Australia	On average, social returns to annual expenditure on data collection suggest an increase in social returns of $15 million	2011	Houghton (2011)

Sector/Agency	Estimate	Year	Source
Geoscience Australia (GA)	Comparing the impacts of free provision of GA topographical data relative to cost recovery was overall increase in net welfare gain of $4.7 million per annum	2001-06	PWC (2010)
Spatial data	Given government expenditure on raw spatial data of around $70 million, the net welfare benefits from providing free access over cost recovery are around $25 million per annum.		Houghton (2011)
Spatial data	Estimates that industry revenue could be of the order of $1.37 billion and industry gross value added around $682 million	2007-07	ACIL Tasman (2008)
Geoscience Australia	Estimated increase in GDP due to the accumulated impact of GA's provision of geospatial products and services of $1.8 billion	2010	Australian Government (2011) referencing ACIL Tasman
Spatial data	Estimate of the non-productivity benefits of geospatial, earth monitoring, groundwater and hazards information is $1.7 billion per annum	2010	Australian Government (2011) referencing ACIL Tasman

5.2. International quantitative estimates

The only major study to quantify the economic benefits to open data on a global scale is the McKinsey Global Institute study *Open data: Unlocking innovation and performance with liquid information*[47]. In contrast to this literature review, the McKinsey study includes data from other institutions and enterprises, and from individuals in its definition of open data. It takes a bottom-up approach, examining microeconomic industry trends across a body of McKinsey work to make global findings. The report does not specify in detail the assumptions and more precise methodology of how the estimates were reached. The key finding is that an estimated $4 trillion in annual economic potential could be unlocked globally through increased efficiency, development of new products and services, and consumer surplus.

This is calculated across seven main domains: education, transportation, consumer products, electricity, oil and gas, health care, and consumer finance. Despite considering downstream benefits, these were not quantified and therefore excluded from the $4 trillion. Additional large-scale studies include those

[47] Manyika, J. Chui, M. Groves, P. Farrell, D. Van Kuiken, S. and Doshi, E, A.

quantifying the benefits of open government data in the EU[48] the central estimate for the value of open government data is a current contribution of $102 billion annually.

Another more recent study of European open government data[49] returned a much smaller estimate of the overall market for public sector information in the EU region plus Norway with an estimate $39.2 billion with an upper boundary of $71.1 billion. Key areas of difference in estimates suggest that often the people interviewed for their thoughts on the size of the open government data market simply did not know the answer. The study also identifies that the only way to get good data was to ask firms but this was not feasible on a large scale.

5.2.1. United Kingdom

Increasing the economic value of open data in the UK has been a government priority for some time resulting in more rigorous evaluation, both in government commissioned reports and academic literature.

Relatively recent estimates put the overall economic value of government open data in the UK at $3.7 billion (2011 prices) but when a measure of societal value is included, the figure jumps to between $12.9 billion and $14.0 billion.50 These estimates come from the UK-wide market assessment of public sector information (in this literature review referred to as government open data), conducted by Deloitte for the UK Department for Business Innovation and Skills.

As well as the government-commissioned reports, there is a range of economic papers[51] that estimate the welfare gains to UK society from opening up access to open government data under specific restrictions. Pollock (2009) specifically estimates that the welfare gain could be $3.3 to $4.2 billion per year. From a UK Government perspective, this means that the estimates for potential gains from opening access to open government data have ranged between $2.3 and $4.2 billion per year (from estimates made between 2006 and 2009).

Finally, there are a number of sector-specific studies to come out of the UK. A 2013 study found that Ordnance Survey's (OS), Britain's mapping agency, OpenData initiative would deliver a net $27.0 million to $59.3 million increase in GDP in 2016. This comprises an increase in net productivity gains ($16.08 million to $37.9 million) and additional real tax revenues ($9.2 million to $17.3 million).52 Comparing this to an Australian study using data from PWC (2010), Houghton (2011) found that the net welfare benefits from providing free access over cost recovery to Geoscience Australia topographical data would be around $25 million per annum.

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[48] PIRA. (2000*). Commercial exploitation of Europe's public sector information*, European Commission, Brussels. Retrieved from ftp://ftp.cordis.europa.eu/pub/econtent/docs/2000_1558_en.pdf And: Dekkers, M. Polman, F. te Velde, R. & de Vries, M. (2006). *MEPSIR: Measuring European Public Sector Information Resources,* European Commission, Brussels. Retrieved from http://ec.europa.eu/information_society/newsroom/cf//document.

[49] Dekkers, M. Polman, F. te Velde, R. & de Vries, M. (2006). *MEPSIR: Measuring European Public Sector Information Resources,* European Commission, Brussels. Retrieved from http://ec.europa.eu/information_society/newsroom/cf//document.

[50] Deloitte.

[51] Newbery, D. M., Bently, L., & Pollock, R.

[52] Carpenter, J. & Watts, P. (2013). Assessing the Value of OS OpenData™ to the Economy of Great Britain—Synopsis, Ordinance Survey, UK. Retrieved from www.gov.uk/government/uploads/system/uploads/attachment_data/file/207692/bis-13-950-assessing-value-of-opendata-to-economy-of-great-britain.pdf

5.2.2. United States of America

Of the $4 trillion annual economic surplus that was estimated as potential global value to be unlocked through open data, the McKinsey study calculated that the US proportion of this figure would be approximately $1.5 trillion. The global McKinsey study heavily relied on a previous report on the health care sector in the US, which again calculated the benefit of open data including private sources as well as government ones, at $469 to $536 billion. Like the global report, the exact methodology used in this study is ambiguous.[53]

PIRA estimated the annual economic value of the information sector in the US in order to provide a comparison point with the EU.[54] They price the information sector, which is built on open government information, at $1 trillion. As noted by te Velde[55] this is a very optimistic estimate given that $1 trillion was almost 8 per cent of US GDP in that year. The MEPSIR[56] study, despite collecting data from the US in order to make comparisons with the EU, did not give an estimate of the overall market size.

5.2.3. New Zealand

The major piece of work that has been completed for the New Zealand economy is the ACIL Tasman (2009) report into spatial information using similar methodology as the report by the same group on the Australian economy.[57] The report estimates that in 2008, the use and re-use of spatial information added $1.1 billion in productivity-related benefits to the New Zealand economy.

Further, they predict that 'had key barriers been removed it is estimated that New Zealand could have benefited from an additional $432.9 million in productivity-related benefits in 2008, generating at least $90 million in government revenue'.[58]

5.2.4. Canada

A 2014 report *Open data: the way of the future* by the Canadian Standing Committee on Government Operations and Estimates noted that there are few studies that have been conducted to measure the economic impact of having ready access to more information. To provide a sense of the value of open data to the Canadian economy, the committee heard from an author of the McKinsey Global Institute report, Michael Chui, who acknowledged that a rough estimation of the potential impact of releasing open data in

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[53] Groves, P. Kayyali, B. Knott, D. Van Kuiken, S. (2013). The 'big data' revolution in healthcare: accelerating value and innovation, McKinsey Global Institute for the US Centre for US Health System Reform Business Technology Office, US.

[54] PIRA.

[55] Te Velde, R. (2009) 'Public Sector Information: Why Bother?' in Paul Uhlir (ed.) *The socioeconomic effects of public sector information on digital networks: Towards a better understanding of different access and reuse policies*, National Academies Press, Washington DC.

[56] Dekkers, M. Polman, F. te Velde, R. & de Vries, M. (2006). *MEPSIR: Measuring European Public Sector Information Resources,* European Commission, Brussels. Retrieved from http://ec.europa.eu/information_society/newsroom/cf//document.

[57] ACIL Tasman. (2008).

[58] ACIL Tasman. (2009).

Canada (from government at all levels and from the private sector) would be close to $134 billion, based on the ratio of Canada's Gross Domestic Product (GDP) to US GDP.

Although no studies quantifying the economic benefit of open data in Canada have been identified, several studies[59] provide significant discussion of the policy context of open data in Canada. There are, however, some published empirical studies[60] on geospatial data.

5.3. Summary of international reports on open government data

A summary of international reports covering the scope, methodology and quantitative estimates of the value of open government data in Australia and other countries is presented in **Appendix A**.

6. Industry insights on the value of open government data

Two sources of industry insights on open government data in Australia are covered in this paper. The first is the initial survey on companies using government data, a project undertaken by the then Department of Communications as part of the Open Data 500 Australia initiative. The other source is the consultations conducted by Deloitte Access Economics with three key industry players for this project—SIRCA, Google, and Lateral Economics (Dr Nicholas Gruen).

6.1. Open Data 500 global network and Australia's participation

Open Data 500 is a network of international organisations that aims to look into the usage and impact of open data by, amongst other things, surveying companies that use open government data in their business, with a view to:

- providing a basis to measure the value of government-owned data;
- promoting the development of new open data-driven companies; and
- encouraging a dialogue between businesses and government on how government data could be more useful.

[59] Castro, D. & Korte, T, (2015). *Open Data in the G8: A Review of Progress on the Open Data Charter*, Centre for Data Innovation: Washington DC. Retrieved from www2.datainnovation.org/2015-open-data-g8.pdf Klinkenberg, B. (2003). The true cost of spatial data in Canada. *The Canadian Geographer,* 47(1), 37–49

[60] Sears, G. (2001*). Executive Summary: Geospatial Data Policy Study*, KPMG, Canada, Retrieved from http://wmsmir.cits.rncan.gc.ca/index.html/pub/geott/ess_pubs/292/292107/cgdi_ip_22e.pdf ; OSTP, (2011). *Lessons Learned from OOS in Canada: Preliminary Assessment of OOS Value*, Ocean Science and Technology Partnership (OSTP), Canada. Retrieved from www.qc.dfo-mpo.gc.ca/publications/science/documents/Preliminary%20OOS%20value%20assessment_e.pdf ; and Genovese, E. Roche, S. Caron, C. Feick, R. (2010) The EcoGeo Cookbook for the assessment of Geographic Information value. *International Journal of Spatial Data Infrastructures Research, 5, 120-144.*

The study has been designed such that the results are both globally comparable and country specific.[61] New York University's GovLab currently coordinates the network.

Countries such as the US, Mexico, Italy, Korea and Australia are members of the network and have initially completed or are in the process of undertaking their respective surveys.

In the United States Open Data 500 study[iv], for example, some of the preliminary survey findings[62] show that US-based companies—large and small, old and new—are using government data and are building economic value in transportation, health, energy, finance and other aspects of the economy. Of the 523 companies identified by the GovLab as using open government data, the majority of organisations are in technology and data business (18 per cent), followed by finance/investment (14 per cent), and business and legal services, governance, healthcare and geospatial mapping (between 6–8 per cent). The majority of the US companies are private (77 per cent), with 18 per cent from the public sector and 3 per cent from non-profit groups.

The Australian Open Data 500 study[v] provided generally similar results to the US in terms of the type of responding companies using government data:

- the majority were data/technology companies (25 per cent; in the US: 18 per cent), followed by research/consulting companies (15 per cent), and geospatial/mapping organisations (12 per cent)
- about 70 per cent of the responding companies are private (69 per cent; in US: 77 per cent) or non-profit organisation (20 per cent; in US: 3 per cent)
- geospatial/mapping data is the most commonly used data by the responding companies (60 per cent), followed by environmental data (49 per cent), demographics and social data (45 per cent) and positioning/GPS data (42 per cent), and
- in terms of usage, over half of the Australian companies which participated in the survey use open data to create new or improved products and services, generate cost efficiencies, and identify new opportunities.

However, unlike the US study, where two thirds of respondents were founded in the last five years, 74 per cent of participants in the Australian study were founded prior to 2010.

6.2. Consultations with SIRCA, Google and Lateral Economics

Industry insights from key stakeholders SIRCA (a not-for-profit company operating as an intermediary between data providers and academia), Google (a technology company) and Lateral Economics (Dr Nicholas Gruen, a policy economist and Chairman of the Australian Centre for Social Innovation and the Open Knowledge Foundation) were obtained to help validate the results of this project and ensure they will have currency with the business community, government and consumers. These insights on how they use open government data, how they interact with the Australian government agencies supplying the data, and what their views are on how the government can maximise the potential benefits of open government data are presented below.

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[61] The OD500 Global Network, *www.opendata500.com*

[62] *Open Data 500: Help Gather Data About Open Data*. Dec 2013. http://thegovlab.org/open-data-500-help-gather-data-about-open-data/

Industry Insights: SIRCA and the business of 'big data'

SIRCA was founded in 1997 as a not-for-profit company, operating as an intermediary between data providers and academia. It provides businesses with the confidence that data is being looked after properly, and provides academics with collated, analytics-ready data in a consistent format. SIRCA operates as a subscription service with its member universities paying an annual fee, and is one of the world leaders in the processing of complex high frequency data.

SIRCA is in the business of 'big data', ranging from financial markets (stock exchanges, Thomson Reuters) through to agricultural and meteorological data. While its focus is primarily business data, SIRCA is well placed to understand the challenges and opportunities that open government data presents.

SIRCA's view is that at present, there are limitations on accessing government data. Bureau of Meteorology data is challenging to work with as its application program interface (API) is not published, and instead users often access this data via commercial third-party providers such as Weatherzone as it saves on significant development costs.

SIRCA believes ASIC's current model of data provision is limiting innovation; information is only provided on the title of a document with a pay-per-view model for access. There is a significant information asymmetry here—only the holders of data know what is there, while the users don't have the full picture. With limited information, the opportunities for innovation are not fully understood, and hence the potential business case for opening the data is limited. Fully readable and searchable data would be preferred, noting that similar institutions overseas do provide this service for free to encourage financial system innovation.

Dr Mike Briers, CEO, has 'seen the power of linking datasets first-hand'. He believes that 'if data is locked away in a 'tomb', there's no value, and the value of data increases with circulation'. While the case for releasing data may at first be for public benefit research, other use cases will emerge, including innovative analysis for government, such as better-directed policy, and ultimately commercial applications. Dr Briers acknowledges a significant government investment through the Systemic Infrastructure Initiative in 2001 to catalyse SIRCA's main financial market use case which in turn has led to the company's financial independence.

Governments would benefit from 'taking a leap of faith that there will be value from making data available'. If just one strong benefit can be identified for a given dataset, the government should make the data available, rather than delaying and waiting for further research, regulation or other processes to confirm this.

Source: Deloitte Access Economics consultation with SIRCA, June 2015

Industry Insights: Google's use of data to communicate bushfire warnings

During the 2009 Black Saturday bushfires, the Country Fire Authority (CFA) website that was providing information about the location, size and alert level of fires across the state crashed under heavy web traffic. Google offered providing a second source of bushfire information, however, their plan to integrate bushfire data into its map API did not materialise due to copyright hurdles. Google engineers were ultimately able to source/obtain the data from CFA's website and build the software necessary to overlay the data onto Google Maps to produce a real-time map of the fires' locations and intensity.

This example illustrates the challenges that licencing and copyright restrictions can create. Data sharing and coordination between the government and the private sector should be improved to have a better and more efficient natural disaster warning communication systems. This will also help ensure that failure in one part of the system will not stop the flow of information altogether. More flexible licensing arrangements for open government data would help achieve this.

Google indicated that one of the current challenges of open government data is that much of the government data currently available online is licenced under a Creative Commons Attribution licence. With the exception of crisis response data, this can restrict Google's ability to use the data in new innovative ways and sublicense it to other users.

For example, Google must negotiate for separate and less restrictive licensing agreements with government agencies to facilitate the fast integration of transit and other data into Google's products and services. According to Google, a less restrictive licensing arrangement for open government data could help fast track the pace of innovation and widen the offering of innovative products and services available in Australia.

From Google's experience, having government data in an open machine readable format is also important. There are existing standard formats for both alerts and fire location data. Victorian emergency services has released alerts data in a standard format, however it is yet to be properly implemented. The same holds true for fire location data, which is not yet machine readable. Google and the Victorian emergency services are working together to convert this data into a suitable format.

Part of Google's mission is to 'organise the world's information and make it universally accessible and useful'. This is also exemplified by Google's International Public Data Explorer, which makes large, public-interest datasets easy to explore, visualise and communicate. Some examples of the types of data Google is interested in mapping globally includes crisis and emergency management data and health statistics. Google understands the potential for innovation and efficiency gains that can be made with open government data and supports open government data initiatives because they align with their mission.

Sources: Deloitte Access Economics consultation with Google, June 2015 and Donaldson (2015)

Industry Insights: Lateral Economics (Dr Nicholas Gruen) on quantifying impacts of open data and creating incentives to make data more open

Along with John Houghton and Richard Tooth, Nicholas Gruen was one of the co-authors of the Lateral Economics report commissioned by the Omidyar network, Open for Business: How Open Data Can Help Achieve the G20 Growth Target.

Gruen believes that the benefits of open data may be non-linear. Open data is an ingredient in a complex system, meaning there 'may be critical tipping points where a small input of extra data may transform the network into a different state entirely'.

Gruen also highlighted that at present, most studies have focused on the benefits of open data where they are clearest—including health, geospatial data and meteorological data. However, the impact of more open data is pervasive. It may well be the case that there are more gains to be made from more open approaches to data in the private sector which policy could promote in a variety of ways as illustrated in the report to Omidyar Network for the G20.

Specifically addressing the methodologies used to quantify the impacts of open data, Gruen believes it is better to take a reasonable 'best guess' approach rather than finding a base-line figure estimated using conservative assumptions. This is because the benefits of open data are often hard to observe and measure. 'I've always believed that, where there's a lot of uncertainty, it makes more sense to provide a reasoned, transparent 'best guess' than adopt any particular valuation methodology if that methodology is likely to produce a biased result. It's always better to be approximately right than precisely wrong.'

Gruen believes that there needs to be the right incentives for business and government so that it is in their interest to make data open. For instance, specification of strict standards by a central body around data release may create barriers for opening data. If standards are developed iteratively as data is released, there is potential for greater engagement and success in opening government data. Further, there are many ways in which market architecture can induce greater data openness for business and this should be an important consideration for policy.

Source: Deloitte Access Economics consultation with Lateral Economics (Nicholas Gruen), June 2015

7. Conclusions

Open government data invariably has a net economic benefit

While there is little consensus on the magnitude of the economic benefits of open government data sets, it is apparent that they provide substantial current and potential net benefits to the economy and society.

In Australia, the estimated economic value of open government data sets range from a lower boundary of $500 million to an upper boundary of $25 billion—per year. Globally, the potential value of open data (both public and private) could be up to $4 trillion per year. Significant benefits associated with open government data include improved government services, more efficient operations and business practices, better information exchange, and more engaged citizens, as shown by the sample projects and initiatives discussed in this report.

The maximum public benefit will accrue from free provision of raw government data, or at the most pricing data at the incremental cost of provision

Given that the government collects a significant amount of raw data in the course of its usual operations—for example the provision of broadband and public transport services —much of the fixed cost associated with data collection is already incurred. Net public benefits of open government data are likely to be maximised by pricing at zero or, at the most, the incremental cost of provision (short-run marginal cost), reflecting its public good characteristics of being non-rivalrous and non-excludable.

Value-adding in open government data is generally better left to the private sector

The rationale for the Australian Government's provision of open data is strongest for raw data. Raw government data is likely to exhibit the strongest public good characteristics, and hence the broadest benefits from its release. In general, net public benefits will be greater if significant value adding (beyond provision in machine-readable form) is left to the market, as the market sector will generally have more informed insights in identifying what value-add is of benefit to the users. The private sector, especially in developed industries such as ICT, generally have a more established capability and capacity in transforming raw data into products and services that could be introduced in the market.

Certain government data sets that are likely to have more significant economic impacts

Some of the potential high-value data sets held by governments that have been identified to date are spatial data, health data, transport data, mining data, environmental data, demographic and social data, and real-time as well as past emergency (e.g. bushfire) data.

Implications for governments

Maximising the benefits of open government data

As indicated above, benefits are likely to be maximised by governments focussing on opening basic or raw high value government data, rather than value adding to data that is already available. The public sector should not invest significantly in tailoring data for the private sector, as the potential uses will vary. There are greater potential benefits from moving from data being 'not available' to available, than the marginal benefit of value added data over raw data.

Government agencies could usefully undertake a stocktake of their available data and determine the 'high-value' and priority data sets. This could occur through consultation or surveying relevant industry participants and the agency's key stakeholders, international comparisons, analysing FOI requests, call centre data and hotline inquiries. Strategies to pull together national data sets from data that reside in state and territory jurisdictions (for example, transport data, bushfire data in real time) may also be useful.

There has been demonstrated value in government agencies building a business case for allocating resources to open government data initiatives and in ensuring these actions are value-adding and sustained. The Open Data Institute in the UK has published a good reference material for government agencies to build business case on open data: https://theodi.org/guides/how-make-business-case-open-data.

Develop and reward the market for data-driven innovation

Projects and initiatives that reward good ideas and innovation driven by government data have been used to stimulate awareness of its availability and its productive use. Government agencies could partner with private companies and other institutions to fund and manage reward programs, to stimulate markets for data-driven products and services that contribute to the Australian economy and society.

Appendix A: Summary of international reports on open government data

Report	Scope	Method	Estimate in reported currency	Estimate in Australian Dollars
Global				
McKinsey (2013)	Open data including government, institutions and enterprises, and from individual. Makes global estimates but also divides them into US, UK and 'rest of world' estimates	Bottom-up approach, examining microeconomic industry trends	Potential for US$3 trillion per annum to be unlocked globally. (around 4% of global GDP) US proportion: US$1.1 trillion EU proportion: US$900 billion	Potential for $4 trillion per annum to be unlocked globally. (around 4% of global GDP) US proportion: $1.5 trillion EU proportion: US$1.2 trillion
Australia				
Gruen et al. (2014) Methodology 1:	Australia - looks at open data, open government data and the current and potential economic value	Calculates Australia's proportion of the McKinsey (2013) estimates given the relative size of its economy	Current value of open government data of up to $25 billion (around 2% of GDP) Potential for all open data in Australia to contribute an additional $64 billion per annum (around 5% of GDP) Reinvigorating open data policies could contribute an additional $16 billion per annum	Current value of open government data of up to $25 billion (around 2% of GDP) Potential for all open data in Australia to contribute an additional $64 billion per annum (around 5% of GDP) Reinvigorating open data policies could contribute an additional $16 billion per annum
Gruen et al. (2014) Methodology 2:	Australia—open government data including publically funded research	Top-down, return-on-investment methodology	The government receives a return worth 1.5 times the investment in open government data	The government receives a return worth 1.5 times the investment in open government data

Report	Scope	Method	Estimate in reported currency	Estimate in Australian Dollars
Europe				
MEPSIR (2006)	EU plus Norway—value of open government data	Large survey of open government data producers and users	Current value of €26.1 billion per annum (around 2% of GDP) with an upper boundary of €47.8 billion (around 4% of GDP)	Current value of $39.2 billion per annum (around 2% of GDP) with an upper boundary of $71.1 billion (around 4% of GDP)
PIRA (2000)	EU plus Norway—value of open government data	Top-down, value-added methodology	Current estimate that open government data is worth €68 billion per annum. (less than 1% of GDP)	Current estimate that open government data is worth $102 billion per annum. (less than 1% of GDP)
UK				
DotEcon (2006)	UK—value of open government data How well the supply of open government data is working for customers	Bottom-up approach using case studies and calculating the net economic value of open government data as the willingness to pay for it minus the cost of supplying it	2005 value of approximately £590 million with a potential value of around £1.1 billion per year (around 0.1% of GDP)	2005 value of approximately $1.2 billion with a potential value of around $2.3 billion per year (around 0.1% of GDP)
Deloitte (2013)	UK—value of open government data to consumers, businesses and the public sector in 2011/12	Bottom-up methodology based to calculate the economic value (based on the DotEcon methodology), case studies to calculate societal value	£1.8 billion (sensitivity analysis range between £1.2 billion and £2.2 billion) in economic value, £6.2 billion and £7.2 billion (around 1% of GDP) when including societal value (2011 prices)	$3.7 billion (sensitivity analysis range between $2.5 billion and $4.6 billion) in economic value, $12.9 billion and $14.0 billion (around 1% of GDP) when including societal value (2011 prices)

Appendix B: Glossary of economic terms

There are a number of economic concepts in this report, but the list is by no means comprehensive. It should be noted that definitions may differ in different contexts, but the ones presented here are relevant for this report.

Economic term	Definition
Adverse selection	The phenomenon under which the uninformed side of a deal gets exactly the wrong people trading with it
Dynamic efficiency	Involves improving allocative and productive efficiency over time by developing new or better goods and services and finding better ways of producing goods and services
Economies of scale	When long-run average costs fall as output rises, costs are said to exhibit economies of scale
Economies of scope	When it is cheaper to produce two products together in one firm instead of separately in two specialised firms, costs are said to exhibit economies of scope
Externalities	A situation in which one person's behaviour affects the welfare of another in a way that is outside existing markets
Fixed costs	Expenditure on factors that are fixed
Imperfect information	A situation in which one side of an economic relationship has better information than the other
Market failure	An economy with freely operating markets may fail to generate an efficient allocation of resources due to market power or nonexistence of markets
Moral hazard	Another name given to situations of hidden action because, in such cases, the informed side may take the 'wrong' action
Non-convex	If technology and/or preferences are nonconvex, then prices do not convey all the information necessary in order to choose an efficient allocation
Non-excludable	A good for which preventing consumption is prohibitively expensive
Non-rivalrous	When one household partakes of the commodity's benefits, it does not diminish the benefits received by all other consumers of the commodity
Private benefits	The benefit to an individual economic agent, such as a consumer or firm, from an event, action, or policy change

Economic term	Definition
Public benefits	The cost to society as a whole from an event, action, or policy change
Public good	A commodity that is non-rival in consumption
Short-run marginal cost	The change in short-run variable cost due to the production of one more unit of output
Spill-overs	See externalities
Static efficiency	Can refer to Allocative efficiency: Ensuring resources are allocated between alternative uses in a way that maximises welfare Productive efficiency: The situation in which output is being produced at is lowest possible average cost
Willingness to pay	The maximum amount an individual is willing to sacrifice to procure a good or avoid something undesirable

Source: Katz and Rosen (1998); Varian (2006); Australian Parliamentary Library (2014); Deardorff (2010).

Appendix C: Summary of reports on government data

No.	Paper	Academic source	Abstract/Description	Comment
1	ACIL Tasman. (2008). *The Value of Spatial Information: The impact of modern spatial information technologies on the Australian economy*, ACIL Tasman for CRC for Spatial Information & ANZLIC—the Spatial Information Council, Retrieved from www.crcsi.com.au/assets/Resources/7d60411d-0ab9-45be-8d48-ef8dab5abd4a.pdf	No	Terms of reference: To establish the verified and quantified economic impact of spatial information to the Australian economy in 2006–07 year To estimate the cost of inefficient access to data and identify the factors operating to create these inefficiencies To consider the future prospects for spatial data to contribute to Australia's economic, social and environmental development goals.	Value-added approach based on general equilibrium modelling with inputs from case studies. Study estimated that in 2006–07, the estimated direct impact of spatial information industry includes 'contribution to a cumulative gain of between $6.43 billion and $12.57 billion in Gross Domestic Product', increased household consumption to $6.87 billion on a cumulative basis, and increased investment to $3.69 billion on a cumulative basis. Other impacts include social benefits, biosecurity, and environment.
2	ACIL Tasman. (2009). *Spatial information in the New Zealand economy: Realising productivity gains*, ACIL Tasman for Land Information New Zealand, Department of Conservation, and Ministry of Economic Development, Retrieved from http://www.acilallen.com.au/cms_files/ACIL_spatial%20information_NewZealand.pdf	No	The report: Describes how spatial information is used across sectors of New Zealand's economy Describes and quantifies the value of spatial information in the economy Estimates the gains available from removing barriers to spatial information making a greater contribution to productivity Describes and estimates the value of greater use of spatial information to innovation and product markets.	Similar methodology as Australian study ACIL Tasman (2008). Reports that the benefits are likely to be underestimated because non-productivity benefits are not included. It also assume that the size of the spatial industry will remain relatively stable.

No.	Paper	Academic source	Abstract/Description	Comment
3	Carpenter, J. & Watts, P. (2013). Assessing the Value of OS OpenData™ to the Economy of Great Britain—Synopsis, Ordinance Survey, UK. Retrieved from https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/207692/bis-13-950-assessing-value-of-opendata-to-economy-of-great-britain.pdf	No	Ordnance Survey commissioned ConsultingWhere and ACIL Tasman on behalf of the Department for Business, Innovation and Skills to undertake a research study to evaluate the economic impacts, success or otherwise and benefits of OS OpenData and to inform any future developments relating to open data from Ordnance Survey.	Used a bottom-up methodology including case studies and CGE modelling. Conclusions include that the OS open data initiative is expected to deliver a net increase of £13.0 million—£28.5 million in GDP, mainly from net productivity gains and additional tax revenues in 2016; also a predicted increase in real national disposable income between £10.2 million—£24.1 million by 2016.
4	Castro, D. & Korte, T, (2015). *Open Data in the G8: A Review of Progress on the Open Data Charter*, Centre for Data Innovation: Washington DC. Retrieved from www2.datainnovation.org/2015-open-data-g8.pdf	No	This report reviews the progress of each G8 signatory to the 2013 Open Data Charter. It also examines if signatories are members of the Open Government Partnership, providing a useful definition for stakeholders seeking to differentiate between open data and open government. It scores each country on how well they meet the five principles of the Open Data Charter	Rankings: The UK is ranked first, followed by Canada, the US, France, Italy, Japan, Germany, and finally Russia (which has been suspended from the G8). the UK is noted as the world leader in open data, delivering on most of its commitments
5	Davies, J. B., & Slivinski, A. (2005). *The public role in provision of scientific information: An economic approach* (No. 20051). University of Western Ontario, Economic Policy Research Institute.	Yes	This paper discusses some of the basic economic issues concerning the public role in provision of scientific information (SI). Governments have a wide range of involvement in the provision of SI, ranging from meteorological information (MI) and weather forecasting through other kinds of forecasting (air pollution, ice, climate, avalanches, and earthquakes) to health and product safety information	Distinguishes between basic and value-added data Basic data has public good characteristics should be priced at marginal cost, although collection costs mean that it may be more realistic to make this data free

No.	Paper	Academic source	Abstract/Description	Comment
6	Dekkers, M. Polman, F. te Velde, R. & de Vries, M. (2006). *MEPSIR: Measuring European Public Sector Information Resources,* European Commission, Brussels. Retrieved from http://ec.europa.eu/information_society/newsroom/cf//document.	No	The main objectives of the study were: 1. To develop, document and test a repeatable methodology for measurement of PSI re-use 2. To perform a baseline measurement of PSI re-use in the European Union and Norway, including a comparison with the United States	Average turnover per user calculated from survey. Ratio of re-users per sub-domain was 9.5 (mean) and 8.5 (median).
7	Deloitte. (2013). Market assessment of public sector information, Deloitte (UK) for Department for Business Innovation and Skills, Retrieved from https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/198905/bis-13-743-market-assessment-of-public-sector-information.pdf	No	This Deloitte report was for the UK Department of Innovation, Business and Skills. It aims to assess the market value of public sector information (PSI) and examine how PSI can be further utilised. The report estimates the value of PSI to UK consumers, businesses and the public sector itself (in 2011–12) to be £1.8 billion (2011 prices). The report notes, as others have, greater value may be realised by combining PSI with other data from private business sources.	Built on the methodology used by DotEcon (2006) and was published alongside the Shakespeare Review (2013). The report estimates the value of PSI to UK consumers, businesses and the public sector itself (in 2011–12) to be £1.8 billion (2011 prices).
8	de Vries, M., Kapff, L., Negreiro Achiaga, M., Wauters, P., Osimo, D., Foley, P., Szkuta, K., Osimo, D., O'Connor, J. & Whitehouse, D. (2011). *Pricing of Public Sector Information Study (POPSIS)*. European Commission: Brussels.	No	This Pricing of PSI Study (POPSIS) has assessed different models of supply and charging for PSI and their effects through the analysis of 21 case studies. The studies cover a wide range of public sector bodies (PSBs) and different PSI sectors (meteorological data, geographical data, business registries and others) across Europe.	Moving from a cost recovery pricing regime to setting prices at zero or marginal cost significantly increased re-use, by orders of magnitude, and encouraged use by different types of users (including small and medium enterprises)

No.	Paper	Academic source	Abstract/Description	Comment
9	DotEcon. (2006*). The commercial use of public information*, *Report oft861*, Office of Fair Trading, London. Retrieved from www.opsi.gov.uk/advice/poi/oft-cupi.pdf	No	This study for the Office of Fair Trading in the UK looks at the markets for public sector information and how well the supply of public sector information is working for customers, particularly: What PSI is made available for re-use, at what price and on what terms Whether businesses can compete with PSIHs in the supply of products/services to which value has been added.	Estimates that, with these improvements, the sector could double in terms of the value it contributes to the UK economy to a figure of £1 billion annually. Linear demand curves PSIHs split into three categories and then sub-divided in public sector information type. Assumptions included: calibrated elasticity estimates, value-added public sector information is priced competitively. For 'free' public sector information, value is estimated relative to usage of value-added public sector information
10	Freebairn, J. W., & Zillman, J. W. (2002). Economic benefits of meteorological services. *Meteorological Applications, 9*(01), 33–44.	Yes	This paper develops an overall framework for assessment of the economic value of meteorological services based on the recognition that most national meteorological infrastructure and services possess the non-rival properties of public goods. Given this overall framework for determination of both total and marginal benefits, four main methodologies appropriate for use in valuation studies—market prices, normative or prescriptive decision-making models, descriptive behavioural response studies and contingent valuation studies—are outlined and their strengths and limitations described.	Discussion of meteorological services and the economic theory underlying their provision

No.	Paper	Academic source	Abstract/Description	Comment
11	Genovese, E. Roche, S. Caron, C. Feick, R. (2010). The EcoGeo Cookbook for the assessment of Geographic Information value. *International Journal of Spatial Data Infrastructures Research,* 5, 120-144.	Yes	The EcoGeo II project has, as its main goal, the establishment of an economic model to evaluate geographic information (GI). The first phase of the EcoGeo project has provided a visual representation, called Socioscope, of the overall flows of geospatial data between the main private and public stakeholders of the geomatic sector in the province of Quebec (Canada). The first goal was to analyse the most important existing research and approaches to evaluate the economic value of the GI sector. The second goal was to define the basis or conventions for evaluating GI and, more specifically, to develop a list of parameters which need to be considered for evaluating GI.	The objectives of this study are comparable to the ACIL Tasman (2008) report except focused on Quebec, not the whole Canadian economy. Includes extensive discussion of the theoretical framework behind measuring the economic benefit of geographic information.
12	Groves, P. Kayyali, B. Knott, D. Van Kuiken, S. (2013). *The 'big data' revolution in healthcare: accelerating value and innovation*, McKinsey Global Institute for the US Centre for US Health System Reform Business Technology Office, US.	No	The report argues that 'big data' could transform the health-care sector, but the industry must undergo fundamental changes before stakeholders can capture its full value. McKinsey has created five pathways to assist healthcare stakeholders in redefining value and identifying tools that are appropriate for the new era, focusing on: right living, right care, right provider, right value and right innovation.	Used as the basis for the health care sections of the McKinsey study (2013). Includes governments, individuals, and providers.

No.	Paper	Academic source	Abstract/Description	Comment
13	Gruen, N. Houghton, J. & Tooth, R. (2014). Open for Business: How Open Data Can Help Achieve the G20 Growth Target, Lateral Economics for Omidyar Network, Australia. Retrieved from www.omidyar.com/sites/default/files/file_archive/insights/ON%20Report_061114_FNL.pdf	No	Used two approaches to estimate both overall value and incremental value of open data yet to be realised: Estimates of returns to investment and impacts on returns of increased data accessibility Extrapolation of national and sector impact estimates from McKinsey (2013).	Estimated 'potential economic value of open data (i.e. including government, research, private and business data)' at up to $64 billion per annum.
14	Houghton, J.W. (2011). *Costs and Benefits of Data Provision*, Report to the Australian National Data Services, Canberra. Retrieved from www.ands.org.au/resource/cost-benefit.html	Yes	This report presents case studies exploring the costs and benefits that PSI producing agencies and their users experience in making information freely available, and preliminary estimates of the wider economic impacts of open access to PSI. In doing so, it outlines a possible method for cost-benefit analysis at the agency level and explores the data requirements for such an analysis—recognising that few agencies will have all of the data required.	Net welfare benefits from providing free access over cost recovery to Geoscience Australia topographical data of around $25 million per annum
15	Klinkenberg, B. (2003). The true cost of spatial data in Canada. *The Canadian Geographer,* 47(1), 37-49	Yes	In this paper, the evolution of Geographic Information System (GIS) classicism is explored through examination of the evolution in Canada of GIS itself. The data situation elsewhere in the world is reviewed, the feasibility of 'freeing' data is discussed and a call for a radical change in the way data/ information is handled in Canada is presented.	Historical and theoretical discussion of GIS data in Canada. Policy context has changed significantly since this was written in 2003.

No.	Paper	Academic source	Abstract/Description	Comment
16	Lazo, J. K., Morss, R. E., & Demuth, J. L. (2009). 300 billion served: Sources, perceptions, uses, and values of weather forecasts. *Bulletin of the American Meteorological Society, 90*(6), 785–798.	Yes	Understanding the public's sources, perceptions, uses, and values of weather forecasts is integral to providing those forecasts in the most societally beneficial manner. To begin developing this knowledge, we conducted a nationwide survey with more than 1,500 respondents to assess 1) where, when, and how often they obtain weather forecasts; 2) how they perceive forecasts 3) how they use forecasts; and 4) the value they place on current forecast information. Our results indicate that the average US adult obtains forecasts 115 times per month, which totals to more than 300 billion forecasts per year by the US public. Overall, respondents were found to be highly satisfied with forecasts and have decreasing confidence in forecasts as lead time increases.	Weather forecasts were estimated to have an aggregate value of $31.5 billion annually, relative to annual expenditure of $5.1 billion by the public and private sector to produce those forecasts.

No.	Paper	Academic source	Abstract/Description	Comment
17	Manyika, J. Chui, M. Groves, P. Farrell, D. Van Kuiken, S. and Doshi, E, A. (2013). *Open data: Unlocking innovation and performance with liquid information*, McKinsey Global Institute, New York.	No	The report identifies ways in which open data can create economic value, both in terms of revenue and savings and in economic surplus. It estimates potential annual value that use of open data could bring in seven domains: education, transportation, consumer products, electric power, oil and gas, health care, and consumer finance. The estimates are intended to be indicative and not exhaustive. It does not attempt to estimate the value of all of the considerable societal benefits that can be derived from use of open data. The report aims to inform the agenda for adopting and managing open data in both the public and private sectors and provide a lens for examining the critical issues about privacy and protection of proprietary information that need to be resolved before the full value of open data can be realised.	The report is the only study to place a figure on the potential for open data at a global level. It is considered quite optimistic but still very useful. Note that it includes forms of open data as well as government open data.
18	Newbery, D. M., Bently, L., & Pollock, R. (2008). Models of public sector information provision via trading funds.	Yes	This study has analysed the impact of adopting different models for the provision of public sector information by trading funds. Its basic task has been to examine the costs and benefits for society, and the effects on government revenue, of four different charging policies: profit-maximisation, average cost (cost-recovery), marginal cost and zero cost; both on their own and when interacted with various data distinctions such as raw versus value-added, and unrefined versus refined.	Discusses the economic theory underlying PSI, commitment, incentives and regulation Moving from charging above marginal costs to setting prices at zero for fundamental data would be welfare improving, because setting prices at cost recovery requires a high mark-up, strong and growing demand for data, and of the likelihood of spill overs from the use of basic data

No.	Paper	Academic source	Abstract/Description	Comment
19	Nilsen, K. (2010). Economic theory as it applies to Public Sector Information. *Annual Review of Information Science and Technology, 44*(1), 419–489.	Yes	This chapter reviews the economics literature pertaining to public sector information. The economic arguments put forward in government studies and policy documents are also reviewed, focusing on the current push for harmonisation of public sector information policy across the European Union and the debate as to which model of information dissemination is preferable (i.e. the US open access model versus the more restrictive European model). Some works by economists that appeared in the library and information science (LIS) and other literature is covered, but the LIS literature in general is not reviewed.	Review of the information economics literature, including discussion of the economic theories underlying for PSI, and different PSI policies
20	OECD. (2006). *Digital Broadband content: Public Sector Information and content*. Retrieved from: www.oecd.org/dataoecd/10/2236481524.pdf	No	This study addresses challenges and related policy issues with respect to both PSI and public sector content. It is a first review of the area of PSI and content and it is proposed that follow-up work be carried out in this area, particularly on the economic and distributional aspects of different access, cost, pricing and distribution models for public sector information and content.	Describes the PSI re-use value chain Public sector provision of commercial data has led to unfair competition in some sectors
21	OSTP, (2011). *Lessons Learned from OOS in Canada: Preliminary Assessment of OOS Value*, Ocean Science and Technology Partnership (OSTP), Canada. Retrieved from www.qc.dfo-mpo.gc.ca/publications/science/documents/Preliminary%20OOS%20value%20assessment_e.pdf	No	A preliminary assessment of the environmental, economic, and social value of Ocean Observation Systems (OOS) was carried out in conjunction with an inventory of OOS in Canada conducted by the Ocean Science and Technology Partnership (OSTP). The main objective was to identify actual cases of added value from existing OOS, rather than potential value.	OOS in Canada have demonstrated many positive benefits, although they have rarely been quantified. There is a need for an effective national strategy and governance structure to maximise benefits of investments and a need to communicate and measure the benefits of OOS.

No.	Paper	Academic source	Abstract/Description	Comment
22	Parliament of Victoria, Economic Development and Infrastructure Committee. (2008). *Inquiry into improving access to Victoria's public sector information and data: Discussion paper*. Melbourne, Australia: Victorian Government Printer.	No	This inquiry examines the potential for open source licensing to be applied to Victorian Government information. The committee examined two areas of inquiry encompassed by the Terms of Reference—the application of open content licensing to Government information and data, and the use of open source licensed software by the Government.	Basic data has public good characteristics, and is collected in the course of government's usual operations and should be priced at marginal cost Incremental data should be priced at average cost Commercial products should be priced according to competitive neutrality principles
23	PIRA. (2000*). Commercial exploitation of Europe's public sector information*, European Commission, Brussels. Retrieved from ftp://ftp.cordis.europa.eu/pub/econtent/docs/2000_1558_en.pdf	No	This study builds on previous work in the qualitative area and also provides updates on both the EC and Member States governments' policy initiatives. Also included, through numerous case studies, are examples of good practice in PSI exploitation within the EU. There are descriptions of the barriers present throughout the EU facing the would-be exploiter. How things are done in the USA was also reviewed.	Limited commercial utilisation of government data in the European Union, in part due to cost-recovery pricing, copyright and licencing restrictions, and governments mirroring private sector products
24	Pollock, R. (2009). *The economics of public sector information*. University of Cambridge, Faculty of Economics.	Yes	This paper provides an overview of the economics of `public sector information' (PSI) focusing on the question of funding and regulatory structure. That is: who should pay to maintain public sector information and what regulatory structure should be put in place to support this.	Economies of scale and scope may exist for government to collect data due to high fixed costs Welfare gain could be £1.6–2 billion per year

No.	Paper	Academic source	Abstract/Description	Comment
25	Pollock, R. (2011a). *Welfare gains from opening up Public Sector Information in the UK*, University of Cambridge, undated, Retrieved from http://rufuspollock.org/economics/papers/psi_openness_gains.pdf	No	This brief paper applies the results of Pollock (2009) and Pollock et al. (2008) to providing a simple estimate of the welfare gains to UK society from opening up access to digital, non-personal, public sector information (PSI) for use and reuse. Argues that the benefits from opening up data are not confined to a single specific area but flow from a broad range of improvements across a wide spectrum of society	Provides additional insights from the author to supplement Newberry et al. (2008)
26	Productivity Commission. (2001). *Cost recovery by Government*. Commonwealth of Australia, Canberra.	No	This inquiry is principally a general review of cost recovery arrangements across Commonwealth regulatory, administrative and information agencies. Reports on the nature and extent of cost recovery arrangements, factors underlying these arrangements, who benefits and the impacts on business of the arrangements, and appropriate guidelines for cost recovery arrangements.	Economies of scale and scope may exist for government to collect data due to high fixed costs May be pragmatic to make data free where marginal costs are close to zero (due to transaction costs) Incremental data should be priced above marginal cost to recognise the private benefits of this data

No.	Paper	Academic source	Abstract/Description	Comment
27	PWC, (2010). *Economic Assessment of Spatial Data Pricing and Access*, PricewaterhouseCoopers, Stage 1 Report, ANZLIC, Canberra. Retrieved from www.crcsi.com.au/assets/Resources/ANZLIC-Economic-Study-Stage-1-Report.pdf	No	ANZLIC—the Spatial Information Council (ANZLIC) commissioned the report after recognising a potential benefit in having a robust framework for managing access to, and pricing of, fundamental data to support the development and sustainability of the spatial data industry. There was concern that proponents of the 'free on-line' model have not considered the full economic implications of this approach on the long-term sustainability of the spatial data industry and set out to conduct a holistic analysis of the economic fundamentals surrounding the creation, management, maintenance and provision of access to spatial resources.	The report identifies principles for guiding the development of a pricing and access framework for spatial data
28	PWC, (2014). *Deciding with data How data-driven innovation is fuelling Australia's economic growth,* PricewaterhouseCoopers for Google Australia, Australia. Retrieved from www.pwc.com.au/consulting/assets/publications/Data-drive-innovation-Sep14.pdf	No	This report examines the value add of open data, big data, personal data, and internal enterprise data, provide to business processes, particularly in driving innovation. Noting technological advances such as sensors, consumer devices, cloud computing, as well as the internet, are dramatically increasing the amount of available data.	Argues that innovation driven by this data contributed $67 billion (or 4.4%) to Australian GDP in 2013

No.	Paper	Academic source	Abstract/Description	Comment
29	*SCGOE,* (2014). *Open data: the way of the future,* Standing Committee on Government Operations and Estimates, Canada. Retrieved from www.parl.gc.ca/content/hoc/Committee/412/OGGO/Reports/RP6670517/oggorp05/oggorp05-e.pdf	No	Consistent with Canada's signing of the G8 Open Data Charter, the committee undertook a study to assess and enhance the government's open data practices. This study include: examining how Canadian businesses can better obtain and utilise high-value information with strong economic potential from the government; reviewing the processes and practices of other governments with respect to their collection, storage and transfer of open data; and the committee's use of its findings to provide the government with direction and advice focused on improving the way high-value data is collected, stored and transferred to Canadians, resulting in access to useful and useable open data that will drive economic growth as part of an information economy.	Provides comments by Michael Chui, Partner, McKinsey Global Institute, and author of the McKinsey (2013) study on the applicability of their results to the Canadian context
30	Sears, G. (2001*). Executive Summary: Geospatial Data Policy Study*, KPMG, Canada, Retrieved from http://wmsmir.cits.rncan.gc.ca/index.html/pub/geott/ess_pubs/292/292107/cgdi_ip_22e.pdf	No	The Canadian Geospatial Data Policy Study was commissioned to provide empirical information on the impact of current geospatial data policies on all three levels of government (federal, provincial, municipal) and the users and distributors of the data in the business sector and in the community at large. Based on the findings, the project was to make recommendations on how Canadian government geospatial data dissemination policies and practices could be modified to facilitate business development and the improved competitiveness of the Canadian geomatics industry while still ensuring adequate funding for infrastructure.	Lines of inquiry included: review of central agency policies and guidelines, interviews with key Canadian data agencies, survey of Canadian data users and clients, international comparisons through interviews with sample of Australian and US data agencies and users

No.	Paper	Academic source	Abstract/Description	Comment
31	Shakespeare, S. (2013). Shakespeare review: An independent review of public sector information, Department of Business, Innovation and Skills, UK. Retrieved from www.gov.uk/government/uploads/system/uploads/attachment_data/file/198752/13-744-shakespeare-review-of-public-sector-information.pdf	No	This paper builds on other UK Government documentation in regards to the value of its PSI holdings. The Shakespeare Review of PSI's aim was to consider the use and reuse of government-held data across the private sector, civil society/general public, and the public sector. It deals with how PSI is dealt with within the public sector and makes recommendations as to how this can be improved.	The Deloitte (2013) report was written as an accompaniment to this review.
32	Starr, P., & Corson, R. (1987). Who will have the numbers? The rise of the statistical services industry and the politics of public data.	Yes	This paper reviews the development of the statistical services industry in the United States and discusses its political and economic significance. A section is included on the demographics industry. The growth of demographics and other statistical services owes much to technical advances, but two factors specific to the demographics business have also been significant stimuli. One was the growing interest of corporations in market segmentation and targeted marketing. The other development was a new technology—developed largely at public expense—for associating demographic characteristics with address lists. Various applications of demographics in private industry are also discussed.	Setting prices at average cost for basic data fails to consider its broader benefits, beyond the revenue generated by the sale of data products.

No.	Paper	Academic source	Abstract/Description	Comment
33	Stiglitz, J. E. (2000). The contributions of the economics of information to twentieth century economics. *Quarterly Journal of Economics, 115*(4), 1441–1478.	Yes	In the field of economics, perhaps the most important break with the past—one that leaves open huge areas for future work—lies in the economics of information. It is now recognised that information is imperfect, obtaining information can be costly, there are important asymmetries of information, and the extent of information asymmetries is affected by actions of firms and individuals. This recognition deeply affects the understanding of wisdom inherited from the past, such as the fundamental welfare theorem and some of the basic characterisation of a market economy, and provides explanations of economic and social phenomena that otherwise would be hard to understand.	Assertion that making data excludable is socially inefficient Reviews the information economics literature Discussion of the non-convexities and discontinuities associated with information
34	Stiglitz, J. E. (2006). Global public goods and global finance: Does global governance ensure that the global public interest is served? In J.P. Touffut (Ed.), *Advancing public goods: Papers from 6th Conference of the Cournot Centre for Economic Studies (Paris, 2003)* (pp. 149–164). Cheltenham, UK: Edward Elgar.	Yes	This chapter focuses on some aspects of global public goods and global finance relating to global governance. The central question it addresses is whether global governance, that is, the way decisions are made in the global arena, ensures that global public interest is served. Global public goods and their externalities constitute powerful tools for the analysis of global governance, institutions and their flaws, the fundamental problems of market failure in the provision of global public goods, and potential solutions.	Public goods (such as data, assuming that it is non-exclusionary) will be under-produced by private firms in the absence of government intervention

No.	Paper	Academic source	Abstract/Description	Comment
35	Stiglitz, J. E., Orszag, P. R., & Orszag, J. M. (2000). Role of government in a digital age. 2000.	Yes	The report discusses the theoretical underpinnings behind private versus public production shift as the economy moves toward a digital one. The lack of clear theoretical guidance regarding the separation between government and business in a digital economy makes decision-making rules all the more important. The paper devises a set of 12 principles for government action in a digital economy, along with a decision tree for policy-makers to use when evaluating new government activities. The principles are divided into three categories: 'green light' activities that raise few concerns; 'yellow light' activities that raise increasing levels of concern; and 'red light' activities that raise significant concern.	Basic data has public good characteristics Despite potential economies of scope, governments should exercise caution in providing incremental data Presence of private sector activity suggests that a data product is not a public good, and governments should exercise a great deal of caution in choosing provision
36	Ubaldi, B. (2013). Open Government Data: Towards Empirical Analysis of Open Government Data Initiatives. OECD Working Papers on Public Governance, No. 22, OECD Publishing.	No	This paper highlights the main principles, concepts and criteria framing open government data initiatives and the issues challenging their implementation. It underlines the opportunities that OGD and data analytics may offer policy makers, while providing a note of caution on the challenges this agenda poses for the public sector. The overall analysis of key concepts and issues aims to pave the way for an empirical analysis of OGD initiatives. So far, little has been done to analyse and prove the impact and accrued value of these initiatives. The paper suggests a methodology comprising an analytical framework for OGD initiatives (to be applied to ex post and ex ante analysis of initiatives) and a related set of data to be collected across OECD countries.	Making open government data free can encourage a greater number of re-users, which can in turn, stimulate the economy and provide taxation revenue to governments Data should be in a machine-readable and open format, which can require significant investment in IT infrastructure, skills and time

No.	Paper	Academic source	Abstract/Description	Comment
37	Vickery, G. (2011). Review of recent studies on PSI re-use and related market developments. Information Economics, Paris.	Yes	This literature review looks at PSI market size and impacts following the widely cited estimates in the MEPSIR study (2006). On the basis of more recent studies the narrowly defined EU27 direct PSI re-use market was of the order of €28 billion in 2008. All studies show relatively rapid growth in PSI-related markets, and assuming annual growth of 7 per cent, the direct PSI-related market would have been around €32 billion in 2010. Considering re-use activities in domains not included in the studies analysed in this report (for example, where re-use is not a principal activity, or in government and research activities) the market value of direct PSI re-use (the economic 'footprint') is undoubtedly larger.	Major component of added value for geospatial and spatial data comes from combinations with other information, such as demographic, traffic or environmental data

No.	Paper	Academic source	Abstract/Description	Comment
38	Weiss, P. (2002). Borders in cyberspace: conflicting public sector information policies and their economic impacts. In 18th International Conference of the Committee on Data for Science and Technology, Montreal, CODATA (pp. 137–159).	Yes	This report examines fundamental differences in the policy and funding models for public sector information (PSI) in the US compared to Europe. This report seeks to demonstrate the economic and societal benefits of open access and dissemination policies for public sector information, particularly compared to the limitations of the 'cost recovery' or 'government commercialisation' approach. It focuses primarily on the conclusions of recent economic and public policy research in this area, as well as examples of failed or limited cost recovery experiments in the US and Europe. Emerging European thinking on the issue of government competition with the private sector, and recent developments at the European Commission level and in selected European countries are briefly summarised.	Providing data free of charge can encourage its use, potentially leading to an increase in private sector activity that stimulates the economy and generates taxation revenue that will outweigh the lost revenue from cost recovery

No.	Paper	Academic source	Abstract/Description	Comment
39	World Bank. (2014). Open data for economic growth	No	This paper examines the evidence for the economic potential of open data and concludes that, despite a variation in published estimates and some methodological difficulties, the potential is very large indeed. It reviews the latest data about companies using open data, and highlights four companies that did not exist ten years ago, which are driven by open data, and which are each now valued at around $1 billion or more. It discusses the five archetypical types of businesses using open data, and cites concrete examples of each, and discusses the types of data that are proving most likely to lead to widespread business adoption and innovation. It makes some recommendations for policies and actions which governments could take to maximise the economic growth possible from their data.	When data is collected in the course of government's usual operations, to assist policy making, resource allocation or meet legislative requirements, the collection of data is justified in and of itself

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Asides

[i] Please note: currencies throughout this report are converted into Australian dollars using the exchange rate current 13 July 2015. One Australian dollar is worth 0.75 US dollars, 0.48 British pounds and 0.67 euros, and 1.11 New Zealand dollars.

[ii] Australian Government's Open Access and Licensing Framework (AusGOAL) www.ausgoal.gov.au

[iii] Percentage of GDP is calculated by Deloitte Access Economics using ABS (2014) figures and Gruen, Houghton, Tooth (2014) estimate.

[iv] n=511 to 523 companies; raw figures (in *.CSV format) sourced from www.opendata500.com/us/list/ as at 14 September 2015; analysis provided by the Department of Communications' Bureau of Communications Research.

[v] n=65 use cases; Private sector use of open government data. (August 2015). Department of Communications. www.communications.gov.au/publications/open-data-500-report