

Statistics New Zealand's Business Model Transformation Strategy: Creating a new Business Model for the 21st Century National Statistical Office

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Abstract

In mid-2004, Statistics New Zealand instigated the Business Model Transformation Strategy (BmTS), an investment and long-term plan that aims to improve the way information is managed. The BmTS will streamline and standardise our business processes, methods and systems throughout the end-to-end statistical cycle and deliver a new processing and information platform on which all of our statistical systems will work in future.

For establishment surveys the BmTS will build on the strengths of SProceT (which were presented in a paper by Statistics NZ at ICES II), but generalise it further and eventually supersede it. This paper provides an overview of the new BmTS platform and a summary of progress to date; it then focuses on how the platform has been implemented to support the processes and methods used in Statistics NZ establishment surveys and the changes that have resulted from this.

Keywords: Business, survey, BmTS, SProceT, process, system

1. Introduction to the BmTS

The Business Model Transformation Strategy (BmTS) is fundamentally about changing the way we do our business. A large challenge facing any programme of change is that of altering an organisation's culture and capability. The BmTS requires changes to Statistics NZ culture; in particular the BmTS is driven by business processes and metadata rather than ICT and will therefore increase our focus on analysis.

The BmTS is a major long-term strategy that focuses on statistical business processes, methods and systems. It aims to improve the way information is managed by streamlining and standardising processes and systems throughout the statistical process: from the identification of a need for a statistical output; the design and building of processes, methods and systems for meeting that need; the collection, processing and analysis of data, to the production and dissemination of output.

Statistics New Zealand instigated the Business Model Transformation Strategy (BmTS) in mid-2004 with the aim of delivering a new data processing and information platform for all statistical systems to work on in the future.

1.1 Objectives of the BmTS

Statistics New Zealand's objectives in undertaking the Business Model Transformation Strategy can best be defined in terms of the following hypotheses:

Statistics NZ believes it can provide better service to all its stakeholders. This will be achieved by minimising the 'compliance burden' on respondents by increasing the use of administrative data as a primary source, by finding new ways to re-use the richness of data already held, and by ensuring that new surveys are set up in a way that is not narrowly subject-specific, but rather with a view to re-using the data collected to meet a range of different needs.

Statistics NZ believes it can achieve operational excellence, providing optimum outputs and meeting or exceeding international comparisons within constraints of available funding, and without sacrificing either accuracy or timeliness. Over time this will allow for the introduction of innovative products and services to meet new needs.

Statistics NZ believes it can create a workplace that will attract enthusiastic, high-calibre staff and the working environment in which to retain them.

1.2 Benefits of the BmTS

This major investment in our statistical processes and systems contributes to many of our strategic goals, including:

1. user needs: flexibility to respond to changes
2. internal capability: increased productivity and greater capacity to use skills appropriately
3. access: improved access to data
4. information management: easier integration of data from different sources, and

5. cost-effectiveness: a reduction in the time needed to design and build new information sources and a reduction of maintenance costs.

A successful strategy will deliver a number of benefits over the next three to five years and provide a solid basis for growth and development in the future. Benefits of the BmTS include:

1. Abstracting the business users and their processes from the underlying data structures and database systems; moving our statistical staff up the analytical 'value' chain; and providing an environment that facilitates the more challenging data integration and analysis necessary to meet the increasingly complex policy and research needs of government and the wider research community.
2. Creating the flexibility to respond to changes in user needs and demands; making use of new data sources or methods and providing a flexible range of information access methods while also making it easier to match and confront data in order to increase the quality of Statistics NZ information.
3. Reducing the time to design, build and process information sources, providing more time for analytical and dissemination processes.
4. Building a professional environment that creates a more satisfying working experience.
5. Increasing the use of administrative data, reducing the number of individual collections or the need for new collections to create new statistics.
6. Providing a standard environment and systems that will allow staff to quickly get up to speed with new subject matter, simplifying the migration of data and systems as underlying technologies change, and reducing maintenance costs.
7. Standardising the skills sets and professional development costs of our staff.
8. Utilising a smaller number of larger projects that are more likely to have a real rate of return through the re-use of the investment in a number of business areas.
9. Allowing Statistics NZ to provide standard information management tools and services for official statistical purposes.

1.4 BmTS Deliverables

The BmTS has three core deliverables:

1. a number of standard, generic end-to end processes for collection, analysis and dissemination of statistical data and information
2. a disciplined approach to data and metadata management, using a standard information lifecycle, and
3. an agreed enterprise-wide technical architecture.

2. BmTS

2.1 BmTS approach

Statistics New Zealand recognises the importance of working with the business people in the organisation (for example, statistical analysts, methodologists, data collection, publishing) in order to streamline and standardise processes and methods before initiating design and building generic systems. The BmTS is a business project, not an ICT project. The business people and processes are the drivers, whereas ICT systems and software are regarded as the enablers for (not the drivers of) the business processes. The approach to achieving the desired outcomes is summarized by:

1. people, then
2. processes, then
3. methods, then
4. systems/ICT.

This approach has entailed wide consultation with people across the business and enabled documentation of the processes and methods they use, which has in turn raised awareness and aided acceptance of common solutions.

Standardising, streamlining and generalising have followed an 80/20 policy, focusing on the 80% of processes, methods and systems that are common and widely used across the organisation. The aim is to standardise these so that the resources spent on developing, designing and building solutions to support them are greatly reduced. For the remaining 20% we undertake a cost/benefit analysis on a case-by-case basis to determine whether and how a business area or collection-specific solution is implemented.

By generalising systems, we have initially looked at re-using existing system components perhaps with some redevelopment. If this does not meet user requirements then we are looking at purchasing a system, hence allowing leverage off external development. After exhausting re-use and buy-in options we will develop, design and build in-house systems.

In terms of infrastructure and integration of systems, the strategic direction is towards loose coupling of components and solutions across the BmTS, the re-use of services and the ability to change the ICT infrastructure faster to adapt to changing business needs.

2.2 generic Business Process Model

Before understanding the requirements for information architecture, it is necessary to define and agree on the

core business of the organisation. Statistics New Zealand had already begun work on its end-to-end Generic Business Process Model (gBPM) at the highest level before inception of the BmTS project, but it is through the use of the BmTS that the gBPM has been strengthened, developed to a more detailed level and socialised across the organisation.

The gBPM consists of seven key stages, from the identification of a need at one end to the dissemination of statistical outputs to meet that need at the other end, (figure 1).

The BmTS aims to refocus the gBPM. Currently, the model focuses on strategy and resources from stages two to five, which are the internal phases of designing and building systems then the collection and processing of data. By streamlining and standardising these phases, the strategic focus and resources (in particular staff) can be refocused to analysis and the external phases of need and dissemination.

Figure 1 generic Business Process Model

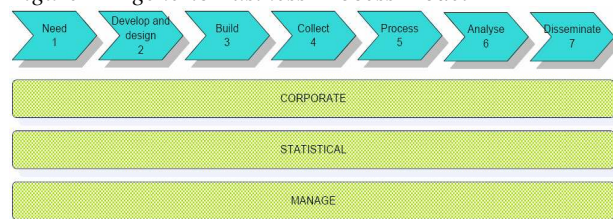


Figure 1 is split in two parts. The statistical gBPM made up of the operational processes shown by the seven dark (teal) chevrons, and the infrastructure processes as shown by three light (green) bars. The gBPM has been agreed for all collections, business and household, survey and census, administrative data or direct collection. Detailed business processes have been developed for the collect, analyse and disseminate phases.

2.3 BmTS platform

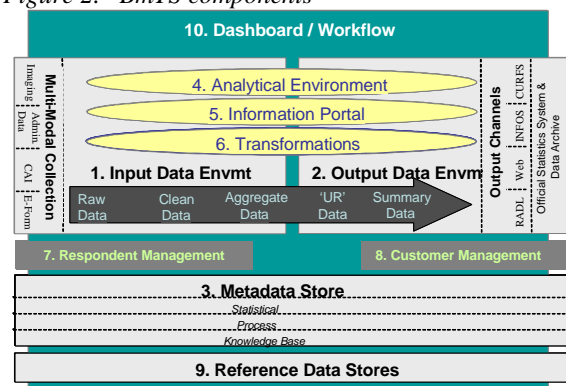
The BmTS component model is an application and infrastructure architecture that provides an ICT environment for statistical, methodological, analytical, research and transformation tasks.

The platform has 10 conceptual components which are required to support and implement the new generic Business Process Model, shown in figure 2. There are input and output data environments, components 1 and 2, with dataflow from multiple modes of raw data to output channels for summary statistics or confidential datasets or other outputs.

Systems and data are supported through this by a metadata store (component 3). Data is manipulated through the statistical cycle by analytical tools, information access tools and transformations, components 4, 5, and 6, respectively.

At either end of the process the providers and users of the data and its results are managed by respondent and customer management systems (components 7 and 8), while the data and knowledge are preserved by an archival reference data (component 9). The final component (component 10, visible on a day-to-day basis), is the dashboard which provides access to all the other components and implements workflows.

Figure 2. BmTS components



2.4 BmTS implementation

The BmTS was planned as a nine-year programme of work starting in July 2004. The first three years focused on BmTS delivery via six strategic programmes, including Business Performance, Linked Employer-Employee Database and Census, each of which was charged with delivering some elements of the BmTS components. Ideally, by the end of year three the BmTS end-to-end platform should be in place, but with no single end-to-end solution. To coordinate and achieve the additional BmTS goals the six programmes were supported by the Business Solutions Team (BST) and Application Architecture team.

Years four to six were planned for starting new work and for migration of existing systems to the BmTS platform, including delivery of the first end-to-end solution. Planning for years seven to nine was for further new work and for migration of the existing systems to the BmTS platform, although some of the existing systems might still be operating in the current environment (that is, non-BmTS) even after year nine. In year three, the structure was changed to ensure that detailed knowledge of BmTS components (for

example, workflow) that had been developed via specific business projects was maintained in the longer term and available to the wider organisation. The new structure includes:

- end-to-end business project teams: (for example, generalised social survey, redevelopment of the system of national accounts, the Business Performance suite of surveys) end users who provide business and software requirements to the component teams.
- component (ICT) teams: (for example, transformations, data environments) design, build, test and implement software solutions to support the business and software requirements provided by the end-to-end business project teams
- core business solutions team (ICT integration): ensures that the various pieces of software delivered by the component teams integrate together.

The evolutionary approach to development and implementation of the BmTS via existing business projects has meant that individual methods and systems have been able to be worked on across a range of the BmTS conceptual components and gBPM phases.

At the current stage of development (year 4) there are many components in various stages of the design, develop and build process, from initial scoping (for example, the customer relationship management system, metadata store and data marts) to full deployment in production (for example, Respondent Management System and QualityStage.) These components also spread over the gBPM; for example both BANFF, a transformation channel, and the Datalab, an output channel, are deployed and in use while SAS EG4 (as an analytical tool) is in development. The first end-end solution in the BmTS platform is the Generalized Social Survey and this is planned to go into the field in April 2008.

Prioritisation of investment in these areas has been driven by opportunity (for example, an existing project) and need (such as a gap in a toolset, obsolescence.) This approach has allowed the BmTS to capitalise on synergies with business projects; however, in some cases this has introduced tension between business project goals and BmTS goals and increased the short-term cost of the business projects. This is offset by long-term gains in efficiency and other strategic targets while the risk is spread: if one project has delivery problems then the entire strategy is not compromised.

The BmTS is a challenging project that has overcome some significant technical challenges and is now working on a realistic timeframe for implementation. We have made a solid start, but there is a lot of work to

do before Statistics New Zealand can fully reap the benefits of the new business processes and ICT environment across the organisation.

2.5 Development of BmTS Components

The approach to the development of a BmTS component was applied in a staged manner. The three stages are described in the following subsections.

2.5.1 White papers

Production of a strategy paper is the first step in the development of a BmTS component (section 2.5). This stage is people-focussed and involves broad consultation. The lead at this stage is taken by the Business Solutions team (BST).

2.5.2 Broad logical design

Following acceptance of the strategy paper, the next level is the production of a broad logical design (BLD), which provides a more detailed picture of the way the component will be implemented and used within the BmTS and how it will interface with other BmTS components. This stage again involves consultation but at a level more detailed than purely strategic, and draws in the subject matter experts and component development teams. The lead at this stage is again taken by the BST.

2.5.3 High-level design and software development

Following acceptance of the BLD, work can begin on gathering requirements for and designing a system to operationalise the component. This stage, which produces a high-level design (HLD), is the first step on our software development life cycle (SDLC) that is used to design, build and implement operational systems. This stage is led by ICT experts in the component development teams.

3. Establishment surveys and the BmTS

3.1 Statistics NZ at ICES II: SProceT

Statistics New Zealand currently uses SProceT, a standard survey processing "template" that is re-used (that is, copied and modified) for each survey-specific processing system. The SProceT system is used for the survey processing phases from data capture to output editing and was developed specifically for business/establishment collections and outputs. SProceT software was developed in Lotus Notes.

3.2 Building on the strengths of SProceT

For establishment surveys the BmTS will build on the strengths of SProceT (which were presented in a paper by Statistics NZ at ICES II), but will generalise these further and eventually supersede them.

The key goals of SProceT were the ability to rotate processing staff between surveys, to improve publication times, to improve quality without adding to costs, and to reduce the risks of errors and development costs.

Elements of SProceT that the BmTS will build on and generalise further:

1. metadata driven systems, with users able to update metadata
2. dashboard that provides a common look and feel to systems
3. re-use of 'best practice' processes and systems
4. management information produced/available at all stages, to assist in balancing work flows and monitoring progress
5. dynamic nature of views, along with the use of categories, sorting and drilling down
6. interactive processing rather than large batch jobs
7. integration with Business Frame (BF), business surveys database of respondent information, with minimum replication of information, the are rest retrieved dynamically during processing, plus changes that are identified during the survey process are fed back to the source (for example, the BF)
8. fully integrated desktop processing, with access to document repository and email
9. making those things standard that can be made so, while allowing specific customisation and flexibility for specific survey circumstances
10. flexibility at a marginal cost
11. re-use across different surveys encourages wide-spread application of best practice (standards)
12. survey managers are able to gain some leverage from the successes of other areas while retaining their own flexibility.

3.3 BmTS: Differences from SProceT

The BmTS platform is not a template. The template model used by SProceT added improvements iteratively via the release of the latest template. Hence, the system developed in increments. This approach led to at least eight different versions of the SProceT template that needed to be maintained and supported.

The scope of SProceT was limited to the processing phases of establishment surveys. The scope of the BmTS is end-to-end of the survey cycle business process model. Thus it covers the collect, process, analyse and disseminate phases, rather than just survey processing.

The BmTS is to be used by all Statistics NZ collections and outputs, including business/establishment, household/social and administrative collections.

SProceT was implemented in Lotus Notes; in contrast the BmTS platform will be implemented in a modular way on architectures which are fit for the purpose.

Key enhancements of BmTS compared with SProceT:

1. generic business processes, including collect, process, analyse and disseminate (that is, end-to-end)
2. standard methods to support the generic business processes
3. generic transformation modules to support the standard methods; re-use of these modules generates a transformations tool box
4. workflows: control process flow, order, triggers
5. user design of process flows (that is, workflows)
6. user configuration of workflows (for example, imputation method, etc.)
7. centralised corporate data and metadata stores – accessible, structured, secure
8. service-oriented architecture (SOA) – as key enabler of the BmTS, SOA provides the ability to:
 - specify and store metadata once as a corporate resource
 - access and execute the metadata as enterprise services, and
 - abstract these services from any particular underlying source or format to enable re-use.

3.4 Methodology improvements

The capacity of our methods is currently being expanded in order to support Statistics NZ's strategic goals including the BmTS.

Key areas of expansion include:

- longitudinal Business Frame
- updated size measures on our Business Frame
- use of modelled tax data for the "small" strata in our establishment surveys
- introduction of regular reselection in our establishment surveys
- record linkage methodology
- selective editing methodology
- research on the potential for sample rotation

- introduction of p% rule for confidentiality of tabular magnitude data.

We have also progressed work on the methodological principles, guidelines and standards that support our strategic goals and the BmTS in the following areas:

- data integration manual
- business survey design and monitoring manual
- editing and imputation strategy & principles
- confidentiality manual
- project to develop and document confidentiality standards and guidelines
- project to develop and document editing and imputation (E&I) standards and guidelines
- project to document coding best practice and guidelines
- drafting of confidential unit record files and remote access data laboratory manual.

3.5 Establishment collections delivering BmTS components

These are not necessarily all establishment surveys (for example, LEED is based on administrative data), but all are delivering elements of BmTS components that will support establishment surveys as they migrate to the BmTS platform in future:

- business performance
- national accounts
- business demography statistical system
- merchandise trade
- core prototype model (collect to clean)
- student loans
- census.

4. Successes

What have we achieved to date? The most visible aspects of the BmTS are the ICT tools that emerge at the final stage of a long process. Most of the achievements and problems occur in the preceding stages where strategy, process and methodology are developed. The BmTS has helped inspire work in other areas, in particular statistical architecture and the statistical methodology work program.

Successes in these areas include:

Strategy

1. white (strategy) documents produced for 7 of the 10 BmTS components (that is, key BmTS components) — agreed with the business, internationally peer reviewed

2. broad logical design documents for 7 of the 10 BmTS components (that is, key BmTS components) — practical starting point for development projects, represent a move away from silo systems, which is a huge change/paradigm shift for both business and service areas
3. high-level requirements and designs for elements of 7 of the 10 BmTS components — focussed on the elements of each component required by the end-to-end projects

Processes

1. Generic Business Process Model — high-level (processes and sub-processes) for all collections — developed, agreed and used
2. detailed generic business processes (to activity level) — documented for need, collect, process, analyse, disseminate
3. developed by working with people from a range of business areas — establishment and social collections, data collection, dissemination.

Methods & standard modules

1. development and/or documentation of standard transformation methods — still a work-in-progress in some areas
2. re-use and/or evaluation and selection of generic tools/modules to enable these standard transformation methods — still a work-in-progress in some areas (for example, sample selection, rotation and maintenance). Selected tools include:
 - Blaise
 - BANFF (Statistics Canada)
 - INTERP (in-house)
 - QualityStage for data integration
 - GREGWT (ABS) for integrated weighting
 - X12 / SADJ
3. adoption of the MetaNet Reference Model™ (Version 2) as the base for development of our conceptual metadata model.

Systems / ICT and Application Architecture

1. user interface guide developed and utilised
2. proof of concept (in the national accounts area) proved the metadata- driven configuration of common workflows and integration of components works and the transparency and visibility of the interim data states
3. The re-use of components is happening, suggesting the model is really starting to work and gaining momentum
4. production of fact table approach to our data model for all input and unit record data, contextualised by its metadata.

5. prototype solution that instantiates dissemination products for Census 2006, via our integrated publishing environment (IPE)
6. a standardised 'collection' phase in production, including multi-modal collection, telephony and CRM technology to manage the survey collection life-cycle
7. prototype model completed from collect to clean, incorporating workflow framework and transformation framework ICT solutions
8. service-oriented architecture — BmTS components are loosely coupled, services are re-used and changes to one component impact on interfaces rather than other components
9. selection and use of standard analytical tools – SAS, Microsoft Reporting Services & Analytical Services.

5. Changes and challenges related to the BmTS

Challenge comes with change and the BmTS has been no exception. The evolutionary model has allowed some challenges to be faced in a staggered manner, de-risking the project and allowing a large project to meet its challenges without requiring a large resource bubble. The challenges Statistics NZ have faced are both cultural and prosaic. The cultural challenges posed by the BmTS are systemic but have motivated a healthy self-awareness of aspects of the organisation's culture.

5.1 Culture and capability

When business units are initially contacted about generalised processes and systems a typical response would be to ask what makes that particular business unit or collection special or different from others. The BmTS requires the focus to shift to commonalities between collections rather than differences. An example of the BmTS achieving this is the acceptance of all collections, from the smallest business survey to the population census of the same high-level business process model (gBPM). The model is adapted at lower breakdowns for specific collections but provides the framework for identifying and then capitalizing on their similarities.

For different business units to use general processes and systems it is critical to adopt a culture that is supportive of standards, values the cost reductions and increases in productivity resulting from their use, and recognises the importance of metadata (that is, its metadata that allows business units to customise a generic system for their specific requirements).

The shift in focus and resources from the internal designing, collection and processing phases to the analysis and external phases of need and dissemination require concomitant changes in culture, from an internal to an external focus.

To reap the benefits of staff moving up the value chain (greater utilisation of fewer resources and the flexibility to respond to a more complex environment), a culture that greatly values analysis is required. It also needs a human resources focus on the capability of analysts to ensure that they develop the analytical knowledge and skills they need in the new working environment.

5.2 Other Challenges

Along with the systemic cultural changes necessary other key challenges have been identified

- Ownership of processes, methods, and tools (software) by the most appropriate business units. This includes aligning needs with benefit, use and cost.
- The need to establish a clear architecture early on in order to avoid the accidental architecture of many legacy systems.
- Monitoring progress towards achieving benefits. Progress on the BmTS occurs simultaneously on multiple fronts, hence, an indicator of progress has to combine information from diverse areas.
- Quantifying short term costs is part of the standard business process; however measuring the long-term gains of a generalisation programme is a complex exercise.
- Clarifying our future collect architecture/statistical architecture before migrating to the BmTS platform.
- Determining the impact of the BmTS changes on data quality.
- Determining the impact on specific outputs, as these are migrated to the BmTS platform. Impact assessments are led by business areas most highly affected. These business areas require extra support.

6. Lessons learned

The BmTS has been running for three years now and we have had the opportunity to learn from some early failures and successes. This learning and adaptation to changing conditions has caused the BmTS to evolve.

People first, then processes, then methods and systems last, that is, if the final outputs of the BmTS are to be widely accepted and the desired outcomes are to be achieved, then it is necessary to work with the analysts and methodologists in the organisation in order to

standardise both processes and methods before building generic systems.

Surveys and collection areas tend to focus on their differences; it is our experience that when these are examined the differences are outweighed by commonalities at a rate of more than 80/20 in collections as varied as a population census and a collection of manufacturing establishments. Centralized service areas, for example Methodology, Integrated Data Collection, Product Development and Publishing along with the gBPM, are vital to ensuring commonalities are identified and leveraged off.

Metadata is therefore critical to developing standardised and generic processes, methods and systems, and then tailoring these to the specific needs of different business areas in practice. This must be acknowledged from the outset of programmes such as the BmTS to ensure that the right approach to metadata is taken and that metadata is seen as an integral part of all solution components.

The development strategy for the BmTS — evolutionary transformation via existing business projects — is the strategy least likely to incur a systemic failure; however, it is also the most likely strategy to be marked by many minor successes and failures. This is the first principle of evolution.

Pragmatic compromises between development and delivery of business-as-usual outputs need to be made when implementing strategies such as the BmTS, especially if the outputs are of primary importance, as is the case at Statistics New Zealand.

The structure of the BmTS programme has also evolved along the way with the addition of development teams focusing on each of the BmTS components, and a corporate 'core' project team charged with integrating and prototyping the end-to-end solution.

The long-term aim of reducing time spent on the develop and design, build and process phases of the gBPM requires a short-term expansion in time spent on these phases due to the extra effort required for initial development, design and building of generic processes, methods and software.

Expecting delivery of generic services from input and output specific projects leads to significant tensions, particularly in relation to added scope elements within fixed resource schedules. While there is verbal buy-in, the real challenge does not come until the subject matter areas are faced with migration of their specific systems to the generic BmTS platform.

7. Concluding remarks

The move from 'silo systems' to a BmTS type model is a major challenge that should not be underestimated. It involves major cultural and technical

challenges, it is difficult to measure and it requires an evolutionary model of implementation to spread the resource requirement and risk.

Do not expect to get it 100% right the very first time. Minor failures and successes along the way are an anticipated and acceptable feature of the evolutionary model.

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References

- Dunnet G (2007). "The BmTS: Creating a new business model for a national statistical office of the 21st century", paper presented to UNECE Managing Statistical Information Systems, Geneva, 8-11 May, 2006.
- Dunnet G, Mitchell C and Jug M. "Statistics New Zealand's End-to-End Metadata Life-cycle" Case study presented at Workshop on Statistical Metadata, Vienna July 4-7, 2007.
- Freeman R (2000). "Statistics New Zealand's Survey Processing System - A Template for the Re-engineering of SNZ Survey Processes", *Proceedings of ICES II*.
- Gillman, D. (2004). Metadata Registries, Data Harmonization and Maximizing Use of Warehouse, US Bureau of Labor Statistics.
- Karge, R (2003). *MetaNet Reference Model - Version 2*, Run Software, Berlin.
- McKenzie R (2007). "A Statistical Architecture for Economic Statistics", *Proceedings of ICES III*
- Statistics New Zealand (2004). *BTS Program Charter*, Statistics New Zealand, Wellington.
- Statistics New Zealand (2004b). *BmTS End-to-End Model White Paper*, Statistics New Zealand, Wellington.
- Statistics New Zealand (2006). *BmTS Transformations White Paper*, Statistics New Zealand, Wellington.
- Statistics New Zealand (2006). *Statistics New Zealand's generic Business Process Model v1*, Statistics New Zealand, Wellington.
- Statistics New Zealand (2007). Statement of Intent 2007, <http://www.stats.govt.nz/about-us/corporate-reports/statement-of-intent-07/default.htm>, Statistics New Zealand, Wellington.