Enabling Business to Government Digital Interaction:

A Report for the Australian Government

15th June 2015

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Executive Summary

Purpose of paper

This Review provides information and recommendations on the most appropriate ways to facilitate efficient and flexible business interaction and reporting with Australian governments using emerging industry digital information exchange practices enabled by data services called APIs.

It also addresses why existing business reporting standards and practices need to be updated as they are now no longer sufficient in terms of flexibility, scalability and efficiency. The existing approaches will align with emerging industry processes, hinder the objective of reducing business compliance costs, create unnecessary government expenditure through duplication and become a barrier to innovation.

This Review also explains why the adoption of APIs (both Web Services & RESTful) are a key building block for successful digital government services through creating choice and innovation around how businesses interact with government, as well as driving efficiencies in government operations and the broader economy.

Finally, the Review explains how Australian governments can work with industry to develop a collaborative approach to establishing a flexible framework for standards, guidance and assurance relating to APIs that will support simple information exchanges and more complex transactions, as well as addressing the needs of both large and small organisations.

Recommendations and Key Findings

1   The Australian Government should develop and release a policy framework to ensure that business reporting to and interaction with government agencies is enabled as a wholesale service as a default position unless there is a good reason not to comply. This should apply to all investment decisions in business facing programs and ICT systems.

2   The Australian Government's operations and agility would be greatly enhanced through the adoption of APIs as the preferred method for the exchange of information both between government agencies and all external organisations.

3   There is also the need to develop the maturity and organisational capability of both government agencies and businesses in using APIs to innovate and adopt new business practices and forms of interaction. The introduction of an initiative similar to the New Zealand Government *Better for Business* program would address this need.

4   It is recommended that a Digital Services Innovation Centre be established to support the small government agencies which implement digital services using APIs.

    a)   The Centre could support agencies in the design, implementation and testing of new services that publish APIs and provide advice on consuming external APIs.

    b)   The Centre could also provide tools and platforms to help agencies create and test their APIs in a more streamlined and consistent manner.

    c)   The Centre should also have a role in advising and assisting small businesses in adopting APIs for business-to-business and business-to-government interactions (similar to the New Zealand *Better for Business* program).

5   The following methods are recommended to ensure the availability of relevant technical documentation:

a) The Australian Government's Interoperability Framework should incorporate the trend towards the use of contemporary APIs incorporating both Web Service and RESTful APIs. The framework should identify preferred/recommended methods to support different interaction patterns, from simple to complex, and those requiring low to high assurance.

b) The Australian Government should make its technical documentation regarding new standards and protocols relating to APIs available to businesses and other external organisations via a central Australian Government repository.

c) The Australian Government could also make its technical documentations (including reference architecture, implementation and code examples) available through popular technology collaboration and development platforms such as GitHub. This will help increase the exposure of these documents to a larger developer community involved in creating and consuming APIs.

6 The Australian Government should develop an API Directory to manage and make its APIs discoverable and human and machine readable in a central location and where possible federated to other directory services.

a) The Australian Government could either build a customised API portal/directory based on requirements or reuse/extend the data description features in existing data management systems (e.g. CKAN as used for data.gov.au).

b) As an initial measure, it is recommended that Australian Government APIs listed on Data.gov.au be more easily discovered through both search and browse functions (eg having a tab and/or tag marked APIs or similar on the front page) for human readers. The API Directory can be later extended to support better machine consumption.

c) The Australian Government should also make its information about government digital services and documents shareable to other directory services such as the popular developer website, "The Programmable Web".

7 The Australian Government agencies should publicly report on the level of API use on a central government dashboard to promote greater awareness and understanding around the growing importance of APIs for business to government interaction.

8 Complementary governance solutions are required for business and government stakeholders to build and maintain both agency and business support to encourage new ways for efficient business and government digital interaction using APIs.

a) It is assessed that Australian business stakeholders are not ready for highly structured governance models. There is a need to fund a program consisting of at least two full time advisers, or a specialist organisation to champion the adoption, over two to three years to raise awareness and generate support for a more interoperable environment, both for business-to-business and business-to-government digital interactions.

b) A more formal governance arrangement is possible for Australian Government agencies, either through leveraging and adapting existing structures as currently existing for the SBR program or starting from scratch to align with the Digital Transformation agenda.

c) A supporting ecosystem should also be developed, both formally and informally with other government jurisdictions (state/territory and local government) to ensure there is a consistent approach from government.

d) A formal industry based governance structure has been proposed once there is sufficient business support for such an initiative.

e) An alternative governance approach is to leverage existing standards and industry organisations to champion a more consistent approach for digital interaction practices within their sphere of influence. Some of the candidate organisations include GS1 (Global

Standards One), Standards Australia, Open Technology Foundation and the Australian Institute of Health & Welfare.

9 It is proposed that a number of pilot and demonstrator projects be funded to extend awareness amongst key stakeholders and prove the value of new forms of digital interaction using APIs. Some candidate projects include:

- Childcare services and payment,
- Birth of a child information exchange,
- Homelessness information sharing,
- Port Botany logistics information sharing,
- Online retailers supply chains,
- Agriculture provenance information and supply chains,
- Federated identity assurance,
- Automation of invoicing,
- Automation payroll processing,
- APIs for access and sharing personal banking information.

Key issues

There is a need for an updated framework for business-to-government interactions that is consistent with the emerging business-to-business practices associated with digital services that use APIs. New approaches need to be articulated at different levels as listed below;

- at a policy level through a series of service delivery principles;
- at strategic technology level through guidelines and standards; and
- at an implementation level through directories, technical documentation, tool sets, testing, etc .

This framework should inform the future policies and standards for the Standard Business Reporting (SBR) program as well as broader government policies regarding the contestability of government services and facilitation of innovation in the delivery of government services by both government agencies and external service brokers.

It should also set out the components that are required to create the appropriate level of assurance and confidence that information can be exchanged easily, reliably, accurately and securely. The framework should be flexible to promote modern service oriented interactions and use of APIs (both web services and RESTful APIs) while recognising the need for legacy and bespoke systems.

Background

Digital services enabled by APIs are becoming increasingly important for the business sector. APIs have enabled many new digital services to be offered in the form of websites and business-to-business services. These digital services are driving a broader transformation of industry, allowing for greater efficiency, scalability and flexibility of business activities.

APIs could create similar benefits for government as they have for business. They can open access to government-held data for reuse by external organisations. They can also support more complex transactions that require higher levels of assurance and security. Using APIs, third-party innovators can create products and services that are beyond the scope, budget and capability of a government agency.

APIs allow the different functions and processes with government to become modular and flexible, enabling genuine reuse of government ICT systems, and the reduction of duplicated agency ICT services.

APIs allow governments to make decisions about what is core and non-core to their operations and allow greater industry co-creation of services. They enable Government as a Platform, where businesses and citizens can interact with and receive services from government through external

service brokers (or intermediaries), rather than having to deal directly with government agencies.

Australian governments should provide business with choice around how it reports and exchanges information with government agencies either through government websites and software or through non-government websites and software.

The latter is a more scalable and efficient solution as it aligns with B2B processes, customer choice and competition, supports innovation/emergence of new solutions, and reduces the requirement for government expenditure on its own systems.

Stakeholder consultation
Broad stakeholder consultation was undertaken with a set of participants in government and industry to identify the current digital interaction trends being pursued, the speed at which adoption is occurring and their expectations around engaging with government.

All stakeholders surveyed acknowledged the possible benefits in moving to a digital interaction model for the exchange of data. Notably, there was consensus that it was important that government be part of a single system for data exchange rather than running separate digital interaction processes.

It was also widely agreed that the evolution of new processes is still evolving and that an agile approach to digital interactions and data exchange patterns will need to be adopted so that inefficient processes do not become embedded in business dealings.

2 Business Reporting Background

2.1 About Standard Business Reporting

What is Standard Business Reporting?

Standard Business Reporting (SBR) is a policy framework with the objective of making it easier for businesses to interact with governments while reducing the regulatory burden of reporting.

A key principle of SBR is to base business-to-government reporting obligations on the common practices of businesses in managing and reporting their financial and related business information. The intent of this is to minimise the effort and potential duplication of reporting by business to government. This approach has been described as putting business needs at the centre when designing reporting processes rather than basing them on existing government processes.

While the SBR was originally focused on business reporting to government (B2G), the framework has since been extended to include most other regulated organisations such as educational institutions, health agencies and non-government organisations. The framework also has a potential to be used not only for B2G reporting, but also for G2G and B2B information exchanges.

SBR uses standards to describe the information being exchanged (e.g., taxonomies) and the method of secure transmission over the internet (e.g., protocols). This allows businesses to send information to government agencies from the common software applications they use for collecting and reporting information, provided that the software is compatible with the SBR standards.

Origins of SBR

The concept of Standard Business Reporting (SBR) emerged in the mid 2000s as financial reporting in digital formats started to usurp traditional paper based reports. With the adoption of software applications to manage business information, it was possible to automate the reporting of selected information to government.

The uptake of the internet as the dominant method for sending information between businesses also helped enable SBR. The internet allowed for the easy exchange of information between any business and also with any government agency.

SBR was also developed as a more flexible extension of earlier Electronic Data Interchange (EDI) systems that had been developed since the 1950s in selected industries such as transport, logistics and automotive sectors. EDI had struggled for broader business adoption as it was expensive and complex to use, in part due to the use of proprietary standards and private telecommunications networks.

Netherlands Government SBR

The Netherlands Government was the pioneer of the SBR with the adoption of the Nederlandse Taxonomie Project (NTP or Dutch Taxonomy Project) in 2004.[1] The Project's

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1 OECD (2007), OECD e-Government Studies: Netherlands 2007, OECD Publishing, Paris.

objective was to standardise financial reporting information (e.g. annual accounts, taxes and financial statistics) between companies and the public sector to reduce the administrative burden on businesses.

The NTP created a taxonomy to describe the content and data structures for financial reporting based on the open standard computer language called XBRL (Electronic Business using eXtensible Markup Language). The NTP was implemented in 2007 and renamed as Standard Business Reporting Programma in 2008 to align with Australia's SBR Program.[2]

The Netherlands Government established an agreement with key industry associations and business intermediaries (such as software companies, accounting firms and tax agents) to develop and incorporate SBR in their systems. However, adoption by businesses in the Netherlands has been lower than expected to date, partly because intermediaries and software companies lack incentives to invest in SBR. From 2013, SBR was mandated as the exclusive channel for online lodgement of corporate and income tax reports in the Netherlands.[3]

2.2 Australian experience of business reporting

Australia was one of the first countries to adopt the Dutch policy framework for business reporting. In 2006 the Australian Government's Taskforce on Reducing Regulatory Burdens on Business made a recommendation that;

'The Australian Government should develop and adopt a business reporting standard within the Australian Government sphere by 2008, based on the Netherlands model and work undertaken by the ATO. COAG should consult with state and territory governments to extend this approach to state, territory and local governments as soon as practical thereafter.'[4]

In 2007 the Australian Government approved the business case for the SBR Program and appointed Treasury as the initial lead agency for implementation. At its July 2008 meeting, COAG agreed to support the SBR program as a mechanism for reducing the regulatory burden of reporting requirements on business.[5] The SBR program commenced operation on 1st July 2010.

The scope of the Australian Government's SBR program was to:
- standardise reporting terms based on international standards and best practice;
- remove unnecessary and duplicate information requested in government forms;
- utilise business software to automatically prefill government forms;
- provide validation and confirmation of requirements and confirmations in reporting; and
- use a single, online secure sign-on to meet the reporting requirements of the agencies involved.[6]

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http://dx.doi.org/10.1787/9789264030299-en

2 'Dutch track record' in Standard Business Reporting Programma, Government of Netherlands, http://www.sbr-nl.nl/english/dutch-track-record/

3 Productivity Commission, 2012, Impacts of COAG Reforms: Business Regulation and VET, Research Report, Volume 1 – Overview, Canberra, p. 104. http://www.pc.gov.au/inquiries/completed/coag-reporting-busines-vet

4 Angela MacRae, Australian Productivity Commission, SBR Conference - history of standard business reporting and the Banks review 26 May 2009, http://www.sbr.gov.au/__data/assets/pdf_file/0004/7429/20090526-sbr-conference-history-of-standard-business-reporting-the-banks-review-by-angela-macrae-australian-productivity-commission.pdf.

5 COAG 2008d

6 Productivity Commission, 2012, p. 107.

In Australia, adoption of SBR is voluntary and business uptake to date has been low. This has been attributed to a number of factors including low awareness by businesses, lack of compatible software applications, competing regulatory reforms and reliance on existing reporting arrangements with government agencies. In 2012, the Productivity Commission reported that fewer than 1% of Australian businesses (including non-for-profit organisations) were using SBR.

The Australian Government has introduced a number of new services that are expected to increase the adoption of SBR. This includes the upgrade of the ATO's Electronic Lodgement System (ELS) to be SBR compliant and the establishment of the Superstream program to enable easier exchange of superannuation information such as rollovers and contributions between fund managers, employers and relevant government agencies.[7]

In 2013/14, the SBR online gateway processed 395,000 report lodgements (double the previous year) from almost 50,000 end user businesses (approximately 2.4% of active Australian businesses). The major growth in SBR use has been with look-up services for Tax File Numbers and ABNs.[8] In 2013/14, **superannuation funds made 3.2 million requests** for verification of TFNs through the SuperTick service (managed under the Superstream program). In 2013/14, **businesses made 315.5 million web services requests for verification** of ABNs through the ABN Lookup service managed by the Department of Industry.[9]

The original SBR business case estimated there would be annual nominal cost savings of $795 million to business with full implementation of the program by 2013/14. In 2012 the Productivity Commission, while noting the realised benefits to date have been far lower, have estimated the potential benefits from the revised SBR Program to be approximately $560 million per annum.[10]

The SBR Program is currently managed by the ATO on behalf of the Australian Government. The SBR Advisory Board, comprising representatives from the major SBR agencies and the business sector, provides broad strategic oversight of the program. A SBR Steering Group, consisting of SBR agencies, guides the development of SBR initiatives and operations. The SBR Business Advisory Forum, consisting of representatives from industry groups and professional associations, helps communicate SBR initiatives and allows feedback from the business sector.[11]

2.3   International experience of business reporting

A small number of countries have adopted formal SBR programs similar in scope to those developed by the Netherlands and Australia. Brazil is drawing on Australia's SBR program to develop a project for intra-government reporting. Singapore is also currently in the process of developing a business case for SBR.

Most other advanced economies have established more general standards for financial and banking reporting to governments. The eXtensible Business Reporting Language (XBRL) standard, used by the Australian SBR program, has been mandated for particular businesses and government agencies in Japan, China, Spain, United Kingdom, United States, Denmark and India.[12]

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7   Report of the Australian Business Registrar 2013-14, p. 3.
     https://abr.gov.au/About-us/Report-of-the-Australian-Business-Registrar-2013-14/
8   Report of the Australian Business Registrar 2013-14, p. 26 & pp. 43-44
9   Report of the Australian Business Registrar 2013-14, pp. 13-15.
10   Productivity Commission, 2012, pp. 123-125.
11   Report of the Australian Business Registrar 2013-14, pp. 6-7.
12   Productivity Commission, 2012, p. 104.

3 Industry and Technology Developments

3.1 Technology developments

Over the past few decades, there has been an ongoing process of transformation which has impacted how businesses use digital services to interact with each other in an automated way.

Electronic Data Interaction (EDI) was the first digital interaction system for business that started to gain adoption in selected industries in the 1980s. The original focus of EDI was to replace pre-defined business forms, such as purchase orders and invoices, with similarly defined electronic forms. Its failure to gain adoption in general industry was because it was expensive and complex to use, in part due to the use of proprietary standards and private telecommunications networks.[13]

The development of Application Programming Interfaces or APIs is the other important technology which enables automated exchange of data between businesses. APIs were originally developed to allow data to be exchanged between two computers at the same location. They have now been adapted to support data exchange between any computer systems that are connected via a telecommunications network. The best lay definition of an API is that it is a way for different computer applications to share selected data and take actions automatically without human intervention. The New Zealand Government's Better Business for Business program states, "Think of them like a smart plug that connects systems and allows different apps or services to talk to each other'.[14]

There are two main categories of APIs:

- Web Services (or WS-*) APIs are APIs exposed over the SOAP messaging/integration standard. Web Services were first developed in the early 2000s and are based on a highly structured protocols and standards. Web Services have typically been adopted by larger businesses and government agencies that have a mature ICT capability.

- RESTful APIs are APIs exposed over HTTP standard following the REpresentational State Transfer (REST) architecture style. RESTful APIs use standard web protocols and language and are a more flexible and lightweight alternative to SOAP based Web Services.

RESTful APIs have become the more common form of API in recent years, having become the default technology for most websites and mobile apps due to their ease of development by creators and consumption by users. However, Web Services are necessary for more complex transactions that require a higher degree of assurance involving security and quality of service. There are ways of supporting reliability and security in RESTful APIs but they are not standardised. The NICTA/CSIRO report on *Message Protocols for Enabling Digital Government Services* provides a more detailed analysis of message protocols traits relating to different APIs.[15]

Diagram 1 shows the broad relationship among the different categories of APIs against their ability to provide agility and assurance. It also shows that RESTful APIs, in their current

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13   Introduction to EDI - A Primer, Simon Petravick, Bradley University
        http://hilltop.bradley.edu/~simonp/atg383/edip01.html
        see also http://www.w3.org/TR/2004/NOTE-ws-gloss-20040211/#webservice
14   Better Business for Business program,
15   NICTA and CSIRO, Message Protocols for Enabling Digital Government Services, June 2015.

development state, are best suited for data sharing and data look-up services while Web Services are the most suited for secure and complex transactions.
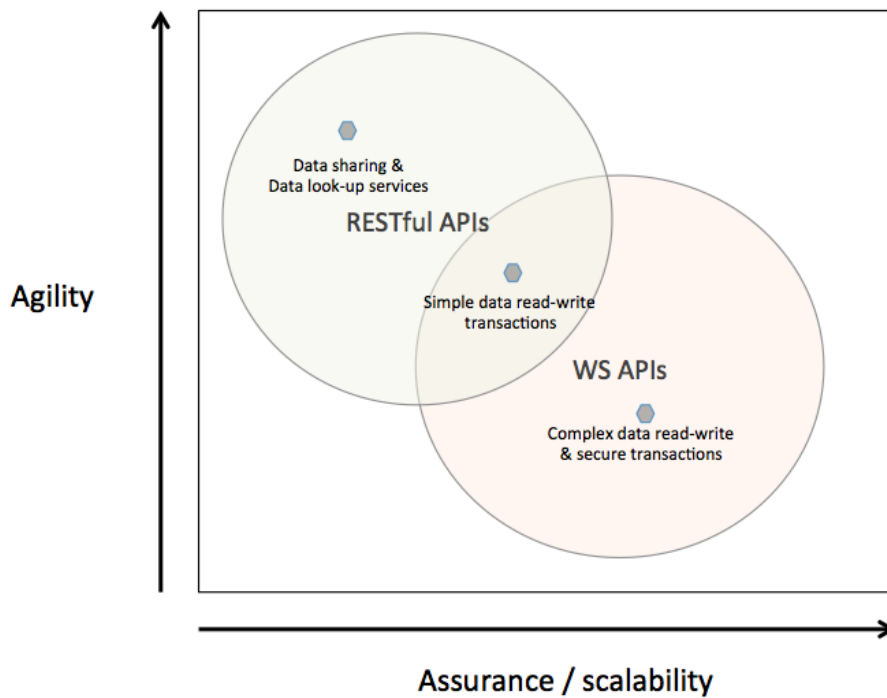

Diagram 1: Digital Interaction solutions relative to agility and assurance

3.2   Industry developments

APIs are a key enabling technology underpinning most digital business models and have been used by digital businesses to scale rapidly and become corporate giants. Salesforce and Amazon were early pioneers in using APIs to connect their online platforms via the internet to the information systems of suppliers and customers. Salesforce released its first Web Service API in 2000 and Amazon in 2004. Other companies such as a Facebook, Google, eBay and Twitter soon followed in releasing APIs to grow their businesses.[16] These companies used APIs to extend the reach of their businesses beyond the user base of their websites, meaning that other users could consume their services while using other applications and websites.

APIs are part of a new paradigm for digital interaction where organisations can expose their core business services to the world to extend their reach, improve service delivery and to allow external innovation with other organisations.

Successful organisations that create APIs usually build an ecosystem of development partners around their core platform and services that can drive further innovation and impact within the wider market. Google has done this by building a large network of external developers around their API services such as those provided through Google Maps to embed maps in third party websites.

APIs have also been rapidly adopted in many traditional industries such as travel, tourism, insurance, banking and retailing. Most airlines provide APIs to allow customers to plan and book flights using a variety of channels including third-party websites and corporate travel applications.

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16   History of APIs, Kin Lane,
       http://apievangelist.com/2012/12/20/history-of-apis/

The central role of APIs in this new paradigm of business interaction has been credited with creating an API economy. An article in Forbes magazine states 'application programming interfaces – commonly known as APIs – are the new must-have for business, representing the future of customer and community engagement with far broader implications than traditional web-based business models.'[17]

The concept of an API economy is basically the same as that of the digital economy, a term used to describe the part of the economy that is being transformed through the rapid growth of digital services. The digital economy is enabled by a range of technologies that include APIs, web and mobile applications coupled with the widespread adoption of the internet.

APIs are also enabling the business sector to shift towards a more real-time economy where automated financial and other commercial transactions can be processed immediately.   The traditional overnight processing of bank settlements is more a result of legacy regulatory, technology and cultural practices rather than what is possible through the use of modern API technologies.

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17   Welcome to the API Economy, Forbes Magazine, 29th August 2012,
      http://www.forbes.com/sites/ciocentral/2012/08/29/welcome-to-the-api-economy/

4   Policy Developments

4.1   Digital Government policy frameworks

Digital Government is a term used to describe the next development stage of a process commenced by eGovernment and Gov 2.0 initiatives within the last two decades. Digital Government describes an ambition to place digital services and innovation at the very centre of government operations and service delivery.[18]

Over the last five years, Gov 2.0 strategies have encouraged governments to adopt a greater level of openness to outside contribution in the design and development of services and policy making, as well as encouraging the reuse of public information in new and creative ways.[1]

Since then, governments have started to embrace more customer-focused and integrated approaches to managing services across multiple delivery channels including the web, mobile, call centres and face-to-face. These initiatives have made it easier for customers to find and use services irrespective of the structures of government, and support 'joined-up services' informed by the principle of 'just ask once'.[19]

While most digital government strategies have primarily focused on improving the quality and public use of government websites, there has been some attention on opening up government information either as raw data or as APIs.

The US Government's Digital Government Strategy (2012) mandates that all new agency IT systems follow government-wide web API policy and that agencies release two APIs based on high value data/content.[20]

The UK Government's Digital Government Services (GSS) has announced it will be recommending principles, standards and priorities for data formats and exchange for APIs for adoption by government agencies.[21] The GDS have also issued a guide called 'APIs: Using and creating Application Programming Interfaces' as part of their Government Service Design Manual.[22]

The New Zealand Government has established a Better for Business Program and API Leadership Group to promote the use of APIs for business and government digital interaction.[23]

In Australia, digital government strategies and policies, while addressing the need to improve government websites and open up government data, have not explicitly set out actions or targets for the development and adoption of APIs for government services.

18   OECD, 2014,
     Principles for Digital Government Strategies: Bringing Governments Closer to Citizens and Businesses,
     http://www.oecd.org/internet/recommendation-on-digital-government-strategies.htm
19   Eggers, William, Government 2.0: Using Technology to Improve Education, Cut Red Tape, Reduce Gridlock, and
     Enhance Democracy, Rowman & Littlefield, 2005, p. 189.
20   Building a 21st Century Digital Government, US State Department, 2012,
     http://www.state.gov/digitalstrategy/
21   Government Digital Strategy: December 2013, UK Government Digital Service,
     www.gov.uk/government/publications/government-digital-strategy/government-digital-strategy
22   APIs: Using and creating Application Programming Interfaces, UK Government Digital Service,
     www.gov.uk/service-manual/making-software/apis.html
23   Better APIs for Business program, New Zealand Government
     webtoolkit.govt.nz/blog/2015/03/introducing-better-apis-for-business/

The Australian Government has set a target for 80% of the public to use digital channels to access government services by 2020. More recently it has determined that all high volume services (those with more than 50,000 interactions) be available online by 2017.[24]

In January 2015, the Australian Government established the Digital Transformation Office (DTO) to be responsible for digital service delivery across government. The scope of their role covers making government services digital by default with a focus on the design and functionality of websites and the associated technology investments and systems. The DTO has also a Digital Service Standard that encourages but does not mandate government agencies to use 'web service APIs, open standards and common government solutions where possible'.[25]

Service Broker model

Public sector or independent service brokers are increasingly important to delivering and designing these services. Service brokers are organisations or businesses that enable customers to interact with other organisations through easy-to-use and seamless interfaces.

In the digital realm, an example of a public sector service broker is one that provides a customer-focussed portal, such as the Federal Department of Human Services' MyGov website.

Independent service brokers from the private or community sectors can also provide greater service choice and innovation in how people interact with governments.

Models for independent *service brokers* include Digital Mailboxes and Personal Safeboxes (eg Australia Post); public transport information *service brokers* (e.g., TripView, Tripgo and Google Transit), taxation service brokers (e.g., Xero and MYOB Online), community *service brokers* (e.g., HubCare) and access brokers for government services (e.g., public libraries, online access centres) to assist those who are unable to access digital services.

The role of independent *service brokers* is an extension of the concept of 'government as a platform' where government's core role is to provide the underlying information systems to allow other organisations to develop services for the public. Under this model, governments need to be able to separate out and rationalise their different roles as a wholesaler versus a retailer of information and services.

This model provides an alternative way of providing government services that can be more agile and responsive to customer needs. Service brokers offer the opportunity to make Digital Government more flexibly demand-driven and customer-focussed rather than a one-way service pushed out by governments. It also presents opportunities to drive efficiencies and financial savings for government agencies by targeting these services more accurately.[25]

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24   Advancing Australia as a Digital Economy, 2013
      Department of Broadband, Communications and the Digital Economy, June 2013.
      http://www.archive.dbcde.gov.au/2013/september/national_digital_economy_strategy/advancing_australia_as_a_di
      gital_economy

      Coalition Liberal and National Parties, August 2013
      The Coalition's Policy for E-Government and the Digital Economy,
      http://www.malcolmturnbull.com.au/assets/Coalitions_Policy_for_E-
      Government_and_the_Digital_Economy_%282%29.pdf [

25 NICTA., New models for Digital Government: The role of service brokers in driving innovation, Dec 2014,

The US Government's Digital Strategy has explicitly identified a role for service brokers (called private sector digital services) that are separate to government digital services. It has also identified that APIs are a critical building block for enabling government as a platform, where services (presentation layer) can be delivered by either public sector or private sector service brokers.
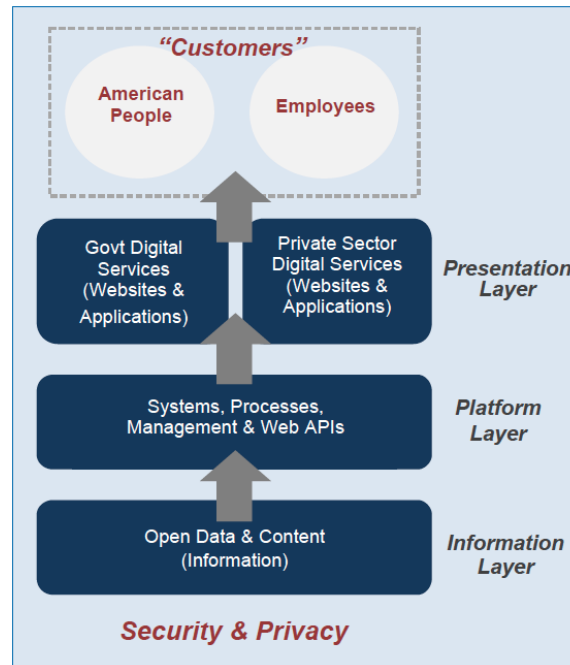

Diagram 2: Government as a Platform, *Digital Government* (2012)

4.2   Creating a contestable market for government interaction

Australian governments can provide business with choice around how it reports and exchanges information with government agencies either through its own websites and software or through non-government software.

The latter is a more scalable and efficient solution as it aligns with B2B processes, allows for customer choice and competition, supports innovation and the emergence of new solutions. The other benefit of this approach is that it reduces the requirement for government expenditure on its own systems.

This is about defining the role of government as a platform or as a wholesale service – facilitating 'service brokers' to design a range of solutions for the delivery of government service.

The concept of government as platform assumes it is not the core role of governments to build full business-to-government computer systems and websites but rather enable other organisations to collect, process and report information from business.

In order to promote a contestable market for government interaction, a policy framework is required that allows business to exchange information with government in a manner that is consistent with the future directions for business to business interaction.

There is a requirement however, for standards to be adopted to ensure that common information can be exchanged between multiple parties in a consistent manner. For example,

the SBR Taxonomy allows specific financial information to be exchanged between different government agencies and identified correctly.

There is also a need for a policy framework that enables modern service oriented interactions that use APIs while recognising the need for legacy and bespoke systems. This requires that investments and upgrades in all government ICT systems are mandated to implement the capability to publish and/or consume API services as appropriate.

In summary, APIs help enable but do not determine whether governments develop and operate retail digital services. This remains a policy decision of government. However the failure to develop a capability to expose government information systems through APIs could severely limit the choices available to government. APIs allows governments to make decisions about what is core and non-core to their operations and allow greater industry co-creation of services.

5   Stakeholder Consultations

5.1   Questions design

This section provides details about the industry survey conducted in March to May 2015. Feedback received from this survey was used to guide the review and development of recommendations. The survey was semi-structured, which allowed us to collect information in response to specific questions as well as explore topics and issues with interviewees in detail to gain deeper insights.

First, we designed a set of questions with the intention to collect answers that reflect industry needs for information exchange, as listed in Table 1 below.

Catalogue	Questions
General digital interaction requirements for business	Q1. With whom does your organization need to exchange business documentation/data? (e.g., i-invoicing, orders, valuations, referrals, etc.) Q2. How frequent are the exchanges currently? Q3. What is the documentation sizes/volumes currently exchanged? Q4. How do you see this changing over the next: (a) 12 mths; (b) 3-5 yrs? Q5. What reporting/documents do you exchange currently with government? (e.g., BAS, ABS, APRA, etc.) Q6. Does your organisation have experience in electronic data exchange in other jurisdictions? If so, how effective is it for business? Q7. What are the major roadblocks to be overcome in making electronic data exchange ubiquitous? What are your views on the affect that acceptance of initiatives such as "Single Touch Payroll" will have on the industry view of a move to Standard Business Reporting approaches to B2B and B2G interactions (e.g., is industry ready to embrace this style of approach to achieve productivity savings)?
General requirements for document exchanges	Q1. What messaging products are you using at present? Q2. How do you do the documentation exchange (i.e. what information exchange patterns)? Q3. What messaging protocols are they using for the above B2B/B2G information exchange? Do you believe a mixed regime of messaging protocols (e.g., REST, SOAP etc) would be preferred as a path for enabling a faster adoption of standard messaging protocols?
Expectations for new messaging QoS	Q1. What are the limitations of the current messaging technologies? Q2. What new features/QoS would you like to have/add on? Q3. What is your ideal messaging architecture for B2B/B2G information exchange? Q4. To what level of inspection should messaging protocols extend to confirm interoperability (e.g., message received v action taken at app level)?
Awareness and Adoption of ebMS2/AS4	Q1. What are the roadblocks to a fast uptake of messaging protocols utilising the principles of ebMS3/AS4? Q2. To what level should standards be set around messaging protocols?
Governance	Q1. What are the most successful governance models you have worked with to gain broad industry acceptance/adoption? Q2. What are the approaches that create the most difficulty ?(e.g., open source, government mandated approaches) Q3. Would moving to an agreed registered Standards approach be effective?

Table 1: Pre-designed questions for the industry interview

5.2   Participant list

Second, we identified a list of candidates to be interviewed spanning a representative range of organisations in type (e.g., government, industry) and size (e.g., large business, SMEs). We undertook in excess of 20 interviews with representatives from the following areas:

- Federal Government (large and small agencies)
- State Government (large and small agencies);
- Large industry players with significant inter and intra-business activity;
- SME organisations with high B2G interactions but limited ICT capacity;
- Larger not-for profit organisations with extended B2G interactions and substantial IT capability;
- Software development participants providing IT capability to large numbers of customers with B2B and B2G interaction requirements; and
- Professional advisor groups and peak industry bodies.

5.3 Feedback from government agencies

The feedback from Australian government agencies has been summarised as follows:

Australian government policies are following US and UK models for the Digital Transformation Office, with a focus primarily on enabling better customer services through government digital channels.

Senior government technology managers in government agencies are less aware of the need to build capability and maturity with the use of APIs (web services and RESTful) but have some knowledge of standard frameworks and profiles.

Existing business reporting to government at a wholesale level has been shaped by detailed architectures and protocols that have only had partial adoption across government agencies.

There is limited knowledge around success stories which include the use of SBR APIs for ABN and Super look-ups services with strong adoption by businesses. NSW Government Licensing Service will be implementing similar look-up services for validation of current trade licences. An opportunity exists to show economic benefits from these examples and for broader adoption.

There is an emerging need to identify the level of use and costs of delivering services across different channels including digital, phone and counter-services.

Strong interest exists in developing options for federated identity assurance (that would be enabled by APIs).

There is good interest in pilot projects to extend awareness, build capabilities and demonstrate value of the new approach.

5.4 Feedback from industry

The industry feedback from our consultations is summarised as follows:

Senior business leaders are now very aware of digital disruption and the need for agile and flexible practices to exchange information with other businesses and customers.

Senior technology managers in business are aware of the need to build capability and maturity with the use of APIs (Web Services and RESTful) but have limited knowledge of standard frameworks and profiles.

However, many legacy business and technology processes will remain in place for some time (at least 10 years). While one forecaster predicts that nearly 80% of businesses will adopt APIs by the end of 2018, nearly all businesses will still retain traditional computing systems and

information exchange practices.[26]

Reports indicate Australian industry is lagging behind leading markets in its response to digital disruption and adoption of new digital services (innovation gap).[27]

In-principle support exists for the development of more standard approaches for government interactions as well as for industry specific needs.

Value proposition for standard business reporting is not seen at the firm or industry sector level.

Interest is strong in enabling users of government reporting systems to receive feedback either directly or as aggregated information on the level of adoption.

The use of APIs is becoming increasingly common for many businesses as they adopt new digital business models and methods of interacting with other companies. However, close to universal adoption will still take some time, at least a period of five to 10 years. The Australian Government could help accelerate adoption through supporting pilot projects and education programs.

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26 Layer 7/CA Technologies, 2013

27 Deloitte, Digital Disruption: Short Fuse, Big Bang, 2012

6 Review and Key Findings

6.1 Product and development lifecycle management

The responsibilities for product and development lifecycle management are different for agencies if they are an API creator or API consumer. These responsibilities are outlined below:

a) For the API Creator
   − Best practices in API design (included in a central repository)
     • API ownership, differentiated APIs with clear business model, design for adoption, get feedback early, prevent misuse
     • Reference architecture/implementation, different language kits for consumer
   − Versioning
     • semantic versioning 2.0, backward compatible, support for multiple versions and slow phase out, be aware of implementation change leak
   − Testing
     • Compliance testing for different implementation of the same APIs
     • Consumer-driven contracts (CDC) co-owned by API consumers
   − Life cycle management
     • Connect API design/development with operation of APIs through DevOps
     • Automated deployment of APIs across development, test, stage and production environment.
     • "Managed" API: Security, rate limiting and monitoring, scale up/down

b) For the API Consumer:
   − Do not make assumptions of API internals and use out-of-band communication
   − Assume APIs are not always reliable during runtime and have your own reliability handling layer
     • Fail fast, understand API call timing profiles, defensive error handling
   − Use automated tools to test your applications
     • Simulate API and resource behaviours
     • Stating/production environment and testing
   − Have undo or compensation transactions mechanisms
   − Do not abuse or misuse APIs
   − Adhere to service delivery quality level

In a government wholesale service model with government agencies being the API creators, API consumers are often service brokers delivering services to the end users (e.g. citizens). There should be mechanisms for monitoring "end user" experiences and a channel (automatic or through other ways) to allow end users to flag issues with both the API consumers (service brokers) and the API publisher.

For example, Twitter provides APIs for their services and there are thousands of third-party websites and apps that consume the Twitter APIs and deliver new and value-add services to their end users. Twitter has specific policies, agreement and guidelines for these API consumers which is a useful example for government agencies.

> Sample Policies derived from Twitter API policies
> https://dev.twitter.com/overview/terms/agreement-and-policy
>
> - Twitter may suspend or revoke access to the Twitter API if we believe you are in violation of this Policy.
> - Respect Twitter's requirements on how to display and interact with users' content.
> - Do not modify, translate or delete a portion of the Content.
> - Maintain the features and functionality of Content and Twitter API. Do not interfere with, intercept, disrupt, filter, or disable any features of Twitter or the Twitter API, including the Content of embedded Tweets and embedded timelines.
> - Only surface Twitter activity as it surfaced on Twitter. For example, your Service should execute the unfavourite and delete actions by removing all relevant Content, not by publicly displaying to other users that the Tweet is no longer favourited or has been deleted.
> - Do not remove or alter any proprietary notices or marks on Content or the Twitter API.
> - Republish Content accessed by means other than via the Twitter API or Twitter other tools.
> - Do not use, access or analyse the Twitter API to monitor or measure the availability, performance, functionality, usage statistics or results of Twitter's products and services or for any other benchmarking or competitive purposes, including without limitation, monitoring or measuring:
>   > the responsiveness of Twitter websites, web pages or other online services; or aggregate Twitter user metrics such as total number of active users, accounts, user engagements or account engagements.
>   > Use Twitter Content, by itself or bundled with third party data, to target users with advertising outside of the Twitter platform, including without limitation on other advertising networks, via data brokers, or through any other advertising or monetization services.
> - You may advertise around and on sites that display Tweets, but you may not place any advertisements within the Twitter timeline on your Service other than Twitter Ads.

6.2 Differentiation for different sized agencies

There is a need to differentiate interactions and processes for smaller agencies to enable them to move towards providing wholesale and contestable services

There is a need to develop tools and guidelines that will enable "non-technical" domain experts to implement changes and submit reports and informational based data.

The role of translation services/hub for smaller government agencies should be investigated.

Establish an Innovation Services Centre to create centralised developer or set of developers to support small agency/SME implementation. This Centre could:

- support agencies to develop and test APIs (similar to the US and NZ innovation centres)

- liaise with software developers regarding interoperability and testing APIs

6.3 Service management

Government agencies (APIs publishers) need to implement governance and reporting processes for the ongoing service management of their APIs for their stakeholders (consumers of APIs and other government agencies).

The objective of services management is that government supplied APIs remain up to date, compliant, compatible and readily available. This is critical if third party software developers and end users are to invest resources in consuming these APIs and for maintaining trust.

Government agencies need to maintain:

- Service level availability and data quality,
- Compliance and compatibility of APIs
- Roadmap and predictable version release cycles for APIs (includes API, messaging profiles, taxonomies, assurance frameworks)
- Information on the level of use of their APIs & economic/social impact
- Identify the major consumers of APIs (engage as appropriate)
- Feedback from users on improvement and modifications to the APIs

Service management governance models could include:

- Limited release of API to qualified users with obligations to maintain quality standards, provide reporting, etc. This model was used by Transport for NSW in the release of their API for the GPS location of public transport services (eg buses, trains and ferries).
- Light touch quality control for on-boarding API consumers
- Open access with voluntary reporting and quality standards

Best practice is to automate the creation of Service Level Agreements (SLA's) to enable meaningful delivery of services which are aligned with client expectations.

There is also a need for periodic reviews of existing retail digital services to consider alternative service delivery opportunities using APIs.

6.4   Implementation Principles

The following implementation principles have been identified to guide government adoption of APIs as both creators and consumers of services.

- Design principles need to focus on flexible and modular technologies that support changing information exchange patterns.
- Recognise the need to align initiatives to the software product development lifecycle management, including release, version and problem management, etc.
- Identify datasets and business documents that can be easily converted into machine readable form and exposable over APIs (quick wins for simple information look-ups)
- Adopt technologies that enable the collaborative development of reusable taxonomies and the harmonisation of similar but different taxonomies and data schemas across multiple agencies
- Solutions need to transition over agreed timeframe to be able to support large mature businesses, as well as small to medium enterprises, non-government organisations and smaller government agencies.
- Stakeholder understanding, support and adherence is critical to success – need to broadly communicate benefits and level of use widely; focus on areas of greatest impact; etc.
- Governance is about building an effective ecosystem of support and adoption of standard digital interaction practices. Governance needs to be multi-layered – include formal elements but allow for in-formal engagement with a greater number of organisations.

6.5   Long-term Governance Model

It is recognised that to achieve a successful, widespread adoption of digital interactions, there is a need to move over time to a broad governance model that addresses the specific needs of both government and industry in their wholesale interactions.

The proposal is for a progressive move to a more formalised governance model be adopted to allow for continuing emergence of common standards at the API level and to factor in the different participant maturity levels.

The recommendations below are based on the consideration that a staged implementation is likely to be more successful. This means avoiding a 'big bang' approach and gradually building a coalition of support for the work of the Association and adoption of recommended information exchange pattern/ messaging protocol configurations for particular digital service types.

The following discussion lays out our recommendations and underlying rationale for the potential proposed governance arrangements that could be the optimal model to promote oversight of best practice digital interactions on a B@B and B@G level. These are based on inputs from our industry consultations, experience, academic research and recognised best practice.

Good governance is critical to fostering and facilitating digital interactions between: government agencies (G2G); government agencies and business organisations (B2G; G2B); and government agencies and individual members of the public (G2C; C2G). Here, digital interactions span a continuum from basic information dissemination/submission to complex data exchange activities and commercial transactions, comprising individual or aggregated retail or wholesale interactions. This section lays out recommendations for governing these interactions and the underpinning rationale for the proposed framework.[28] It pays particular attention to governance of wholesale/contestable service interactions.

Definition
In essence, the spirit of governance is good order and workable arrangements (Bannerman, 2009). In this report, governance is defined as the arrangements by which digital interactions within and between business and government are fostered, formalised, facilitated, guided and ordered for the benefit of both public and private sectors. In addition to the establishment and maintenance of good order and workable arrangements in digital interactions, other key roles of governance include: facilitation of buy-in and participation by agencies and business organisations; formulation and specification of preferred, recommended and standardised mechanism for digital interoperability; and providing advocacy and direction to members in efficient data exchange and cost effective digital service delivery. The traditional focus of governance is the 'means' of good order: control, authorities, responsibilities and processes. By contrast, the framework proposed here also recognises the importance of governance 'ends' – outcomes as well as structures and processes – to promote buy-in by industry and government organisations in the establishment of workable digital ecosystems for the benefit of all parties involved.

Design Principles
On this basis, the recommended governance arrangements derive from the following design principles:

- *Inclusiveness* – open participation is encouraged and fostered within industry and government organisations

- *Egalitarianism (aka one for all and all for one)* – value creation is encouraged via collaborating, co-creating, co-dependent 'sovereign' entities and ecosystems

- *Open service interactions* – limitations on types of business/government service interactions and/or information exchanges supported are avoided (outside of agreed policies and standards that may apply limitations)

- *Open standards orientation* – proprietary, single-use and partisan interactions are avoided

- *Full lifecycle management scope* – from design to development, testing, adoption, use, maintenance and retirement/replacement

- *Decision transparency* – openness in policy making, standardisation and decision making

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[28] Note that these recommendations shares features with the recommendations in the messaging protocol consultancy (Services Contract No. 15.5-0-5), particularly relating to structures and processes.

- *Self-determination* – the opportunity to agree together rather than be forced to adopt particular service interaction or information exchange mechanisms

- *Accessibility* – open/managed access to digital interaction means and technologies by all participating agencies and organisations as agreed by the governing body

- *Simplicity and agility* – complex, bureaucratic, partisan, rigid and/or inefficient interaction designs and mechanisms are avoided

These principles aim to respond to the feedback from our industry consultations which indicated that an acceptable governance arrangement must foster participation, cooperation, collaboration, co-creation and innovation between co-dependent industry and government organisations and ecosystems. Its operations should be transparent and decision-making open. Adoption of standards should be by agreement of the body rather than mandated from outside. In turn, the principles inform the recommended structural and operational design of the recommended governance arrangements.

Structures

The recommended governance structure follows the dominant global pattern. It comprises a single peak governing body with a single persistent technical group and optional temporary project-oriented working parties to do detailed work as required. Each recommended entity is described below (note that the name used for each body is indicative and may be changed):

Australian Digital Interactions Coordination Association

This is proposed to be the peak governance body responsible for overseeing and delivering the requirements of the digital interactions and message protocols recommendations in this report and the Message Protocols report prepared by NICTA and CSIRO.

This is a persistent organisation that integrates government agency and industry organisations as members. Membership is open to organisations (not individuals). Membership attracts an annual fee to fund operating costs, as agreed by the Association. No remuneration is paid to members or officers of the Association (the Association may determine, however, that one or more full time technical resources are required for technical services delivery).

Member organisations are represented by a nominated representative (changes of member representation must be advised in writing). Only member organisations have voting rights - one vote per organisation. Other member representatives and invited technical specialists may attend scheduled meetings but may not vote.

Executive positions (at least a Chairperson and Secretary) are held for a fixed term only. Executive position holders are alternated between government agency and industry organisation member representatives (concurrent appointments from the same sector are to be avoided).

The Association is responsible for digital interactions and information exchange policy, strategy, direction, coordination, standardisation, communication and control. The Association oversees and directs the operations of the *Digital Interactions Technical Group* and any *Digital Interactions Working Groups* that are initiated (please see below).

Digital Interactions Technical Group

This is a persistent group that is operated by the Association to: provide technical advice and recommendations relating to the Association's objectives (such as on technology lifecycle management); establish, oversee and/or maintain any technology infrastructure required by (or for) the Association (such as relating to directories, repositories or other servers administered by the Association); and provide other technical services for the Association as required.

The group is headed by a Technical Lead, appointed by the Association (as a secondment, contract or permanent position), who reports to the Association Chairperson.

The group is the Association's technical knowledge repository and provides advice on API management and technical standards, quality, security and compliance. The *Digital Interactions*

Technical Group may also provide advice and support to working groups as directed by the Association.

Digital Interactions Working Groups

The Association may establish working groups from time to time to conduct specific projects on its behalf. These are temporary teams staffed by nominated member representatives, specialists or recognised experts in a particular field. Working Groups are coordinated by a Group Leader who reports to the Association.

Working Groups act on specific briefs and/or directions from the Association. They operate and are managed by the Association as projects. They report progress to the Association as required in the brief or direction. A mandatory review must be held of any working group that has existed for more than twelve months, following which any extension must be formally approved by the Association.

Participation in working groups is voluntary (unfunded by the Association). Working groups typically have a domain-specific focus (see further below). They develop, change or update specific digital interaction and/or information exchange artefacts on behalf of the Association or for recommendation to the Association.

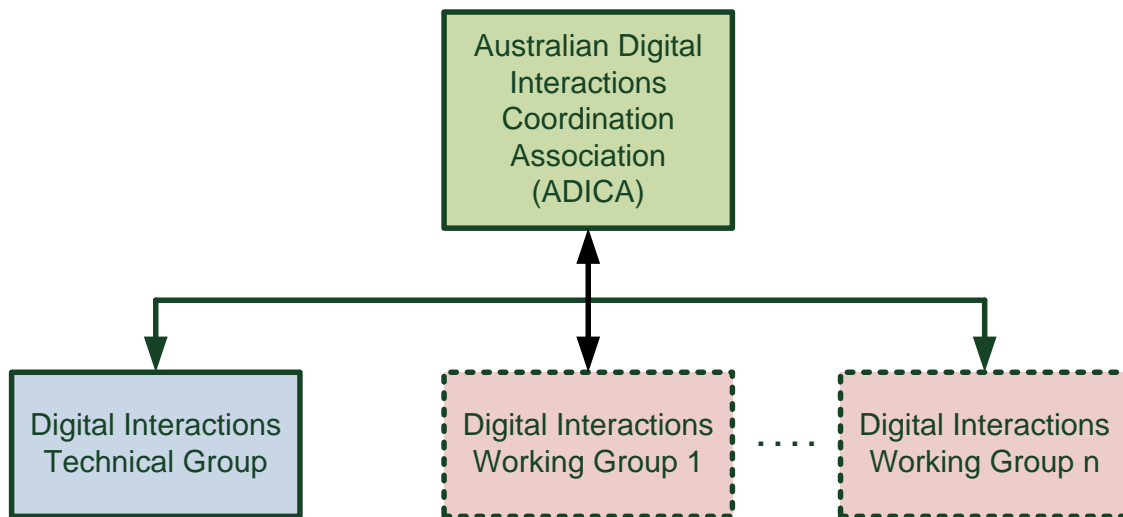This governance structure is summarised in Diagram 3

Diagram 3: Governance Framework

Governance Domains

Governance activities will mostly be domain-specific. That is, they will occur within particular technical, government or business areas of interest or ecosystems. Determining the domains in which to operate is the responsibility of the Association. For example, domains may comprise one or more of the following (the list is indicative rather than complete):

- web interactions (B2B, B2G, G2B, G2G, C2G, G2C)
- whole of federal government
- agencies
- corporates
- industries
- intermediaries
- small and medium enterprises
- supply chains
- cross-industry applications
- technologies
- architectures
- platforms
- standards

- processes
- special interests

This domain-specificity means that not all governance activities will be relevant to all member organisations all of the time. Consequently, the design principles of inclusiveness, decision transparency and self-determination are critical to solicit participation and retain engagement. The alternative design of structuring the governance according to domain-specific interests is not recommended because it is likely to result in fragmentation, inconsistent decisions and conflict.

Processes

Specific governance activities required in relation to digital interactions include ongoing lifecycle management of the following artefacts (refer to the Messaging Protocols report for specific processes relating APIs):

- Messaging interoperability preferences, recommendations and standards
- Data interoperability preferences, recommendations and standards
- Application interface and process preferences, recommendations and standards
- Assurance processes including development and maintenance of references architectures, implementation examples and testing suites
- Central documentation repository (or repositories)
- Service and service related documentation discovery registry (or registries)
- Access control and security policies and administration
- Specific legal requirements
- Escalated interoperability dispute resolution

Key responsibilities of each governance body are summarised in Table 2.

Governance Body	Persistence	Key Responsibilities
Australian Digital Interactions Coordination Association	Permanent	• Overall governance direction and control • Digital interactions policy and strategy • Governance processes and structures • Development and maintenance of artefacts • Standardisation • Stakeholder coordination and communications • Oversight of Technical Group and Working Groups • Membership relations
Digital Interactions Technical Group	Permanent	• Provide technology advice and recommendations • Provide advice/recommendations on technical processes • Provide advice/recommendations on technology standards • Provide assurance tools and services • Provide support to working groups (as required) • Lifecycle management of technical artefacts • Lifecycle management of any technical infrastructure • Lifecycle management of technical documentation
Digital Interactions Working Groups	Temporary	• Project manage specific activity briefs • Operational resources of the peak body • Responsible to the peak body • Report to the peak body (as required) • Interact with the Technical Group (as necessary)

Table 2: Summary of Responsibilities

Staged Implementation

The introduction and development of the recommended governance framework needs to be staged managed. This recommendation is based on industry consultation feedback, and consideration given to the likely challenge of securing buy-in from both government agencies and industry organisations that may be satisfied with their existing arrangements or approaches to digital interactions with stakeholders.

We recommend that the Association is formed from the steering committee through a series of pilot projects that are conducted to 'prove' the feasibility of the recommendations in the joint reports prepared by NICTA and CSIRO. These projects will demonstrate the value of the recommended arrangements to the wider industry.

We recommend starting with three (or more) selected projects targeting interactions that are relevant to high profile industry organisations and government agencies. Each project should be run by a common steering committee that represents an embryonic form of the recommended peak governance body (the *Australian Digital Interactions Coordination Association*). The projects should be operated as *de facto* working groups.

A number of pilot projects have been identified that could be initiated at a modest level and scaled at a later stage based on perceived benefits and willingness to invest further by the relevant stakeholders. Potential subjects for pilot projects could include:

a) Childcare where there are multiple touch points across government, business and non-government organisations and with duplication of processes and key information gaps.
b) Birth of a child where there is potential to remove unnecessary duplication of information requests across health, state and federal agencies.
c) Homelessness where there are multiple touch points across government and non-government organisations to track and support clients who use multiple service providers.
d) Trade and supply chain logistics which is currently a heavily paper based information exchange system involving multiple businesses and some government agencies. An example is the Port Botany logistics transfer Hub for handover of data for import requirements and shipping to other hubs;
e) Digital commerce projects for driving greater standardisation and efficiencies for digital information exchange between Australian online retailers and their suppliers. The National Online Retailers Association (NORA) is currently exploring such an initiative.
f) Agriculture where provenance information for supply chains could be better shared to support the growth in international trade, brand promotion & biosecurity.
g) Identity Assurance where there is a growing need to accept shared identity assurance services from government agencies and the private sector. The UK Government is implementing a federated approach to identity assurance using third party services.
h) Open Innovation events such as hack days and competitions to encourage agile innovation around new uses for government API data services.

Standards Hierarchy

Finally, we recommend that standardisation be viewed as a maturity life cycle of staged progression from *optional* to *recommended*, *preferred*, *standard* and *mandatory* requirement (or a similar hierarchy, as agreed by the Association), before retirement or replacement by a more suitable alternative. Skipping stages should be avoided so that a consensus of agreement is built up among Association members for each transition towards maturity. It is likely, however, that few digital interaction mechanisms and/or information exchange patterns would ever advance beyond a *preferred* status. Those that do would have broad relevance and appeal to members and widespread support from industry and government stakeholders. This approach will enable maintenance of the self-determination design principle *and* the ability to mandate significant relevant mechanisms without imposing the requirement from outside of the governance framework.

7 Recommendations

7.1 A recommended way government can make digital service delivery available as a wholesale service

The Australian Government should develop and release a policy framework to ensure that business reporting to and interaction with government agencies is enabled as a wholesale service as a default position unless there is a good reason not to adopt this approach. This policy framework should encompass both the design and review of government services separate to a preferred technology solution such as the exposure of government services through APIs.

The policy framework should include:

- A statement regarding the principle of contestability of government services so that all agencies separate out the wholesale and retail parts of their technology investments and service planning.

- The establishment of objectives, business rationale and principles for the widespread adoption of APIs. The guideline should communicate in plain language to a general senior management audience in agencies and not just technology managers.

- This guideline should reference but be separate to the technical documentation regarding standards and interoperability framework for government use of APIs.

This policy framework could be issued by the Australian Government through the Digital Transformation Office (DTO) as a Digital Government Standard. The policy framework should also be presented for adoption by other government jurisdictions in Australia through COAG or other suitable processes.

There should be a requirement for all investment decisions in Australian Government on business cases involving ICT systems to implement APIs by default for all new systems and upgrades unless there is a good opposing reason identified. This process should apply to both formal gateway reviews as well as internal agency investment approvals.

7.2 Advice on the methods for facilitating digital interactions with government, such as using Application Programming Interfaces (APIs).

The Australian Government's operations and agility would be greatly enhanced through the adoption of APIs as the preferred method for the exchange of information both between government agencies and with external organisations. This would make government computing systems more modular and allow for greater re-use of common systems and information.

This process also follows the increasing adoption of APIs by businesses to drive digital commerce. It would allow the Australian Government to align its reporting processes with the increasingly common and more flexible business information exchange solution.

The adoption of APIs help enable but do not in themselves ensure efficient and flexible business interaction with government. There is also the need to enhance the maturity and organisational capability of both government agencies and businesses in using APIs to innovate and adopt new business practices and forms of interaction.

While APIs have been adopted by many market leaders in the business sector, there is a need to build awareness and capability for many less mature and capable businesses and other non-government organisations. The New Zealand Government's *'Better APIs for Business'* program which promotes the adoption of APIs by businesses is a good example of such an initiative. There is a similar need to build awareness and capability within the public sector agencies which needs to be further developed (see Recommendation 7.4 for details).

The Australian Government's technology policies should provide choices around APIs in terms of using WS/SOAP or REST-based approaches. The framework would identify WS APIs for interactions that require a higher level of security and assurance versus the use of REST-based APIs for many other forms of interaction.

The Australian Government should monitor the level of use of APIs by businesses, both as individual calls on APIs as well as the combination of APIs that support specific transactions and government services. This is similar to agencies monitoring the use of their websites by recording the number of page impressions and visits.

Australian Government agencies should also publicly report on the level of use of APIs on a central government dashboard to promote greater awareness and understanding about the growing importance of APIs for business to government interactions. This reporting should have equal prominence to the reporting on public use of government websites.

Australian Government agencies could also use APIs to provide automated feedback to businesses when they are submitting reporting information. This feedback could be very simple such as a benchmark about their report (eg '20% of businesses in your category are using this channel to submit their reports').

7.3   Recommendations for making available government technical documentation to promote use of the new standards and protocols for digital information exchange.

The Australian Government's Interoperability Framework should incorporate the trend towards the use of contemporary APIs incorporating both Web Services and RESTful APIs. The Framework should identify preferred/recommended methods to support different interaction patterns, from simple to complex, and those requiring low to high assurance.

The framework should include:
- Profiling of standards for Web Services and RESTful APIs;
- Syntax and semantics (including taxonomy) for data interoperability;
- Messaging profiles (of existing messaging protocol standards) and patterns;
- Assurance framework for trust and legal requirements.

The Australian Government should make its technical documentation regarding new standards and protocols relating to APIs available to businesses and other external organisations via a central Australian Government repository. This repository should address the needs of both the creators and consumers of APIs.

The relevant technical documentation for this repository should include:
- Policies
- Strategies
- Standards and profiles of standards
  - Processes, interfaces, data, messaging protocols
- Taxonomies
- Reference architecture and implementations
- Best practices, patterns and code examples

- Reusable libraries and components

The Australian Government could also make its technical documentations (including reference architecture, implementation and code examples) available through popular technology collaboration and development platforms such as GitHub. This will help increase the exposure of these documents to a larger developer community involved in creating and consuming APIs. This will also encourage closer and more flexible collaboration with business and agencies from other government jurisdictions on specific initiatives where documentation from all parties can be shared and developed.

7.4 Proposed methods to enable government agencies to consume and publish their digital services

It is recognised that government agencies will need assistance to build awareness and capability in their capacity to both publish and consume their digital services as APIs. This is required primarily for smaller government agencies but will also be valuable for larger agencies that have less relevant skills or agility due to their reliance on legacy technology systems.

It is recommended that a Digital Services Innovation Centre be established to support the small government agencies as they implement digital services using APIs. The Centre could support agencies in the design, implementation and testing of new services that publish APIs and provide advice on consuming external APIs.

The Centre could also provide tools and platforms to help agencies create and test their APIs in a more streamlined and consistent manner. An example of such a tool is the api.data.gov service developed by the US Government's Government Digital Service that is a free API management service that makes it easier for agencies to track and manage the performance of their APIs.[29]

The Centre should also have a role in advising and assisting small businesses in adopting APIs for business-to-business and business-to-government interactions (similar to the NZ *Better for Business* program). It would also liaise with external software developers regarding the interoperability and testing of applications that using APIs to interact with government agencies. Staff should comprise a small team of software developers and business advisers.

The other benefit delivered by the creation of the Centre would the accelerated adoption of APIs across the entire economy covering business, government and non-for-profit sectors. It is expected that this would have a positive economic impact in terms of productivity improvements through the greater use of automated information exchange and increasing the capabilities of Australian organisations to adapt to the impact of digital disruption.

7.5 Proposed methods to ensure government digital services and documents are discoverable, machine consumable, usable and testable by software developers.

The Australian Government could develop an API Directory to manage and make its APIs discoverable and human and machine readable in both centralised and federated fashion. This should cover both Web Services and RESTful APIs.

There are different types of government technical documentations.

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29 'About api.data.gov', on Data.gov, US General Services Administration,
http://api.data.gov/about/

For adopted or suggested technical standards, standard profiles, guidance, best practices, API descriptions and other materials intended for human readers, there should be a central document repository with proper version control and metadata to facilitate search and references (See Recommendation 7.3)

For sharing data as packaged datasets, a data-sharing friendly data management system (e.g. CKAN as used for data.gov.au) should be deployed. The system should support easy import, search, metadata and version management in both centralised and federated fashion. Some of these features should also support APIs to allow data management task automation.

For sharing data or conducting business transactions using APIs, API descriptions should first have both human and machine readable forms. For traditional SOAP-based Web Services, WSDL is the standard machine readable format. For RESTful Web Services, popular machine readable description formats include Swagger, RAML, API Blueprint, HAL, Hydra.[30] There are still no common standards in machine readable RESTful API description. A repository (often named API Directory or API Portal) should be used to manage these human and machine readable APIs in both centralised and federated fashion.

The API portal/directory feature is often offered together with API gateway and API analytics features in a product category called API management, which includes many commercial offerings. Due to the largely federated nature of the perceived repository with no requirements on centralised API gateways and analytics, we recommend to either build an API portal/directory based on one's own requirements or reuse/extend the data description features in existing data management systems (e.g. CKAN).

However, these data management systems are designed for sharing data and describing data access APIs, not APIs for conducting business transactions. On the other hand, API descriptions, especially machine readable ones are often merely linked to (e.g. in CKAN), not necessarily retrieved and collectively processed in the system to enable better navigation, comparison, understanding and use for API consumers.[31]

The Australian Government's data.gov.au directory, based in the CKAN software, should be assessed for its suitability as the platform for this API Directory. Data.gov.au currently contains information about a number of government APIs but they are difficult to discover. As an initial measure, it is recommended that Australian Government APIs listed on Data.gov.au be more easily discoverable by both search and browse functions (eg having a tab and/or tag marked APIs or similar on the front page) for human readers. The API Directory can be later extended to support better machine consumption.

The US Government has mandated that all Federal Government APIs be listed in the Data.gov directory. The Data.gov directory also makes it easy to discover the list of APIs released by US Government agencies.

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30 See:
    Swagger, https://github.com/swagger-api/swagger-spec#readme
    Rami, http://raml.org/
    ApiBluePrint, https://apiblueprint.org/
    Hal, http://stateless.co/hal_specification.html
    Hydra, http://www.w3.org/ns/hydra/spec/latest/core/
31 See the last points. CKAN is very good at publishing and managing datasets and auto-generate basic APIs for querying published datasets. However, if the data is not a self-contained dataset but only available through an API for dynamic query, CKAN only provides a link to the API. The link can point to anything about the API and there are very limited ways to promote and, more importantly, effectively use the machine-readable API descriptions at the end of that link. In addition, if the APIs are not for data sharing but for performing business transactions, the CKAN model is not very suitable. CKAN supports federation but it has the same issues outlined above.

The Australian Government could also make its information about government digital services and documents shareable to other directory services that are managed by non-government organisations and other government jurisdictions.

The Programmable Web is an example of such a third-part directory that is popular with software developers.[32] It is a global directory service for business and government APIs that is human searchable but not machine discoverable. It is recommended that Australian Government APIs and related documentation be published to the Programmable Web, preferably as an automated real-time data feed from the Australian Government's API directory service to maintain currency and accuracy of the information.

7.6 Advice in relation to ongoing governance of the above facilities.

There is a need for governance mechanisms to build and maintain both agency and business support for the adoption of standard approaches for digital interactions.

Complementary governance solutions are required for business and government stakeholders to build and maintain both agency and business support for new ways of encouraging greater business and government digital interaction using APIs. The general principle should be to align government solutions to emerging practices and standards adopted by business while also directing business practices towards more open, generalised solutions and standards.

It is considered that Australian business stakeholders are not ready for highly structured governance models. There is a need to build awareness and support for a more interoperable environment, both for business-to-business and business-to-government digital interactions. This will requires that a supportive ecosystem be nurtured on a collaborative basis with industry associations, business software companies and end user businesses and non-government organisations.

One particular target for this outreach is the corporate standards/architecture bodies in leading Australian companies as they often have a large impact on their own ecosystem of suppliers and partners (eg major banks, insurance, logistics and retailers).

A more formal governance arrangement is possible for the Australian Government, either through leveraging and adapting existing structures for the SBR program or creating afresh to align with the Digital Transformation agenda. This governance mechanism should be able to mandate standards and common solutions for digital interactions by Australian Government agencies.

A supporting ecosystem should also be developed with other government jurisdictions (state/territory and local government) to ensure there is a consistent approach from government. More formal inter-jurisdictional arrangements should also be explored to extend mandates to other government agencies where appropriate.

It is recommended that dedicated resources be allocated to such an outreach program. It is estimated that at least two full time advisers or consultants would be required over a two to three year period in order to have sufficient impact to develop this awareness and supportive ecosystem.

A formal industry based governance structure has been proposed once there is sufficient business support for such an initiative. This has been given the working name of the

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32 The Programmable Web
   www.programmableweb.com

Australian Digital Interactions Coordination Association where key industry stakeholders are invited to participate in the development of mutually beneficial technical frameworks for information exchange.

The proposed governance structure follows the dominant pattern used globally. It comprises a single peak governing body with a single persistent technical group and optional project-oriented working parties to do detailed work as required. Details on this structure are outlined in section 6.5.

An alternative governance approach is to leverage existing standards and industry organisations to champion a more consistent approach for digital interaction practices within their sphere of influence. Most of these organisations could be effective in accelerating the adoption in their specific domain. Some of the candidate organisations include:

- GS1 (Global Standards One) – a not-for-profit organization that develops and maintains barcode standards for supply and demand chains across multiple industry sectors.[33]
- Standards Australia – the peak non-government standards development body in Australia.[34]
- Open Technology Foundation – an independent organisations supported by selected Australian and New Zealand governments and businesses to promote the sharing and re-use of interoperable solutions and open standards.[35]
- Australian Institute of Health & Welfare –Australia's national agency for collecting and reporting information and statistics on Australia's health and welfare as well as participating in developing taxonomies for the health and human services sector.[36]

7.7   Pilot and Demonstrator Projects

It is proposed that a number of pilot and demonstrator projects are supported to extend awareness amongst key stakeholders and prove the value of new forms of digital interaction using APIs. These projects will be critical in helping explain to senior business and government leaders the economic and social benefits that could be realised through more modern and automated digital interactions between businesses, government and non-government organisations.

A number of pilot projects have been identified that could be initiated at a modest level and scaled at a later stage based on perceive benefits and willingness to invest further by the relevant stakeholders. Potential subjects for pilot projects could include: Childcare where there are multiple touch points across government, business and non-government organisations and with duplication of processes and key information gaps.

i)   Birth of a child where there is potential to remove unnecessary duplication of information requests across health, state and federal agencies.

j)   Homelessness where there are multiple touch points across government and non-government organisations to track and support clients who use multiple service providers.

k)   Trade and supply chain logistics which is currently a heavily paper based information exchange system involving multiple businesses and some government agencies. An example is the Port Botany logistics transfer Hub for handover of data for import

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33   GS1 Australia
      www.gs1au.org
34   Standards Australia
      www.standards.org.au
35   Open Technology Foundation
      http://opentechnologyfoundation.org/
36   Australian Institute of Health and Welfare
      www.aihw.gov.au

requirements and shipping to other hubs;

l) Digital commerce project for driving greater standardisation and efficiencies for digital information exchange between Australian online retailers and their suppliers. The National Online Retailers Association (NORA) is currently exploring such an initiative.

m) Agriculture where provenance information for supply chains could be better shared to support the growth in international trade, brand promotion & biosecurity.

n) Identity Assurance where there is a growing need to accept shared identity assurance services from government agencies and the private sector. The UK Government is implementing a federated approach to identity assurance using third party services.

o) Open Innovation events such as hackdays and competitions to encourage agile innovation around new uses for government API data services.

The demonstrator projects are those that would involve a greater level of investment and/or regulatory change that would be designed to be sustainable due to the benefits to be obtained.

a) E-invoicing to encourage greater automation and efficiency of invoicing between business and government, and potentially for broader business-to-business adoption.

b) E-Payroll to encourage greater automation and efficiency of payroll processing and associated reporting to government in terms of taxation and related information.

c) A data sharing and Open Data policy for the banking sector where the banks are required to provide APIs to make it easier for customers to access and transfer their personal banking information to other service providers. The UK Government is planning to introduce such a scheme for the UK banking sector.[37]

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37   Report on Data sharing and open data for banks, UK Government, December 2014.
      https://www.gov.uk/government/publications/data-sharing-and-open-data-for-banks

Appendix A:
Terms of Reference

The provision of Consultancy services to provide expert advice and recommendations in relation the most appropriate way to facilitate the consumption, publication and management of standardised interactions (based on recommendations for new standardised information architecture and message protocols delivered by other consultancies in early 2015).

Services will include:

- A recommended way government can make digital service delivery available as a wholesale service.
- Advice on the methods for facilitating digital interactions with government, such as using Application Programming Interfaces (APIs).
- Recommendations for making available government technical documentation to promote use of the new standards and protocols for digital information exchange. (different – before – gaining support for standards)
- Proposed methods to enable government agencies to consume and publish their digital services.
- Proposed methods to ensure government digital services and documents are discoverable, machine consumable, usable and testable by software developers.
- Advice in relation to ongoing governance of the above facilities.

Deliverables

Deliverables will include the following advice and recommendations:

- Product and development lifecycle management - including release management, version management, problem management, etc.
- How interactions/processes may be differentiated for different sized agency implementations to support the move towards providing wholesale and contestable services
- Service management - testing, engagement and interaction model
- Governance arrangements for ongoing management of the wholesale/contestable services.

Appendix B
Terminology

- **Traditional Technical Terminology[38]**
  - > API (Application Programming Interface): the interface between two components or parties.
  - > Service: concrete implementation of an API.
  - > SOAP/Web services: API exposed over SOAP web service standard.
  - > RESTful services: API exposed over the HTTP standard following REpresentational State Transfer (REST) architecture style.
  - > REST: an architecture style that advocates explicit use of HTTP verbs, stateless services among others principles and constraints

- Some popular trends in terminology
  - > Use API and services interchangeably
    - − RESTful API == RESTful services
  - > Use Web APIs
    - − Includes both Web Services and RESTful APIs
- In this report, we use
  - > APIs to refer to both
    - − Web Services sometimes shortened as WS-* to refer to the set of stds.
    - − RESTful API

- Non-technical definitions of API

  - > A way for different computer applications to share selected data and take actions automatically without human intervention.

  - > 'Exposing information to other computers in a machine-readable format – commonly known as providing web APIs' (US Government Digital Strategy)

  - > 'APIs (Application Programming Interfaces) connect systems to allow them to share information. Think of them like a smart plug that connects systems and allows different apps or services to talk to each other.' (NZ Government Better for Business website)

  - > 'An API is a software-to-software interface, not a user interface. With APIs, applications talk to each other without any user knowledge or intervention.' (How Stuff Works)

- Profile
  - > provides interoperability guidance for existing standards.

- Examples
  - > WS-I: a profile from the Web Services Interoperability industry consortium (WS-I) that provides interoperability guidance for core Web Services specifications such as SOAP, WSDL, and UDDI.
  - > AS4: a profile from OASIS that provides interoperability guidance for ebMS 3.0 specification in order to bring continuity to the principles and simplicity that made AS2 successful.
  - > RFC6909: to enable the definition of new profiles that do not alter the basic semantics of the (REST) resource representation, but to allow clients to learn about additional semantics in addition to those defined by the media type.

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38   L. Richardson, M. Amundsen, RESTful Web APIs, 2013
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FAQs: The Digital Transformation Office, Malcolm Turnbull MP website,
http://www.malcolmturnbull.com.au/policy-faqs/faqs-the-digital-transformation-office#established

API management software sites:
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Rami, http://raml.org/
ApiBluePrint, https://apiblueprint.org/
Hal, http://stateless.co/hal_specification.html
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