*Tonje Køber, Nina Arnesen, Matz Ivan Faldmo,
Jenny Linnerud, Peder Næs, Grete Olsen,
Bente Thomassen, Harald Utne and Li-Chun Zhang*

Statistics Norway's Business Process Model

Department for Management Support

Contents

1. Introduction

1.1. Background

The preparation of a business process model describing standardised work processes in statistical production is a project within Statistics Norway's programme on improvement and standardisation of statistical production (FOSS) that commenced in March 2008.

The business process model is intended to provide a basis for assessing the possibilities and the need for standardisation and improvement of processes within Statistics Norway. The model will be an important tool in planning new statistics, in activities to improve existing work processes in statistical production, and for training purposes. It is estimated that the positive impacts of using the model primarily pertain to reduction of risk, better documentation of the production processes, e.g. through common terminology, and easier training, integration and rotation of staff.

One of the premises for FOSS and the creation of the business process model is the discussion of systematic quality control of processes and products under Quality in every process in *Strategy 2007*: "…Processes and methods shall be evaluated and further improved. Good documentation shall ensure reuse and transfer of knowledge." The description is based on the work processes currently employed within Statistics Norway, but gives also an indication of how these processes should be.

The model was developed by the FOSS Coordination Group, based on the draft that was available in February 2008. The FOSS Coordination Group, consisting of Peder Næs (leader), Nina Arnesen, Matz Ivan Faldmo, Tonje Køber, Jenny Linnerud, Grete Olsen, Bente Thomassen, Harald Utne and Li Chun Zhang, has prepared this report.

1.2. Reader's guide

This report contains a description of the purpose of the work on the business process model (Chapter 2), and the deliberations made during the work. The model itself is then described (Chapter 3) and the experiences made when comparing the model to work processes in individual statistics (Chapter 4).

2. Purpose of the model

The purpose of business process models is to describe organisations; how employees work and what they produce. One of the rationales for making a business process model is to contribute to a better understanding of the work processes in the organisation; another is to provide support for the holistic approach.

2.1. Long term and short term goals

Statistics Norway needs a detailed description of all the work processes in statistical production in order to be able to achieve the long term goal "improvement and standardisation of work processes in statistical production" of FOSS. The business process model fulfils this requirement.

Long term goals:
Improvement and standardisation of work processes in statistical production should contribute to:
– efficiency improvements
– reduction of risk
– reduction in the number of statistical systems and IT applications
– better documentation of the production processes
– easier documentation of the quality of published statistics
– more comprehensive and more flexible expertise
– easier rotation of employees

Short term goals:
A detailed description of all work processes within Statistics Norway's statistical production.

The descriptions should provide sufficient detail to make it possible to carry out standardisation and improvement of the work processes within Statistics Norway's statistical production.

2.2. Correspondence between business process models

The draft business process model available in February 2008 was essentially a translation of LOTTA from Statistics Sweden and BPM from New Zealand. It is important that the methodology and design of the business process model is as generic as possible to facilitate comparison of models between countries. When in doubt, we chose to stay in line with the models of other countries. The model is adapted for processes and routines within Statistics Norway, and register-based statistics are incorporated.

The method for designing and documenting the process description builds upon best practice among statistical offices. The business process model may be applied to different types of statistical production and other processes such as survey-based statistics, register-based statistics and delivery of micro-data to external researchers.

Terms and expressions used to describe the business process model correspond with other process descriptions within Statistics Norway, e.g. the system development method.

The business process models vary from one statistical office to the next, but since the core business is statistical production, the models also share a common foundation which enables the organisations to improve their business processes through collaboration and dialogue. The Statistics Norway business process model, as it is presented in this report, is a model consisting of 7 phases of the statistical production process and 2 over-arching processes that apply throughout the 7 phases (Support & Infrastructure and Quality Management). The 7 phases are described on 3 levels. The following is an overview of other countries'/institutions' business process models that the coordination group has analysed and used while developing the Statistics Norway model.

Other models:
- **Statistical business process model (BPM) from Statistics New Zealand (paper from the 2nd of November 2006)** 7 phases of the statistical business process, 3 over-arching processes and 3 levels. The three over-arching processes are Corporate, Statistical and Manage.
- **LOTTA from Statistics Sweden (SCB) (paper from the 12th of October 2007)**. 7 phases of the statistical business process, 2 over-arching processes and 2 levels. Statistics Sweden based their model on the model from New Zealand when they started making LOTTA in September 2006.
- **The Generic Statistical Business Process Model prepared by the UNECE secretariat (paper from the 14th of March 2008).** 9 phases of the statistical business process, with 3 levels. UNECE drew on the New Zealand model, in developing its own model, and the two are almost identical. UNECE added "Archive" and "Evaluate" as separate phases of the statistical business process, while Sweden, New Zealand and Norway have these as over-arching processes.
- **Standardisation of processes and methods in the ESS from Eurostat (paper from the 10th of March 2008).** 4 phases of the statistical business process and 3 levels. The Eurostat model resembles those of New Zealand and UNECE, but starts with the "Collect" phase (phase four in the other models). In other words, Eurostat omits: 1 Specify Needs, 2 Develop and Design and 3 Build.
- **Methodology Directorate Business from the Office for National Statistics (UK) (paper from the 13th of June 2005).** 15 phases in a value chain.

3.   The business process model – standardised work processes

The Statistics Norway business process model, as it is presented in this report, is a model consisting of 7 phases of the statistical business process and 2 over-arching processes (Support & Infrastructure and Quality Management). The business process model describes the business processes in the statistical production on three levels. Level 1 provides a general description of the main elements in establishing a new statistic, from the need for the statistic arises until the statistical product has been disseminated to the users.
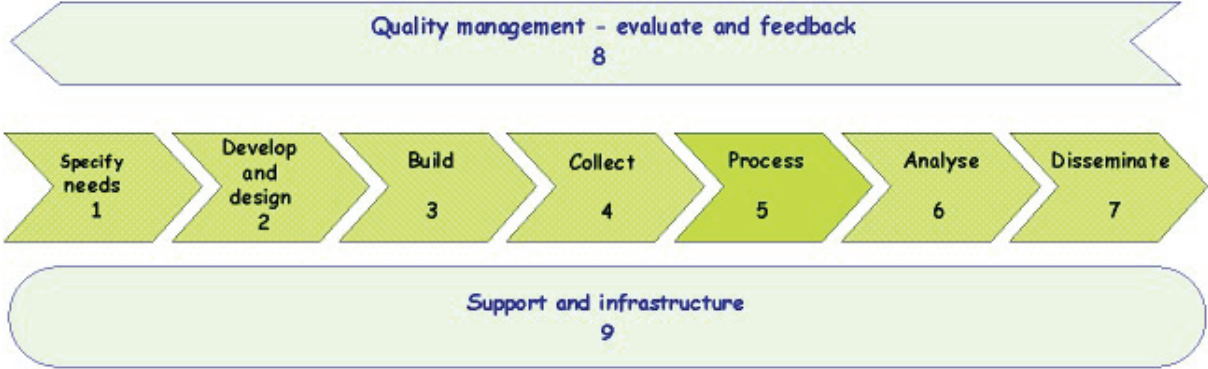
For regular production of statistics, all the processes are reviewed when the statistic is established for the first time and later when the process is revised. Each time the statistic is produced, phases 4 Collect, 5 Process, 6 Analyse and 7 Disseminate are reviewed. To ensure continuous improvement of the production process, it is important to consider how often the phases 1 Specify needs, 2 Develop & Design and 3 Build should be re-visited.

In addition to the individual work processes in the production, over-arching functions such as Quality Management and Support and Infrastructure will make important contributions to continuous improvement of the production. These elements are described in phases 8 and 9, which can contribute to all phases of the production process.

The model may also be illustrated as a cycle that shows how dissemination of the statistic not only concludes the production with the release of one statistic, but that feedback on the publication provides input for specifying the need which can contribute to improvement of the next release of this statistic.

Specify needs	Develop and design	Build	Collect	Process	Analyse	Disseminate
1	**2**	**3**	**4**	**5**	**6**	**7**
Determine need for information **1.1**	Outputs **2.1**	Build and enhance process components **3.1**	Establish frame and registers, select sample **4.1**	Classify and code **5.1**	Acquire domain intelligence **6.1**	Prepare data for dissemination database **7.1**
Consult and confirm need **1.2**	Frame, register and sample methodology **2.2**	Integrate production system with other systems **3.2**	Set up collection **4.2**	Micro-edit **5.2**	Produce statistics **6.2**	Produce product **7.2**
Establish output objectives **1.3**	Data collection methodology **2.3**	Test production system **3.3**	Run collection **4.3**	Macro-control **5.3**	Quality assure statistics **6.3**	Release and promote product **7.3**
Check data availability **1.4**	Process and analysis methodology **2.4**	Finalise production system **3.4**	Finalise collection **4.4**	Impute for partial non-response **5.4**	Interpret and explain statistics **6.4**	Manage user queries **7.4**
Prepare business case **1.5**	Production system **2.5**			Calculate weights and derive variables **5.5**	Prepare statistics for dissemination **6.5**	
					Finalise content **6.6**	

The phases in level 1 and sub-processes in level 2 are illustrated as running sequentially from left to right to indicate the order in which the business processes should be performed, but sub-processes may also proceed in parallel and be repeated.

Three levels have been created in the model. For the time being, the conclusion is that three levels are sufficient, with a short text description in addition. The phases in level 1 and sub-processes in level 2 will be involved in the production of the majority of statistics/statistical products. Level 3 comprises sub-processes that not all statistics necessarily undergo.

At level 3, the sub-processes are presented sequentially top-down under each sub-process from level 2. Particularly on level 3, there can be cases where it is necessary to go back to an earlier sub-process, or the order of the sub-processes can change.

3.1. Specify needs

This phase determines whether there is a need for the identified statistics and whether these statistics can actually be produced. For regular production of statistics, the process is examined when the statistics are initially established and subsequently reviewed in response to a new demand and any need for further development/expansion of the statistics. Phase 1 Specify needs is divided into 5 sub-processes at level 2:

> **1.1. Determine need for information.** This sub-process entails initial mapping and identification of demand for statistics. This applies both to development of new statistics and further development of existing statistics. For statistics in completely new domains, it may be necessary to develop new concepts. New needs for statistics may also arise out of international requirements and recommendations, such as Eurostat regulations.

> **1.2. Consult and confirm need.** This sub-process focuses on a more detailed investigation, determination and confirmation of user needs. It is important that the statistics producer and the users have a mutual understanding of the needs and possibilities, so that any potential misunderstandings about the final product are eliminated at an early stage.

> **1.3. Establish output objectives.** Here the first conceptual definitions of the variables concerned are produced, i.e. definitions corresponding to what one ideally aims to measure. The next step is to create viable definitions of the variables, i.e. definitions based on what it is actually possible to measure. Finally, the needs are confirmed in draft form in table outlines.
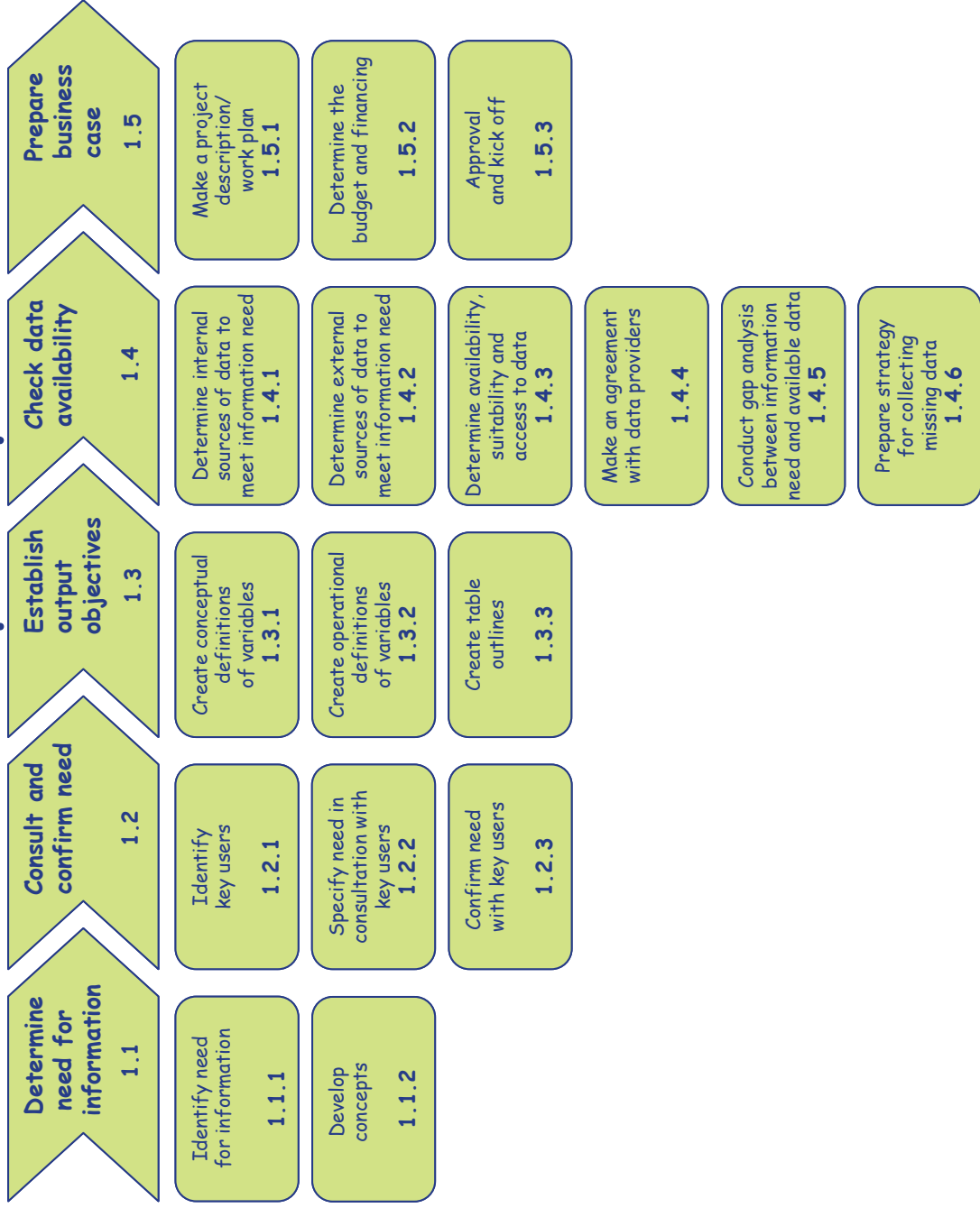
> **1.4 Check data availability.** Here we identify internal and/or external sources of data. Contact must then be made with data providers to check possibilities for access to data. A gap analysis must be made between the documented information needs and the available data. A strategy must then be made on how to collect the data needed to fill the gap.

> **1.5. Prepare business case.** For projects, a project description is prepared and for regular statistical production, a work plan. Budget and financing are determined before the project description/work plan is approved and work commences.

> The decision to produce a new statistic (Section 2-1 of the Statistics Act) must officially be approved by the Director General. The decision must refer to the obligation to provide information (Statistics Act, Section 2-2 and Compulsory fines, Section 2-3) where this is relevant. The date of the official decision should be entered in the product register. The Department of Communication must be contacted for the establishment of a title for the new statistic. Before the project starts and at the latest by sub-process 1.5, a product number must be assigned. When drawing up the project description and the budget, Statistics Norway's *Project handbook* and *Guidelines for pricing of user-financed statistical commissions* should be used.

Phase 1. Specify needs

Determine need for information 1.1	Consult and confirm need 1.2	Establish output objectives 1.3	Check data availability 1.4	Prepare business case 1.5
Identify need for information 1.1.1	Identify key users 1.2.1	Create conceptual definitions of variables 1.3.1	Determine internal sources of data to meet information need 1.4.1	Make a project description/ work plan 1.5.1
Develop concepts 1.1.2	Specify need in consultation with key users 1.2.2	Create operational definitions of variables 1.3.2	Determine external sources of data to meet information need 1.4.2	Determine the budget and financing 1.5.2
	Confirm need with key users 1.2.3	Create table outlines 1.3.3	Determine availability, suitability and access to data 1.4.3	Approval and kick off 1.5.3
			Make an agreement with data providers 1.4.4	
			Conduct gap analysis between information need and available data 1.4.5	
			Prepare strategy for collecting missing data 1.4.6	

Need for information

Approved project/ work plan

3.2. Develop and design

This phase describes investigation, development and design activities for defining statistical outputs, methodologies, collection tools and work processes. For regular production of statistics, the process is examined when the statistics are initially established and subsequently reviewed in response to a new demand and any need for further development/expansion of the statistics.

Phase 2 Develop and design is divided into 5 sub-processes at level 2:

2.1. Outputs. Here we design the content of the statistical product, set goals for product quality, define preservation and destruction requirements, and plan dissemination at a general level. The starting point for this work is metadata from similar and previous collection processes. This information forms the basis for defining which data are needed for the statistical product.

2.2. Frame, register and sample methodology. Relevant data sources are administrative registers, registers within Statistics Norway (statistical registers), censuses or sample surveys, and a description is made at this stage of how these sources might be combined. For register statistics, the register sources are analysed. The frame of units for sampling or conducting a census is developed and designed. An analysis is made of how the sampling frame covers the target population, i.e. the units we would ideally like to obtain data on. The next step is to produce the sample design. The actual sample is created in Phase 4 - Collect (sub-process 4.1: Identify and validate sample), using the methodology, specified in this sub-process.

2.3. Data collection methodology. The activities in this process vary depending on the collection method. The methods include interviews (CAI and CATI), printed and online questionnaires, administrative data from other government bodies and combined methods depending on the user needs and data requirements. To ensure coordination and correct procedure in the preparation of questionnaires, the *Task list for production of questionnaires* is used. The data collection methodology is based on a repository of questions (reuse of questions and related attributes) and a questionnaire tool to facilitate rapid and straightforward creation of questionnaires for early cognitive testing (user testing). Questionnaires are usually subject to user testing (sub-process 2.3.5). Statistics Norway's *Practical user testing handbook* covers this.
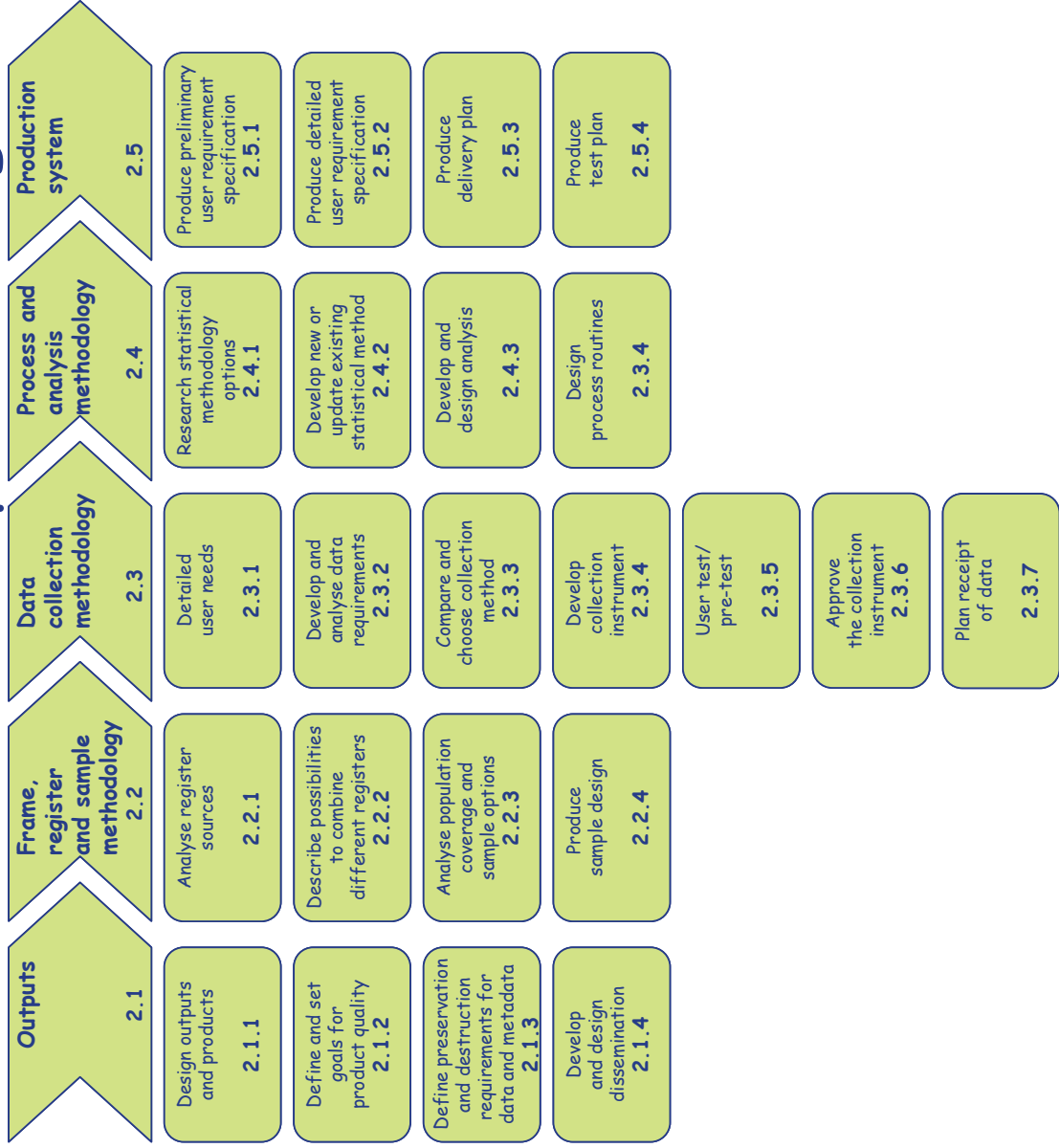
Questionnaires used under the authority of the Statistics Act must be approved (sub-process 2.3.6) by the Director General both on initial release and when the questionnaire undergoes major changes. The date of the approval must be entered in the product register. The approved questions are used in designing the production tools in phase 3 Build. Receipt of data from both register-based and questionnaire-based data collection is planned here.

2.4 Process and analysis methodology. Here we plan the methodology for processing and analysing the data, which will be carried out in phases 5 Process and 6 Analyse. The development and/or adaptation of statistical methods are covered in this sub-process.

2.5. Production system. Where IT expertise is required, the procedure in Statistics Norway's *Process guide for system development method* (SD method) is followed. Here the user requirement specification is designed according to the SD method and the detailed user requirement specification is approved. A general principle in the business process model is to reuse processes and technology. In addition to user requirement specification and a delivery plan, a test plan is produced for the tests to be conducted in 3.3.

Phase 2. Develop and design

Approved project/ work plan

Outputs 2.1	Frame, register and sample methodology 2.2	Data collection methodology 2.3	Process and analysis methodology 2.4	Production system 2.5
Design outputs and products **2.1.1**	Analyse register sources **2.2.1**	Detailed user needs **2.3.1**	Research statistical methodology options **2.4.1**	Produce preliminary user requirement specification **2.5.1**
Define and set goals for product quality **2.1.2**	Describe possibilities to combine different registers **2.2.2**	Develop and analyse data requirements **2.3.2**	Develop new or update existing statistical method **2.4.2**	Produce detailed user requirement specification **2.5.2**
Define preservation and destruction requirements for data and metadata **2.1.3**	Analyse population coverage and sample options **2.2.3**	Compare and choose collection method **2.3.3**	Develop and design analysis **2.4.3**	Produce delivery plan **2.5.3**
Develop and design dissemination **2.1.4**	Produce sample design **2.2.4**	Develop collection instrument **2.3.4**	Design process routines **2.3.4**	Produce test plan **2.5.4**
		User test/ pre-test **2.3.5**		
		Approve the collection instrument **2.3.6**		
		Plan receipt of data **2.3.7**		

All designs approved

3.3. Build

In this phase, the production system is created, tested and put into production. The production system consists of different components/solutions to be used in different phases and for different purposes in the statistical production.

The phase is adapted as far as possible to Statistics Norway's SD method which describes how a statistical system within Statistics Norway should be developed. It is therefore recommended that the SD method is employed whenever possible.

Phase 3 Build is divided into 4 sub-processes at level 2:

3.1. Build and enhance process components. Both the development of new and enhancement of existing components are covered in this sub-process. The user requirement specification prepared in sub-process 2.5 forms the basis for the work to be carried out. The first phase consists in constructing, or outlining, the various components of which the production system is to consist. For this, techniques such as data modelling, logical dataflow and dialog design are employed. The second phase is to perform the development work itself, e.g. programming and design of screens. The third and last phase is to test that each individual component functions as intended, for example, that the sampling algorithm works and meets the specification.
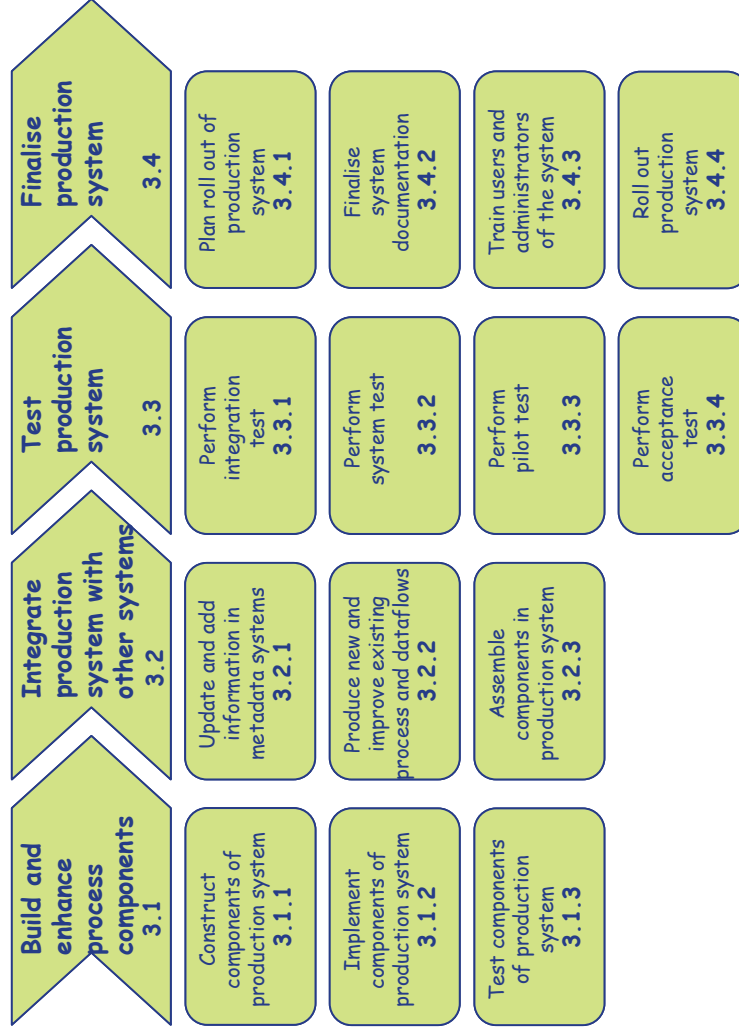
3.2. Integrate production system with other systems. There will very often be a need to integrate one production system with other systems. It is important to establish interaction with metadata systems for definitions of variables, questionnaires and questions, and standard classifications so that updated metadata is available everywhere it is needed. Other examples include integration with sample frame systems and population registers e.g. people, businesses, ground properties, addresses and buildings registers. In this work process, every effort is made to ensure that the electronic coordination is suitable and optimised for maximum efficiency.

3.3. Test production system. Testing of the production system is divided into four: integration testing, system testing, pilot testing (optional, but recommended) and acceptance testing. The purpose of integration testing is to test that the various subsystems work together. System testing must be carried out for the system as a whole once the final integration testing has been completed. It must be performed under conditions that are as close to the final operational environment as possible. Ideally, the system testing phase should be carried out by impartial testers, but in practice it is often performed by IT developers. The acceptance test should ensure that the system conforms to the original requirements (user requirements specification in sub-process 2.5), and must always be performed by the requestor.

3.4. Finalise production system. This process starts with planning for rolling out a production system, proceeds with finalisation of the system documentation, then progresses to training of users and administrators of the system, and concludes with hand-over of the production system to operations in accordance with IT Infrastructure Library (ITIL process).

Phase 3. Build

All designs approved

Build and enhance process components **3.1**	Integrate production system with other systems **3.2**	Test production system **3.3**	Finalise production system **3.4**
Construct components of production system **3.1.1**	Update and add information in metadata systems **3.2.1**	Perform integration test **3.3.1**	Plan roll out of production system **3.4.1**
Implement components of production system **3.1.2**	Produce new and improve existing process and dataflows **3.2.2**	Perform system test **3.3.2**	Finalise system documentation **3.4.2**
Test components of production system **3.1.3**	Assemble components in production system **3.2.3**	Perform pilot test **3.3.3**	Train users and administrators of the system **3.4.3**
		Perform acceptance test **3.3.4**	Roll out production system **3.4.4**

System in production

3.4. Collect

All the data that are identified in the planning in phase 2 Develop and design, are now collected using the data collection tools and IT solutions developed in phase 3 Build. All the data are recorded and stored electronically in specific databases/data files in designated areas. Finalised data files are documented. For regular production of statistics, this process is repeated each time the statistical product is produced. The activities in this process will differ depending on whether the statistics are based on a dedicated data collection or on register data. There are also certain differences between activities/routines for short-term statistics and for annual statistics, and between surveys subject to the statutory obligation to provide information (business surveys) and voluntary surveys (the majority of individual/household surveys).

Phase 4 Collect is divided into 4 sub-processes at level 2:

4.1. Establish frame and registers, select sample. Based on the development and design in phase 2 Develop and design, the frame is established. This is specified as a list or a register of units that can be counted or drawn (typically from a population register). Necessary linking, checking and harmonisation of data sources are carried out. The use of external data sources is coordinated and relevant registers are controlled, maintained and updated. The sample is selected, controlled and documented. It is important to coordinate and distribute the workload over samples that share a common frame.

4.2. Set up collection. Here the necessary training of employees who will be working on data collection is carried out. Staff members are taken through how collection should be performed, schedules must be created and responsibilities distributed. In addition, an information letter is produced (examples are provided on Statistics Norway's internal website) for data providers, and pre-printing and pre-recording of previous data is carried out. On several occasions, a special hotline is set up to make it easy for data providers to get in touch with Statistics Norway for assistance in completion of questionnaires or for answers to other queries in connection with the data collection. Checks must be made to ensure that paper questionnaires are correctly printed and that electronic questionnaires are available on the Internet etc.
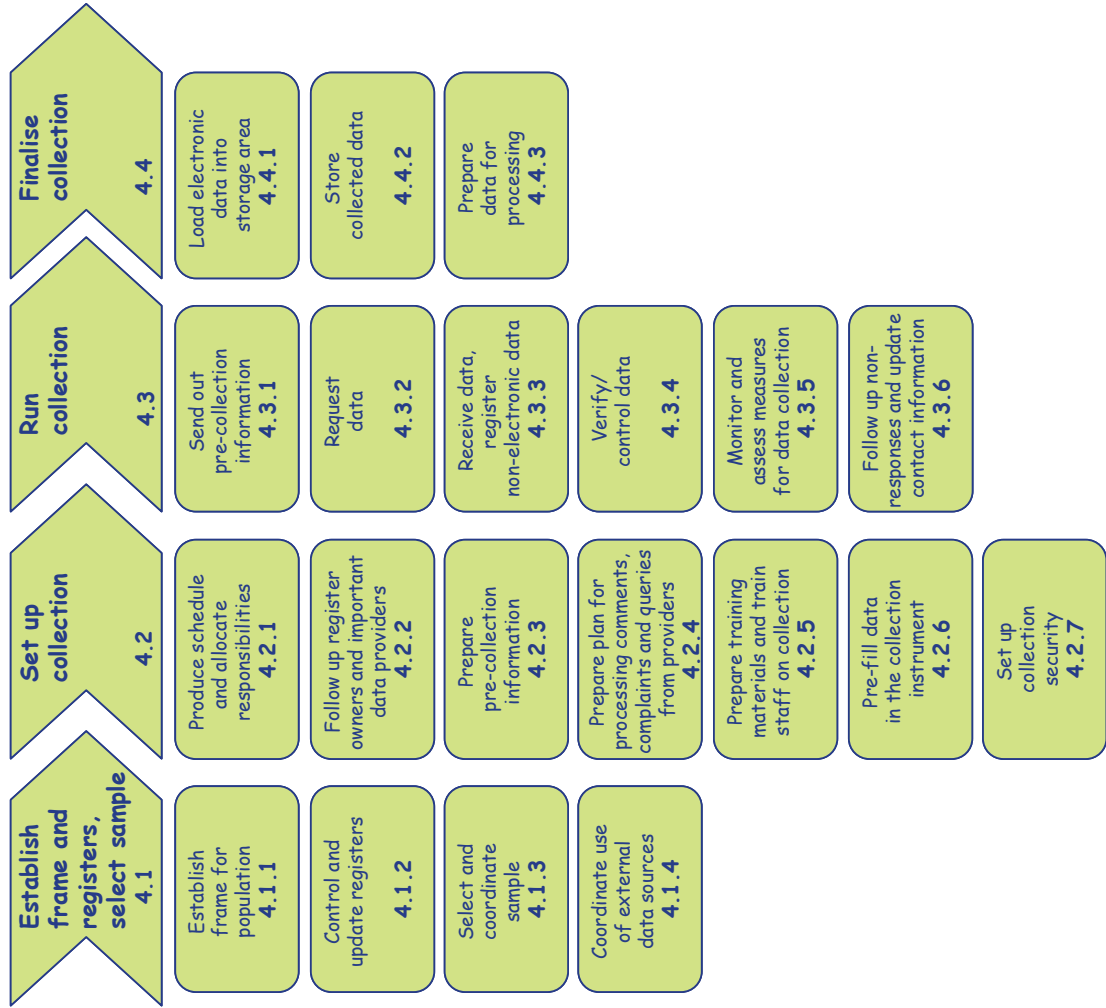
4.3. Run collection.
Information about the survey is sent out to the data providers. Information about the statutory obligation to provide information is included in the letter to data providers when this applies. Data is requested via interview-based surveys or self-administrated surveys. A supply date is agreed upon for register data. During receipt of data from self-administrated surveys, non-responses are typically followed up by tracking down new addresses for those questionnaires returned by the post. In surveys subject to the statutory obligation to provide information, filled-out questionnaires of insufficient quality will be returned to the data provider, or the data provider will be contacted by phone or e-mail. Paper questionnaires undergo optical reading and verification prior to automatic check-in in the survey frame. Electronic questionnaires are checked in automatically to the survey frame. Reminders are issued for individual/household surveys, with notice of a possible compulsory fine and the decision of a compulsory fine for those who fail to provide information for business surveys covered by the statutory obligation to provide information.

4.4. Finalise collection. Data from the various collection methods are stored. Paper questionnaires are subject to necessary checks before the data is stored. The statistical division is notified once the data are ready for editing, and stored. Staff involved in the data collection process complete a checklist of quality controls performed on the data – from planning of the data collection, through training of those collecting the data, dispatch, interview and receipt of data. The statistical division, or external user, receives an evaluation form to be completed to indicate their level of satisfaction with the work performed. The statistical division issues instructions concerning destruction of printed forms and deletion of image files from optical reading.

Phase 4. Collect

Establish frame and registers, select sample
4.1

- Establish frame for population
4.1.1

- Control and update registers
4.1.2

- Select and coordinate sample
4.1.3

- Coordinate use of external data sources
4.1.4

Set up collection
4.2

- Produce schedule and allocate responsibilities
4.2.1

- Follow up register owners and important data providers
4.2.2

- Prepare pre-collection information
4.2.3

- Prepare plan for processing comments, complaints and queries from providers
4.2.4

- Prepare training materials and train staff on collection
4.2.5

- Pre-fill data in the collection instrument
4.2.6

- Set up collection security
4.2.7

Run collection
4.3

- Send out pre-collection information
4.3.1

- Request data
4.3.2

- Receive data, register non-electronic data
4.3.3

- Verify/ control data
4.3.4

- Monitor and assess measures for data collection
4.3.5

- Follow up non-responses and update contact information
4.3.6

Finalise collection
4.4

- Load electronic data into storage area
4.4.1

- Store collected data
4.4.2

- Prepare data for processing
4.4.3

Data ready for processing

System in production

3.5. Process

In this phase, the statistical data for phase 6 Analyse is prepared on the basis of raw data from phase 4 Collect. It is made up of activities such as processing of statistical units, scrutiny of data, running imputations for missing values, estimation of extrapolation weights. Phase 6 Analyse may reveal circumstances making it necessary to repeat parts of phase 5 Process. Activities within phase 5 Prepare and phase 6 Analyse may commence before phase 4 Collect is completed.

Phase 5 Prepare is divided into 4 sub-processes at level 2:

5.1. Classify and code. Different data sources are linked together and statistical registers are established. Units are identified and statistical units established. A statistical unit is an object of statistical survey and the bearer of statistical characteristics. The statistical unit is the basic unit of statistical observation within a statistical survey. Observation units, i.e. those entities on which information is received and statistics are compiled, are identified. In sub-process 5.1.2 problems with duplicates are examined and resolved together with any other special issues with observation units. Micro-data are coded and finally stored (data which have not been edited at the micro-level).

5.2. Micro-edit. All types of logical checks that may reveal defects and deficiencies in the data are now run. Correction routines are run and evaluated. These should to the greatest extent possible be automated. Controls to indicate suspicious values are run and necessary manual editing performed. All the controls run in sub-process 5.2 are referred to as non-statistical controls since they are applied at the unit level (micro-data).
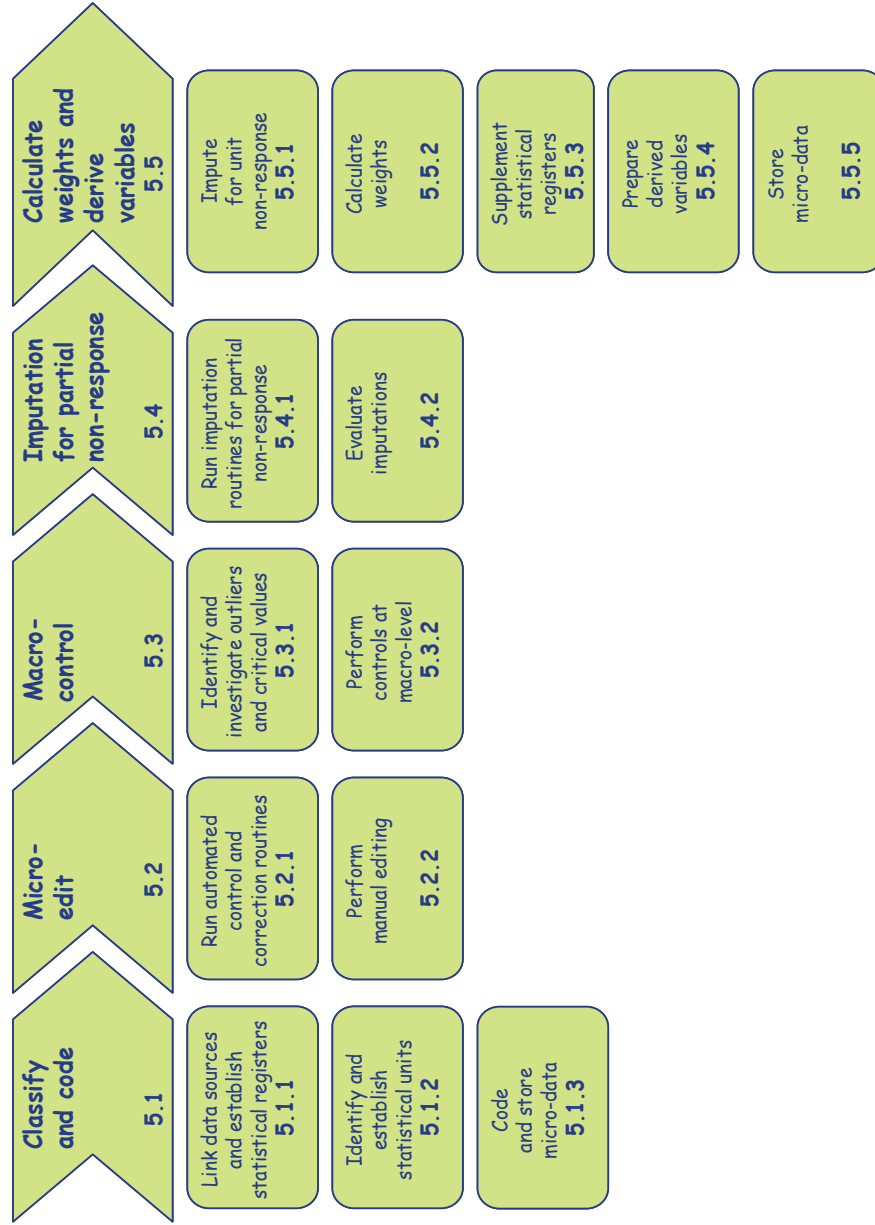
5.3. Macro-control. Extreme values, outliers and critical values are identified using statistical controls run for aggregated or groups of units. Critical values are values for a unit that have large significance, and thereby affect the figures substantially. Non-critical values are processed automatically, while critical values are examined manually, if possible. Controls at macro-level to detect any unusual groups of units are run and evaluated. The controls in sub-process 5.2 may need to be adjusted/extended and re-run as a result of new factors that come to light in sub-process 5.3.

5.4. Impute for partial non-response. Imputation routines for partial non-response are run and evaluated. Parts of sub-process 5.4 may commence before process 5.5, but cannot be completed before sub-process 5.3, since imputation in principle may need to employ all available data.

5.5. Calculate weights and derive variables. Imputations are made for unit non-response where relevant. Weights are calculated for sample surveys. Imputation or weighting for statistical registers with missing information is carried out. Statistical properties of the results are evaluated and documented. Derived statistical variables are produced and the final edited micro-data are stored.

Phase 5. Process

Data ready for processing

Classify and code
5.1

- Link data sources and establish statistical registers
  5.1.1
- Identify and establish statistical units
  5.1.2
- Code and store micro-data
  5.1.3

Micro-edit
5.2

- Run automated control and correction routines
  5.2.1
- Perform manual editing
  5.2.2

Macro-control
5.3

- Identify and investigate outliers and critical values
  5.3.1
- Perform controls at macro-level
  5.3.2

Imputation for partial non-response
5.4

- Run imputation routines for partial non-response
  5.4.1
- Evaluate imputations
  5.4.2

Calculate weights and derive variables
5.5

- Impute for unit non-response
  5.5.1
- Calculate weights
  5.5.2
- Supplement statistical registers
  5.5.3
- Prepare derived variables
  5.5.4
- Store micro-data
  5.5.5

Data ready for analysis

3.6. Analyse

In this process, the statistics are produced, quality assured, interpreted and prepared for dissemination. The acquisition of domain intelligence in order to be able to understand and assess the statistics is also included in this process.

Phase 6 Analyse is divided into 6 sub-processes at level 2:

6.1 Acquire domain intelligence. Information and comments from external and internal sources is collected and assessed as required. Those responsible for the statistics keep their knowledge up to date in their domain.

6.2 Produce statistics. Tables which will form the numerical basis for the statistics are generated. Standardised metrics such as relative numbers and any indexes are produced, and seasonal adjustments and forecasts are made where applicable. Accuracy measurements are produced.
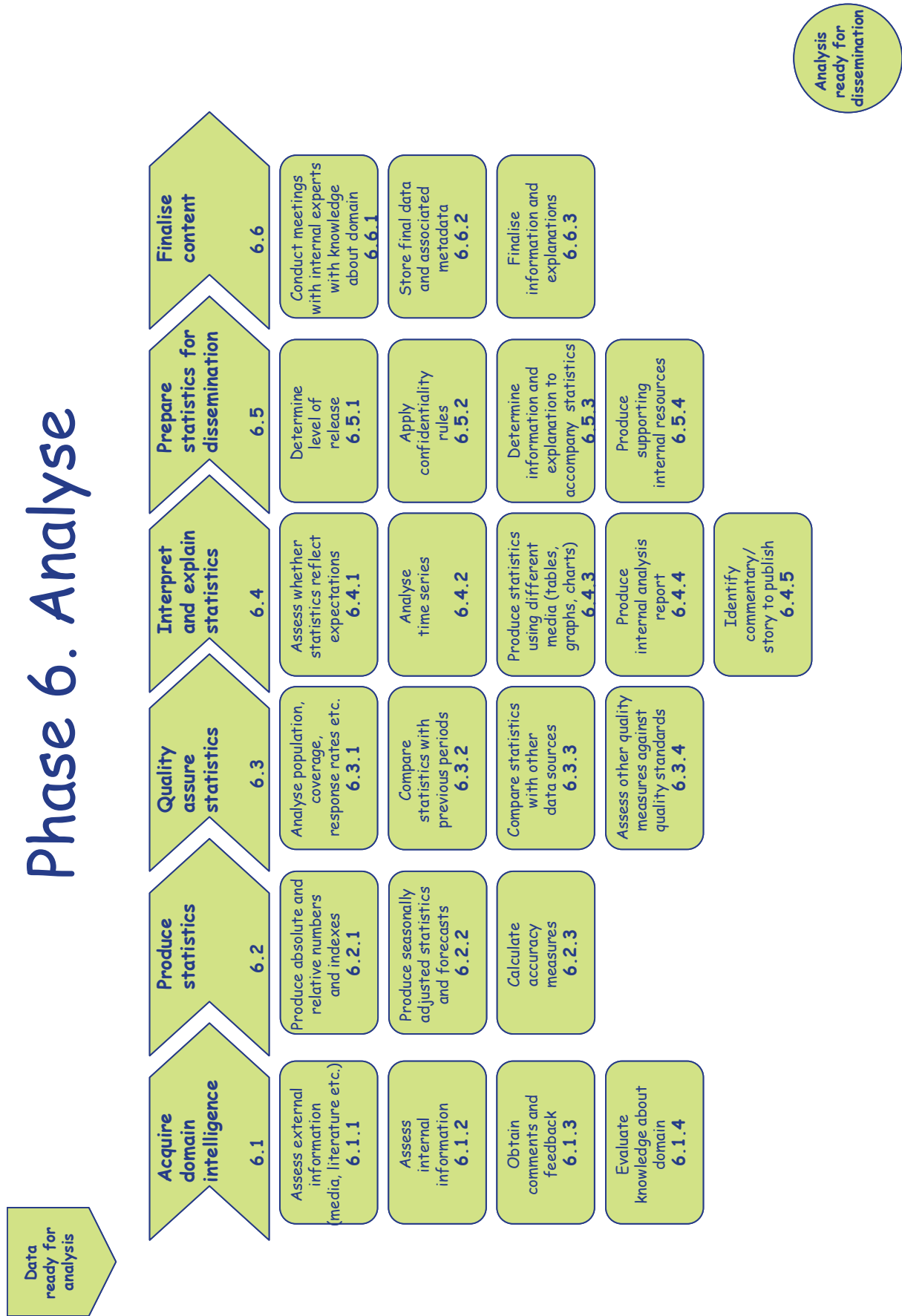
6.3. Quality assure statistics. Depending how the statistics were produced, it may be relevant to carry out analyses of population, coverage, response rates etc. The statistics are compared with results from previous periods and results from other sources in order to check comparability and consistency. The results of quality measurements are assessed against quality standards.

6.4 Interpret and explain statistics. The statistics are assessed based on expectations from previous experience and any known events after the previous publication. Time series are analysed. In addition to tabulations, various graphical renderings may serve as useful tools in the analysis. The analysis is summarised in an internal report which in turn forms the basis for commenting on and finding interesting angles for dissemination of the statistics. Factors revealed during preparation of the statistical product (sub-process 7.1) may make it necessary to go back to sub-process 6.4 to revise interpretations and explanations.

6.5 Prepare statistics for dissemination. The release level is determined in accordance with Statistics Norway rules, and confidential data are suppressed (cell suppression, rounding etc.). The information and explanation to accompany the statistics are prepared. In addition, necessary support resources are created for in-house use, which might, for example, be useful in answering queries from users.

6.6 Finalise content. Meetings with internal experts are conducted where relevant. Data and metadata are stored. Storage must follow the guidelines in Statistics Norway's *Security handbook* and *Data storage on Unix handbook*. Archive files must be documented in the archive file documentation system. All variables that are published must be documented in the system for variable documentation, and all classifications according to which the statistics are published must be documented in the database for standard classifications. Information and explanations are finalised and the statistics are now ready for dissemination, i.e. the content has been approved by the person responsible for the statistics. Formal approval of publishable material takes place in sub-process 7.2.

Phase 6. Analyse

Data ready for analysis

Acquire domain intelligence 6.1	**Produce statistics** 6.2	**Quality assure statistics** 6.3	**Interpret and explain statistics** 6.4	**Prepare statistics for dissemination** 6.5	**Finalise content** 6.6
Assess external information (media, literature etc.) **6.1.1**	Produce absolute and relative numbers and indexes **6.2.1**	Analyse population, coverage, response rates etc. **6.3.1**	Assess whether statistics reflect expectations **6.4.1**	Determine level of release **6.5.1**	Conduct meetings with internal experts with knowledge about domain **6.6.1**
Assess internal information **6.1.2**	Produce seasonally adjusted statistics and forecasts **6.2.2**	Compare statistics with previous periods **6.3.2**	Analyse time series **6.4.2**	Apply confidentiality rules **6.5.2**	Store final data and associated metadata **6.6.2**
Obtain comments and feedback **6.1.3**	Calculate accuracy measures **6.2.3**	Compare statistics with other data sources **6.3.3**	Produce statistics using different media (tables, graphs, charts) **6.4.3**	Determine information and explanation to accompany statistics **6.5.3**	Finalise information and explanations **6.6.3**
Evaluate knowledge about domain **6.1.4**		Assess other quality measures against quality standards **6.3.4**	Produce internal analysis report **6.4.4**	Produce supporting internal resources **6.5.4**	
			Identify commentary/story to publish **6.4.5**		

Analysis ready for dissemination

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3.7. Disseminate

This phase prepares, produces and manages the release of the statistical product.

Phase 7 Disseminate is divided into 5 sub-processes at level 2:

7.1. Prepare data for dissemination database. The date for when various statistics (*Daily Statistics*) plan to be published must be sent to the *Advance Release Calendar* four months before the release (sub-process 7.1.1). Official statistics must be published in the dissemination database StatBank on www.ssb.no/english. Exemptions from publication in StatBank must be made by the Director General. In connection with the publication, metadata must be available for the statistics in both Norwegian and English (sub-process 7.1.2).

7.2. Produce product. This process focuses on production of statistical products such as the *Daily Statistics* (DS), publications in Statistics Norway's publication series, articles in periodicals or in the mass media, user-commissioned statistics and data for external researchers. The statistical products must meet the users' needs, as determined in phase 1 Specify needs.

Proposals for decisions concerning the establishment of new statistics or significant changes to existing statistics must be submitted to the Director General with documentation of principles, definitions, use of the statutory obligation to provide information and of compulsory fines, proposed collection approach (use of registers and contents of questionnaires), editing/processing and release. Well in advance of the *first release* the proposal and results must be approved (sub-process 7.2.5), as a minimum through a summary decision by the Director General. The proposal must be discussed with the Department of Communication before being submitted to the Director General. Following a decision, the Department of Communication assigns a short designation and establishes a new webpage. For regular publications, the final DS must be approved by the director of the relevant statistics department or the person they have delegated this responsibility to.

7.3. Release and promote product. Here the statistical product is released through publication, primarily on Statistics Norway's website – www.ssb.no/english. In addition, the statistical product may be presented via other channels such as press conferences and seminars. Finally, the statistical product is documented and archived.

7.4 Manage user queries. All enquiries and questions are recorded, analysed and answered. User satisfaction is evaluated from the experiences of those with direct user contact, or measured by means of dedicated surveys.

Phase 7. Disseminate

Analysis ready for dissemination
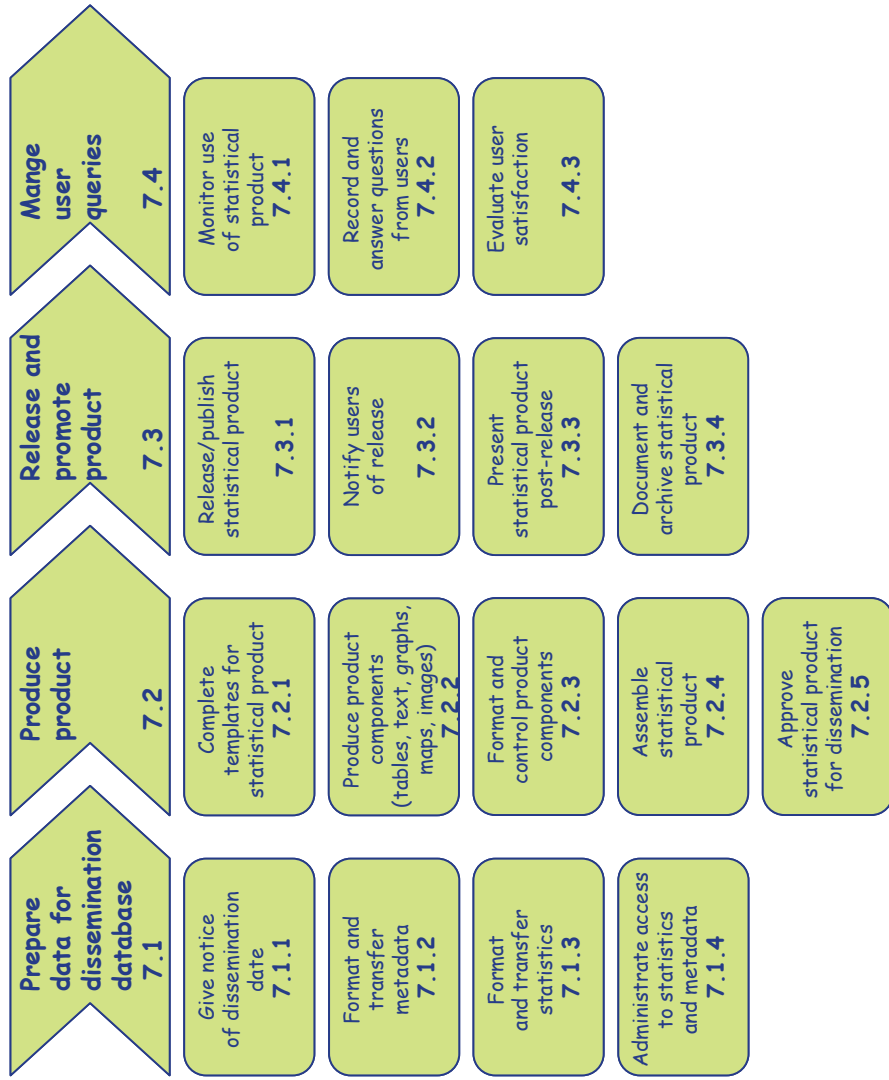
Statistics disseminated

Prepare data for dissemination database
7.1

- Give notice of dissemination date **7.1.1**
- Format and transfer metadata **7.1.2**
- Format and transfer statistics **7.1.3**
- Administrate access to statistics and metadata **7.1.4**

Produce product
7.2

- Complete templates for statistical product **7.2.1**
- Produce product components (tables, text, graphs, maps, images) **7.2.2**
- Format and control product components **7.2.3**
- Assemble statistical product **7.2.4**
- Approve statistical product for dissemination **7.2.5**

Release and promote product
7.3

- Release/publish statistical product **7.3.1**
- Notify users of release **7.3.2**
- Present statistical product post-release **7.3.3**
- Document and archive statistical product **7.3.4**

Mange user queries
7.4

- Monitor use of statistical product **7.4.1**
- Record and answer questions from users **7.4.2**
- Evaluate user satisfaction **7.4.3**

3.8. Quality management – evaluate and feedback

The object of the systematic quality processes within Statistics Norway is to continuously improve statistics and analyses in line with user needs, in order that the institution retains its integrity and standing.

A method for continuous improvement is to implement the Quality Cycle:
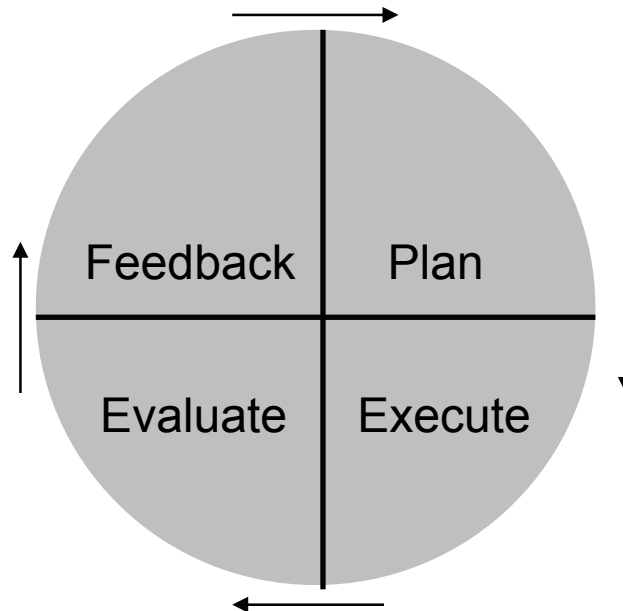
The improvement activities are posited as a process in which the key factor is to evaluate the process in order to be able to transfer back experience in such a way that planning and execution are improved in the next cycle.

The systematic quality process may be characterised by the following keywords:
- User orientation
- Process orientation
- Facts in the form of documentation and data as a basis for improvements
- Participation from the whole organisation, e.g. through project and team work
- Leadership and continuity

Quality of statistics means that it must meet the needs of different users. Normally, this entails that it is:
- Relevant
- Accurate
- Timely and punctual
- Comparable and coherent
- Accessible and clear (documented)

This process is associated with, among other things:
- Quality control in every processes
- Identify and propose process-related improvements
- Collection, follow-up and analysis of process data
- Identify and propose product-related improvements
- Collection, follow-up and analysis of user and customer feedback
- Quality indicators

3.9. Support and infrastructure

It is neither feasible nor practical to enumerate everything that comprises phase 9 Support and infrastructure, but a few main categories and examples for each of these, are given here:

- Legal acts, e.g. the Personal Data Act and the Statistics Act
- Control documents, e.g. Strategy 2007, business plan for each year,
- Systems and associated documentation, e.g. master metadata systems (variable definitions, standard classifications, archive file descriptions), but also administrative systems such as time stamping and dissemination systems such as Statistics Norway intranet
- Templates, guidelines and handbooks with good examples to follow, e.g. templates for user requirements specification, dissemination policy, project handbook and process guide for system development methodology.
- Committees, fora, expert groups, e.g. the Confidentiality committee, Metadata forum and SAS group. Depending on their mandate, these bodies can provide advice, offer recommendations, make decisions and/or provide specialist support
- Support processes, e.g. ITIL (IT Infrastucture Library) which describes the process for roll out of a system.
- Data storage and administration, e.g. registers and archive files.
- Population administration, e.g. the business register, the population register and the register of ground property, addresses and buildings.
- The following themes cut across the entire organisation and are a source of useful information to support the business process:
    - Security, e.g. updating of register notices and the handbook for Data storage on Unix within Statistics Norway
    - International activities such as Development Assistance Cooperation and EEA cooperation
    - Financial matters, e.g. Rules and guidelines concerning public procurements, and the State's standard agreements for contracting firms
    - Competence and development, e.g. Statistics Norway's internal training school

Finally, it should be mentioned that the business process model itself will become a part of Support and infrastructure.

4. Evaluation of the model

4.1. Evaluation of the model

In the development process, the project group had a need to test the model out on ongoing statistical production and other work processes within Statistics Norway. We attached importance to presenting the model to employees within different types of statistical production: social statistics and financial statistics, interview-based and register-based statistics together with short-term statistics and structural business statistics.

The evaluation was performed for the following statistics/work processes:
- Labour surveys (interview-based short-term statistics)
- Population and household statistics (register-based statistics)
- Structural business statistics for the travel industry
- Transport statistics (reporting from municipality to state)
- Interview activities
- Price index for legal services (structural business statistics). Production process for "Price index for legal services" is described in the Metadata in the production process (MDPP) project. A version of the FOSS process model from November 2007 was used as the basis, but more recent versions were used as they became available, and the version from July 2008 was the one used in writing up the report. A proposal has been submitted for a check list focusing on the role of metadata in various stages of the production process, from the perspective of the section responsible for the statistics. Based on the work on the process, proposals have also been made for changes to the business process model and these have been passed on to the FOSS Coordination group. Some of these proposals have been adopted. For more information, refer to the final MDPP report.

The following specialist environments within Statistics Norway were also consulted
- Division for IT Development
- Department of Communication

4.2. Further plans for the model

The business process model has already been adopted by various environments within Statistics Norway. To ensure that it is also used in the future, it will need to be reviewed and updated on a continuous basis to ensure that it reflects the real state of affairs at any time.

Recommendations to the FOSS committee
1. The creation of a process guide for the model on Statistics Norway intranet

2. That the model originally in Norwegian be translated into English for international use i.e. this document.

Appendix: Definitions and abbreviations

Terms and abbreviations	Definitions
Acceptance test	Acceptance tests which are run on the production system must always be performed by the requestor. The aim of an acceptance test is to confirm that the system is as requested.
Administrative register	An administrative register is a register established by a central government administration to support their activity.
Anonymisation	The removal of sufficiently many variables/categories so that it is no longer reasonably possible to link the data directly or indirectly with identifiable individuals and/or establishments.
CAI (Computer Assisted Interview)	Telephone or personal interview conducted with the aid of a computer.
CATI (Computer Assisted Telephone Interview)	Telephone interviews conducted with the aid of a computer.
Coding	Grouping of data according to a code list (standard classification) and the assignment of a valid value
Collection method	A method used for transferring data from the provider to the statistics producer
Confidential data	Information that can be traced back to the provider or other identifiable individual and therefore normally can not be made public.
Critical values	Values for a unit that have large significance, and thereby affect the figures substantially
Dissemination database	Statistical database which is available to users, e.g. over the Internet. Statistics Norway's dissemination base is StatBank.
Editing	Examination, control and amendment/correction of values that are incorrect, or assumed to be incorrect, to a correct value or assumed more correct value. Within Statistics Norway often referred to as revision.
Extreme value	Data value which deviates significantly from other values in the data set and which might be incorrect. The value must be controlled to check whether it is correct (an outlier) or incorrect and requiring correction.
Frame	A list or other specification of units to be counted or from which a sample is to be selected. A frame gives access to the target population without its units necessarily being statistical units of interest.
Impute	To assign a value to a variable, either because the value is missing or the value collected is inconsistent with other values.
Index	A quantity that shows by its variations the changes of a magnitude over time or space (Source SDMX and ISI (2003)).
Integration test	Depending on the size of the system, different groups may develop their own sub-systems. As the different sub-systems are finalised in whole or in part, they have to be integrated into the total system. The aim of integration testing is to check that these parts of the whole function satisfactorily when assembled.

Terms and abbreviations	Definitions
IO (interview object)	Person selected to take part in a sample survey.
ITIL	Information Technology Infrastructure Library is a structured framework, or ontology, for quality assurance of supply, operation and support within the IT sector. ITIL deals with the organisational structure and the specialist skills of an IT organisation by presenting a detailed set of management procedures which an organisation can use for managing its IT operations. These procedures are supplier-independent and are relevant for all aspects of an IT infrastructure.
Manual correction	The person responsible for editing, inserts values manually to remedy errors or missing data on the basis of rules and own judgement, in consultation with the data provider if necessary.
Meta data	Metadata is data that defines and describes other data. (Source SDMX and ISO/IEC FCD 11179-1). Statistical metadata is structured information about statistics. This includes information used for producing, disseminating, understanding, finding and (re)using statistics.
Microdata	Information on the smallest statistical unit – usually an individual/household or business/enterprise. Information about the unit may be available with full identification (name, address), de-identified or anonymised.
Non-response	Interview object who does not wish/is unable to take part in a survey.
Observation unit	Observation units are those entities on which information is received and statistics are compiled, (Source: SDMX and UNECE (2000))
Outliers	Extreme values that are correct.
Partial non-response	Units that have responded to the survey, but for which certain items of information are missing (incomplete response)
Pilot test	A quantitative trial survey amongst future users prior to full-scale launch of the final product or service. The aim of the pilot test is to acquire information about how the effectiveness of the main survey can be improved, e.g. improvements to the questionnaire.
Population	Population is the total membership or population or "universe" of a defined class of people, objects or events. (Source: SDMX and UN statistical division)
Precompleted form	Information that has been completed on the form, in full or in part before it is sent out to the observation unit. This information, for example, can consist of address details or information from administrative registers.
Pretest	Activities preceding a pilot test to determine whether the observation unit has understood the question, whether they can perform the exercise set out in the question, and whether the interviewer will be able and willing to ask the question, and in some instances whether the observation unit will answer the question.
Product elements	Tables, text, graphs, charts and images which together make up the product (e.g. the statistics)
Provider	The provider or reporting unit is the unit from which we receive the

Terms and abbreviations	Definitions
	information
Quality	Quality is the sum of the properties of a product or service pertaining to its ability to meet requirements or needs.
Raw data	Original data received from the provider, before any controls or processing are carried out.
Register	A register is (ideally) a complete inventory of the statistical units within a specific population. Different variables are used to describe these units. All statistical units in a register have an identifier which makes update possible.
Requirements specification	Document in which detailed requirements are derived (itemised) from rough specifications. The requirements must describe well-defined properties or functions of the system. Each requirement is specified in such a way as to make it verifiable.
Rough specification	The rough specification is a general description of what the user/requestor expects of the system.
Sampling plan	A plan for how the sample is to be selected from a population (survey population)
SD methodology	System development methodology. A methodology used when developing systems.
Statistical controls	Methods for identifying and examining extreme or critical values in the data.
Statistical data	Data that have been checked and corrected if necessary.
Statistical registers	Registers that have been adapted for statistical use, often based on one or more administrative registers.
Statistical units	An object of statistical survey and the bearer of statistical characteristics. The statistical unit is the basic unit of statistical observation within a statistical survey. (Source: SDMX and UNECE (2000))
Survey frame	System for administrating sample-based data capture from industry and increasingly also from individuals, families and households.
System documentation	System documentation provides an overview of the system, where the programs are stored, and important IT information about system functionality.
System test	The system test must be carried out for the system as a whole once final integration testing has been completed. It must be performed under conditions that resemble the final operational environment as closely as possible.
Table outline	Outline/draft of table, often without data.
Target population	Target population is the population outlined in the survey objects about which information is to be sought. (Source: SDMX and UN statistical division)
Test specification	A test specification describes how tests are to be performed to verify that each requirement has actually been met in accordance with the requirements specification, and identifies who is to perform which tests.

Terms and abbreviations	Definitions
Theoretical definition of variable	The variable is defined at the conceptual level without regard for how it can actually be measured in the survey in question (context).
Unit non-response	Units in the survey population for which data are entirely lacking (due to refusal, drop-out etc.).
User testing	Methods used for testing products and services among relevant users. Examples of user tests are cognitive interviews and focus groups.
Operational definition of variable	Definition of a variable that can be used to measure the value of the variable in the survey in question. Contextual definition.
Weight	Each observation/unit is assigned a weight so that the net sample is representative of the entire population.

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LOTTA from Statistics Sweden (SCB) (paper from 12th of October 2007).

The Generic Statistical Business Process Model prepared by the UNECE secretariat (paper from 14th of March 2008).

Standardisation of processes and methods in the ESS from Eurostat (paper from 10th of March 2008).

Methodology Directorate Business from the Office for National Statistics (UK) (paper from 13th of June 2005).

Statistics Norway's organisation and management February 2008 *Plans and Reports 2008/2* (internal report).

Final report from the FOSS-project Metadata in the production process (internal report)

Metadata strategy (http://www.ssb.no/english/subjects/00/doc_200508_en/doc_200508_en.pdf)

Advance Release Calendar (http://www.ssb.no/english/subjects/calendar/)

Internal documents/handbooks

Guidelines for pricing of user-financed statistical commissions

Task list for production of questionnaires

User guide for the project planning tool

User guide for the product register

Decision regarding the obligation to provide information and compulsory fines

Project handbook

Visual design of questionnaires handbook

Practical user testing handbook

Process guide for system development method

Security handbook

Data editing, controls, examination and correction of data. Recommended practice.

Data storage on Unix handbook

Dissemination policy