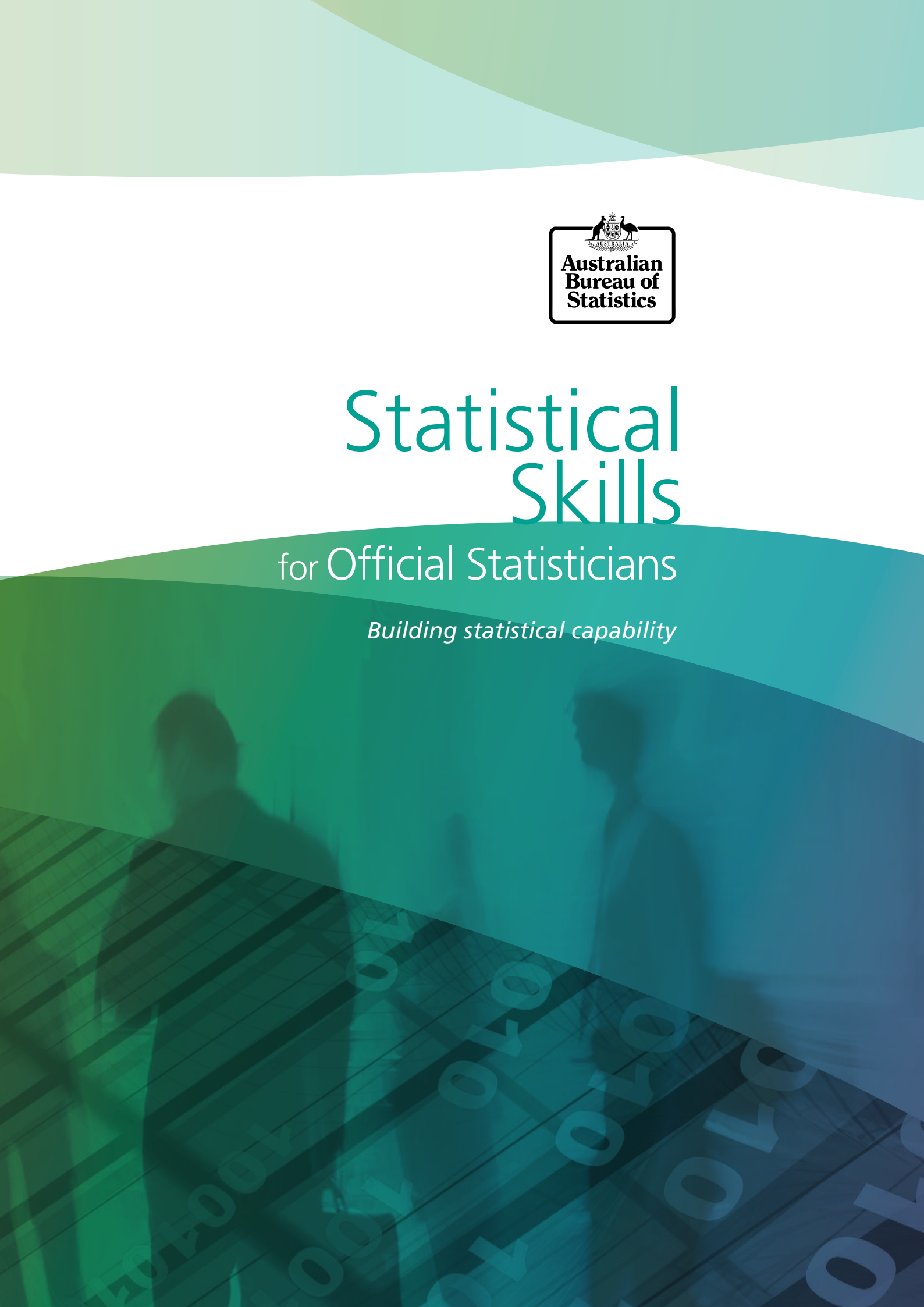
Australian Bureau of Statistics

Statistical Skills

for Official Statisticians

Building statistical capability



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FOREWORD

WELCOME TO: *Statistical Skills for Official Statisticians*

Whether you are an aspiring statistician, a new starter to the Australian Bureau of Statistics (ABS), or an existing ABS employee who works in either a statistical or service area, this resource is for you.

Statistical Skills for Official Statisticians will:

- give you a greater understanding of the range of statistical skills, knowledge and expertise needed to work effectively throughout the end to end statistical production cycle (based on the Generic Statistical Business Process Model (GSBPM));
- give you a greater understanding of the role of the ABS in official statistics and the policy and legislative environment governing statistical work;
- enable you to develop your statistical career; and
- enable you to assist others who may be seeking development opportunities.

After reading this resource, you will also have a greater understanding of the context and challenges regarding future statistical production work within a ***national statistical agency***, as highlighted in the ***ABS Corporate Plan***. This understanding will further strengthen your ability to continually add value to the organisation and the wider ***National Statistical Service*** (NSS).

What this resource means for the ABS

Statistical Skills for Official Statisticians is a resource which forms an integral part of strengthening the ABS' overall statistical capability, as outlined in the ***ABS Corporate Plan***. To illustrate this commitment, this resource is aligned to the ***ABS Integrated Statistical Capability Framework*** (Table 1) which incorporates dimensions of *Statistical Leadership, Statistical Production*, and *Statistical Literacy* across key target audiences. This framework not only guides the ABS' statistical capability development initiatives internally, but also within the wider NSS and international community.

With the ABS embarking on new initiatives to deliver business and information transformation, the way statistical data and information is produced, and the way it is managed will change, as will the subsequent skills and capabilities required by ABS statisticians.

This resource outlines how statistical production work will continue to evolve in the future. It provides guidance around the statistical skills, knowledge and expertise statisticians require for designing and delivering statistical solutions that meet the changing needs of governments and the community.

So, as an aspiring or current ABS statistician, it is now your responsibility to bring this resource to life to ensure you continually enhance and build on your statistical skill set throughout your professional career, and in developing the statistical capability of others domestically or within the Asia Pacific region.

VISION & MISSION FOR THE ABS

The ABS Vision

A trusted and progressive world-class statistical leader.

The ABS Mission

We assist and encourage informed decision making, research and discussion within governments and the community by leading a high quality, objective and responsive national statistical service.

To achieve this vision and mission we need to:

- be a values based organisation with clear accountabilities and responsibilities for all;
- transform our business systems and processes and foster our ability to innovate;
- be responsive, innovative and able to adapt quickly so as to remain relevant;
- actively engage and collaborate across all levels of government and be an outward focussed organisation. The ABS Forward Work Program needs to respond to emerging policy priorities, and support evidence informed decisions for our community;
- shape, influence and promote the use of shared standards, classifications, frameworks and data policies to encourage statistical coordination and enhance Australia's evidence base;
- have strong management teams that prepare our people for the future, and who operate in a strategic and coordinated manner; and
- build statistical capability and capacity domestically and within the Asia Pacific region.

Brian Pink
Australian Statistician

ABS ROLE AND THE NATIONAL STATISTICAL SERVICE (NSS)

The ABS Role

Trusted official statistics are fundamental to democracy; they inform public debate, enable good decision making across all sectors of society and are central to effective government.

The ABS is Australia's ***national statistical agency***. The ABS has two key roles: as a producer of official statistics and as a leader within the NSS coordinating statistical activities across official bodies.

The ABS is a major producer of official statistics in Australia. The ABS mission is that 'we assist and encourage informed decision making, research and discussion within governments and the community'. The term 'community' in our mission is all encompassing – it includes organisations outside the government sector, as well as the Australian people and key users of our data internationally.

ABS Functions

There are two key pieces of legislation which enable the ABS to deliver on its mission: the ***Australian Bureau of Statistics Act 1975***; and the ***Census and Statistics Act 1905***.

The ABS mission and legislated functions clearly acknowledge the ABS' important leadership and coordination role with respect to the statistical activities of other official bodies in Australia, and a liaison function with international organisations on statistical matters. These relationships provide an opportunity to exchange knowledge, build capability, improve practices and influence statistical standards. Within Australia, the ABS does this by 'leading a high quality, objective and responsive national statistical service' as stated in the ABS mission.

What is the NSS?

The NSS is the community of government agencies working to build a rich statistical picture in order to better inform Australia. The NSS comprises both producers of statistics and custodians of administrative datasets which have the potential to contribute to official statistics. It also embraces all levels of government.

By supporting the development of the NSS, the ABS aims to realise the full potential of statistical information not only for the benefit of government, but also the broader Australian and international communities. Unlocking the value of and making better use of existing statistical assets will contribute to reducing data provider burden in Australia. The ABS will also continue to raise awareness of the important role quality data plays in shaping today's decisions regarding Australia's future.

What is the ABS role in International Statistical Communities?

The ABS plays a strong statistical leadership role internationally in shaping international discussions regarding statistical frameworks, standards and classifications, policies and systems which provide the essential statistical infrastructure that supports statistical production.

The ABS also plays a key role in building statistical capacity and capability within the Asia Pacific region.

DIFFERENT TYPES OF STATISTICAL SKILLS

Building your Statistical Skill Set

While no one person is expected to possess all of the statistical skills listed in this resource to perform a particular job, an official ABS statistician should gain a broad range of statistical skills over time. Gaining experience in various statistical areas will enhance your ability to contribute to the ABS and NSS, and will provide you with opportunities to develop and apply your skills, knowledge and expertise.

By gaining exposure to different statistical areas, it will also enable you to broaden your ABS career pathway.

Statistical Skills Required

The essential statistical skills for ABS statisticians described in this resource are aligned to the ***ABS Integrated Statistical Capability Framework*** (Table 1). These skills are not mutually exclusive to any one dimension, but can and should be applied across *Statistical Leadership, Statistical Production* and *Statistical Literacy*. The depth and application of these skills will vary depending on what dimension is being focused on.

Statistical Leadership Dimension

Statistical Leadership Skills

Statistical Production Dimension

Stakeholder Engagement Skills
Research Skills
Collection Design Skills
Data Transformation Skills
Analytical Skills
Data Quality Management Skills

Statistical Literacy Dimension

Table 1: ABS Integrated Statistical Capability Framework – High level overview

Statistical Capability Dimension	Target Audience										
		Government		Education				Industry			
	Internal ABS	Data producers	Policy developers	Educators	Students (Yr 1 -12)	General Community	Media/ Opinion leaders	Small & medium size businesses	Industry associations & large businesses	Not for Profit sector	NSOs (Asia Pacific region)
Statistical Leadership	✔	✔	✔				✔				✔
Statistical Production	✔	✔									✔
Statistical Literacy	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔

Note – ✔ identifies statistical capability priority by target audience.
Note – for each statistical capability dimension there is a basic, intermediate and advanced skill level. (Note: This resource will not provide a breakdown by skill level)
Note – Statistical Production includes work on statistical infrastructure, re-engineering and methodological support.

STATISTICAL LEADERSHIP

What is Statistical Leadership?

At a broad level, statistical leadership refers to:

Engaging and influencing users and producers of official statistics to enhance Australia's statistical assets and infrastructure for informed decisions by:

- *leading statistical coordination through the use of frameworks, standards and policies; and*
- *building statistical capability and capacity both domestically and internationally.*

According to the ***ABS Integrated Statistical Capability Framework*** (Table 1) the three main areas of statistical leadership are: *Position, Engage and Collaborate*, and *Enable*. The following table highlights the focus of the ABS in its statistical leadership role.

Position	Engage and Collaborate	Enable
This will be achieved through: • environmental scanning; • setting relevant statistical programs; • external Statistical Governance; • promoting ABS brand and building institutional knowledge; and • developing internal statistical excellence - professional knowledge of ABS business and the range of statistics and infrastructure produced across the statistical system, business processes, methodologies and technologies used nationally.	This will be achieved through: • strategic engagement; • managing client relationships; • statistical coordination; • international collaboration; and • identifying and promulgating standards and frameworks.	This will be achieved through: • identifying statistical capability gaps; • providing external training solutions; • building statistical literacy; and • developing and enhancing active networks.

Skills required by statisticians to do this successfully are listed in the next section.

STATISTICAL LEADERSHIP SKILLS

What is required as a statistician?

Enhancing the NSS

Ability to:

- Actively develop the statistical literacy skills of users and producers of statistics. The emphasis is on enhancing the capability of data users so they can understand the world described in numbers, and the capability of data producers to describe the world in numbers. The overall goal is to ensure stakeholders know what data is available, are able to understand statistical concepts and simple statistical analyses, and can communicate statistical information (*See Statistical Literacy section*).
- Understand important national (ABS and non-ABS) and international statistics that relate to current and emerging policy issues, and facilitate their delivery to users along with related information to help understanding and application of data.
- Establish and maintain good working relationships and close links with key stakeholders in relation to particular statistical fields.
- Contribute to the development of national and international statistical standards, classifications, frameworks and protocols. This requires promulgating their use within the statistical community through making them available to both users and producers of statistics to ensure coherency and consistency in statistical data.
- Actively participate in, and contribute to networks, seminars and groups of experts involved in statistical activities to share knowledge and information for the advancement of the ABS and NSS.
- Influence both ABS and non-ABS statistical activities in a particular field of statistics, and undertake statistical coordination activities within or across agencies to reduce duplication and increase synergy.
- Promote data access and facilitate data sharing with other government agencies and organisations. Statisticians should influence stakeholders on data collection methods and data integration possibilities (*See Statistical Production section*).

Working within the Policy and Legislative Environment

Knowledge and working understanding of:

- Relevant legislation and policy governing statistical collections and the release of data, including those that govern data integration projects. For statisticians this means having an understanding of key pieces of legislation including *Australian Bureau of Statistics Act 1975*, and *Census and Statistics Act 1905*.
- Current and emerging policy issues and debates, their potential statistical impacts, and availability and relevance of statistics (ABS or non-ABS) to the debate. Statisticians need to understand the policy decisions made at the local, national and international level to better define fit for purpose information solutions.
- How to conduct statistical work which is aligned to, and consistent with the APS and ABS Values and Code of Conduct, NSS Key Principles and the Fundamental Principles of Official Statistics (set out by the United Nations).

Understanding the Business of Statistics

Ability to:

- Manage, implement and innovate within a complex end to end process from collection design to output dissemination and negotiate agreements on the provision of data and technical services with relevant ABS areas, to agreed timetables and budgets. This includes knowledge of the Project Management Framework principles and procedures, and ability to apply them to ensure statistical production work is well managed and cost effective.
- Understand all phases of the end to end statistical production cycle (i.e. GSBPM) and apply:
  - knowledge of national and international statistical frameworks and standards, including concepts and classifications when conducting statistical work; and
  - economic, environmental or social knowledge and expertise to day to day statistical production work for the purposes of informing discussions and decisions, delivering statistical outputs, identifying possible efficiencies, and enhancing the knowledge of others.
- Look outwards to ascertain the breadth and depth of statistics collected outside ABS and make judgements on how these can be utilised by the ABS and stakeholders.

Where do Statistical Leadership Skills fit into the *ABS Integrated Statistical Capability Framework?*

Statistical Leadership	**Position**	**Engage and Collaborate**	**Enable**

STATISTICAL PRODUCTION

What is Statistical Production Work?

The statistical production work you undertake in the ABS will support the organisation to achieve its transformation requirements, vision, mission and NSS role. This work will revolve around the end to end statistical production cycle and is based on the nine phases of the GSBPM.

For statisticians, this work will involve:

- specifying stakeholder needs;
- designing and building cost effective statistical collections;
- transforming and integrating data;
- disseminating statistical outputs through bringing data analysis and interpretation together in a meaningful and coherent way; and
- continually questioning and evaluating statistical business processes.

Changing Nature of Statistical Production Work

Due to the rapidly evolving environment and increasing demand for more accessible, integrated and metadata driven statistics (i.e. defining and describing data so it can be found, understood, used, and shared to maximise data exploitation and exchange across users and organisations), the type of work statisticians are required to undertake is changing. These changes to statistical production work are due to the ABS needing to transform its business and information processes to:

- provide a better evidence base for use by governments and the community;
- respond more rapidly to the evolving requirements, needs and expectations of clients through increased cooperation between institutions;
- become more relevant and efficient, by reducing the time it takes to complete certain statistical processes tuned to delivering statistical products at minimal cost with greater flexibility; and
- increase the range and quality of products and services.

Future Statistical Production Work

These changes to statistical production work are supported by the introduction of new technological applications which will allow statisticians to move through certain processes more quickly (i.e. Collection, Process and Dissemination) and to assemble data in new ways from new sources. This will allow greater emphasis to be placed on higher value work activities (i.e. Specifying Client Needs, Survey Design, Analysis and Evaluation) which will, in turn, produce more responsive and relevant statistical solutions.

Stakeholder Engagement Skills

What is required as a statistician?

Determining Stakeholder Information Requirements

Ability to:

- Listen to, engage and partner with stakeholders and others in the NSS to understand information needs, gaps and priorities, and how these can be effectively and efficiently addressed. This requires the ability to communicate technical issues with non-technical stakeholders using clear and unambiguous language and without jargon.
- Engage with stakeholders to understand their information requirements, and advise and promote the use of statistical solutions. Statisticians need to apply their knowledge of national and international statistical frameworks and standards, to ensure the statistical solutions provided are coherent and consistent.
- Discuss with stakeholders available data sources, including internal datasets and possible administrative sources, and determine fitness for purpose. Statisticians need to understand the conditions under which different data sources are collected and available, including any restrictions on their use or comparability, and engage and negotiate with relevant administrative data providers for access to data *(See Data Transformation Skill Group)*.
- Engage and negotiate with stakeholders early in the collection design process so that the statistics made available are those which are needed, and the resources required to produce them are highlighted for stakeholder funding considerations *(See Collection Design Skill Group)*.
- Communicate ABS legislative requirements and the impact this has upon the collection and release of certain types of ABS data.

Establishing Statistical Objectives

Ability to:

- Articulate statistical outputs in sufficient detail (i.e. actual statistics and analyses to be performed) so as to appropriately weigh the costs and benefits of proposed statistical collections.
- Understand the research and policy aims of key users of a collection, the concepts being measured in a collection, and the ways the outputs will be used.
- Engage with stakeholders to develop a collection strategy, including prioritising its content, collection method, methodological and quality parameters, and dissemination strategy fit for the purposes of the collection. In developing dissemination strategies, the ability to engage effectively with stakeholders to develop timely and cost effective output plans that meet priority needs is essential *(See Collection Design Skill Group)*.
- Apply knowledge and professional judgement of statistical business processes, methodologies, and technologies used nationally and internationally and communicate this understanding to stakeholders to ensure the establishment of fit for purpose outputs.

Communicating Data to Stakeholders

Ability to:

- Inform stakeholders what various social, economic and environmental data shows, how the data should be interpreted, and what pitfalls may arise in interpreting the data. This requires statisticians to ensure the statistics are understood by key stakeholders through understanding the collection methodologies, and analysis of the statistics *(See Analytical Skill Group & Statistical Literacy section)*.
- Communicate quality issues to stakeholders and how they will affect data use, and the potential impacts of all stages of the collection process (from instrument design, frame creation, sample design, through to follow up and editing strategy, imputation and analysis) on the outputs. This includes developing and communicating Quality Declarations to stakeholders *(See Data Quality Management Skill Group)*.

Where do Stakeholder Engagement Skills fit into the *ABS Integrated Statistical Capability Framework?*

Statistical Production	**Specify Needs**	**Design**	Build	**Collect**	Process	Analyse	**Disseminate**	Archive	Evaluate

Research Skills

What is required as a statistician?

Identifying and Utilising Suitable Sources of Data

Ability to:

- Acquire data from various sources and across different modes for the delivery of fit for purpose statistical outcomes and outputs, in line with the ABS Data Quality Framework *(See Data Quality Management Skill Group)*.
- Research and review existing internal and external statistical processes and systems, to establish a greater knowledge base relevant to the data need.
- Identify and utilise the most appropriate sources of information to conduct research on when analysing statistical data to explain discrepancies, and to accurately confront the data *(See Analytical Skill Group)*.

Developing Research Questions

Ability to:

- Gather intelligence and develop research questions that allow greater exploration of the policy aims of key users of a collection, possible impact of any changes on the collection (i.e. legislative changes), and refining the ways the outputs will be used.
- Design analytical research questions following the establishment of statistical objectives to inform collection design. These questions may result in researching the availability of existing survey or administrative data, and the suitability of standards, classifications and concepts *(See Collection Design Skill Group)*.

Enhancing the Statistical Environment

Ability to:

- Research and gather best practice approaches that influence and contribute to continual improvement in collection design development *(See Collection Design & Data Quality Management Skill Group)*.
- Undertake continuous internal and external environmental scanning for the purposes of identifying new trends and recent statistical developments. This involves researching statistical processes, technologies, techniques and methodologies applied by other ABS statistical areas and other authorities, to judge whether they may be fit for purpose and can be reused.
- Determine if a statistical project is necessary and feasible. This requires determining whether current data sources are fit for purpose and meet user requirements. If they do not, statisticians should research the suitability of other data sources, their methodologies, the limitations of the statistics, and the requirements for obtaining that data to determine whether they would be suitable for statistical purposes.

Where do Research Skills fit into the *ABS Integrated Statistical Capability Framework?*

Statistical Production	**Specify Needs**	**Design**	Build	Collect	Process	**Analyse**	Disseminate	Archive	**Evaluate**

Collection Design Skills

What is required as a statistician?

Understanding Collection Design Principles

Understands:

- All activities associated with the collection cycle, including broad statistical frameworks, classifications, standards and concepts which enhance the coherency and comparability of the data. This also requires understanding the archiving rules for the statistical data and metadata associated with the collection.
- Various collection methods and instruments including their cost and resource implications, as well as the different data sources outlining their advantages, and the impacts the different methods will have on the data collected. Where pre-existing data sources (both internal and external) exist such as administrative data, statisticians must understand the procedures for obtaining this data, and business processes that affect its statistical properties *(See Data Transformation Skill Group)*.
- Sampling principles (i.e. populations, sampling frames, sample size, different forms of sample designs and sampling error, weighting, estimation, imputation methods) and the impact these have on statistics produced and implications for collection and processing options. Statisticians should recognise and act when specialist expertise is to be sought to build this understanding.
- Sources of all error that affect the quality of statistics, including non-sampling errors such as interviewer and respondent error, and mitigation strategies which can be employed to minimise error.

Designing a Collection

Ability to:

- Transform stakeholder data and/or information objectives gathered during the 'Specify Needs' phase of the GSBPM into statistical specifications to ensure the appropriate collection instruments and processing systems are developed within cost and budget limitations. This requires engaging with ABS areas for the provision of existing data if required, and negotiating technical services of internal experts required for the collection.
- Liaise effectively with internal experts on all facets of collection design to ensure an overall collection plan and strategy is in place. This requires statisticians to:
  - understand the considerations for developing: sampling strategy (i.e. stratification, quality requirements, frame, coverage and scope of collection, key classifications, variables and constraints, forms design), editing strategy (i.e. key data items, quality constraints, end use of the data, levels of disaggregation, editing methods and techniques), and imputation strategy (i.e. when and why it is used, differences between explicit and implicit imputation, relationships between data items, data items to impute, contributing donor units, quality checks).
  - assist in developing and building collection content (i.e. topics, data items, variable descriptions, classifications, questions) and methodological parameters (i.e. sampling, editing and imputation strategies) that consider provider load issues and costing implications. This requires statisticians to understand the situation of data providers, and how each stage of ABS collection activity impacts them.
  - understand what affects the quality of measurement, what works and what doesn't in terms of operational collection activity, and what information needs to be available to the user for effective use of collection outputs *(See Data Quality Management Skill Group).*
  - assist in designing, specifying and validating the required collection instruments or leverage off existing sources where appropriate. This can involve designing data collection instruments with the capacity to integrate data across multiple modes and from a variety of data sources and formats.
  - understand the impact of changes to collection instruments (i.e. questions, modes of collection) on the quality of outputs including data coherency and consistency, and the implications of collection design on downstream processing systems and procedures *(See Data Quality Management Skill Group)*.
  - assist in designing and specifying statistical processing systems which provide access to stored data and set the parameters for coding, editing, imputing, estimation, integration and validation.
  - design and prepare testing programs and evaluation plans in partnership with internal experts for the collection and processing instruments to ensure they are fit for purpose, user friendly, minimise provider load and are subject to continuous improvement.
  - design and develop training material and instructions for the statistical collection with an emphasis on conveying confidentiality requirements in data collection.

Where do Collection Design Skills fit into the *ABS Integrated Statistical Capability Framework?*

Statistical Production	Specify Needs	**Design**	**Build**	**Collect**	Process	Analyse	Disseminate	**Archive**	**Evaluate**

Data Transformation Skills

What is required as a statistician?

Understanding the Data Integration Environment

Understands:

- The rights, roles and responsibilities of all parties involved in data integration activities. This requires an understanding of what data custodians, data users and integrating authorities are, and their role in establishing and designing statistical collections utilising various data sources.
- When and how to utilise data integration and linking techniques to improve statistical outputs and analyses. This requires understanding the different types of linking strategies, and how adding new dimensions to data enhances the value of the available information. Statisticians must also be able to recognise when it is not possible or appropriate to link datasets together and articulate the rationale for this.
- The broad issues associated with data integration such as privacy, confidentiality, the separation principle, legislative requirements, and data quality. This requires ABS statisticians to understand the need to maximise the use of statistical resources through data linking, whilst balancing public interest in the preservation of personal privacy through adhering to ABS legislative requirements *(See Data Quality Management Skill Group)*.
- The procedures and conditions for making linked data accessible to external users within the confines of confidentiality rules and legislation.

Integrating Data

Ability to:

- Assess data quality and resolve any inconsistencies in the way data is represented or encoded in the various datasets before linkage with other files is attempted to ensure administrative data sources are integrated within the legislative and quality boundaries *(See Data Quality Management Skill Group)*.
- Extract datasets and apply appropriate data cleaning, data standardisation, data scrubbing or data pre-processing tasks required for transforming the source data into clean and consistent sets of records ready for loading into the appropriate ABS storage facility. This involves managing quality issues such as: data containing no unique entity identifiers, typographical and formatting errors or variations, missing or dummy values, out of date values, stability of data, similar variables stored differently, different coding schemes, and issues associated with data collected at different times.
- Apply the appropriate data linking technique, routines and methodology to the data. This requires having a working knowledge of different types of linking (i.e. exact linking, deterministic and probabilistic), statistical linking principles as well as other data combining techniques.

Data Processing

Ability to:

- Understand a collection's processing and data transformation methodology, how the data was obtained, the data items being collected and their movements over time.
- Apply a number of micro editing techniques to the data. This includes automated classification routines when coding and classifying data, and employing methods for identifying discrepancies and anomalous records during input data validation. This may also include developing derived data items, based on existing variables.
- Review unit level data and apply a range of validation measures in accordance with the principles of the ABS Data Quality Framework. This requires statisticians to have a working knowledge of the framework and quality gates at each stage of the collection to ensure the data is accurate, coherent and interpretable *(See Data Quality Management Skill Group)*.
- Understand and apply imputation techniques and rules, where appropriate, to missing or unreliable data and derive new variables not explicitly provided in the collection, but needed to deliver the required statistical outputs/objectives.
- Understand and apply weighting criteria to collected data to develop reliable and representative estimates of the target population, which can then be aggregated by geography or other population characteristics during the macro editing phase.

Where do Data Transformation Skills fit into the *ABS Integrated Statistical Capability Framework?*

Statistical Production	Specify Needs	Design	Build	Collect	**Process**	Analyse	Disseminate	**Archive**	Evaluate

Analytical Skills

What is required as a statistician?

Data Analysis

Ability to:

- Apply judgement, intelligence and commonsense when analysing data by asking questions such as: Does the data make sense? Are there discrepancies within the data and what is the reasoning? Is it consistent with other data? Is it plausible? Does it reflect the social, economic, or environmental reality that it is measuring? Will clients understand and be able to use it?
- Identify key issues or problems with the data, dissect or isolate its components, organise information for decision making, establish criteria for evaluation, and draw appropriate conclusions about the data by undertaking appropriate testing.
- Look at datasets from a range of perspectives (i.e. both time series and cross-classified) and evaluate at varying levels of detail, and against other available statistical information. This requires an understanding of how methodologies and analytical tools (i.e. sampling, seasonal adjustment, price deflation, age standardisation) affect datasets.
- Utilise a variety of exploratory data analysis techniques (i.e. graphical, correlation, summary statistics, principal components) and a range of other advanced analytical techniques including multilevel, geospatial, univariate and multivariate regressions when analysing data from direct collection, administrative collection and linked datasets.
- Employ the correct analytical technique depending on the type of data (i.e. time series data, cross sectional data, panel data, longitudinal data) and analysis required to identify important characteristics of a population, and provide insights into the topic being investigated, including the reasons for discrepancies in the data.
- Transform output datasets into a variety of formats and confront data against other relevant data sources (both internal and external) to assess its coherency and ensure it is consistent with what is being produced externally *(See Research Skill Group)*.

Interpreting the Data

Ability to:

- Bring together messages represented in the data, and communicate data limitations (i.e. sampling and non-sampling errors) and data gaps to assist users to make informed judgements about the data's fitness for purpose, and relevance for decision making *(See Statistical Leadership section & Stakeholder Engagement Skill Group)*.
- Utilise and transform data to meet the data and/or information objectives developed during the 'Specify Needs' phase of the GSBPM. This involves breaking the data down and formatting it to ensure fitness for purpose outputs. This may also involve the construction of summary indicators *(See Stakeholder Engagement Skill Group)*.
- Ensure statistics are understood by users through meaningful analysis of the data. This involves being able to explain movements in the figures over time and between geographical domains, within the constraints of data limitations and data quality issues, and undertake conceptual and empirical confrontations from different sources. Statisticians must be able to explain the story behind the numbers in an easily understood and interesting fashion by providing reasoning for unusual results and turning findings from data interrogation and data confrontation into a story *(See Stakeholder Engagement & Data Quality Management Skill Group)*.
- Apply techniques that can be used to extrapolate and interpolate data to other domains (i.e. time periods or populations) for which directly collected data are not available.
- Detect and display relationships between variables, through modelling and other analytical techniques, and through the confrontation, analysis and synthesis of data from a variety of sources.
- Explain what datasets or data items are fit for purpose in particular ways and what are inappropriate because they are based on the wrong concept, or inaccurate for some other reason.
- Transform datasets into a range of dissemination outputs by effectively drawing the data together and presenting statistical stories which are clear, consistent, cohesive, objective, apolitical, maintain confidentiality, and increase user understanding of the content.

Where do Analytical Skills fit into the *ABS Integrated Statistical Capability Framework?*

Statistical Production	Specify Needs	Design	Build	Collect	**Process**	**Analyse**	**Disseminate**	Archive	**Evaluate**

Data Quality Management Skills

What is required as a statistician?

Maintaining Quality & Supporting Continuous Improvement

Ability to:

- Apply the ABS Data Quality Framework and other quality initiatives to understand best practice principles for data quality in collection management and continuous statistical improvement. This requires understanding the seven quality dimensions before designing, collecting, and producing statistics.
- Assess the impact of work on upstream and downstream statistical processes, as well as other related areas of the ABS and in doing so take steps to ensure potential impacts on data quality are communicated to affected areas.
- Evaluate and improve current systems, processes and procedures to maintain or improve the quality of data produced and identify associated efficiencies where possible. This requires identifying and implementing continuous improvement activities based on lessons learnt from previous collections, and knowledge of new and emerging statistical methodologies nationally and internationally.

Mitigating Risks

Ability to:

- Plan and implement quality strategies for collections, in line with the ABS Data Quality Framework, that allow the allocation of resources to ensure data is fit for purpose, and provide relevant quality measures to support the effective use of collection outputs.
- Develop testing and evaluation plans and undertake appropriate testing prior to the implementation of any new or updated processes and/or systems to ensure errors and potential quality issues are identified and resolved *(See Collection Design Skill Group)*.
- Identify the key statistical issues and potential quality impacts for all stages of the collection process and take the appropriate steps to mitigate. These steps can include being able to identify Quality Incidents and develop the appropriate Quality Incident Response Plans, when required.
- Implement best practice for statistical risk mitigation in collections through designing and developing quality gates across the end to end statistical production cycle and regular quality reviews.
- Conduct risk assessments on datasets that are derived from administrative sources through understanding the three broad types for risk assessment: Within the source; Within the ABS; Wider environment.
- Maintain ABS credibility through declaring quality of data to users of statistics through developing Quality Declarations and Quality Statements, and promoting quality assurance practices internally and externally *(See Stakeholder Engagement Skill Group)*.

Where do Data Quality Management Skills fit into the *ABS Integrated Statistical Capability Framework?*

Statistical Production	Specify Needs	Design	Build	Collect	Process	Analyse	Disseminate	Archive	Evaluate

STATISTICAL LITERACY

What is Statistical Literacy?

Statistical literacy refers to the knowledge and skills that enable data users and producers to understand, evaluate and communicate statistical data and information.

The role of the ABS extends beyond the provision of official statistics: access to data alone does not guarantee good decisions. Effective use of data is reliant on statistical literacy skills and ABS statisticians have an important role in building this capability to enable:

- data users to understand the world described in numbers, and
- data producers to describe the world in numbers.

ABS statisticians will approach the building of this capability for both data users and producers through the following four areas. It is important to note, statistical leadership and statistical production skills are inherent within statistical literacy, and as such are essential in building the below skills.

Data Awareness	**Understanding Statistical Concepts**	**Analyse, interpret & evaluate statistical information**	**Communicate statistical information and understanding**
Involves understanding the important role of data in society, the different sources of data, what impacts on data quality, and having an understanding of the context within which the data was collected. This includes skills such as: • recognising the importance of data; • formulating research questions and defining data needs; • recognising how to minimise errors; • describing and assessing data quality; and • determining fitness for purpose.	Involves an understanding of statistical terms, concepts and their appropriate use. This includes skills such as: • understanding and applying a range of commonly used concepts (i.e. mean, range, variance, percentages, rates and ratios, statistical significance); • interpreting information in graph or table form; and • choosing the correct statistic for the purpose.	Involves analysing, interpreting and evaluating statistical information. This includes skills such as: • presenting and using metadata to assess data quality and fitness for purpose; • understanding what statistical tools are appropriate to the context; • accurately predicting and generalising from data; and • drawing out the main relationships, causations and trends in the data.	Involves communicating statistical information and understanding in a way that makes it real, relevant and meaningful to the audience, giving the data context and credibility. This includes skills such as: • describing what the data is saying, both in words and visually, and reporting data using appropriate mediums; • organising and managing data; • applying statistical reasoning to support decisions; and • demonstrating adherence to ethical issues such as confidentiality.

While the nature and complexity of the required skill will vary depending on the target audience (e.g. decision maker, data producer), essentially the goal is to improve the ability of people to think critically about data.

OTHER PROFESSIONAL SKILLS

Regardless of which area of the ABS you work in, or which phase of the end to end statistical production cycle you are working on, you need to have an understanding of not only how to undertake your current work, but why it is done the way it is, and how it fits within the overall end to end cycle. This understanding needs to be based on a sound knowledge of the statistical principles, frameworks, processes, concepts, sources and methods underpinning your work. This will enable you to effectively facilitate the business and information transformation requirements of the ABS.

Additionally, you need to be able to relate your work to the goals and objectives of the ABS, NSS, and the needs and requirements of the external environment to ensure the statistical solutions assist and encourage informed decision making within governments and the community.

This resource focuses on the generic, broad level statistical skills, knowledge and expertise you are encouraged to develop over your statistical career. To become a well-rounded and capable statistician within the ABS and NSS, it is also recommended you build your other professional skill set. The ***Integrated Leadership System*** (ILS) provides guidance on the capabilities and associated behaviours required by all Australian Public Service employees. For ABS statisticians, this means building and developing the following skills and knowledge:

- leadership experience and skills;
- technical knowledge;
- supervisory and staff management skills, knowledge and experience;
- team working skills;
- strategic thinking and problem solving skills;
- project management skills and knowledge;
- networking and communication (both verbal and written) skills;
- change management skills; and
- business process analysis skills.

CAREER DEVELOPMENT

Although no one person is expected to possess all of these statistical and professional skills, as an ABS statistician you are encouraged to develop your skills, knowledge and experience by taking advantage of the development opportunities ABS provides.

What is available?

To make the most of the opportunities available, it is recommended you apply the 70:20:10 approach to career development. This suggests that:

- 70% of your development and learning occurs on the job;
- 20% occurs through feedback, mentoring, coaching, seminars and self-paced learning; and
- 10% occurs through formal training.

Based on this approach, your statistical and professional skill sets can be developed through a range of avenues including:

- on the job training;
- coaching and mentoring;
- buddying;
- networking;
- self-paced learning;
- conferences and seminars;
- formal training and study options;
- broadening your experience by working in different areas within the ABS and where possible, internationally (balancing this with the need to develop some in-depth specialised skills);
- developing your understanding of the policy environment, emerging information requirements and technical issues within your area of expertise; and
- through participating in direct engagement (i.e. 'outpostings') with other agencies that are significant users or producers of statistics or custodians of data used in statistical compilation.

Why is career development essential?

By gaining broad knowledge, expertise and experience in the many and varied aspects of the statistical work undertaken in the ABS, you will reap the benefits of a high level of job satisfaction, sense of professional contribution to the statistical work of ABS, and an enjoyable career. You will also gain a greater understanding of the complexity and inter-relationships of work undertaken in the ABS and throughout the NSS.

Furthermore, refreshing, updating and further developing your skills will allow you to continue to do your job in the most effective, efficient and professional way, and can open up opportunities to take on new challenges or new projects.

We hope this resource is helpful to you as either an aspiring ABS statistician, new starter to the ABS or an existing staff member at any level who is committed to further developing their statistical career.

For further information on development opportunities, please access:

- *The ABS and NSS website; and*
- *ABS Learning Assistant's* ***Capability Development Pathway*** *(ABS staff only).*