Abstract

Data users are becoming more sophisticated and require data faster, cheaper and in a more integrated format than ever before. If National Statistical Institutes are to remain relevant, they must respond to this changing environment.

The Australian Bureau of Statistics (ABS) is currently undertaking a major business transformation program. This program recognizes ABS needs to manage its information as a corporate asset, and that information becomes more valuable the more it is used and shared. The change program has a number of goals, including creating a client environment where statistics are readily available and can be integrated easily with data from other sources; a statistical production environment that is both flexible and efficient; and a systems environment that is built around standard models and supports collaborative developments internationally.

This paper discusses ABS experiences and lessons learned from operationalizing our metadata frameworks across the statistical cycle, and in the context of international collaboration efforts. It also briefly discusses issues and challenges for the future.

Key Words: GSIM, HLG-BAS, lessons learned, metadata, metadata frameworks, operationalizing metadata

1. Introduction

The topic of operationalizing metadata frameworks is receiving more widespread, more active, more consistent and more strategic attention than ever before at an international level among producers of official statistics. The paper discusses two shared strategic challenges which have led to this increased attention in Section 2.

The topic itself, however, is far from new. While this paper presents an ABS perspective that draws on historical experience and the consequent evolution of thought and practice over time, in most instances similar “lessons learned” have been reported by other agencies.

When looking ahead to remaining challenges in regard to operationalizing metadata frameworks, it is useful to take stock of how far understanding and practice has progressed already. It is also vital the lessons of history are kept in mind as we continue to progress - we can’t afford to repeat them!

This paper discusses operationalization at various levels

- international
- whole of agency (ABS)
- teams responsible for a particular “subject matter area” (e.g. Labour Force, Consumer Price Index).

It is important to consider these different levels because the effective operationalization of metadata frameworks embodies the principle “think globally, act locally”. Specifically

- a centralized “command and control” approach to production of official statistics is unlikely to be sufficiently responsive to domain specific statistical requirements, including changing use requirements and new opportunities within individual subject matter areas

1 The views expressed in this paper are those of the authors and do not necessarily reflect those of the Australian Bureau of Statistics.
a fully decentralized approach to production of official statistics is likely to result in a range of subject matter specific products, datasets and definitions which are not harmonized and cannot be integrated to provide a multifaceted perspective on a particular problem or issue a user needs to analyse.

Section 2 of this paper provides a summary of current international strategic directions in regard to developing and consistently operationalizing shared metadata frameworks as a key element of industrialization and standardization of statistics production. These directions are consistent with ABS thinking expressed over the past three years, and with many elements of ABS thinking before that date.

Having briefly discussed what is meant by “operationalizing metadata frameworks” in this context, and how it relates to broader strategic directions in business architecture for statistics, Section 3 then briefly summarizes benefits from operationalizing metadata frameworks, as understood in the international and ABS context currently. Section 3.1 underscores why it is essential that business benefits are explicit, credible and correctly attributed in order for a metadata framework to be operationalized successfully. Section 3.2 summarizes general benefits, and Section 3.3 summarizes additional benefits when the framework and its operationalization are agreed internationally.

Section 4 examines the historical context specific to the ABS, and is divided into four chronologically based “phases” ranging from the 1980s to 2009 onwards. Each subsection concludes with a summary of the advances made during that evolutionary phase as well as the lessons which shaped the approach taken during the next phase.

Section 5 briefly introduces the current ABS Statistical Information Management Framework and approaches to its operationalization. It highlights that it is essential to not only have a sound and agreed conceptual model (5.1) but also governance (5.2) and capability (5.3) – from the perspective of people, processes and technology – to drive and support consistent and effective operationalization of a metadata framework. The design of the Statistical Information Management Framework and its operationalization draw on the lessons learned from the phases described in Section 4.

The paper summarizes a 30 year journey for the ABS, and where we find ourselves now in an international and agency specific context. It is expected the journey will continue with further lessons learned over the next decade. Section 6 summarizes five high level conclusions based on the journey so far.

2. Current International Context

2.1 Establishment of HLG-BAS

At the heart of the current international context is direction setting by the High Level Group for Strategic Developments in Business Architecture in Statistics (HLG-BAS). HLG-BAS was established by the Conference of European Statisticians (CES) in 2010, with a mission to oversee and guide discussions on developments in business architecture for the statistical production process.

To this end, an inventory of nearly 30 international groups has been established whose work is relevant to fulfilling various aspects of the mission of HLG-BAS. This includes a number of international groups related to metadata. A key example is the Steering Group on Statistical Metadata (METIS), which reports directly to HLG-BAS.

HLG-BAS currently comprises the heads of five National Statistical Institutes (NSIs) and three international statistical organizations (UNECE, Eurostat and OECD). Each member of HLG-BAS is therefore in a position to ensure practical progress through marshalling and co-ordinating the resources of their own agency, and through influencing other heads of agencies that do not participate in HLG-BAS directly.

While HLG-BAS was commissioned by CES, its intent is to promote developments in business architecture in conjunction with the full international community (or “industry”) of producers of official statistics. HLG-BAS has already undertaken outreach to other UN Regional Commissions, such as ESCAP (Economic and Social Commission for Asia and the Pacific).
2.2  **HLG-BAS Strategic Vision**

An early deliverable from HLG-BAS was its Strategic Vision. The vision was endorsed by CES in June 2011, and work is currently underway to finalize the strategy for putting the vision into effect.

The vision has been very important in crystalizing, and expressing in shared terms, strategic drivers which had been recognized by a number of agencies, including the ABS. The paper, *The Case for an International Statistical Innovation Program - Transforming National and International Statistics Systems* (Pink, et. al., 2009), is an example of earlier ABS thinking in this regard.

The HLG-BAS Strategic Vision focuses on two sets of challenges

- the “product” challenge of ensuring the on-going relevance and fitness for purpose of the outputs of statistical agencies in an environment where user needs and expectations are changing, and other sources of information are proliferating
- the “process” challenge of ensuring internal production processes are both agile enough to meet rapidly evolving user needs for products, and standardized, streamlined and automated enough to be sustainable in a climate of increasing needs and (in many cases) decreasing budgets.

The ABS recently characterized this as a movement toward an “Assemble to Order” paradigm in regard to data, metadata, processes and products.

2.3  **Operationalization of metadata frameworks**

In regard to the “process challenge”, the opening statement of the HLG-BAS Strategic Vision is

*The production of statistics should be based on common and standardized processes, transforming raw data into statistical products according to generic and commonly accepted information concepts.*

Emphasis has been added to the aspect of this statement which can be seen, and is seen by the ABS, as relating directly to operationalizing a metadata framework.

Within the Strategic Vision, the overall direction in addressing the “process challenge” is termed *industrialization and standardization of statistics production*. The vision also notes the production of official statistical information should have its own industrial standards, and presents a widely reproduced figure (Figure 1 below) in regard to industrializing statistics.

**Figure 1: Industrializing Statistics**
The figure is divided into the conceptual part being described by architectures and models including common standards, and the implementation part comprising best practice and standardized methods and the technical implementations. The methods and the technology are a practical implementation of the models in the conceptual area, and as such the set of standard solutions used to produce statistics.

The model aligns directly with operationalizing metadata frameworks. In particular, according to the Generic Statistical Information Model (GSIM) V0.3 (the latest version at the time of writing), GSIM is a reference framework of information objects, which enables generic descriptions of data and metadata definition, management, and use throughout the statistical production process.

3. Business benefits from operationalizing metadata frameworks

3.1 Business benefits to be explicit, credible and correctly attributed

It was formally recognized in the Strategy for End-to-End Management of ABS Metadata (ABS, 2003), that

- regardless of how well they align with international standards, or how elegant and/or innovative they are from a conceptual design perspective, metadata frameworks are of no value to an organization unless they can be operationalized (actively applied) to shape at least some of the core business operations of the statistical office
- when metadata frameworks are operationalized they need to add practical value. Metadata frameworks, similarly to other elements of enterprise architecture, will apply constraints in terms of what must be done and not done. These constraints need to be based, however, on adding value to the business through realizing practical benefits such as reductions in costs and improvements to quality through standardization and reuse. There has commonly been a concern from business that frameworks might be operationalized on a basis that values “conceptual purity” and/or alignment with external standards above net business value realized in practice.

These factors mean that proposals to operationalize metadata frameworks need to provide credible practical justifications. The fact that operationalization of metadata frameworks is now an accepted international enabler for “industrialization” presents both advantages and complications when it comes to summarizing business benefits. The complication is that it is often hard to differentiate the benefits that arise directly from operationalizing metadata frameworks, from the broader benefits that arise from industrialization of statistical production.

In regard to the latter, it is recognized by the ABS and by the authors of the latest version of GSIM, that operationalizing a common metadata framework is necessary, but not sufficient on its own, to realize the broader benefits.

3.2 Benefits from operationalizing metadata frameworks

Common metadata frameworks, if introduced effectively across an organization, improve the efficiency and effectiveness of communication between different roles in statistical production (e.g. statisticians, methodologists and information technology experts) and statistical subject matter domains.

This facilitates reuse of statistical data and metadata, saving money, improving statistical coherence, and making best use of existing data resources (reducing provider load). It also allows the different roles to work together using a common language to specify and design new methods and new IT capabilities which meet the business needs of the organization more broadly and more effectively. Once again, this saves money (in terms of development, re-work and maintenance), and promotes coherence.

A metadata framework designed for practical operationalization also supports establishment of metadata driven processes. This allows processes to be both more automated and more flexible, with more aspects of the behaviour of the process determined by the information provided to it. Costs are then reduced by

- minimizing the need for human intervention
- making information that determines the behaviour of the process explicit, rather than it being hidden “in a black box”.

Moreover risks should be reduced, including risks arising from human error, as well as continuity risks arising from changes to the environment (business or IT) in which the process is operating.
In addition to the benefits for communication and statistical production within the organization, there are likely to be benefits for the end users of data and metadata produced. For example, the operationalized common framework helps simplify the design and production of new products to meet changing user demands. Also, where the product is conceptually relevant to multiple statistical domains, a common information model implemented across those domains should help the product creation process for one statistical domain to be applied to others. An example would be products which address the growth in expectations from researchers across statistical subject matter domains to undertake microdata analysis, while guaranteeing protection of privacy and confidentiality for individual respondents.

A second area of benefit for end users is the ability to provide consistently structured, fit for purpose, metadata for all statistical outputs. At present, where metadata for different subject matter domains within the organization may be structured differently, either

- some domain specific metadata may not be readily available to end users
- where such metadata is available, users interested in comparing or integrating data from multiple subject matter areas are hindered because metadata is structured on different bases.

The benefits of improved coherence realized through appropriate reuse of data and metadata during the design and implementation of statistical production processes are also vitally important to end users.

3.3 Additional benefits from consistent international operationalization

Where metadata frameworks are shared internationally, consistent operationalization can enable the sharing of the “means of production” (as expressed by the HLG-BAS Strategic Vision). An example might be sharing components that implement specific methods to perform a specific function or step within a statistical business process (see definitions in Renssen and Camstra, 2011). Sharing could be at the level of

- component “as built” (including its IT implementation)
- component “as designed” (allowing for different IT implementations, without requiring parallel and possibly unnecessarily divergent specification and design processes)
- statistical method implemented by the component, without any technical detail on how the component implements the method.

A common metadata framework allows agencies to have a common understanding of

- the business process step that the component performs
- exactly what information inputs (including data, rules, methods, parameters and other metadata) the component requires
- exactly what information outputs the component produces (including transformed statistical data and “process metrics” describing the performance of the component, including the changes it has applied to each of the inputs).

If two agencies have operationalized the common metadata framework on a common basis, then the agency evaluating the component for possible local application could more easily present information inputs, and consume information outputs, on the same basis as the agency that developed the component.

This internationalizes cost effectiveness and consistency benefits. It also creates the possibility of sharing components designed by the world’s leading experts in any given business process step the component supports and in the statistical methods appropriate to performing that step.

The benefits described in section 2.3 in regard to communication, and for end users, are also achieved on an international scale if there is consistent international operationalization of a common metadata framework.

4. Historical perspective from the ABS

4.1 1980s

While currently out of date by around six months, a longer term historical perspective on the approach to metadata management within the ABS is provided in the document A Brief History of Metadata (in the ABS) (Hamilton, 2011), which forms part of the Metadata Case Study for the ABS within the METIS wiki.
As noted in the Brief History, a number of “data dictionary” projects were prominent in the 1980s. These promoted sharing and reuse of definitional metadata at a practical level. Some degree of process automation was achieved using this metadata. These experiences proved that, at least in the case of simple examples which did not set out to be all encompassing, metadata frameworks could be operationalized to deliver practical business benefits.

At later stages in their careers, having reached more senior and influential positions within the ABS, several staff who had leading roles in the data dictionary work during the 1980s became key advocates for subsequent initiatives. They brought with them a focus on practical application of metadata to support business processes, rather than a more abstract and theoretical perspective.

4.2 1990s
Professor Bo Sundgren from Sweden, who is internationally recognized as a pioneering thought leader for statistical metadata frameworks, undertook a five month review in 1991 which resulted in an influential paper entitled Towards a Unified Data and Metadata System at The Australian Bureau of Statistics. While it was based on conceptual underpinnings that were leading edge for the time, the paper was focused on practical implementation.

One lasting legacy of this work was a data model for the first data warehouse, the ABSDB, which was developed by the ABS. This output-oriented corporate repository pre-dated the formal and de facto standards for modelling data warehouses which emerged from the work of pioneers in that field, such as Bill Inmon and Ralph Kimball. Nevertheless, the data model based on Bo Sundgren’s work in 1991 has proved usable in a fundamentally unchanged form for nearly two decades. (However, the ABSDB’s lack of architectural congruence with “industry” standards which emerged after its design, is an increasingly pressing matter.)

The ABSDB placed a particularly strong emphasis on the metadata required to support the output data. Major repositories were developed to collect and structure metadata related to the statistical activities which produced the output data, metadata describing classifications, and so on. In this regard, and others, the ABSDB proved more “statistically aware” than more modern, standards aligned, commercial data warehouses which were investigated around a decade ago as potential platforms to replace the ABSDB.

A key lesson here, once again, was that a well-designed metadata framework can be operationalized to achieve enduring and innovative business benefits. A further lesson, however, related to practical limitations arising from operationalizing a locally designed metadata framework which was inconsistent with industry standards, as these became more clearly defined and more prevalent in application. This made it much more complex and expensive to buy and integrate Commercial Off The Shelf (COTS) solutions, where these solutions might otherwise have offered value for money.

4.3 2001-2008
A milestone during the period from 2001-2008 was the endorsement of the Strategy for End-to-End Management of ABS Metadata (ABS, 2003) by high level management. This strategy was developed in four parts over 18 months, based on widespread consultation across the ABS. In fact, the development process helped align and consolidate thinking across the ABS. High level management then agreed to a number of directions which continue to be pursued today.

These directions included recognizing the need for an agreed conceptual metadata model which was linked to the processes that form part of the statistical processing cycle, with the model using international standards wherever possible. Metadata conforming to the agreed model would then be used to actively drive statistical production processes to the greatest extent possible.

During the period the strategy was being developed, three major corporate initiatives sought to harness ISO/IEC 11179. By its own description, ISO/IEC 11179 - Metadata Registries (MDR), addresses the semantics of data, the representation of data, and the registration of the descriptions of data. It is not specific to describing statistical data – it applies to any kind of data. There is a reasonably common though not universal opinion that ISO/IEC 11179 more readily, and powerfully, describes unit record data than aggregate data.

Given ISO/IEC 11179 does not set out to provide a metadata framework specifically for statistical data, it certainly does not set out to describe all the constructs such as questionnaires and sample designs used to
produce that information. ABS’s operationalization of ISO/IEC 11179 as a metadata framework often sought to “extend” the reach of the standard well beyond its intended purposes.

These experiences led to an important qualification of ABS metadata frameworks underpinned by international standards. Such underpinnings must be consistent with the intended application and the reach of the relevant standard. Some extended uses, while not technically inconsistent with the standard, may be unwieldy in practice. (As a simple illustration, while SDMX Metadata Structure Definitions can be used to structure shopping lists, this is not one of the intended purposes. In practical terms, Metadata Structure Definitions are not particularly “fit for purpose” as a basis for structuring these lists.)

A corollary to the above is that different aspects of a comprehensive metadata framework designed to support statistical production might be based on different “industry standards”. The key points here are

- a particular standard is relevant for informing a particular aspect of the framework
- while not all based on the same standard, the different aspects of the framework work together effectively in practice.

On the other hand, harnessing additional standards tends to add complexity when explaining, maintaining and applying the framework. The target would appear to be the minimum set of underpinning standards required to arrive at a framework that is fit for purpose across its full scope.

Progress in the five years following endorsement of the Strategy for End-to-End Management of ABS Metadata (ABS 2003) was not as strong as expected. The strategy set out

1. a model of how metadata should be structured and accessed to support “end to end” purposes
2. a set of metadata management principles which, if applied consistently to all new systems development work, would lead the ABS towards an integrated metadata management environment
3. processes to facilitate the application of metadata management principles to future developments undertaken by the ABS.

With the benefit of hindsight, the model based on an extension of ISO/IEC 11179 was not as clearly defined, as firmly driven by practical business requirements, or as fit for purpose as it should have been. This may account for some of the hesitation demonstrated in putting the second and third elements of the strategy into practical effect.

The initial design of the strategy targeted “opportunistic” progress toward the objectives of the strategy. The level of practical progress achieved using an opportunistic/incremental approach over the subsequent five years was disappointing. By 2009, for a number of reasons, the ABS was ready for a framework driven transformation, rather than a continued incremental approach.

An implicit lesson from this experience was that achieving consistent and timely operationalization of metadata frameworks requires strong and continued corporate leadership and resourcing.

4.4 2009 onwards

In October 2009, ABS high level management formally confirmed SDMX and DDI as the standards to form the core of ABS’s future directions and developments for statistical information management.

Placing the emphasis on a coherent standards aligned framework for “statistical information management”, rather than simply “metadata management” (as per the strategy in 2003), was considered significant. The aim was to span the range of statistical information from conceptual to operational and technical in a coherent manner, and avoid an artificial separation of “data” and “metadata”. Similar thoughts may have been present internationally when GSIM was defined as a generic model for statistical information.

SDMX and DDI are modern standards which span data and metadata. They provide broad coverage and seek to work with other recognized standards which provide more detailed coverage of a narrower range of information (e.g. ISO 11179 for concepts, ISO 19115 for geospatial metadata, Dublin Core for discovery metadata).

The decision in October 2009 regarding SDMX and DDI led to an intense period of planning and analysis regarding how best to put this decision into effect. This culminated with the announcement of the ABS Information Management Transformation Program (IMTP) in February 2010. IMTP was an ambitious and
far reaching program related to business transformation, or business re-engineering. Transformation in the
definition, management and use of statistical information was a key element, but not the only aspect.

In February 2012, the scope of the transformation program was broadened further, and the designation
ABS 2017 was adopted. The work program elements related to transforming statistical information
management in the ABS will continue to be progressed within the broader ABS 2017 program.

A priority for the ABS 2017 program is to establish the full set of “necessary and sufficient” enablers that
will allow the ABS to achieve industrialization of statistical production along the lines envisaged in the
HLG-BAS Strategic Vision. This has led, for example, to an intense focus on establishing the
“architecture” required for the future – cascading down from the enterprise and business architectures, but
also spanning the information, applications and technology architectures.

The work fully recognizes that many aspects of the required architecture will be common for the
“industry”, rather than being specific to the ABS. ABS 2017 has a focus on engaging with initiatives and
experts beyond the ABS to work together on defining this architecture as quickly as possible, harnessing
the best thinking available globally.

5. ABS Statistical Information Management Framework

5.1 Conceptual Framework

In 2010, as an early element of the IMTP, an ABS Statistical Information Management Framework (ABS
SIMF) was defined, with the top level structure shown in Figure 2 below.

The conceptual framework envisages an internationally agreed GSIM which other agencies will also seek
to operationalize. It is expected this approach will maximise the chances of realizing the benefits described
in sections 3.2 and 3.3 regarding operationalizing metadata frameworks.

Figure 2: ABS Statistical Information Management Framework (SIMF)
Development of GSIM to date, including the latest version, foreshadows the use of SDMX and DDI as the recommended (but not mandatory) means to operationalize GSIM whenever these standards are fit for purpose. It is also expected that enhancements to SDMX or DDI will be requested where a feature is in scope for the standard, but is not yet implemented in a way that supports operationalization of GSIM in a manner that is most effective from a business perspective. The DDI Alliance has already confirmed that it would welcome such requests.

In common with a number of other agencies, the ABS expects this approach will make it significantly easier for agencies to operationalize GSIM, and to implement that operationalization on a consistent basis that aligns with relevant industry standards. The approach should also inform the thinking of producers of official statistics regarding how best – from a business rather than technical perspective - to use SDMX and DDI to address specific needs. This is because choices about how best to harness SDMX and DDI are being driven from a business oriented conceptual model. This should clarify and improve the use of SDMX and DDI as “industry standards” applied by different agencies in a consistent manner.

These needs and benefits may not be apparent to readers who have not applied the standards in practice to meet a specific business need. Both standards are large and offer many options, suggesting specific business needs could be met in multiple ways, each technically compliant with the standard. Where two different agencies implemented different solutions to the same business need, then in some cases a component developed by the first agency may not be readily reusable by the second agency. Such questions have already arisen several times for the ABS when applying SDMX and DDI.

In such cases it will become possible to identify which of the technically feasible approaches was best aligned with the conceptual business modelling in GSIM. While not the only factor in every choice, GSIM should help shape better and more consistent choices in the application of the technical standards.

5.2 Governance Framework

In the context of the current paper, the other two high level elements of the ABS SIMF are reminders that appropriate operationalization of metadata frameworks requires more than simply mapping to appropriate implementation standards.

Governance is required to ensure statisticians, methodologists and information technology experts have a clear understanding of the strategic business goals the metadata framework is intended to support. The governance framework also needs to ensure all staff clearly understand what is expected from them in terms of implementing the metadata framework, and have specific rules and guidelines that help them fulfil their role. There also needs to be processes for monitoring compliance. This includes ensuring exceptions from strict compliance only occur where there is a proven business rationale for divergence.

In some cases, such as a choice to use non-standard rather than standard aggregate categorizations for output purposes, the decision maker may be held accountable for their choice (e.g. based on a combination of confidentiality requirements and specific user interests), rather than needing to seek specific formal permission in advance.

Evidence of appropriate governance processes can also assist in allaying any business concerns, of the type mentioned in section 3.1, that the framework will be unresponsive to real business needs. Governance is required to identify cases where “non-compliance” indicates the framework may need to be updated to better support business needs, either because the initial design of the framework was flawed in some way, or because circumstances have changed making the framework no longer appropriate in its current form.

While the Conceptual Framework should be largely common across producers of official statistics, the practical details of the Governance Framework (and the Capability Framework) will be more specific to the ABS and its context – although some aspects may be in common with other agencies.

5.3 Capability Framework

This element of SIMF is broadly based, spanning capabilities related to people, processes and technology. It is based on identifying the capabilities required to put the conceptual model and governance into effect, and then taking steps to ensure the required capabilities are developed and made available.
Activities in this regard have included

- training staff, where such training is relevant to their role, in regard to underpinning standards, particularly SDMX and DDI
- developing a community of practice and advisory panel to assist with development and sharing of expertise beyond the formal training
- developing processes which ensure relevant advice and support is available to key implementation projects
- developing technical infrastructure, such as the Metadata Registry Repository and related information services, which developers - and the business users of applications they develop - can harness when implementing the conceptual framework.

There are important interdependencies between different top level elements of ABS SIMF. For example, certain governance processes may not be able to be introduced until certain capabilities (e.g. IT infrastructure) are delivered, making it feasible and efficient from a business perspective to comply with the provisions. At the same time, however, it is important for the governance plan to identify the desirability of introducing the new process in future, otherwise the capabilities required to introduce the process may not be prioritized and delivered in practice.

6. Lessons and Conclusions

The following broad lessons and conclusions can be drawn for ABS experiences so far.

1. Contemporary approaches to the design and operationalization of metadata frameworks position this work in the broader context of “business architecture”.

   This is highlighted in Section 2 (internationally) and Section 4.4 (within the ABS). Lessons from past experience confirm this is a crucial association if either the metadata framework or the broader business architecture is to be successful. If an agency doesn’t have a coherent view of its business (current and future) then it is impossible to design a coherent metadata framework which can be operationalized by the agency to support its business.

2. The design and operationalization of metadata frameworks should be common across statistical agencies to the greatest extent practicable.

   While the conceptual basis for frameworks may be identical (e.g. based on GSIM), differences between agencies in factors such as organizational mandates, strategic priorities, business requirements and/or capability maturity levels mean the design of other elements (e.g. governance, capability) may need to differ. The primary focus in all cases, however, should be on what elements can be in common with other agencies’ frameworks. Particularization should only occur where there is strategic agreement that this is necessary to ensure the framework meets local business needs.

3. Metadata frameworks, and their operationalization, should draw on relevant implementation standards (e.g. SDMX and DDI) to the greatest extent possible.

   This will make it quicker, simpler and more cost effective to operationalize the framework in a consistent manner. It becomes possible to reuse training materials, utilities and format mappings developed by other members of the standard’s community. It also assists in the sharing of statistical information and applications with other agencies in the future.

   A key realization, however, is that implementation standards should be used as tools to facilitate operationalization of a framework driven by business needs. Some previous initiatives tended to start with a particular standard (e.g. ISO 11179), and then develop a broader metadata management framework based on it. This represents “the tail wagging the dog”.

   Implementation standards may need to be updated (or, as a worst case, diverged from) where their current specification does not adequately meet business needs for a particular aspect of operationalization.
4. Active, integrated and effective governance is crucial to achieving successful operationalization of metadata frameworks.

As highlighted in section 4.1, operationalization of metadata frameworks needs to occur in the context of, and be integrated with, broader business architecture. Governance related to metadata management likewise needs to be integrated with other governance requirements and processes within the organization (e.g. related to Collection Design, Application Design, Project Design/Business Cases, etc.). If governance is not integrated, understanding and compliance with metadata management governance provisions will be more complex, and hence less efficient for subject matter statisticians and for development projects alike. There will also be a risk that directions and decisions related to governance of metadata management will be inconsistent with, or hard to reconcile with, agreed directions for other aspects of the business.

There also needs to be understanding across the organization of how, in real terms, this governance supports strategic business needs - even where its provisions may sometimes conflict with local “tactical” business preferences. If the framework is perceived as “reasonable in theory, but a barrier to realizing sound business outcomes in practice”, then implementers will typically expend energy “fighting” the governance process and/or find ways to avoid it. Establishing this understanding requires communication that is meaningful and convincing for different sets of stakeholders across the agency. It may also require coaching to promote cultural change on aspects of “thinking globally while acting locally”, so they become established business practices rather than theoretical notions.

If any aspect of the framework adds burden to business implementers, without clearly returning sufficient business value to warrant the impost (possibly to others, not necessarily the implementer), then a “fight or subvert” response from implementers will be encouraged. Some past approaches either failed to ensure there was sufficient business value from particular provisions or, at least, failed to convince implementers this was the case.

Governance processes also need to be responsive. Where local business requirements warrant a somewhat different approach, it needs to be possible to apply the aspects of the framework which remain relevant to the case while still accommodating the specific need. In some cases such exceptions may be strictly “local”, but in other cases they may indicate that specific details of the framework need to be updated.

Such processes are essential to maintaining the effectiveness of the framework over time, as business directions and needs evolve. If the framework and its operationalization do not evolve over time, then what was originally a business aligned framework will eventually become a “business barrier” in some respects.

5. Planning and developing capabilities to support operationalization of metadata frameworks is essential.

Even if a framework is well aligned with business needs and directions in a conceptual sense, operationalization will not be effective if current capabilities (in terms of people, processes or technology) cannot support it efficiently.

An example which has arisen in the past is the provision that requires reuse of metadata whenever it is fit for purpose to support a new business need. If it is extremely time consuming and complicated to discover what metadata might be appropriate to reuse, then business staff, with a reasonable business justification, will tend to create new metadata rather than reuse existing metadata.

There is a need to identify what capabilities will be required to operationalize the framework effectively and consistently. A realistic assessment needs to be made of the extent to which the required capabilities already exist within the agency. This is likely to identify a need for capability building. At a minimum, this will include educating staff in regard to the framework and its applications. In many cases there will also be a need to update business processes and IT applications so they provide better support for staff approaching metadata management in the new way.
An implication of the above is that operationalization often needs to occur incrementally, with each increment being designed based on what the business capabilities, at their current state of development, can realistically support. This has the further advantage that the next incremental step in operationalization can be more accurately targeted, based on an evaluation of actual outcomes from implementing the current step.

References


