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Enterprise Architecture – how does it work in the Australian Bureau of Statistics?

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Abstract

Within Australian Commonwealth government agencies, the Australian Bureau of Statistics (ABS) is perceived as a leader in its application of Enterprise Architecture (EA). This is a case study of some of the factors enabling ABS to successfully utilise EA. This paper examines how the ABS develops and applies EA (artefacts and processes) in its business environment. Outcomes of this study include some possible answers to organisations functioning without a formal EA. ISO 15704 (2005) was the basis for assessing completeness of the ABS EA. Further research needs to be undertaken to understand the value ABS is deriving from using an EA.

Keywords

Australian Bureau of Statistics, Enterprise Architecture, ISO 15704 (2005)

GLOSSARY

ABS   Australian Bureau of Statistics

ASAC   Australian Statistics Advisory Committee –provides advice to ABS on statistical matters.

EA   Enterprise Architecture – (a definition) establishes links from business functions and processes through information, applications and data layers, to specific technologies to support the business. (Chief Information Officer Council 1997).

FWP   Forward Work Program

IRMC   Information Resources Management Committee – oversights priorities and funds for IT projects

SDLC   System Development Life-Cycle

SES   Senior Executive Service (head of agency and next three senior levels of management).

TA   Technical Applications Branch (branch in TSD)

TI   Technical Infrastructure Branch (branch in TSD)

TSD   Technical Services Division – responsible for all IT related activities in ABS.

INTRODUCTION

Two seemingly contradictory statements from Zachman: "A simple argument for Enterprise Architecture: every organisation needs it to survive." (Zachman undated) and "Organisations survive, even prosper, without an EA" (Zachman 2000) highlight organisational ambivalence to EA. Surveys of the private sector in New Zealand (Wilton 2006) and Australian government sector (AGIMO 2006), show 30% of organisations claim to have a formal EA.

This paper examines the ABS approach to developing and applying EA, and the degree of completeness of the resulting EA. This paper follows on from Martin's (2005) PhD thesis examining business strategy and information systems alignment with IT using EA in the ABS and three other government agencies.

ABS has a formal EA with a range of EA artefacts and processes. ABS's use of EA is generally highly regarded by many in the Australian public sector. This is demonstrated by the number of government agencies seeking assistance from ABS about EA, the Australian Government Information Management Office (AGIMO)[1] 'always' including ABS in working groups, and Gartner using ABS as an industry partner.

ISO 15704 (GERAM) has been used as a point of comparison with a number of EA standards and industry-based models e.g. TOGAF (Saha 2004), Zachman and C4ISR (Noran 2003). Martin's thesis (2005) used ISO 15704 incorporating suggestions from Michael Rosemann (Martin 2005, p.90) to check for 'completeness' of EAs

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[1] AGIMO is responsible for coordinating whole of government use of ITC in Australia.

developed by government agencies. I have amended Martin's assessment model by incorporating the ISO 15704 2005 revisions, adding the 'Economic View' and a 'Decision-Making View' (see Appendix 2).

BACKGROUND

This analysis is part of an ongoing investigation into how the ABS uses EA models and processes as part of its 'business as usual'. The focus in ABS is largely on the application of EA within IT, although this still necessitates significant interaction with business areas to be achieved to existing levels.

The ABS workforce is largely professional (statisticians, accountants, economists, sociologists, ITC), with most having professional training in the development and use of models, and an understanding of information life-cycles: capture, manage, and disseminate. ABS is able to rely on a professional approach to EA and not on a 'clockwork' model of behaviours (ABS EA 2006 (3)). The EA provides guidance but also implies obligations.

ABS is an organisation generally comfortable[2] with their use of EA. From their Deputy Statistician down, there are many in the organisation both aware of the EA, and use (to varying degrees), the artefacts and processes of the EA. However, if you search for formal EA artefacts you will find only a small number (95) of documents (see Appendix 1 for examples). Martin (2005, p 70) identified a number of other documents (annual reports, corporate plans, Parliamentary papers, etc) related to the EA. Even adding these documents, the total number is still less than 110 unique documents. In an organisation of 3,500 people, this small number of documents cannot hope to fully describe the business and technology processes of this organisation.

If we can reconcile Zachman's conflicting claims in the Introduction, you would expect, in an organisation that is a 'leader' in their use of EA, more substantive evidence. Resolving this issue for the ABS may also help to explain how 70% of organisations function without a formal EA. In the ABS this was easily resolved. There are more than 1,700 documents classified as corporate manuals, and more than five million documents in Workgroup storage. Corporate manuals describe processes such as the development and use of the data collection, data editing, data analysis, policy and legislation development, forms design, recruitment, financial management, and so on. Workgroup documents exist for many purposes including repositories for project documents, discussion forums on a range of topics (e.g. standards for survey development, issues with software development tools, usefulness of modelling techniques), and locally developed and used work practice guidelines. Together these different sets of documents fill many of the gaps left by the formal EA documents. However, as noted by Harmon (2003), "A pile of documents does not make an enterprise architecture."

In the EA team there is frequent mention of the level of loyalty[3], trust and respect between management and staff. This is due, at least in part, to a much lower level of change thrust upon ABS than other commonwealth agencies. ABS has been in one portfolio (Treasury), administering primarily the same legislation since 1932; there have been six changes to the legislation since 1973. Other areas in government have had 50 changes to legislation during that time (e.g. Social Security Act), and / or multiple changes in portfolio (e.g. Disabilities).

The directly funded EA team consists of a senior manager and three senior consultants. There are a further 12 people in TSD with architecture as a primary, sometimes sole, role. To develop the links with business areas there are the four internal account managers whose primary role is liaison between TSD and business areas.

A3 size posters stored in a Notes database are the primary sources of EA-artefacts. While there is notionally a standard for these posters, the results often differ in 'look and feel', with differing ancillary information such as contact details for poster or topic owners. Should the poster reader require further information, the 'BSC Business Process Improvement' poster lists nine 'champions' (one per topic area). In contrast, the 'Business Process Taxonomy' poster has no contact details. Some topics also have extensive meta-data on the poster database (legends, definitions, security), although many have no information apart from the poster itself. Even if a 'complete' set of metadata is present, this only represents a small proportion of the information on a topic, let alone the knowledge, required to fully comprehend that particular topic.

Similar to many organisations[4], ABS uses a 'home grown' EA (Schekkerman 2005). This is indicative of the perspective of many organisations, perhaps best represented by the Centrelink Applications Architect claiming there is not one way of doing business and therefore, cannot be one model for EA. (Centrelink EA 2006).

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[2] While ABS is 'comfortable' with their efforts so far, they recognise there is more to be done than has been achieved so far. ABS EA (2006(1))

[3] ABS has among the lowest turnover rates of staff (2.3%) in the Commonwealth Public Sector. Some agencies have up to 19% staff turnover a year. (APSC 2005)

[4] Percentages of organisations using 'home grown' EAs vary over-time from 22% to 34%, with Zachman's approach being the 2nd most popular varying from 12% to 24%.

There is discussion of applying EA more broadly than 'just' to IT, but there is no planned approach toward this end. The EA focus is very much from the perspective of IT (TSD). This is reflective of the more usual approach of EA being a 'creation' of IT (Kluge 2006), and the reluctance of TSD to 'oversell' EA (ABS EA (3)). TSD's view is that it is difficult enough to manage IT issues of EA without attempting to include enterprise-wide EA perspectives.

ABS has substantial knowledge of various EA models but uses a largely 'home grown' approach. Elements from frameworks such as Zachman, the now defunct Meta Group (Meta 1999), Gartner (Schulman 2004), TOGAF (The Open Group 2002), etc, are used to inform EA related activities. A presentation to TSD staff (ABS AA 2003) surveyed features of TOGAF by comparing it to FEAF, TEAF, CIMOSA, and C4ISR. One line in the summary typifies the ABS approach: "pick those parts of TOGAF that are useful".

This 3 dimensional model (ABS EA Developer, 2006) has been developed as a means of initiating discussion.
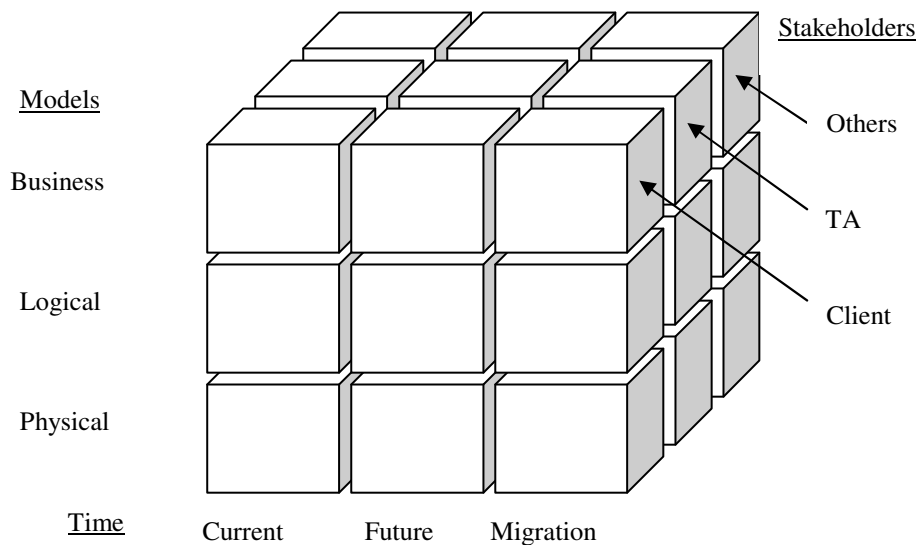

Figure 1: Enterprise Architecture – ABS Discussion Model

This model is used to prompt discussion rather than all cells needing to be completed. When combined with 'dumb' questions (based on 40 years experience in ABS and IT), information can be collected for the EA. When collecting information for the web gateway, the dumb questions included "What *Physical* models have been developed for the *Client* for the *Current* system?" In this case the answer was "None"!

Stakeholders: include the two primary participants *Client*, (the owner of the area of interest), and *TA*, and *Others*, representing business areas, people external to the organisation, and other areas in TSD.

Migration: includes elements such as gap analysis, change management, and metrics such as cost-benefit, milestones, etc, to know when the change has been implemented and how 'success' is to be determined.

Commonwealth government agencies use a variety of approaches to managing their EA including:

- Project Management as a basis for EA (e.g. CrimTrac and the Department of Education, Science and Technology). Project Managers undertake EA as part of their project management role and consider the impact of their project on existing infrastructure and systems, and on the organisation itself. This approach is functional, relying on experienced project managers, even though a formal EA is not described or used in these organisations.

- Internally developed using components from several EA models without any one model being a primary source (e.g. the ABS and Department of Family and Community Services and Indigenous Affairs). The ABS approach is an ever-evolving process with the new EA artefacts continuing to be developed.

- An amalgam of the C4ISR Architecture Framework and Meta Group Enterprise Architecture Framework in the Department of Defence.

- Zachman Enterprise Architecture Framework as adapted for use in Centrelink; and

- Internal developments influenced by Zachman and TOGAF in ATO.

THE CASE STUDY

Martin (2005) evaluated the ABS and three other government agencies against ISO 15704. Research between December 2001 and October 2003 (Martin p. 70), showed the ABS as satisfying each of the (then) seventeen

requirements except for 7 and 14[5], which weren't undertaken in the ABS, Centrelink, or Queensland Department of Main Roads.

Using an updated version of Martin's model (Appendix 2), ABS is assessed against each of the ISO 15704 requirements, giving examples of the artefacts (EA and non-EA), and processes, used to satisfy each requirement, or a discussion of why this requirement is not being satisfied.

Applicability and Coverage of Enterprise-Entity Types

    1.   Enterprise Design

There is little formal EA documentation of this requirement. Legislation is a prime driver of the business of the ABS which is also influenced by parliament (including the minister), other government agencies, ASAC, consumers, and business partners. Until the "Overview of the ABS" (ABS FWP 2006) was published there was no single source of information about ABS and its relationships with stakeholders. These relationships may have been well understood (I observed several hand-drawn versions) but it had not been published. At a high level of abstraction there is some descriptive material on how various stakeholder relationships are managed. For example, the Corporate Plan (2005) mentions collaboration with ASAC but there is no discussion of how this is achieved. In formal EA documents, ABS interaction with ASAC is briefly mentioned several times, but again there is no elaboration of how these interactions is to be managed.

There is substantial documentation on ABS's role as Australia's central statistical authority, including various professional and technical requirements for compiling, analysing, and disseminating statistical information. This is published at a *business* level (see Figure 1) in the EA, at *logical* levels in the corporate manuals, and is further detailed in Workgroup documents. Although not formally part of the EA, the corporate documents, and almost all of the Workgroup documents, are discoverable through the ABS knowledge management system.

The ABS EA has never been intended to model the whole organisation[6], focussing on what is considered to be achievable (ABS EA (2)) i.e. on those elements of the EA over which TSD has control. This is evident in the large number of current posters, 55 of 95 (ABS EA Poster Database), focused on TSD requirements (e.g. IT security architecture, SOAP messaging life-cycle, technical perspectives of XML).

Since the beginning of 2006, ABS have been using a consultant (a retired staff member with more than 40 years experience in ABS and TSD) to develop, and facilitate development of, EA posters. This has varied from providing guidance while people develop their posters, through to becoming the de-facto project manager in gathering EA requirements, developing conceptual models, and producing the EA artefacts.

Of the 40 non-TSD posters, TSD were responsible for the development of 21, TSD staff now in business areas developed 11, with only 8 being developed by people outside of TSD. For example the "Business Process Taxonomy" posters modelling the business processes of designing, collecting, evaluating, and disseminating population census data, were largely prepared by people in TSD. The preponderance of posters, and the location of the poster authors, highlights the ABS EA as still being primarily an IT activity.

This is changing as shown by the production of the EA-relevant "Overview of the ABS" poster in the FWP. People may also be undertaking EA activities without recognising they are EA activities. An Architecture Panel meeting was held with the chair apparently wondering why this meeting was being held, although they knew they had to hold one (ABS EA 2006(4)). An aim of the ABS EA is to have EA become subsumed into the fabric of ABS; to "become part of their 'business as usual' ".

    2.   Enterprise Operation

As mentioned in "1. Enterprise Design", four of the five major aims of the EA are focussed on IT (ABS EA 2004), and only one focussed on 'business'. In addition, only some of the processes associated with the EA are described, or even mentioned, in formal EA documents. For example, described activities include:

- The Forward Work Program – allocating and monitoring priorities for all ABS business activities.
- IRMC – oversees allocation of priorities and funds to IT projects.
- Architecture Panels – bringing together selected TSD staff to assist the system development process.
- Project management framework – all activities associated with project management.

Activities that occur but are not described in EA documents include:

- Multi-day corporate off-site sessions for the more than 50 ABS senior executives;

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[5] Requirements 8 and 9 are additions to Martin's version. What was requirement 14 is now requirement 16.

[6] Four of the five major aims of the EA include a reference to IT e.g. "to help us build an IT environment" ABS Enterprise Architecture poster (v1.1)

- Monthly CIO open forums where topics of interest are presented to all staff;

- Multi-day off-site sessions for the 50 or so senior TSD managers;

- Technical presentations from business areas;

- ABS-Tech, a bi-annual month long virtual conference for all ABS staff; and

- TSD breakfasts where senior TSD managers and a rotating group of staff at all levels meet six times a year to raise and discuss issues at a number of levels.

Many activities are not part of any formal documentation but occur as part of an unwritten communication strategy.

Enterprise Concepts

    3.   Human Orientation

There is only limited information addressing this requirement in the formal EA documents. Roles associated with governance of the EA are included in some of the posters (e.g. IT Governance) and other EA processes (e.g. project approval and funding processes) identify the various committees and panels to be used when seeking funding and other approvals for projects.

Independent of the formal EA documents, the organisational structure is outlined in a number of corporate documents and databases including the ABS "Corporate Directory" listing all staff and contractors, and locates them in the organisational hierarchy. Although local and corporate job titles are included, the Corporate Directory has limited descriptions of roles and responsibilities. Also independent of the EA, are numerous corporate manuals and databases such as the "Chief Executive Instructions" and the "Delegations Database". These manuals and databases are the primary source for information in areas such as who has authorisation "to spend public monies", recruit, conduct surveys, and so on.

    4.   Process Orientation

The primary business functions of the ABS (i.e. collecting, processing and disseminating statistical products), are represented, primarily at a *business* level, by only 19 of the 40 non-TSD posters. By far the majority of the *logical* and *physical* ABS EA information is contained in the more than 1,700 sections within the corporate manuals, and in Workgroup databases.

Two EA posters address the "ABS Control Framework" establish requirements for corporate governance; outline the legal framework, corporate structure, corporate committees; and make reference to corporate manuals. Specific areas addressed in this framework include organisational objectives such as capability and engagement marketing, staff, privacy, financial and risk management, business continuity, asset management, and information technology.

However there are several major ABS business functions only covered in the corporate manuals and not in formal EA documents. These functions include the production, dissemination, collection and processing of statistical questionnaires, legislative processes, human resource management, and financial management.

    5.   Technology Orientation

The majority of the EA posters are technically oriented. This is consistent with the literature (Kluge 2006) and the view in TSD that it is difficult enough to control what is happening in TSD without attempting to bring in business area, CEO, and deputy CEO perspectives (ABS EA, 2006(2)).

Even here there are gaps in what has been developed. XML posters were developed by members of the EA team and are covered in depth. Other topics covered include SOAP, SQL, programming languages, and various hardware platforms, although often only at a *business* level with little *logical* or *physical* level detail.

Some posters (e.g. the web gateway), have only recently been developed. An early draft of the web gateway poster highlighted the value of the 'to-be' architecture (Kluge 2006). After a meeting to discuss progress, the draft poster was immediately used in a meeting to facilitate discussions with the primary business user.

    6.   Mission Performance

The Business Process Taxonomy posters address the main business functions of the ABS. Together with posters describing business continuity, risk management and community engagement, the EA largely addresses this requirement, at least at a *business* level.

Given that any area can produce a poster in almost any style, there are few limitations to representing business processes in the EA. The collection of 'taxonomy' posters, although still A3 size, are substantially different in 'look and feel' to other EA posters (see Appendix 1 – ABS Business Census Class). A further example is the "Overview of the ABS" (Appendix 1) representing ABS in the context of its relationships to parliament, government and Australian citizens and business. This model was produced using the 'look and feel' of EA posters but does not form part of the formal EA documentation.

7. Framework for Enterprise Modelling

There is no published ABS EA model nor, as was noted in Background, any one EA model being used as a base. One result is a lack of consistency in the representation of function, behaviour, information, resource, and organisation (ISO 15704), in EA posters (e.g. Appendix 1 'ABS Census Class' and 'ABS Service Architecture'). These posters represent the extremes of differences between posters. Aside from specific information related to the function they are representing, posters generally include a purpose, identify the audience, and provide contact details. Some posters satisfy each requirement while others address only some.

In addition, information from the 'design rationale' (i.e. decisions made during EA artefact design, such as specific inclusions and exclusions e.g. Preece 1994), could be recorded and made available. The ABS EA Developer (2006(1)) discussed the value of including meeting notes, design reviews and, in the style of 'good' knowledge management, possibly video recordings on the nature, use, and limitations of individual posters.

An outcome of more recent discussions with the ABS EA Developer (2006(2)) was his development of the three dimensional model shown in Figure 1. Each cell would ideally be completed for each poster topic e.g. the web gateway. The initial set of information for the web gateway project had a strong *physical* orientation, was focussed on the *current* system, and was intended for use only within the team. Over several meetings, the outputs moved to a *logical* level for the *future* architecture, with some *business* aspects also being considered. Using the revised web gateway as an example, the three levels of detail would be:

(i) *business* level – how business requirements may be presented to users of that service (e.g. a statistical collection or dissemination process or service);

(ii) *logical* level – how application software will interact with services offered by the web gateway; and

(iii) *physical* level – the technical components supplying this service e.g. model numbers, software versions.

The reality of limited resources means that a *logical* level poster is often the only output.

The pervasiveness of the EA poster 'look and feel' has already been mentioned with it being the model for the ABS FWP. The same look and feel has also been applied to posters for some strictly non-EA activities e.g. how to operate data projectors in conference rooms.

8. Economic View

The FWP committee oversights funding allocations for all ABS projects. Where projects include IT expenditure, this is managed by the IRMC. The IRMC assesses value-for-money and priorities for IT projects, and provides oversight of projects. The economic view is only given brief mention in EA artefacts but receives significant attention in corporate manuals. However, economic considerations are taken into account, and have changed projects, and the outputs of projects. For example, the web gateway project became a priority as the internet site is increasingly becomes the 'face' of ABS. There has been a higher focus on cost reduction using interactive collection of data and the online provision of published information. Web site accesses have grown from 8.9 million (1998-99) (Annual Report 2001-02) to 60.6 million (2004-05) (Annual Report 2004-05).

Duplication of effort and effort focussed on purely local issues has been substantially reduced, although the reasons are not clear-cut reasons whether this was the result of EA or just 'good management'. This aligns with the Ross et al (2006, p 2) where management of core processes reduces the money being 'frittered away' on non-core processes. As is discussed further under *Enterprise Modules*, ABS has been applying these practices prior to EA. For example, one areas survey production, distribution, etc, has become a corporate function managing these activities for all ABS surveys. (ABS EA Developer (2)) (further elaborated under *16 – Enterprise Modules*.

The value for money provided by the EA to the ABS is not being explicitly measured, but is an area of concern (ABS EA 2006(1)). While the perceived value of EA is understood by senior levels of management (e.g. there is explicit ongoing EA funding in the IT FWP), EA-related outputs are constrained by available resources. Metrics to assess the value of EA to ABS are being examined but are still at a very early stage. A role ABS EA considers essential for the EA is to provide value to both senior management and to the users of the EA.

9. Decision View

The decision view was a prime reason for ABS adopting an EA approach to business and IT alignment. The EA was intended to be a "framework for getting sensible people to make sensible decisions" (Fitzpatrick 2003). More than 50 of the 95 posters explicitly refer to decision support available by using that poster with statements such as "the investment decisions and decision to narrow the gap" between the 'as-is' and 'to-be' architectures (Maintaining and Using the ABS EA) and "promote and communicate management decisions" (ABS EA).

In addition, the IT components of the FWP are managed by the IRMC, and are intended to support the allocation (and re-allocation) of funds and priorities for all IT projects. Activities not allocated funds in the FWP process will not be able to commence or to continue. For IT projects, approval is critical as the sole source of funding is via charge-back to business areas. The IRMC meets four times a year to set project priorities and funding, and provide

project governance through a monitoring process. The IRMC is chaired by a Deputy Statistician (2nd in charge of ABS), and consists of senior managers from each major business function, and senior IT managers.

Project Boards (business and TSD representation), and Architecture Panels (selected TSD staff), meet from project initiation, through development, implementation, and sometimes conduct semi-formal project reviews.

10. Life Cycle

The Business Process Taxonomy describes the statistical life-cycle and refers to various activities undertaken during the life-cycle and to the various business process classes affected by that life-cycle. These business classes are described at a *business* level with *logical* and *physical* levels described in the Corporate Manual and / or Workgroup documentation. Life-cycles may be triggered by events such as the cyclical nature of statistics (the agriculture census is run every five years) or the retirement of technology (e.g. the mainframe). The ABS also maintains an annual calendar of business events.

The EA life-cycle is not mentioned in the primary poster ("ABS Enterprise Architecture") but is briefly described in the "Maintaining and Using the ABS Enterprise Architecture": "To ensure the ABS EA remain current, we will: review and renew every 6 months …". This has not been followed with, in some instances, more than two years elapsing between reviews although a significant EA 'refresh' is in progress. There are various other life-cycles (e.g. software management) that are also described in EA documentation.

As an aside, one Architecture Panel meeting (Agriculture Census 2006) highlighted the relatively low staff turn-over with people not only discussing the current agriculture census development, but several people at that meeting able to recount their experiences from participation in the two previous agriculture censuses!

11. Modelling Views or Sub-Architecture

The development of views of EA artefacts, to provide representations of different perspectives for EA consumers (also suggested by Henderson 1999 and Kluge 2006), is a recent addition to the ABS discussion of EA artefacts. This was raised during the development of the web gateway materials but is yet to be developed. Resource constraints, including limited software support for the EA, and the manual effort required to develop those different views, mean the development of views is likely to remain on the ABS wish-list. EA artefacts will continue to be developed for the primary audience with alternative views only being developed as needed.

Architectural Components

12. Information System Development Methodologies

The primary information systems in ABS are those associated with the collection, processing and dissemination of statistics, and are described, at the *business* level, in the Business Process Taxonomy poster set. Detailed descriptions of activities associated with these processes are contained in the Corporate Manuals and Workgroup documentation specific to the business area.

In IT, the Software Development Process is defined as a process in the context of the Project Management Framework. The 'Proposed Software Process Life Cycle' describes the phases of the systems life-cycle from inception to retirement and provides brief descriptions of the content of each step. Detailed description is not provided in this poster nor does it link to other, available, sources of information.

13. Modelling Languages or Descriptive Constructs

There are two Business Process Management (BPM) documents and eight BPM System (BPMS[7]) documents describing the system to support BPM. The BPM posters are relatively high-level *business* content descriptions while the BPMS documents are generally high-level *logical* views. For example, "BPMS – Technical Mapping" describes, in some detail, functions of BPMS and how data flow diagramming notation is applied in BPMS. For further information the poster refers the reader to the BPMS experts or the "reference material". In addition to flow-charts, the BPMS also uses state diagrams and Microsoft's BPMN.

The ABS software development process uses a system development life-cycle model with reference to the project management framework. The six posters describing the SDLC are at the *business* and *logic* levels with informal models of the process used. The SDLC supports both UML and traditional structured methodologies and models. For TA readers, there is extensive documentation provided on the application of XML.

14. Enterprise Models

As noted in the Introduction, the ABS EA is not model based. Patterns are applied to a hierarchy of posters with differing levels of detail, usually developed with a common look and feel. The "Overview of the ABS" model (Appendix 1), while using the ABS EA look and feel, was produced without reference to ABS EA staff and is not part of the formal EA documentation. A stated aim (ABS EA 2006(2)) is "not to do EA", rather to "have EA become a normal part of business".

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[7] The BPMS, based on Notes Workflow, allows mapping of workflows and execution of automated workflows.

The Input Data Warehouse (IDW) poster series provides a 'single' view of ABS data and information for collection, verification, storage, and dissemination. The IDW includes a class diagram identifying 'facts' and their 'sources', and links to the "Output Production and Dissemination Class" business processes. These models are used by all business areas in ABS e.g. household surveys and census, economic surveys.

15. Enterprise Tools

Standard tools used by ABS are incorporated into EA documents. An EA management tool is not part of this suit of software. The primary tool used is IBM Notes which, aside from being used for word processing, spreadsheet, presentations, and email, is also used for workgroup messaging, and the collection, storage and use for personal, workgroup and corporate information management. ABS had used mainframe computers since the 1960's but, except for one application, had phased out its use at the end of July 2006. Servers are predominantly Windows platforms using a range of products such as UML, SOAP, Microsoft's ".NET" environment, and SQL databases.

The standard set of IT infrastructure (software, hardware, database, and network tools) is used with limited exceptions, although there is a healthy ongoing debate, both formal (in TSD planning meetings) and informal (via the online discussion forum) on the merits of continuing to use or change to a new standard.

16. Enterprise Modules

The EA outlines intended directions for further development of business processes as a series of components. While this has been an ABS intention since 2001 (ABS EA poster 2001), in IT there has been only limited progress toward this goal. For example, version 2.0 of the Application Architecture poster in October 2002 outlined the expectations of Service Oriented Architecture (SOA). In mid-2006, SOA is still the subject of ongoing research into determining the most effective means of implementation.

Outside of IT, and only partially covered in EA documents, the ABS is implementing modular systems in a number of business areas. Survey production, distribution, return, and data capture and editing, are among the services that have become a business service function rather than each business area undertaking these activities. Centralising these functions (in Sydney), has enabled business areas to focus on their areas of expertise. This ongoing process is represented in the (non-EA) Business Process Improvement Guide, although some processes (e.g. Business Statistics Innovation Program), are represented in EA posters.

17. Operational System Descriptions

Two posters (one *business* level, one *logical*) give overviews of the software systems with one *business* level poster describing the hardware systems. There is little formal documentation at the *logical* or *physical* levels at the detail required for operational use. The "IT Infrastructure Architectures" poster describes the functions provided, and the software used to provide those functions, but makes no reference to hardware apart from a high-level network diagram. Recent efforts to document the proposed web gateway development is in response to requests for information from a number of sources. The senior business manager responsible for information dissemination wanted to understand the business opportunities offered by the proposed changes; business managers at the operational level seeking to understand how they could meet their (external) client needs; and applications developers wanted to understand the web gateway's capabilities and constraints.

Discussions ranged across the *business*, *logical* and *physical* levels but resource and time constraints constrained output to the *business* level with some *logical* level information. This level poster was seen as the highest priority by senior managers in TSD: i.e. most likely to meet client needs. During development, the responsible area recognised the potential benefits of producing posters at each of the three levels, and has now added these tasks to their future workloads.

Architectural Representation

18. Graphical Depictions

It is unusual for EA posters not to contain some form of graphical depiction with some posters consisting solely of models and accompanying labels, but not always any description. The models are 'informal' (Noran 2003) representing the perspective of the author, or authoring area. Few of the models represent information in a form that is necessarily meaningful to the proposed target audience (Henderson 1999, Kluge 2006). ABS is aware of the discrepancies in models but is of the view that it is better to have an artefact of some use, rather than force authors into specific modelling techniques that then become a barrier to development of the artefact,

As noted in Technology Orientation, much of the technical infrastructure is not included in either formal EA documentation or even in 'discoverable' documentation. Documentation at the *logical* and *physical* levels is more often represented in partially completed formal models, hand drawn models, on white-boards, and in personal collections necessary for people to maintain the infrastructure. Only at the *business* level is this information sometimes represented in the EA. Inclusion of this information in the EA is an increasing priority with additional resources being provided and TI incorporating EA tasks into their ongoing workload.

Architectural Glossary

19. Glossary of terms

A consolidated glossary of terms is not available as part of the EA, nor is there a corporate repository of terms. A corporate Wiki has been raised by their knowledge manager although not developed. Some posters contain lists of terms but most do not, relying on other sources of information in ABS for such descriptions.

The "Business Process Taxonomy" poster includes several terms understandable by most in ABS (e.g. SAS), but some terms (e.g. OLAP), would not usually be understood outside of TSD. This poster contains 18 acronyms of system names and software tools (e.g. ABSIW, PL/SQL), only three of which are described. Posters such as "IT Governance Framework" have only two acronyms, both of which are described.

CONCLUSIONS

As is being demonstrated in ABS, EA is a long-term commitment that cannot be built and utilised with short-term bursts of enthusiasm. The relative stability of ABS itself, and it's particular environment, has enabled ABS to develop their EA over a '90 month' period which can be contrasted with the often used '90 day' EA consultancies (FaCS and UC being just two examples). Even within ABS, one of the ongoing features is the continued 'selling' of EA to ABS staff (e.g. publication of posters, and use of more formal mechanisms such as Architecture Panels – 34 were held in 2005). An aim of the ABS EA is to make EA part of the culture of ABS: to become part of the 'business as usual'; not an add-on; not be seen as an overhead. The ongoing effort to maintain interest in the EA distracts resources from continuing the enhancement of the EA, hence the engagement of a former ABS staff member as a consultant to assist with creating and updating EA artefacts. The ABS EA (2006 (1)) considers the EA task will never be completed, with the task currently, at best, not even half done.

ABS places a strong emphasis on EA knowledge retention. Consultancies are only used when it is deemed the knowledge is not available in ABS. One outcome of any EA consultancy is expected to be knowledge transfer to ABS to enable the continuation of maintenance and enhancement of those particular aspects of the EA.

Other government agencies operate in a more dynamic environment with substantial movement of business functions requiring a more intense focus on architectural survival (e.g. integration of heterogeneous networks). As such ABS cannot be a model able to be copied as is, but can provide insights into 'the possible'.

In TSD there are strong links between strategic IT planning and the EA with all funding requests being measured against the current and future EA. The ABS developed its first IT Strategic Plan in 1981 and has had formal IT planning ever since. ABS had IT architectures, such as security and networks, in the 1980's but, until the publication of the EA posters in 1999, these had little impact. At a corporate level however, the link appears, at least formally, not to exist. The 2004-2005 ABS Strategic Plan makes no mention of Enterprise Architecture. The Strategic Plan makes several references to the FWP but no specific mention is made of the contribution of IT, even though there is substantial TSD input into the FWP via the IRMC.

As noted earlier, the formal EA is still predominantly a set of IT artefacts. This may be changing (e.g. the production of the "Overview of the ABS" in the FWP (see Appendix 1) but, for some time yet, the EA is likely to be remain a predominantly IT EA, rather than become a corporate EA.

The EA itself, and the use of EA, has done little to make EA an object of dislike. Of the people interviewed during this research there was some disappointment expressed at the EA not being seen to fulfil its promise, but none who saw the EA as being detrimental to the operation of the ABS. This can be contrasted with personal experience in one government agency when there was overt hostility among some of the (relatively few) people who were aware of attempts to develop an EA.

An aspect of EA that is becoming more prevalent is the standardisation of business processes. As raised in *16 – Enterprise Modules*, ABS has both non-EA business improvement guides and EA innovation programs aimed at improving and rationalising business processes. For example, the Business Statistics Innovation Program "… will set a platform for the future management of our business statistics activities by making improvements in our statistical, technological, methodological and organisational arrangements which will deliver tangible business benefits." This aligns with Ross et al (2006, p 112) when they state that "As companies mature their architectures, they position themselves for greater strategic impact from IT because their focus shifts from technology standardization to IT-enabled process standardization and integration."

Use of the EA, rather than just its production, is considered to be critical to the success of the EA. The journey in producing and using EA documents is important as is having a 'critical mass' of relevant materials. Even with the current set of EA documents, there is no 'neat' set of documents linking strategic directions with 'everyday business' (ABS EA 2006(3)).

Formal EA documents constitute only a small portion of the ABS EA. The majority of documents relevant to the EA are either Corporate documents or in Workgroup storage areas. ABS generally offers support to the findings in Kluge's (2006) paper that the 'to-be' architecture and governance are the two most valuable EA artefacts. The ABS

FWP process provides oversight of all corporate projects (business and IT), and the draft poster of the proposed web gateway was an immediate success enabling a dialogue between TSD and business areas.

In line with the life-cycle model in ISO 15704, ABS is in the process of 'refreshing' their EA. This version of the ABS EA appears to be coming from a more mature base and is less reliant on strong personalities for the EA to occur, although strong management and leadership is still required.

FUTURE DIRECTIONS

In Commonwealth government agencies, even when a formal EA is present, standards-based models are little used e.g. models such as ISO 15704, RM-ODP, CIM-OSA, IEEE 1471. Surveys conducted by Schekkerman (2005) do not indicate any significant use of standards-based EAs, apart from CIM-OSA in the 2003 survey results. Understanding reasons for this lack of use may improve the applicability of these models.

Despite some effort being made in the ABS and other government agencies, there is little 'hard' evidence of the value being provided by an EA. Means of valuing the contribution of an EA may also assist in determining the relative value of various home-grown, industry and standards based models toward improving the efficiency, effectiveness, and / or the agility of organisations.

The role of Corporate and Workgroup documents in the ABS EA may be indicative of what occurs in other organisations, particularly those organisations without a formal EA, but still having significant repositories of EA-like information. An analysis of the state of EA in other government organisations may confirm this occurs more frequently or, at least indicate alternative approaches to EA.

Initial observations of the ABS seem to indicate the organisation is a relatively mature, at least in terms of the EA culture. This research will be the subject of a further paper.

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APPENDIX 1

ABS Enterprise Architecture

ABS Business Census Class

ABS Service Architecture
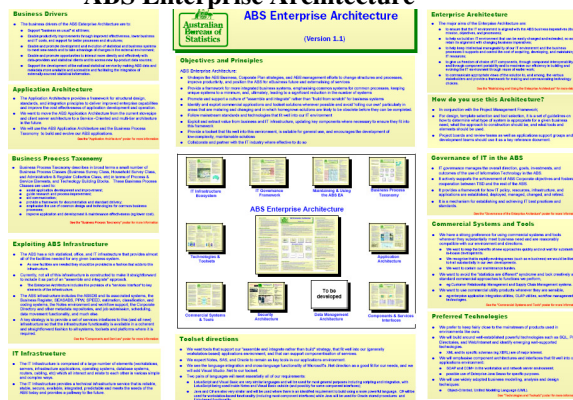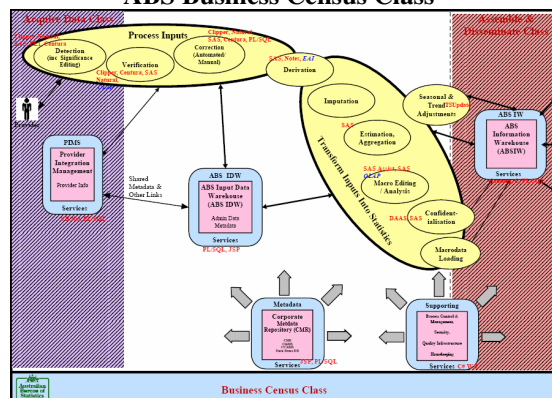
Overview of the ABS – from FWP

APPENDIX 2 – REQUIREMENTS FOR ENTERPRISE ARCHITECTURES (STRUCTURE AND COMPONENTS)

Requirement	Sub-Category	Description
Applicability and Coverage of Enterprise-Entity Types	1. *Enterprise Design*	The Enterprise Architecture shall identify activities required to manage, describe, design, implement and maintain enterprise entities.
	2. *Enterprise Operation*	The Enterprise Architecture shall identify activities required to develop or operate enterprise entities
Enterprise Concepts	3. *Human Orientation*	The Enterprise Architecture shall exhibit the capability to represent human aspects, such as roles and responsibilities, authorizations, and relations to the organisation.
	4. *Process Orientation*	The Enterprise Architecture shall exhibit the capability to represent process-oriented functionality and operational behaviour
	5. *Technology Orientation*	The Enterprise Architecture shall exhibit the capability to represent all technologies employed in the enterprise operation.
	6. *Mission Performance*	The Enterprise Architecture shall exhibit the capability to represent any process or constituent activities involved in performing the stated enterprise mission.
	7. *Framework for Enterprise Modelling*	The Enterprise Architecture (that is model-based, such as CIM-OSA cube, ARIS house) shall exhibit the capability to model entities within the conceptual space. In general, Enterprise Architectures that are model-based shall include these four mode-content views: function, information, resource, and organisation.
	8. *Economic View*	The Enterprise Architecture shall exhibit the capability to assist managers to predict and monitor investments; designers to identify economic benefits; and developers to evaluate economic consequences.
	9. *Decision View*	The Enterprise Architecture shall exhibit the capability to support decision-making for the functional categories of products, resources, time and combinations of these functional categories.
	10. *Life Cycle*	The Enterprise Architecture shall identify and represent the life-cycle phases that are pertinent during the life of the enterprise entities.
	11. *Modelling Views or Sub-Architecture*	The Enterprise Architecture (that is mode-based) shall provide concepts for representing different views to the user. The Enterprise Architecture (that is not mode-based) shall provide representations of different Sub-Architectures to the user.
Architectural Components	12. *Information System Development Methodologies*	The Enterprise Architecture shall provide Information System development methodologies that guide the development of the enterprise Information Systems.
	13. *Modelling Languages or Descriptive Constructs*	The Enterprise Architecture shall identify enterprise modelling languages or descriptive constructs that allow the enterprise operation to be described.
	14. *Enterprise Models*	The Enterprise Architecture (that is mode-based) shall support the concept and creation of enterprise models.
	15. *Enterprise Tools*	The Enterprise Architecture shall be supported by a set of computer-based tools that aid integration of projects.

Requirement	Sub-Category	Description
	16. *Enterprise Modules*	The Enterprise Architecture shall be capable of representing the concept of enterprise modules, building blocks or product families.
	17. *Operational System Descriptions*	The Enterprise Architecture shall be capable of describing the design or model of operational hardware and software systems.
Architectural Representation	18. *Graphical Depictions*	The Enterprise Architecture shall be capable of providing a high level of graphical depiction of the architectural components.
Architectural Glossary	19. *Glossary of terms*	The Enterprise Architecture shall provide or reference all terms used in architectural efforts.