DESCRIPTION OF STATISTICAL SURVEY PROCESSES
Table of contents

0 INTRODUCTION ................................................................. 3

1 ANALYSIS OF NEEDS AND REQUESTS ............................ 5
  1.1 Determining data needs .................................................. 5
  1.2 Studying of sources ...................................................... 5
  1.3 Verification of methodology .......................................... 5

2 SURVEY DESIGN AND PREPARATION ............................ 5
  2.1 Planning of resources and determining the list of activities with deadlines .... 5
  2.2 Defining of survey results ............................................ 6
  2.3 Preparation of the methodology for selecting observation units .................. 6
  2.4 Preparation of statistical data processing methodology ......................... 6
  2.5 Organisation of cooperation with other institutions and planning takeover of administrative sources ........................................... 6
  2.6 Questionnaire design and testing ...................................... 7
  2.7 Preparation of materials for communication with reporting units ............... 7
  2.8 Pilot survey design and implementation ................................ 7

3 SELECTION OF OBSERVATION UNITS ........................... 8
  3.1 Preparation of data sources for sampling frame preparation ..................... 8
  3.2 Sampling frame preparation ............................................. 8
  3.3 Selection of observation units ......................................... 8
  3.4 Address lists .............................................................. 8

4 DATA COLLECTION ............................................................. 9
  4.1 Preparation for data collection ......................................... 9
  4.2 Taking over administrative sources .................................... 9
  4.3 Data collection and communication with reporting units ....................... 9
  4.4 Data capture .............................................................. 10

5 STATISTICAL DATA PROCESSING ..................................... 10
  5.1 Editing of administrative data sources ................................ 10
  5.2 Micro-level editing ...................................................... 10
  5.3 Integration of data sources ............................................ 10
  5.4 Imputation ................................................................. 11
  5.5 Deflation ................................................................... 11
  5.6 Weighting ................................................................ 11
  5.7 Calculation of statistical estimates (aggregation) .............................. 11
  5.8 Macro-level editing ...................................................... 11
  5.9 Table preparation ......................................................... 12
  5.10 Statistical data protection .............................................. 12

6 DATA ANALYSIS ................................................................. 12
  6.1 Time series analysis ....................................................... 12
  6.2 Analysis of adequacy and confirmation of results .............................. 12
  6.3 Interpretation of results .................................................. 13

7 DISSEMINATION AND STORAGE OF STATISTICAL DATA ....... 13
  7.1 Updating of outputs ...................................................... 13
  7.2 Presentation of results ................................................... 13
  7.3 Publication ................................................................. 14
  7.4 User support .............................................................. 14
  7.5 Storage of statistical aggregates ....................................... 14
  7.6 Storage of statistical microdata ....................................... 15

8 SURVEY DOCUMENTATION AND EVALUATION ............. 15
  8.1 Preparation of survey documentation .................................... 15
  8.2 Collection of information for quality assessment ............................ 15
  8.3 Process evaluation ....................................................... 15
INTRODUCTION

The main task of national statistical institutes and authorised producers of official statistics is to collect and disseminate high-quality statistical results that provide the most accurate (statistical) picture of the situation in the country at a specific moment. These results are intended for the general public, scientific organisations, the economy, and most importantly those government bodies that need timely and reliable statistical data for making decisions.

In most cases statistical data are a result of statistical surveys. We understand a statistical survey to encompass all activities for collecting, processing and disseminating statistical data. Through the years the practice of statistical organisations created many different types of statistical surveys. In terms of the method of obtaining input data we can distinguish between these basic types of surveys:

- **Census.** Data are collected for all units of the target population.
- **Sample survey.** Data are collected for a (randomly or non-randomly) selected sample of target population units.
- **Survey conducted from administrative sources.** Data are collected from non-statistical sources. These data were thus originally collected for some other purpose than statistical.
- **Derived statistics.** Via relevant procedures and models statistical results are derived from existing statistical aggregates (especially national accounts and balance of payment).

The division described above is only a theoretical model of classifying surveys. As regards the survey implementation, we actually mostly deal with surveys that are a combination of different categories. There are, for example, many cases when a survey uses a combination of administrative sources and data collected by sample surveys. Recently, censuses have also changed in the direction of using administrative sources. Even though a clear distinction between the above mentioned categories is becoming rare, such a division can still be useful in the sense of presenting different practice that can be covered by the concept of a statistical survey.

Further on we describe processes currently applied or planned to be included in the near future in survey implementation at the Statistical Office of the Republic of Slovenia (hereinafter: SURS). The purpose of this document is to collect in one place and briefly describe all processes that someone planning the implementation of a new survey must know and take into account in the planning. A more comprehensive description and guidelines for correct implementation of individual processes are given in other methodological documents, especially in Quality Guidelines (available in Slovene only)\(^1\) and in various methodological manuals.

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### General Process Model Surs, 2012

<table>
<thead>
<tr>
<th>1</th>
<th>Analysis of Needs and Requests</th>
</tr>
</thead>
<tbody>
<tr>
<td>Determining data needs</td>
<td></td>
</tr>
<tr>
<td>Studying of sources</td>
<td></td>
</tr>
<tr>
<td>Verification of methodology</td>
<td></td>
</tr>
<tr>
<td>Planning of resources and determining the list of activities with deadlines</td>
<td></td>
</tr>
<tr>
<td>Defining of survey results</td>
<td></td>
</tr>
<tr>
<td>Preparation of the methodology for selecting observation units</td>
<td></td>
</tr>
<tr>
<td>Organisation of cooperation with other institutions and planning takeover of administrative sources</td>
<td></td>
</tr>
<tr>
<td>Questionnaire design and testing</td>
<td></td>
</tr>
<tr>
<td>Preparation of materials for communication with reporting units</td>
<td></td>
</tr>
<tr>
<td>Pilot survey design and implementation</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2</th>
<th>Survey Design and Preparation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preparation of data sources for sampling frame preparation</td>
<td></td>
</tr>
<tr>
<td>Sampling frame preparation</td>
<td></td>
</tr>
<tr>
<td>Selection of observation units</td>
<td></td>
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<tr>
<td>Adress list</td>
<td></td>
</tr>
<tr>
<td>Data capture</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3</th>
<th>Selection of Observation Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preparation for data collection</td>
<td></td>
</tr>
<tr>
<td>Taking over administrative sources</td>
<td></td>
</tr>
<tr>
<td>Data collection and communication with reporting units</td>
<td></td>
</tr>
</tbody>
</table>

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<thead>
<tr>
<th>4</th>
<th>Data Collection</th>
</tr>
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<tbody>
<tr>
<td>Preparation for data collection</td>
<td></td>
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<tr>
<td>Taking over administrative sources</td>
<td></td>
</tr>
<tr>
<td>Data collection and communication with reporting units</td>
<td></td>
</tr>
</tbody>
</table>

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<thead>
<tr>
<th>5</th>
<th>Statistical Data Processing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Editing of administrative data sources</td>
<td></td>
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<tr>
<td>Micro-level editing</td>
<td></td>
</tr>
<tr>
<td>Analysis of adequacy and confirmation of results</td>
<td></td>
</tr>
<tr>
<td>Interpretation of results</td>
<td></td>
</tr>
</tbody>
</table>

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<tr>
<th>6</th>
<th>Data Analysis</th>
</tr>
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<tbody>
<tr>
<td>Time series analysis</td>
<td></td>
</tr>
<tr>
<td>Analysis of adequacy and confirmation of results</td>
<td></td>
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</tbody>
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<thead>
<tr>
<th>7</th>
<th>Dissemination and Storage of Statistical Data</th>
</tr>
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<tbody>
<tr>
<td>Updating of outputs</td>
<td></td>
</tr>
<tr>
<td>Presentation of results</td>
<td></td>
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<tr>
<td>Publication</td>
<td></td>
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<thead>
<tr>
<th>8</th>
<th>Survey Documentation and Evaluation</th>
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<tbody>
<tr>
<td>Preparation of survey documentation</td>
<td></td>
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<tr>
<td>Collection of information for quality assessment</td>
<td></td>
</tr>
<tr>
<td>Process evaluation</td>
<td></td>
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<tr>
<td>User support</td>
<td></td>
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<tr>
<td>Storage of statistical aggregates</td>
<td></td>
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<tr>
<td>Storage of statistical microdata</td>
<td></td>
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<tr>
<td>Calculation of statistical estimates (aggregation)</td>
<td></td>
</tr>
<tr>
<td>Macro-level editing</td>
<td></td>
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<tr>
<td>Table preparation</td>
<td></td>
</tr>
<tr>
<td>Statistical data protection</td>
<td></td>
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1 ANALYSIS OF NEEDS AND REQUESTS

1.1 Determining data needs
Determining the need for data starts when data do not yet exist or when existing data do not fully satisfy all users’ needs for data or on the basis of new requests of the legislator or signed partnership agreements. The need for data arises from various users: from ministries and government services, the Bank of Slovenia, national and international institutions, and professional and general public. Within the survey preparation different methods of cooperation with users must be studied and it must be provided that the survey satisfies the widest spectrum of expressed needs.

1.2 Studying of sources
After the decision about covering the newly identified needs of users for statistical data, all existing statistical surveys that are already conducted and the content of administrative sources must first be reviewed and determined whether these statistical data are perhaps available in an already existing source. If they are available, the next step is to study the compliance of existing sources with the needs for a new statistical survey or limitations that disable the use of these sources to satisfy new needs for data (differences in the methodology, periodicity and the purpose of data collection, etc.). Studying of the sources is implemented as a support for making the decision about whether and to what extent administrative sources can be used as direct data sources.

1.3 Verification of methodology
Verification of methodology includes verification of theoretical aspects of the statistical survey methodology (e.g. target population, definitions, sampling methodology, use of existing sources, data processing) and practical aspects of the statistical survey methodology. In the procedure of verifying the methodology we speak about the feasibility and relevance of methodology. With feasibility we verify whether the survey can be conducted according to the planned methodology (with appropriate level of quality of the results). This is especially important from the point of view of reducing the reporting burden in the sense of using existing sources (whether they are available, are of appropriate quality, etc.). With the relevance of the methodology we verify whether the selected methodology is appropriate according to the identified needs. For the process of verifying methodology it is also important whether the methodology has been prescribed in advance (e.g. with an EU regulation).

2 SURVEY DESIGN AND PREPARATION

2.1 Planning of resources and determining the list of activities with deadlines
For successful implementation of a statistical survey it is necessary to plan in as much detail as possible different aspects of survey implementation. It is necessary to plan the use of financial and material resources, to timely reserve...
the tools and to determine the timetable for implementing the tasks by subject-
matter and supporting departments. Every survey (regular or developmental)
needs to be entered into the annual programme of statistical surveys and for it a
work plan needs to be prepared. Accurate and timely planning is of key
importance for effective implementation of work at the Office.

2.2 Defining of survey results
Based on identified needs for data, before starting the survey it is necessary to
define results that we wish to obtain by implementing the survey. It is necessary
to analyse in detail the basic needs that have triggered the procedure of
establishing the survey as well as the possible additional needs, particularly
those arising from EU or national legislation. Based on this analysis, it is
necessary to define input variables and output statistics, determine the levels of
calculating statistics and plan the methods of publication. It is necessary to
determine and describe classifications that will be used and envisage standard
quality indicators that are relevant to be calculated for the survey. In this sub-
process the target population is also determined.

2.3 Preparation of the methodology for selecting observation
units
Both in the case of random sample selection and non-random sample selection,
before the selection a sampling design must be prepared in which methodological
rules are defined for determining the sampling frame, the sample selection and
the procedure of calculating estimates of population parameters that are of
interest in an individual survey. It is necessary to determine the target
population, sources and procedures for determining the sampling frame and the
method of selecting observation units (census, threshold coverage, random
sample), and in case of a random sample determine its size, the appropriate
method for grossing sample data to population estimates (weighting) and
procedures for calculating estimates of standard errors.

2.4 Preparation of statistical data processing methodology
Before survey implementation it is necessary to define and describe the main
procedures for statistical data processing. This regards both methodological
determination of procedures and selection of software tools. Within the activity it
is necessary to define procedures for dealing with non-response and procedures
for statistical data editing, the content and design of output tables, and
appropriate quality indicators. When necessary, the following procedures are
methodologically defined: deflation procedures, calculation of estimates for small
populations, procedures for statistical data protection, and seasonal adjustment.
If data are taken over from different sources, it is necessary to define procedures
for their integration and (if necessary) pre-editing of individual sources.

2.5 Organisation of cooperation with other institutions and
planning takeover of administrative sources
This phase involves planning the use of administrative data collections (taking
over data from other institutions for various purposes) and organisation of
cooperation with other institutions (transferring a specific phase of survey implementation to another institution). When administrative sources are used, data takeover agreements must be signed, and when specific survey phases are transferred, cooperation agreements must be signed. The purpose of takeover agreements is to define the content of the source that SURS is taking over from the manager of the administrative source, the method of takeover and conditions and rules of use, whereas the purpose of cooperation agreements is to divide the tasks between the parties of the agreement. As a rule, a part of the agreement is the technical protocol, which describes the technical implementation of procedures contained in the agreement.

2.6 Questionnaire design and testing

Questionnaire design is an important part of the statistical process since a properly prepared measuring instrument enables us to obtain credible data from reporting units. Before we tackle the preparation of the draft questionnaire, we do not only consult the data users but also the data providers and other experts from the surveyed field who have perhaps already conducted similar surveys. Meetings with data providers can help us clarify the studied concepts. Meetings can also help us in the content design of survey questions and answers. Before we start preparing the draft questionnaire, a decision must be taken about the data collection method. Also the latest standards in the Office must be taken into account.

2.7 Preparation of materials for communication with reporting units

In addition to the questionnaire, before the survey implementation it is also necessary to prepare additional “accompanying” materials intended for communication with reporting units. All these materials are prepared on the basis of uniform standardised templates. It is necessary to define the required materials for a specific survey, determine the content of these materials, prepare the data, and prepare charts and tables that will be included in the information leaflet.

2.8 Pilot survey design and implementation

Before the implementation of a regular survey (especially if new or previously not surveyed content or target population is being surveyed) a pilot survey must be conducted. With the help of this pilot survey we can definitely determine some methodological aspects of the survey such as testing of the questionnaire and obtaining data with which we can define the appropriate sample size. The objectives of the pilot survey must be clearly defined, since the sampling plan for the survey depends on them. The sample for the pilot survey thus depends on the purpose of the pilot survey. Usually, the sample is not random (at least not fully) but a purposive sample. The sample is also usually much smaller than for a regular survey. After pilot survey implementation results must be analysed and on the basis of the analysis further steps in survey implementation must be determined.
3 SELECTION OF OBSERVATION UNITS

3.1 Preparation of data sources for sampling frame preparation
The sampling frame is the list of units from which a sample is selected. In view of the determined target population and selected reference observation period, all data sources that will be used for preparing the sampling frame need to be determined. The aim is to use all available data sources so that the sampling frame is as consistent as possible with the theoretically determined target population. Before using the sources, their quality needs to be checked. In case at certain sources deficiencies are established that could significantly influence the survey implementation and quality of results, all activities for removing them must be implemented. If deficiencies cannot be removed, these sources are not taken into account in preparing the sampling frame.

3.2 Sampling frame preparation
On the basis of determining the target population, available data sources and existing software applications, a sampling frame for a specific survey is prepared. Our final objective is to prepare a single data table that will cover the list of units that will be as close as possible to the theoretically determined target population and in which for every unit the values of those variables that we will need in the later stages of selecting observation units will be determined. The key step in preparing the sampling frame is determining the procedure for selecting units that will be included in the sampling frame. The starting point of the sampling frame is usually one of the basic registers at the selected time reference point. The selection of units, which is determined with the selected time reference point of the register, can be supplemented with additional administrative and statistical data sources.

3.3 Selection of observation units
On the basis of the sampling frame and determined sampling design a sample of observation units is prepared, i.e. the sample of units that are actually included in the survey and about which we will try to obtain the desired data. Broadly speaking, we distinguish between three basic methods of sample selection: selection on the basis of random mechanisms (random samples); selection on the basis of deterministic rules (threshold sampling, census, etc.); a combination of the two (random sample selected from the threshold determined sampling frame). Results of sample selection are also sampling weights (in case of a random sample) and the list of key respondents. Sampling weights are figures that are together with data collected from sampling units used for calculating the estimates of population parameters. Key responders are units that are in view of the anticipated impact on the final result more important for our survey than other units and are thus during the data collection and data editing treated differently.

3.4 Address lists
By preparing the address lists, we prepare a list of reporting units which is intended for communicating with reporting units, sending and controlling the returned material and preparing the database on individual surveys. The source
for preparing the lists can be a register or a record from which the selection of reporting units is prepared and information obtained by contacting the unit. If the survey is periodical, the data in the lists are constantly corrected depending on the current information in the source and criteria for preparing the sample. The list of key respondents is taken into account. The directory must have a list of key respondents, i.e. a list of units that are the most important for the survey.

4 DATA COLLECTION

4.1 Preparation for data collection
Preparation for data collection covers planning of procedures, preparation for their monitoring, development and testing of software, and training of people involved. The process and duration of preparations for data collection depend on several factors, the most important being: periodicity of the statistical survey, method of data collection and technology of data capture. The periodicity of the statistical survey influences the duration and repeatability of preparations in the current year. The method of data collection (self-completion or interview) influences the form, content of the prepared material, answering the questionnaire and requirements towards the reporting unit. All this is intertwined with the data capture technology. The most important phases in the preparation for data collection are the preparation of all the necessary materials and the preparation of data entry software. Before personal interviewing of households or people (by telephone or face-to-face) the sample is divided among interviewers, the interviewers are selected and trained. At the training the interviewers receive the prepared materials and laptops.

4.2 Taking over administrative sources
In some surveys the data (or at least part of the data) are obtained from secondary sources (administrative registers, records, etc.). For taking over these sources, the conditions and the method of transfer and the content of data must be agreed with the data provider. Even before the first takeover appropriate takeover procedures and programmes and formal controls of received data (they must be readable and in the agreed structure and format) must be prepared. Takeover procedures depend on the method of data transfer, e.g. CD, FTP, replication, etc. Records of takeover periodicity and the date of the latest takeover are being kept. These records are available to all employees. Irregularities that happen during the takeover are solved in the manner prescribed in the agreement signed with the data source.

4.3 Data collection and communication with reporting units
Data collection and communication with reporting units depend on data collection method, the target population, the observed phenomenon and the available sources. At this stage the arrival of data is recorded, eventual missing data are supplemented and the mark of the adequacy of the unit for later processes is assigned. In case of lack of clarity, the reporting unit is contacted. In case of non-reporting, the reporting unit is sent a reminder. Key respondents are treated with higher priority. This sub-process is one of the key stages in the statistical process since correct communication with reporting units and appropriate
controls in data collection, especially monitoring and eliminating non-response, contribute to greater quality of collected data.

4.4 Data capture
SURS collects data in different modes. If they are received in electronic mode, they are already ready for integration in the input database (CATI, CAPI, electronic reporting); on the other hand, data from printed questionnaires first need to be converted to electronic mode for later processing (by manual entry or optical reading). The necessary software and procedures for manual entry and optical reading are prepared already when preparing for data collection. At that time the procedures and software need to be tested and eventual corrections implemented. When data are collected with mixed mode methods (e.g. printed, electronic questionnaires, CATI, CAPI questionnaires) or when data entry is done by using combined approaches (e.g. optical reading and manual entry) or when part of the data is taken from an administrative data collection, for the further statistical process the collected data must be integrated in a single database.

5 STATISTICAL DATA PROCESSING

5.1 Editing of administrative data sources
Before the integration of administrative sources it is necessary to clean all the sources and establish whether they contain errors that could prevent integration. In the first step on the basis of defined controls the errors are detected and printed. In the second step on the basis of content guidelines manual or automatic corrections are implemented. If data are deficient (too few entries and/or they are inappropriate in view of the signed technical protocol), the institution is asked to retransmit the data.

5.2 Micro-level editing
As regards the level of data, the data editing procedures can broadly be divided into data editing at micro and at macro level. In data editing at micro level procedures are implemented at the level of individual units, i.e. at the level of microdata. Data editing at micro level differs depending on the data collection method – fieldwork or telephone survey, paper and pen survey (rapid entry or data capture via optical reading). In surveys that are conducted in the field with laptops and in the survey studio logical control is implemented already during the interview. After interviewing the data are integrated into a common file, where, if necessary, the detected errors are corrected manually or automatically. In paper and pen surveys after rapid entry or capture via optical reading logical control, with which errors in captured data are sought, must be implemented. Detected errors are corrected manually or automatically.

5.3 Integration of data sources
In surveys in which several data sources are used these different sources have to be integrated and prepared so that they enable further statistical processing. In view of the registered sources and variables registered in them, the data from
various sources are integrated via defined identifiers. Integrated data are loaded into the production database. Each reported data or data taken over from an administrative source must be equipped with an appropriate variable status. A list of units that the process could not integrate is prepared. These units are then integrated on the basis of additional content-related guidelines or a procedure for integration is determined (usually manual corrections of data for units in the list are necessary).

5.4 Imputation
With appropriate statistical methods we estimate the data that we were not able to obtain in the data collection phase (missing data). There are many imputation methods, but basically they can be divided into two groups:
- **Deterministic methods.** The estimated value is calculated via an analytical procedure by using the appropriate deterministic function.
- **Stochastic methods.** The procedure of calculating the estimates of missing values is based on the procedure that uses some kind of a probability mechanism.

5.5 Deflation
If the survey deals with value data (e.g. turnover), deflation is usually necessary. With deflation the impact of price changes is eliminated from data in the time series, so that we get the real movement of the phenomenon we are interested in (e.g. volume of industrial production). There are two basic approaches: micro-level deflation and macro-level deflation. In the first case data are deflated at micro level, while in the second case aggregated statistical results are deflated. The selected approach dictates where in the process deflation is implemented.

5.6 Weighting
An appropriate weight is calculated for each unit that reported its data. This weight is calculated for various reasons: unequal probability of selection, non-response, adjustment to population values. The weighting procedure is determined by the sampling design and available auxiliary population variables. In cases when weighting is not necessary, each unit is given weight 1.

5.7 Calculation of statistical estimates (aggregation)
In the process of calculating statistics data are processed with the prepared software, so that the necessary calculations, recalculations and transformations are implemented and aggregate statistical results called statistics are prepared. Statistics are entered in a (macro) database and/or in a standard file used for tabulation. In case a random sample is used, together with calculating statistics also estimates of the standard error of these statistics must be calculated.

5.8 Macro-level editing
In the narrow sense data editing at macro level means detecting and localising errors in already aggregated data. If via data editing at macro level a wrong or a
5.9 Table preparation
In this process tables in the predetermined form are prepared and designed on the basis of previously calculated (estimated) statistics. Tables are prepared for standard users and for special subscribers, for national and international reporting. The prepared tables can be used also within other sub-processes as control tables: at macro-level editing, statistical data protection, analysis of relevance and confirmation of results. Files with the necessary metadata for publication on the web portal are also prepared.

5.10 Statistical data protection
In implementing statistical data protection, two basic approaches are distinguished:

- **Table protection.** For table protection it is necessary to define all tables at the same time, links between them and rules for protection. One has to be careful not to define tables in greater detail than necessary, since this reduces the level of protection. Protection is done with the help of Tau Argus software (controlled rounding or the missing data method) and manually.

- **Microdata protection.** Protection for microdata is determined in the file that contains only variables that the researcher or the public wants. Microdata do not contain direct identifiers. Sensitive variables and their classes of sensitivity are determined. The protection threshold and classes for variables that will be combined are determined and microdata protection methods are selected. The rules for protection differ depending on whether microdata will be transmitted to a researcher or to the public. Sensitive combinations of variables are protected with the help of Mu-Argus software.

6 DATA ANALYSIS

6.1 Time series analysis
A time series is a chronological series of data. The main part of the time series analysis is seasonal adjustment, and a smaller part is forecasting. In seasonal adjustment the impact of the season and calendar is eliminated from the time series if this impact is characteristic and relevant. The procedure must be implemented whenever we wish to compare data from different time periods of the same time series or data for the same time period of the same time series for different countries, since during the year they usually change regarding the season, number of workdays and other impacts. In the time series analysis outliers – which represent an unusual change in the time series – are very important. If there is no error in the data, an explanation for the outlier’s existence must be found.

6.2 Analysis of adequacy and confirmation of results
The analysis of the adequacy of results is a process with which the relevance of results, their inner consistency, consistency and comparability in time and space,
and consistency with existing internal and external reference data sources are checked. The analysis of adequacy and confirmation of results is done after the editing of results at macro level and covers checking of internal consistency of results, checking of consistency of results regarding the results in the previous reference periods and regarding the results of related statistical surveys, internal checking of results at SURS and occasional checking of adequacy and relevance of results with external experts.

6.3 Interpretation of results

In the interpretation phase the data are converted into information. Statistical phenomena are explained to the users in a clear and understandable way. The data must be relevant and useful, and all conclusions must be supported by the data obtained in the statistical process. In data interpretation we must take into account the method of data collection and other information related to data collection (metadata). All possible deficiencies in the data, such as deviations between the target population and the population that was actually observed, must be described. In data interpretation the principle of data confidentiality must also be taken into account. Because there are different user groups (professional and general public), data interpretation must be adjusted to this fact. The general public is mostly interested in the most important and most interesting general (popular) statistical data and information presented clearly and understandably. On the other hand, the professional public mostly uses detailed data for the needs of producing further analyses.

7 DISSEMINATION AND STORAGE OF STATISTICAL DATA

7.1 Updating of outputs

Publication of statistical data and information is implemented according to standardised procedures using different technologies. Standardised procedures are based on prescribed structures, formats and metadata that are taken into account already in table preparation (phase of statistical data processing). For all content, the same, standardised procedures apply in accordance with the principle of transparency of processes and taking into account timeliness. Both in preparing new content and in regular updating of outputs, well-prepared documentation, internal exchange of knowledge, standard communication paths and archiving of material and procedures are important.

7.2 Presentation of results

The most basic division of releases is into printed and electronic publications and publication in databases. Data are published also in various interactive web tools. The general principles of presenting the results depend on the type and medium of publication. All statistical data are first published in the collection First Release, at least at the highest level of aggregation. In addition to First Releases, statistical data and information are also published with electronic releases, in the collection Rapid Reports and in other publications (Statistical Yearbook, Slovenia in Figures, brochures, etc.) and in the SI-STAT Database.
Presentation of results must be adjusted to the target group of users and the medium of publication. Data are presented in the form of comments, tables, charts and maps. In addition to general rules, each of these forms of presentation has special rules.

7.3 Publication
The mission of Slovene national statistics is to provide to public administration bodies and organisations, the economy and the public quality, timely, temporally, spatially and internationally comparable data on the situation and trends in the economic, demographic and social fields, as well as in the field of environment and natural resources. Each release of statistical data must be announced in accordance with the publication plan (release calendar). Data are published in the form of news on the website, in printed publications, in the SI-STAT Database and in interactive tools. Publication is also transmission of data to Eurostat. An important part of transparent data publication is the procedure of correcting errors in releases and the procedure for data revision.

7.4 User support
Users must be able to access the data that are the result of statistical surveys, providing the protection of statistical confidentiality. User support is provided mostly via e-mail and telephone, in some cases also by personal contact. User support covers the transmission of statistical data and information, giving advice on access to statistical data and information, and help in seeking and preparing statistical data and information. Under special conditions, users can also access statistically protected microdata; such access is regulated by a contract.

7.5 Storage of statistical aggregates
SURS stores statistical aggregates for further use, both in electronic form and in printed form. Storage of aggregate data in electronic form is done within the policy of backuping and storing electronic data and in the form of monthly storage of SURS’s web portal www.stat.si. The latter is done every month on the basis of an accredited solution provided by an external contractor. The service is performed in line with internal rules of the service provider, which were confirmed by the Archives of the Republic of Slovenia.
Aggregate data in printed form can be published in publications issued by SURS or in publications received by SURS from other institutions. Our library archives contain publications of both types. In both cases the publications are serial and monographic. All publications issued by SURS are stored at SURS at least in one copy. 16 hardcopies of publications are sent to the National and University Library. Via the COBISS system data on the publications are entered into the publications catalogue; this has been done regularly since 1999. Foreign serial statistical publications that can be obtained in Slovenia only at SURS are stored at least in one copy.
7.6 Storage of statistical microdata
SURNS stores statistical microdata for further use at SURNS and for the use in research and analysis by research organisations, government services and independent researchers in electronic form. Storage of statistical microdata in electronic form is done within the policy of backuping and storing electronic data.

8 SURVEY DOCUMENTATION AND EVALUATION

8.1 Preparation of survey documentation
Three types of documents need to be defined: methodological documents, implementation documents and technical documents. In the initial phase methodological documents should contain: definition of the target population, definition of the content of input data, key statistics and the level of publication, and the methodology of survey implementation. Implementation documents should cover guidelines for implementing individual phases of survey implementation (e.g. guidelines for interviewers, guidelines for data editing, guidelines for printing, dispatching and receiving material). Technical documents are prepared in preparing software and other technical resources (e.g. description of preparing data entry and editing software, description of implementing the annual review of time series).

8.2 Collection of information for quality assessment
Collecting data for evaluating the procedures and processes is done during the entire statistical process and usually includes different forms of feedback:
- from users of survey results,
- from managers of individual steps of the process (data collection and processing).
In addition to feedback obtained during the process, at the end of the survey the quality of obtained results must be assessed. To this end information is collected that is necessary for preparing the quality report (especially the assessment of quality indicators).

8.3 Process evaluation
Information collected for quality assessment must be edited and analysed and the report must be prepared containing primarily the detected critical points in the process or in the wider context of conducting the statistical survey. The course of the statistical process is assessed, detected problems are described, an explanation is given as to why they occurred, the delays in the process and reasons for them are described, critical points in the process are identified, the possibility of better process flow is studied, feedback during the process and possibilities for improvement are studied. A quality report is prepared containing a review of all quality components together with values of quality indicators.