

Quality Standards
in German
Official Statistics



Published by the Statistical Offices of the Federation and the Länder

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1 Continuity and Change in Official Statistics

Information is an indispensable basis for democratic processes and for decision-making in politics and businesses. Official statistics is **the** information provider for quantitative information in Germany offering the most extensive range of data. It continuously provides statistical data with subject-matter and regional breakdowns (in part highly detailed) on the state and development of the society, the economy, the public sector, and the environment. At the same time, the data collected by the statistical offices are the basic material for a variety of empirical analyses performed by scientific institutes. Frequently the official data are directly used by such institutes or they serve to expand sample results by providing information on the target populations in the society or the economy.

Parallel to the current economic and social trend towards an information society, the need for data will continue to grow. The range of statistical information offered to meet such demand is characterised by a number of important characteristics.

The statistical offices in Germany are committed to the **principles of objectivity, neutrality, and scientific independence**. Therefore users can, and always could, have **confidence in the quality** of official statistical data. Quality has a long tradition in statistical offices. Over a long period of time, statistical offices in Germany have acquired a wide range of experience in collecting, processing, analysing, and providing information and for decades they have made intensive use of information technology. The high quality of official statistical data is demonstrated, for example, by their use in court. For example, what courts always consider as correct is the number of inhabitants as determined by the Land statistical offices even where local population registers show different figures.

Statistical quality at top level

The high quality of data from official statistics in Germany is ensured by various factors. Those asked by official statistics to provide information are generally obliged to do so because the government and the society need as complete information as possible. In sufficiently large samples, the **obligation to provide information** ensures a **high response rate and informative results** even with detailed breakdowns in terms of subject matter and region. Surveys involving voluntary response generally cannot provide the same quality. In Germany, deciding about what statistical surveys should be conducted is not a matter of the Federal Government, the Land governments or even the statistical offices – it is a matter of legislation. Thus, producing statistics in line with the principle of legality is a highly legitimised procedure.

The counterpart to compulsory response is **statistical confidentiality**, which is defined by law, too. Long before the general idea of data protection emerged, the statistical offices had already attached utmost importance to complying with the principle of data protection. For every publication, it is checked whether statistical confidentiality is safeguarded, which sometimes involves substantial efforts. In this way, the statistical offices guarantee that the respondents' individual data are protected against disclosure. Consequently, respondents may respond in accordance with the facts, without having to be afraid that their data might be used by others such as tax authorities or competitors.

The various statistical surveys of official statistics are not performed separately and isolated from each other but they are **part of an overall system**, i.e. the characteristics covered by different statistics are well

co-ordinated. This allows further processing of the data to form accounting systems such as national accounts, so that conducting specific surveys for this purpose can be avoided and the burden on respondents can be kept low. Overall systems, in particular national accounts, are also **co-ordinated on an international basis**, allowing to compare, for example, economic growth data of different countries.

Statistical information and results are **generally accessible**, and their basic data are available free or at low cost. They are made available to anyone through the media or upon request. In addition to a general basic provision and standard offers based on demand and target groups, data processing tailored to individual needs is offered, too.

Official statistics in Germany are produced by specific authorities specially set up for the purpose, the **Statistical Offices of the Federation and the Länder**. In line with the federal structure of government and administration, the Federal Statistical Office and the 16 statistical offices of the Länder perform different functions in preparing and producing statistics.

In co-ordination with the statistical offices of the Länder, the **Federal Statistical Office** prepares federal statistics in terms of methodology and technology, co-ordinates the statistics with each other, and compiles, presents, analyses, and publishes the federal results. As a general rule, the **statistical offices of the Länder** are responsible for organising and performing on schedule the collection of data and their processing as well as producing Land and regional results, publishing them and transmitting them to the Federal Statistical Office. The statistical offices of the Länder contribute their experience to the methodological preparation and further development of statistics. Apart from such activities performed within the scope of federal statistics, they also produce pure or co-ordinated Land statistics.

The statistical offices co-operate on a basis of trust. As a general rule, the result of their activities is achieved in a process of division of labour characterised by co-operation. The statistical offices of the Länder are not authorities subordinate to the Federal Statistical Office but Land authorities independent of it.

The **federal structure** is one of the strong points of the German statistical system. It leads to a firm and wide regional establishment of the statistical system, which hardly exists to this extent in any other European country. The proximity to the items to be covered by surveys enables the statistical offices to have profound knowledge of regional specificities. For an efficient fulfilment of tasks, it is necessary to co-ordinate things continuously and intensively and to co-operate in a spirit of partnership. An example of good co-operation is the sophisticated division of labour in the sphere of software development, which has had considerable synergy effects in the offices. Without such co-operation, it would have been impossible for a long time already to accomplish the tasks of the statistical offices. Especially in the context of the further development of information technology, co-operation aimed at the provision of up-to-date statistical information that is relevant for decision-making is continuously being improved.

The statistical offices of the Federation and the Länder apply **uniform methods** in statistics production – for example methods used to check collected data for their plausibility – in order to ensure the same high level of quality everywhere and the complete comparability of the data collected in a decentralised manner.

Change as a permanent challenge

The task of the statistical offices is to monitor the changing society in terms of statistics. This alone is enough reason to be **committed to change**. Within the scope of legal provisions, they adjust their products

and services to the changing demand, they optimise work processes while employing new technologies, and they include new scientific findings and international developments in the field of statistics in their concepts and production methods. Working conditions are shaped taking account of the changing needs of the staff.

Current examples of the change taking place in statistics are that the statistical offices

- make increasing **use of data existing** in the administration in order to avoid – as far as possible – resource-consuming direct surveys, thus disburdening the citizens. This is one of the goals of setting up a business register and of developing a new population census concept, replacing the traditional census by using local population registers and conducting just supplementary surveys,
- offer the respondents to **deliver their data in an easy and comfortable way via the internet**. As not **everyone has internet** access, this means that an additional infrastructure for data collection has to be maintained, which involves considerable costs. However, that way of data collection provides the benefit of data flows without discontinuity in the media.

What is more, there are a variety of projects aimed at modernising the administration and helping to further improve the effectiveness and efficiency of the statistical offices. For instance, cost and results accounting is used to obtain information that is relevant for controlling. However, the main starting point in improving efficiency and the main asset of the statistical offices are their staff. The statistical offices need staff members to shape and actually implement the changes. In order to spread new tasks, new methods and new ideas in statistics, and to support their implementation, the statistical offices have set up, among other things, a common advanced training programme, which is regularly updated to meet current requirements.

2 Quality Criteria of Official Statistics

Today, the "quality" of statistical data is assessed by means of a whole set of quality criteria. The following quality criteria have been developed in the European Statistical System (ESS) and are applied to German official statistics in a uniform manner:

Relevance of a statistics

The quality of a statistics crucially depends on the extent to which it meets user requirements. A statistics is relevant if the information obtained meets the requirements of the users. Through participation in the special committees and working groups of the Statistical Advisory Committee, the main users of a statistics may exert influence on the legislation ordering the statistics in case of changing or new information demand, thus exerting influence on the relevance of the entire statistical programme. At the same time, official statistics addresses future information requirements at an early point in time and submits proposals regarding the adjustment of the statistical programme.

Accuracy

Generally, statistics involve some inaccuracy, usually referred to as errors in statistics, even if they are prepared and produced with maximum care and thoroughness. To determine the degree of accuracy, such errors have to be analysed and disclosed to avoid any erroneous use of the data. Also, measurement

errors and biases may occur in statistical surveys, which have to be analysed, documented and eliminated where possible.

Timeliness

Most users of official statistics are interested in up-to-date information. Therefore, statistics are released as closely as possible to dates specified in advance. Early release of the results is getting ever more important and is now a major point of emphasis for many statistics.

Accessibility and Clarity

Statistical data must be easily accessible for the users, they must be available in the desired form, and they must be sufficiently documented as regards concepts and methods. Official statistics offers support regarding data analysis and interpretation.

Comparability (in terms of time and space)

Statistical data should allow to perform reliable comparisons in terms of time and space. To obtain far-reaching comparability of statistics, the individual steps of data production (e. g. methods and classifications, survey processes and survey instruments – especially questionnaires) are designed to be as uniform as possible. Differences that inevitably occur (e. g. change-over from one classification to another, changes in survey variables) are documented.

Coherence

Data from different statistics are coherent if they show the same results for the same questions (addressed to the same target population for the same reference period) or if differences can clearly be explained. Differing results of similar statistics (e. g. results from statistics with different periodicities, provisional and final results, results from statistics with different sources) should be quantified and explained to enable users to establish a relation between different statistics.

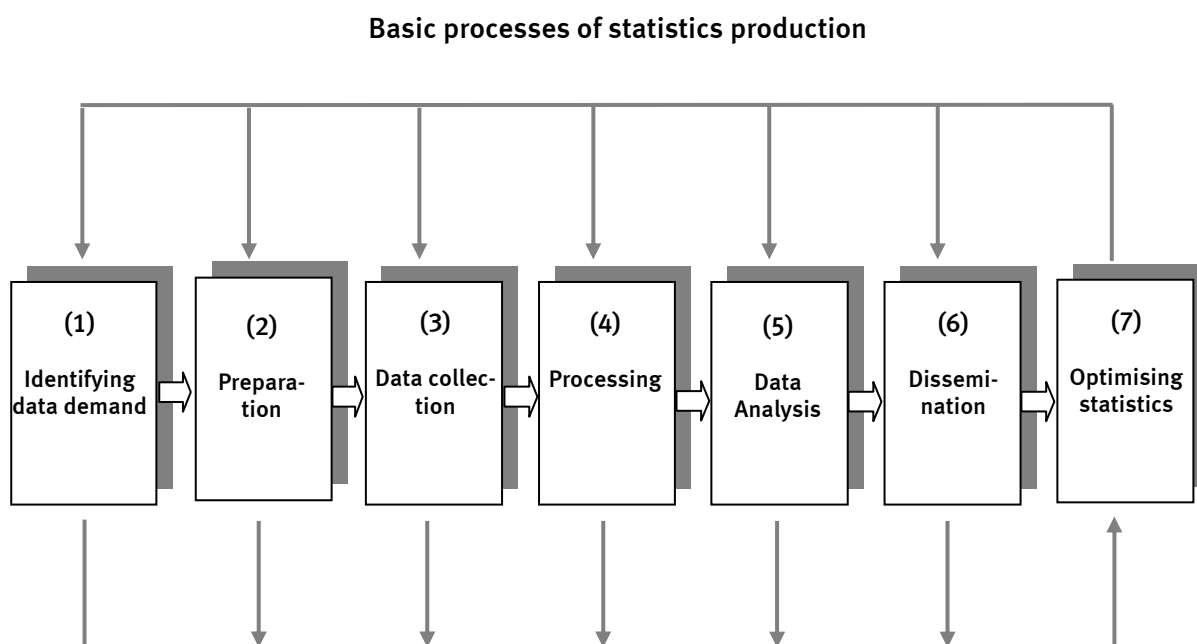
Conflicting quality criteria

The various quality criteria may conflict with each other. This is true in particular of the relation between accuracy and timeliness. It depends, among other things, on the user requirements if, and to what extent a loss in accuracy – for instance in releasing provisional results – can or should be accepted to allow earlier data release.

Improving timeliness, however, does not necessarily involve a loss in accuracy. Improved timeliness is obtained with constant accuracy by increasing the efficiency of the various statistics production processes. Keywords in this context are the use of new data collection methods, the use of flexible analysis software and modern communication technology, as well as the release of provisional results.

3 Quality Standards in Official Statistics Production

The representation of quality assurance methods is based on the statistics production process including supplementary and further activities. Statistics production may be broken down into the following seven basic processes:



Identifying data demand: Through own observations and through contacts with manifold institutions and groups that are relevant for society, the statistical offices identify emerging data demands. If such demand cannot be met by means of existing data, official statistics submits proposals as to how the problem might be solved. This may include envisaging a new survey to cover the new data demand.

Preparation: Based on the data demand thus identified, data collection is prepared. This includes: Participating in the development of the legal basis by giving advice and comments, defining the group of respondents, implementing the survey mode and variables in a questionnaire and performing the relevant tests, sample planning, selection of the survey method, preparing data processing, and data analysis as well as the dissemination.

Data collection: That phase covers the practical steps of data collection through field work or using administrative data, including the technical-organisational preparation.

Processing: For further processing, the data supplied by respondents are brought into a form allowing EDP processing, and errors are eliminated through corrections. Plausible data are expanded/weighted in case of sample surveys. Finally, the data are processed in the form of tables and made available for further evaluations.

Data Analysis: The central work steps of this process are further processing the statistical results to form overall systems, documenting the surveys and their data quality, as well as analysing and interpreting the data.

Dissemination: Disseminating statistical information is the last step of the collection and analysis activities. Dissemination is based on the marketing concept of the statistical offices. Depending on customer interest, and in line with the marketing model, the statistical information is offered as free basic provision, as standard products or as customer-specific processing.

Optimising statistics: A major goal is the continuous improvement of data quality and an increase in efficiency by continuously analysing and improving all the above-mentioned work processes and their results.

3.1 Identifying Data Demand

Businesses, associations, administrations, etc. need statistical data that are relevant for current problems and available in a timely manner to support planning and decision-making processes. Actually, every citizen, too, **always needs up-to-date information for his/her individual planning and decision-making.**

Identifying data demand and the decision as to whether such demand should be met by means of surveys are not tasks performed by official statistics itself. However, based on their subject-matter experience, the statistical offices give advice, provide data serving the purpose of decision-making, and make decision-makers aware of new information demand emerging. The decision regarding the production of statistics is really made by the legislators by creating relevant legal bases.

3.2 Preparation

3.2.1 Survey Goals and Characteristics, Classifications

The survey goals are derived from the **information demand**; they allow to concretise the content of the survey, the characteristics to be covered and the underlying definitions and classifications. Preparing definitions and classifications of characteristics always takes account of their impact on quality criteria. What should particularly be mentioned here is **coherence and comparability**. It should be possible to combine in a meaningful manner data dealing with the same issues but coming from different statistics. Where possible, definitions and classifications are therefore chosen in a way permitting their smooth integration in the overall statistical system and supporting the comparison between results from different statistics. This requirement is particularly obvious in economic statistics, which are intensively used by national accounts, requiring uniform definitions of characteristics.

This purpose is also served by a number of **internationally standardised classifications**, which are used in official statistics, such as the "Statistical Classification of Economic Activities in the European Community", the "Statistical Classification of Products by Activity in the European Economic Community", the "Commodity Classification for Foreign Trade Statistics", the "International Statistical Classification of Diseases" and the "International Standard Classification of Occupations".

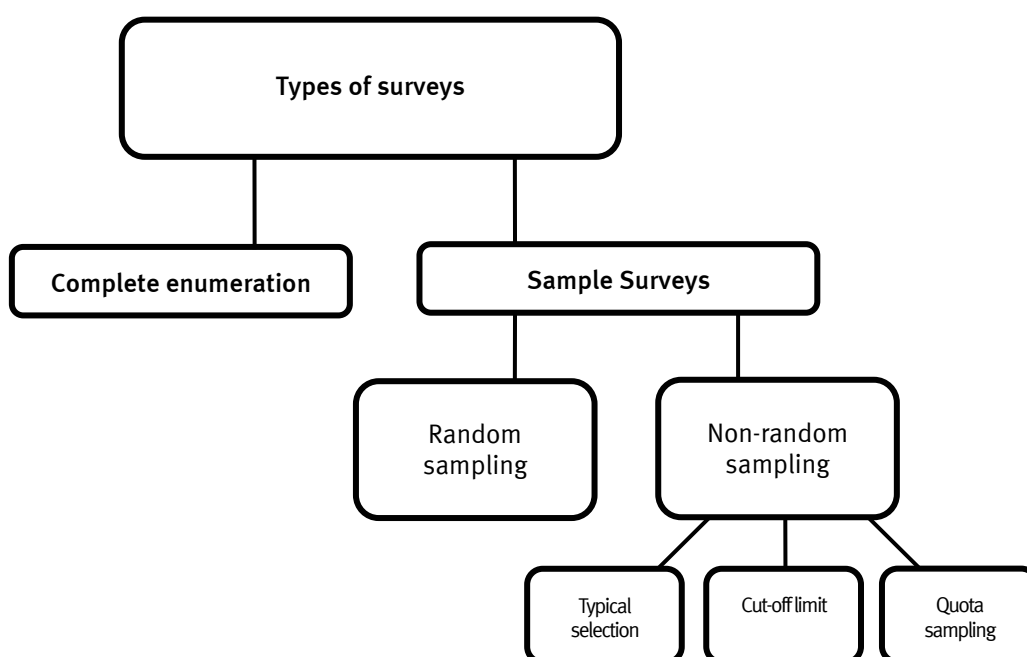
Like any other classification, the above classifications must from time to time be adjusted to changing conditions. Such revisions are performed carefully, however, so that time series comparisons and long-term analyses are affected as little as possible.

3.2.2 Survey Types: Complete Enumeration and Sample Survey

As official statistics attaches particular importance to the confidence and co-operation of citizens, businesses, institutions, and administrations, one of the major goals of statistical offices is to achieve large-scale acceptance through **citizen-friendly behaviour** and – as far as possible – by **reducing burdens on respondents**. To achieve those goals, the best suited – and, where possible, low-burden – survey method is chosen. What is characteristic of the statistical data collection methods applied in official statistics is that they ensure the **representativity** of the results obtained on their basis. This means that only collection and expansion methods are used which ensure that realistic conclusions can be drawn regarding the situation in the population to be represented. Depending on what is to be examined, the survey types used are complete enumerations and sample surveys.

In a **complete enumeration**, the required information is collected from all units of the population (e. g. all enterprises of production industries) and aggregated to form the result. Complete enumerations permit to show data in detailed regional and subject-related breakdowns. They provide highly informative results because they do not involve the types of errors that usually occur in the context of sampling. Also, it is always necessary to cover a population by conducting a complete enumeration if sample surveys based on random samples are to be carried out later.

Types of surveys applied in official statistics



Where the information is obtained from a number of units selected only by random sampling, this is referred to as a sample survey based on **random sampling**. Although only part of the units are questioned, random sampling allows to draw statistically valid conclusions for the population. The result is expanded for the population and the precision of the result can be estimated on the basis of probability rules. When compared with complete enumerations, random samples allow to considerably reduce the number of

units to be surveyed and, consequently, to reduce the burden on all (potential) respondents. This, in turn, allows to reduce survey costs and ensures earlier production of results.

In random samples, the accuracy of results depends mainly on the following elements of the **sample design**: the sampling frame (population), the sample size, the sampling method, the expansion and weighting method, and the use of auxiliary information in sampling and/or expansion. Therefore, before conducting a sample survey based on a random sample, it is examined what sample design is adequate, taking into account the survey goals, the legal requirements and the organisational situation. For repeated surveys (e. g. with annual periodicity), it is also checked whether, and to what extent the burden on the sample units may be reduced by random or planned **rotation**.

Only the regular conduct of complete enumerations can provide a **sampling frame** (total of units from which the sample units are selected) for which it is ensured that it is largely complete (i. e. it covers all units relevant for the survey) and that the sample unit characteristics to be taken into account for sampling are up-to-date. Both items are important for ensuring the representativity of random samples. Therefore, complete enumerations conducted in official statistics are an important basis for non-official statistics produced, for example, by scientific institutions or commercial market and public opinion research institutes.

Apart from random samples, other **sample surveys** are performed in official statistics where the selection of sample units is not based on random sampling but on a deliberately controlled selection procedure. This may be necessary, for instance, where a sampling frame suited for random sampling is not available.

The most frequent type of such a selection procedure is a survey using a **cut-off method**. Such surveys are often conducted where the total figures of a survey are largely characterised by a relatively small number of units with high values of the variables. For example, in surveys of the production industries or in retail trade statistics, only the "larger" survey units exceeding a fixed "cut-off limit" are questioned. That method involves a number of benefits, compared with both random samples and complete enumerations, regarding mainly the costs and the burden on respondents. Concentrating on large units usually allows to have a smaller sampling fraction than in random sampling, which not only reduces costs but also permits earlier dissemination of the results. The shortcoming of surveys with cut-off limits is that they do not provide any information on changes among "smaller" units below the cut-off limit. Therefore, surveys with cut-off limits are applied in official statistics to monitor short-term trends, whereas many analyses of long-term structural changes require complete enumerations.

In **typical selection**, pre-defined criteria are used to select cases for the survey that can be expected to provide an informative picture of the reality to be described. Typical selection is applied where the variety and complexity of characteristics to be described make it impossible to establish a frame for random sampling. The most prominent example here is price statistics.

In a small number of cases, sample surveys with **quota sampling** are performed in official statistics. With this method, the sample of survey units is obtained by defining percentages for specific characteristics (quota characteristics) to be obtained in the sample. The quota characteristics are defined in a way allowing to expect that the population is reflected by them. Consequently, the quality of the sample cannot objectively be verified in quota sampling; this is why that method is applied in official statistics only to a very small number of voluntary surveys where considerable non-response would have to be expected from experience if random sampling was applied.

3.2.3 Data Collection Methods

Various methods of data collection are applied in official statistics. The most frequent method is the survey. What is conducted most often in official statistics is fully standardised postal or oral surveys. In **postal surveys**, the quality of data collection is influenced mainly by optimising the questionnaires. In **personal interviews**, it is especially the skills of the interviewers in combination with the logical structure and design of the sets of questions that can positively influence the respondents' willingness to provide information.

Part of the oral interviews in official statistics are carried out **computer assisted**, either by telephone or with portable computers. Data capture and first data editing are done already during the interview, so that considerable improvements in quality and timeliness are achieved.

The decision as to what data collection method should be chosen is influenced mainly by methodological goals and technological developments. In particular, applying **electronic data interchange** and **standardised data editing methods (plausibility checks)** in data collection may improve data quality, reduce the period between data collection and provision of results, and reduce the burden on respondents.

Electronic data interchange is an obvious choice especially where respondents can retrieve the statistical **data direct from their accounting system or from administrative files**. Data interchange is also applied when using electronic questionnaires. In keeping with the data protection provisions, the data are transmitted to the statistical offices and are processed there. Major areas of application are currently public administrations, hospitals, and schools. That transmission channel from the interviewer to the Land statistical office is already used also in population surveys such as the microcensus.

Especially the electronic **data transmission via the Internet** may considerably improve data timeliness. That modern way of data collection allows not only to have short transmission times in the actual phase of data collection but also to transmit the required statistical data to the statistical offices without switches between media, thus exerting direct influence on the data quality by reducing transmission errors.

Major areas of application are currently business and administrative data, although official statistics intends to rapidly extend that comfortable type of data supply in all areas.

3.2.4 Questionnaires

The questionnaire is the most important tool of data collection. In addition to the printed paper questionnaires computer-assisted questionnaires are more and more often applied, which are used during personal or telephone interviews and as part of online surveys via the Internet. The questionnaire translates the survey characteristics as laid down in the legal bases into wordings that are familiar to the group of respondents – e. g. households, businesses, administrations – and that can be covered by the collection tool chosen. A questionnaire usually contains not only questions and pre-quoted answer categories but also fill-in examples, explanations, and notes on the legal basis of the survey and on the confidentiality provisions. Irrespective of the subject-matter contained in the questionnaire, its design also has some impact on the quality of the results and on the acceptance of the entire survey. The questionnaire thus is the "visiting card" of a statistics.

Therefore, official statistics takes the following criteria as a basis when designing questionnaires:

- **Visual design improving the response.** Optimised questionnaires are clearly structured, e. g. by using different colours, and use words typically used by the respondents. This disburdens the respondents and improves data accuracy.
- **Using uniform layout templates and harmonised wordings for questions and answers** to improve the comparability of results in terms of subject-matter, time, and space (for socio-demographic characteristics, e. g. the "demographic standards" issued by the Federal Statistical Office).
- **Arranging survey characteristics** by subject-matter context and integrating **filter questions**. Where possible, it is attempted to attract the respondents' attention and maintain their interest, for example, by placing interesting questions at the centre or by placing easy questions at the beginning, followed by the more difficult questions.
- Meeting the requirements of **data capture and document scanning**, so that processing can be done without switches between media, thus reducing costs and improving timeliness of the results.

Special guidelines on designing survey documents in official statistics describe how the quality criteria should be implemented when developing questionnaires.

New survey documents or considerably revised questionnaires are generally submitted to **internal and external checks**. In the **external** check, the so-called **pretest**, not only the questionnaire but also the letter and the instructions on how to complete the questionnaire are tested with a small sample of respondents from the range of respondents to be studied. In the pretest report, recommendations are given on what should be changed in the questionnaire before the field phase starts. Especially for postal surveys, the questionnaire will thus get more self-explaining for the respondents, which leads to fewer queries, more exact responses and finally to less effort required for data checking.

Internally, the survey documents are checked in special committees and expert meetings. Also, the future data users – ministries, chambers, associations, research institutes, etc. – are deliberately involved in questionnaire development. What is more, the survey documents are continuously improved on the basis of experience acquired in former surveys.

3.3 Data Collection

3.3.1 Conducting Surveys

When questionnaire development is finished, the actual survey starts. The required information is collected from the respondents either through a postal survey or in an electronic form, or by interviewers.

In order to achieve high data accuracy in personal interviews, it is endeavoured in official statistics that the interviewers obtain correct information from a pre-defined number of respondents over a specified period. To achieve those goals, special importance is attached to **careful recruitment, training and assistance** of the interviewers and to relevant **quality assurance measures**. New knowledge and technical developments are applied to the extent that this is not prevented by legal or economic factors and that it has a positive impact on the surveys.

Interviewer recruitment and training

What is of crucial importance in recruiting interviewers is not only their **subject-related knowledge** but also their **reliability** and **social competence**. Persons working in so-called conflicting occupations, such as police or local tax office, are generally not recruited for surveys.

Interviewer training aims at **providing skills in conducting interviews** and at **imparting knowledge regarding the subject matter and the relevant surveys**. What is performed in addition to this basic training is regular adjustment training focusing on the special organisation and content aspects of the relevant surveys and their changes. Training also includes the simulation of interview situations, handling of example questionnaires and discussing shortcomings of the last survey. Highly experienced staff of the statistical offices are trained and employed as trainers.

Quality assurance measures

During data collection, a variety of controls are used to obtain maximum data quality. Such verification routines aim at ruling out possible errors, but they are not designed to supervise the respondents. When interviews are held, **sample queries** are performed to ensure that the respondents to be interviewed according to the survey design or quota definitions are actually covered by the survey. It is also checked whether interview performance is formally correct and complete. The relevant interviewers are immediately informed about any shortcomings detected. Where data collection is supported by some technical device (e. g. laptop), **data checks** are carried out already **during the interview** in order to avoid time-consuming and costly queries and to improve data quality. For a continuous optimisation of survey processes, proposals for improvement submitted by any party involved are taken into account.

3.3.2 Using Administrative Data

Administrative data have for a long time already been used by official statistics to meet the demand for statistical data. A large part of the required data is obtained directly from files of authorities and businesses already today. In this case, respondents do not have to compile the data by themselves; they just provide copies of their files. As using administrative data reduces data collection burdens on citizens, businesses, and authorities, official statistics will continue to further develop that method of data collection, e. g. through data collection from IT-assisted administrative procedures and through combination with other data stocks.

In this context, the statistical offices make well-aimed and co-ordinated efforts to develop an efficient **data takeover procedure**. This is done more and more often by means of modern computer-assisted methods and involves the intention – in co-operation with those providing the data – to improve the data to be taken over and to integrate them in the overall system of official statistics. Data takeover frequently involves restrictions because facts do not always meet the requirements in terms of contents or the regional and time dimensions of official statistics, and sometimes delays occur, too. Therefore, efforts are made to ensure early involvement of the statistical offices in planning and implementing automation projects at any government level.

3.4 Processing

3.4.1 Data Checks

As part of processing, the data are checked at all statistical offices in a uniform manner for their plausibility, i. e. for formal correctness, consistency of contents, and completeness in terms of number and content. The principle that has proved suitable and has generally been applied here is that any checks – that may be based either on formal provisions, logical conclusion, or experience and that are relevant for the results – are used to ensure maximum data quality. Official statistics endeavours to reduce the time required for data editing (plausibility checks) and the resulting need for corrections by taking appropriate measures and to optimise the data editing process by implementing the following measures:

- **Quality assurance through EDP and organisational measures:** Data should be checked and corrected already when provided by the respondents. Therefore, official statistics endeavours to make respondents use more often electronic questionnaires and to supply data through electronic data interchange.
- **Application of recognised methods and interpretation of results:** Faulty, incomplete, and lacking data are ascertained – where relevant for the results – by queries with the respondents. Errors are also corrected, however, by means of mathematical-statistical methods, largely maintaining the data structure and meeting the requirements in terms of accuracy and timeliness of the results. Lacking data are obtained, where necessary, through imputation methods. Here, the information value of data available in the same context is fully utilised. The imputation methods are selected and applied following objective and comprehensible considerations in terms of subject-matter.
- **Continuous optimisation of data editing (plausibility checks):** For repeated statistics, the statistical offices adjust the settings of data editing to meet changing requirements. Also, they use knowledge acquired from previous editing of statistical data to improve questionnaires and make data editing more efficient.

3.4.2 Documentation of Surveys and Their Data Quality

A procedure applied more and more frequently in official statistics in order to facilitate data interpretation is the documentation of **collection and processing methods** and of **data quality** in a separate report.

The content of the reports is based, among other things, on the standards of preparing quality reports that have been developed by the Statistical Office of the European Communities (Eurostat). The goal of such documentation is to provide a **comprehensive, clear, suitable, and comparable description** of the various statistics, comprising all major steps from data collection to publication.

Depending on the target group and the purpose of the documentation, information on the **legal basis**, the **survey characteristics** and their items, and on **definitions** is provided (e. g. in the subject-matter publications). What is also important for interpreting the results is information on the **data collection procedure**. This includes explanations on data origin, collection method, reference day or reference period, survey periodicity and relevant coverage thresholds or cut-off limits. Information contained in the documentation and important for **processing** includes explanations on the processing process, on the data editing

method and on the expansion and seasonal adjustment methods. Documentations for statistics are set up, referring to the following areas:

- legal basis (laws), responsibility (Federal Statistical Office or Land statistical office),
- subject-related coverage (group of respondents),
- statistical units (quantitative and qualitative definition),
- regional coverage (spatial coverage),
- principle of regional allocation of statistical units (e. g. business location, place of employment),
- reference day, reference period, periodicity,
- type of survey (complete enumeration, administrative register, sample survey, etc.),
- type of response (compulsory response, voluntary survey),
- collection method,
- reporting channel,
- processing method, including data editing,
- publications, including description of subject-related and spatial breakdown of results, and availability of data,
- relevance of data.

In the European Statistical System, regular quality reports are currently being introduced; the information from such reports will be used both for methodological development and quality improvement and for user information.

3.5 Data Analysis

3.5.1 Production and Presentation of Results

The Federal Statistical Office and the statistical offices of the Länder provide results in the required breakdown in terms of subject-matter, time, and region and publish them. Official statistics has set itself the goal **to provide the results early and in a comprehensive breakdown and to present them in a clearly structured and informative manner**. A clear, comprehensible, comparable, and informative presentation of results is ensured by uniform and binding instructions on the table design (see also the guidelines on designing statistical tables for the co-ordination of standard programs and formats).

Graphics are used to illustrate facts in a precise manner that is easy to remember. Since the beginning of 2001, the statistical offices have applied a common guideline on graphics design. It says that graphics contained in the publications of official statistics must meet objectivity standards and must not misrepresent facts. In case of doubt, the goals of objectivity and comprehensibility have priority over aesthetics.

To avoid delays in the production of results caused by some statistical units not having supplied their data yet, suitable **estimation methods** are applied as far as possible in short-term continuous surveys. Using such estimation methods permits early presentation of results by performing tabulations as soon as, for example, 70 to 80 percent of the statistical units have provided their data for the current reference period and the remaining units can be included in the results through estimation. Such methods are continuously improved, with special attention paid to the specificities of any statistics. Methods actually used are first the transfer method where missing values are replaced by previous month's figures. Second, in the context of expansion, non-responses are weighted using the data available from responses (e. g. by ratio estimation). Practical work has shown that estimating missing values does not necessarily impair data qual-

ity; the impact of estimation depends, among other things, on what statistical units have provided their data within the specified deadlines. Nevertheless, complete processing is performed also after estimated results have been published, so that a high-quality basis for future estimations is maintained.

When implementing such measures, care is taken that their application impairs as little as possible the information value of the results. Estimated figures are clearly indicated as "provisional" or "estimated" and in the publications that follow periodically as well as in the databases they will be replaced as early as possible by the results of the final processing.

3.5.2 Interpretation and Analysis of Statistical Data

Analysing and interpreting the data are important fields of activity at the statistical offices. By performing **analyses across various statistics**, official statistics contributes to comprehensive social and economic reporting. The results are generally published in papers or reports where reference is made to the current scientific or political discussion. For the presentation and analysis of problems, a variety of official and non-official data sources are used.

Generally, official statistics are compiled over long periods even in a detailed regional breakdown. This allows not only to describe economic and social facts for a specific point in time but also to analyse their changes over long periods of time. Particular importance is attached to the monitoring of economic activity. In order to identify medium and long-term trends, calendar or seasonal variations and other factors or influences affecting the trend are eliminated from the economic data. Another focus is the analysis regarding changes in the life situation of persons or households, the development of the population and the labour market, and the economic situation of businesses.

Data of official statistics are scientifically analysed by means of well-proven and recognised **mathematical-statistical analysis methods**. Analysing time series or tables is done through methods of time series analysis and forecasting or model calculations. As part of such analyses, the collection and estimation methods of data analysis are presented and taken into account for interpretation, as are the results of error calculations.

Apart from political and economic decision-makers, the **scientific community** is a major user of statistical data. This is why official statistics maintains close co-operation with the scientific community. For example, colloquiums and other joint events are used to promote the exchange of information and the co-operation between the two partners. Also, more and more **co-operation projects** are carried out with the scientific community, especially to deal with methodological issues.

A major example of intensive co-operation with the scientific community is the improved access to microdata, which has been achieved by the Federal Statistical Office and the statistical offices of the Länder in setting up **research data centres**. The scientific community's access to microdata is facilitated by creating new ways of data access and expanding existing ones: For a number of household and person-related surveys, scientists may already today use de facto anonymised data sets (**Scientific Use Files**), which allow to perform a variety of scientific analyses, but can be deanonymised only by making unreasonable efforts in terms of time and costs. Also, the two research data centres offer the possibility of **controlled teleprocessing**, where scientists use standard software to write their analysis programmes on their PC, before sending them to one of the statistical offices where they will be applied to non-anonymised original data. Before returning the analysis results, it will be checked whether statistical confidentiality is maintained. Furthermore, at **safe scientific workstations**, it is possible to work with anonymised microdata that cannot be made available as Scientific Use Files for use outside the statistical offices. Safe scientific

workstations may also be used for joint contractual research projects where only non-anonymised or formally anonymised microdata can be analysed.

3.5.3 Accounting Systems

Data on economic trends are compiled by the statistical offices by combining and further processing individual or basic statistics. A typical example is national accounts.

National accounts provide a comprehensive, detailed and well-structured overall picture of a national economy's activity. Their results are mainly used to assess the economic situation and to analyse short-term economic trends. The aggregate used most widely at an international level is the gross domestic product. Other important factors are the development of capital formation, disposable income, and consumption. Also, the gross national income is used as a basis for assessing the payments to be made by European Union Member States to the EU budget, and net lending/net borrowing as well as public debt – both in relation to the gross domestic product – are among the convergence criteria serving to monitor and control European monetary policy. Moreover, the regional gross domestic product is used as a criterion for regional support measures of the European Union (definition of so-called Objective 1 regions).

Due to the outstanding importance of national accounts, global standard definitions, concepts and classifications have been developed (United Nations System of National Accounts, 1993). For the European Union (EU), those international rules have been made even more precise and have been published as the European System of National and Regional Accounts (ESA) 1995, which has been binding for all Member States since April 1999. What is also done within the EU to further improve the comparability of national accounts data is defining permissible calculation methods and checking their application. What should be emphasised from quality aspects regarding national accounts is not only good transparency – both the conceptual bases and the permissible methods are published – and their permanent integration in the economic discussion but also the idea of national accounts forming a consistent system. Double-entry accounting of economic transactions on the basis of the macro-economic circular-flow theory necessarily leads to a consistent and coherent system of national accounts.

In practice, too – that is in the production of national accounting results – the system aspect of national accounts is an important quality characteristic that can be used in several ways to check the data for their consistency and plausibility. For example, calculating the gross domestic product according to three approaches (production, use, and distribution) improves the stability and sustainability of the results, thus reducing the probability of corrections becoming necessary. Manifold internal comparisons, too, serve to improve the quality, such as the computation of capital formation according to the investors approach and the commodity flow approach. Another example of consistency checks is the goods-related comparisons in input-output computations; the relevant results can then be used to edit data of domestic product calculations. Also, comparing net lending/net borrowing as shown in national accounts with the financial balance of the financial accounts of the Deutsche Bundesbank (German Federal Bank) serves the purpose of quality assurance.

For the quality of the entire system of economic statistics, national accounts are of particular importance, too. As the system of national accounts does not directly collect statistical data, but acts as a user within official statistics, it can give important impetus to the further development of economic statistics. This may refer, for instance, to an improved coverage of areas that have been less important so far (e. g. some service areas) or the development and application of new methods in specialised statistics (e. g. hedonic

price indices). Also, comparing the results from various special statistics as part of national accounting permits to check them for logical and intertemporal consistency.

The **employment estimations** supplement national accounts by providing coherent data on persons in employment and unemployed and on the total number of hours worked within Germany as calculated by the Institute for Employment Research. Thus the employment estimations provide important reference values for a number of economic aggregates, such as labour productivity, the capital-labour ratio, labour costs per employee and earnings per hour worked. Also, data on persons in employment have direct impact on the calculation of gross wages and salaries per employee, which are used, among other things, for the annual adjustment of pensions according to the Social Security Code. As is the case in national accounting, the employment data are derived from various basic statistics, again by employing international standard methods.

The interrelationships between a national economy and its natural environment are examined in **Environmental-Economic Accounting**. The monetary part (environmental protection expenditure) is accompanied by a physical part (use of raw materials, production of residuals and pollutants). Also, data on land use and the condition of air, water and soil are integrated into Environmental-Economic Accounting.

For the accounting systems, too, there are considerable **target conflicts between timeliness and accuracy**. That conflict is solved by first provisional data of national accounts and of employment estimations that are published soon after the end of the reference period, with accuracy initially being subject to some restrictions because of gaps still existing in the data basis. Although further positions of computation (continuous adjustments), which in national accounts are reached over the following four years, loose in timeliness, they gain more and more in accuracy as the data basis is getting more and more complete.

The results of national accounts and employment estimations are subject not only to continuous adjustments but also to **comprehensive revisions**. Such revisions are performed only at larger intervals for rather long reference periods, so that time series without breaks are always available to users. The revisions are carried out about every five years; the last one in Germany was in 1999. Their purpose is to

- take account of statistical bases that were not used in the past (because they were not available yet),
- apply new calculation methods,
- implement improved concepts and definitions, new classifications, etc., and to
- change over to a new price base.

In performing comprehensive revisions, the conflict between the two demands – implementing as early as possible improved methods and material as well as providing to data users a time series that is applicable over the long term and rather unimpaired by corrections – is solved by a compromise.

As such overall systems generally include not only results of official statistics but also data material and information from other sources (e.g. ministries, Federal Employment Agency, Deutsche Bundesbank, economic associations), particularly high demands are made on the documentation of the data sources and methods used. When using the data of the overall statistical systems, the above service aspect in provid-

ing information by the statistical offices is very important. When applying and interpreting the relevant data, user support by the experts of those systems plays a major role.

3.6 Dissemination

3.6.1 Dissemination of Results

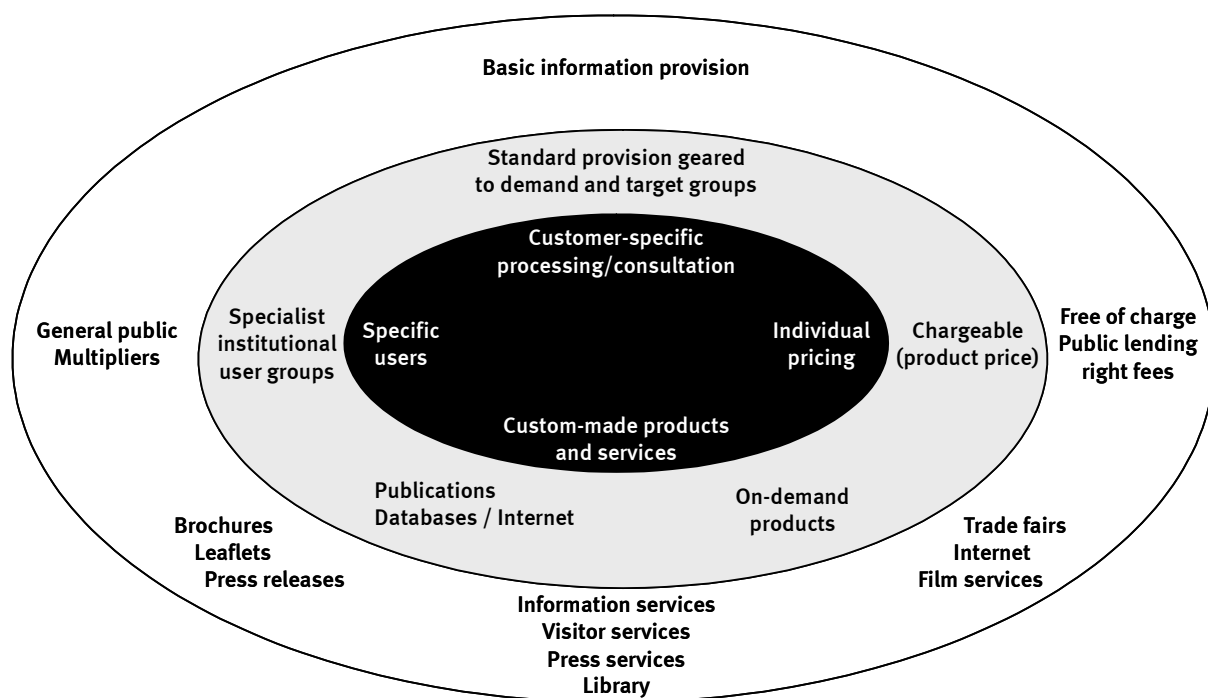
In the context of disseminating statistical results, too, the data requirements of the users are at the centre of action of official statistics. This goal is expressed by the marketing concept of the statistical offices of the Federation and the Länder, which defines a wide range of data offered.

In addition, the statistical offices combine their efforts to identify and analyse their groups of customers by means of market analyses and to cover them more efficiently. Categorising the user groups allows addressing customers in terms of target groups.

As customer interests are manifold and varied, the range of statistical information offered has to be varied, too:

- For the public's **general need for information**, official statistics ensures free basic information provision.
- With its chargeable **standard publications**, official statistics meets the regular and recurring information demand of the customers.
- By offering problem-oriented custom-made products and services, official statistics reacts to customers' individual demands. This covers, for example, special analyses and contract work performed at the statistical offices.

The marketing model of the statistical offices



The functional diversity of statistical products as shown in these three types of offer of the marketing model is supplemented by the **diversity of transmission**. To transport the statistical results to the customers, the statistical offices use a mix of print products, electronic offline products (diskettes, CD-ROMs, etc., online products (Internet), databases, telecommunication (info service, fax retrieval) and personal information.

All statistical offices take this concept as a basis, so that a **uniform dissemination policy** is shaped. This is implemented through a number of individual agreements and guidelines:

- The information services (info service) of the statistical offices immediately answer the enquiries made orally or in writing by users. More specific questions are directly passed on to the competent units. User-friendly service hours, subject-matter competence and an obliging service aim at high customer acceptance. To deal with highly specific issues, the specialised units have maintained direct contacts with their data suppliers and users for a number of years.
- Joint publications of the statistical offices combine the statistical results obtained per Land within the federal system of the Federal Republic to form one product, thus providing users with comprehensive information and giving them the opportunity to draw direct comparisons. As the data producers are jointly responsible for the product, they co-ordinate matters as far as possible, thus producing comparable data material.
- The importance of the Internet in information dissemination is permanently growing. Characteristics of the Internet presence are a wide range of data offered, information on current activities and on products and downloads available, an informative design of the homepage, a comprehensive accompanying service, common or co-ordinated elements in the contents offered by the statistical offices and a far-reaching interlinkage by means of links both between the offices and to other providers.
- In the case of cross-Land enquiries, one of the statistical offices acts as a competent contact for the customer, settles subject-related questions and co-ordinates data supply by the relevant statistical offices of the Länder, the transmission to the customer and the invoicing. At the individual offices, the request is handled as early as possible, meeting the deadline.
- Dissemination of information through the media is an important part of the statistical offices' information policy. The press activities of official statistics include not only current press information but also rapid and media-tailored information service as well as competent consulting for journalists. All journalists get the same access to statistical results. Answering enquiries made as part of journalistic research is done rapidly and generally free of charge.

While these standards determine the quality of statistical publications mainly in terms of statistical results, there are some general criteria relevant for the quality of publications:

- Statistical results are published as soon as possible after data processing is finished. Generally, a press release is soon followed by a standard publication.
- The characteristics, for which statistical results are published, are defined or explained as so-called metadata in the relevant publications where this is necessary for understanding. What is described in the context of presenting the results is the group of respondents and, where applicable, the population of the survey as well as methodological and definitional issues.

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- The statistical offices take account of the growing demand for high-quality products. This includes thematic summaries, analyses, and attractive designs, both on paper and on diskette or CD-ROM as well as on the Internet.

3.6.2 Confidentiality and Data Protection

The legal provisions for federal statistics protect the respondents and those concerned from unlimited collection, storage, use and transmission of their data. They are intended to ensure data protection and to safeguard the fundamental right of informational self-determination.

When statistical results are published, the **confidentiality of individual data** is in any case safeguarded. Therefore, it is a major requirement for official statistics to continuously improve the quality of **confidentiality procedures** and to ensure that uniform methods and standards are used at federal and Land levels. Another reason for continuously improving the quality of confidentiality procedures is that the technology available to potential investigators is improving, too. The most recent result of such efforts is the reshaping of confidentiality provisions. The purpose of the new provisions is, first, to contribute to a further increase in the "confidentiality level" and, second, to reduce the loss of information caused by confidentiality.

Performing the complex confidentiality activities in publication tables is highly time-consuming and cost-intensive. To implement comprehensive and complex tabulation programmes in a rapid and low-cost manner, it is indispensable to have **computer-assisted confidentiality procedures**.

Microdata Files

Many issues of basic and applied research can be treated only by analysing microdata. Microdata are data on individual persons, businesses or organisations. **The passing-on of data is regulated by the Federal Statistics Law.** It says that the Federal Statistical Office and the statistical offices of the Länder may pass on individual data to institutions of higher education or other independent scientific research institutions for the purpose of performing scientific projects if such data are de facto anonymised, i. e. if they can be used to identify respondents or those concerned only by making unreasonable efforts in terms of time, cost and manpower. Generating anonymised primary files has proved to be an efficient form of data supply. This requires the data material to be anonymised once only. By creating such a file it is possible to pass on rather rapidly those data that are relevant for the concrete research project of the individual scientists. The data must be used for the specific purpose and must be deleted as soon as the scientific project is finished.

So far, **data have been passed on to the scientific community** mainly by supplying de facto anonymised microdata files from the microcensus, the sample survey of household income and expenditure, the time use survey, and the European Household Panel.

4 The Organisational Frame of Quality in Official Statistics

For successful application, the quality standards of official statistics are integrated in an organisational frame. In that frame, the **interaction between the individual actors is defined regarding the preparation, implementation and further development of the statistical programme and the various products.** This

section presents general organisational regulations helping to achieve and further develop the quality standards described here.

Dialogue with the users

Through various bodies, official statistics involves the users early in the preparation and further development of statistics to take account of their requirements. Among the most important of those bodies are the Statistical Advisory Committee and the specialist committees.

In the **Statistical Advisory Committee**, major users and the producers of statistical information come together for discussion.¹⁾ The function of this Committee is to give advice to the Federal Statistical Office regarding fundamental questions of the programme of federal statistics. Also, problems of fundamental importance occurring in specific statistics are discussed there. The Statistical Advisory Committee thus plays a key role in further developing the statistical programme through dialogue between users and producers of official statistics. This is also illustrated by a number of reports that have been submitted by the Statistical Advisory Council over the last few years.²⁾

The detailed treatment of individual statistics and the discussion of specific methodological-technical issues are a matter of the **specialist committees** set up by the Statistical Advisory Committee. In those committees, official statistics also attempts to solve the so-called "problem of adequation", that is, to approximate as much as possible the terms and aggregates of economic and social statistics to the "reality" to be described, which should be a process based on a dialogue with the users. This includes, for example, adequately defining the statistical populations in terms of contents and designing the tabulation programme with regard to the connections to be examined. Currently, there are specialist committees for about 20 areas of official statistics.

Co-operation within the federal system of German official statistics

One of the strong points of the German statistical system – as described above – is its **federal structure**. It provides the benefit of the statistical system being broadly embedded in the regions, but it requires continuous and intensive co-ordination and **co-operation in the spirit of partnership** between the statistical offices. Such co-operation contributes to efficiently meeting user requirements within a strong network. The basis of smooth co-operation is **Conferences and Meetings of Heads of the Statistical Offices**, which are held several times a year as the highest consulting and decision-making bodies of the statistical offices of the Federation and the Länder. The Conference of Heads of the Statistical Offices has set up committees and working groups to settle specific issues of the statistical programme, statistical issues of the EU, organisational matters, marketing, information technology, and the employment estimations of the Federation and the Länder; those bodies ensure that the tasks are fulfilled effectively and efficiently.

The most important body for the specialised areas of official statistics is the **expert meetings** where, at the expert level of the statistical offices, methodological-conceptual and technical-organisational issues of the various fields as well as data editing concepts and the actual survey process are discussed. This

1) Members of the Statistical Advisory Committee are, in addition to representatives of official statistics, the federal ministries, the Federal Court of Audit, the Deutsche Bundesbank, the Federal Data Protection Commissioner, the municipal central associations as well as trade unions, employers, associations, scientific institutes and institutions of higher education.

2) Statistischer Beirat: Empfehlungen zur Weiterentwicklung der amtlichen Statistik. Bericht des Statistischen Beirats an die Bundesregierung, Wiesbaden 1999; Statistischer Beirat: Neuordnung der amtlichen Statistik. Vorschläge des Statistischen Beirats für ein Rahmenkonzept, Wiesbaden 1996. Statistischer Beirat: Empfehlungen zur Weiterentwicklung der amtlichen Statistik. Bericht des Statistischen Beirats an die Bundesregierung zur 14. und 15. Legislaturperiode, Wiesbaden June 2002.

ensures continuous communication and constructive co-operation within the federal system. Generally, expert meetings are held once or twice a year for over 30 areas.

International co-operation

For official statistics in Germany, the European integration is both a challenge and an opportunity. Within the scope of co-operation in the European Statistical System, the European Union Member States benefit from each other. At the same time, European integration leads to new additional tasks, which have to be fulfilled despite stagnant or decreasing budgets; this is done either by "harmonising" national statistics or by producing additional statistics that are ordered by European legal acts. The goal of the statistical offices is to openly and actively participate in setting up harmonised statistics at a European level. Of course, intensive contacts with international organisations are maintained, too.

5 References

- Arbeitskreis Deutscher Marktforschungsinstitute/Arbeitsgemeinschaft Sozialwissenschaftlicher Institute/Berufsverband Deutscher Markt- und Sozialforscher (ed.): Standards zur Qualitätssicherung in der Markt- und Sozialforschung, Frankfurt am Main 1999.
- Blanc, Michel/Radermacher, Walter/Körner, Thomas: Qualität und Nutzer, in: Wirtschaft und Statistik 10/2001, p. 799 et seqq.
- Brackstone, Gordon: Managing Data Quality in a Statistical Agency, in: Survey Methodology, Vol. 25, 1999, No. 2, pp. 139-149.
- Chlumsky, Jürgen/Wiegert, Rolf et al. (ed.): Qualität statistischer Daten. Beiträge zum wissenschaftlichen Kolloquium am 12./13. November 1992 in Wiesbaden. Band 25 der Schriftenreihe Forum der Bundesstatistik, Wiesbaden 1993.
- Deutsche Forschungsgemeinschaft (ed.): Qualitätskriterien der Umfrageforschung, Berlin 1999.
- Eurostat (ed.): The Future of European Social Statistics. Harmonisation of Social Statistics and Quality. The Fourth Mondorf Seminar 26 and 27 March 1998, Luxembourg 1999.
- Eurostat (ed.): Qualitätsarbeit und Qualitätssicherung in der Statistik. DGINS Konferenz in Stockholm, Luxembourg 1999.
- Eurostat (ed.): Definition of Quality in Statistics. Eurostat Working Group on Assessment of Quality in Statistics, Luxembourg 2000.
- Eurostat (ed.): Standard Quality Report. Eurostat Working Group on Assessment of Quality in Statistics, Luxembourg, 2000.
- Eurostat (ed.): Quality in the European Statistical System – The Way Forward, Luxembourg 2002.
- Garonna, Paolo/Luige, Tiina: Zur Qualität des Europäischen Statistischen Systems, in: Wirtschaft und Statistik 10/2001, p. 848 et seqq.
- Hahlen, Johann: Amtliche Statistik zwischen "Schlankem Staat" und "Informationsgesellschaft", in: Wirtschaft und Statistik 2, 1998.
- Knoche, Peter/von Oppeln-Bronikowski/Kühn, Diemar: Marketingkonzept der Statistischen Ämter des Bundes und der Länder, in: Wirtschaft und Statistik 7/1999, p. 531 et seqq.
- Körner, Thomas: Qualitätsoffensive Statistik, in: Wirtschaft und Statistik 12/1999, p. 923 et seqq.
- Krug, Walter/Nourney, Martin/Schmidt, Jürgen: Wirtschafts- und Sozialstatistik. Gewinnung von Daten, München/Wien 2001.
- Loreth, Hans: Bürgerfreundliche Wege in der Datenerhebung, in: Baden-Württemberg in Wort und Zahl 48, 2000, p. 26 et seqq.
- Lyberg, Lars et al.: Summary Report from the Leadership Group (LEG) on Quality, Luxembourg 2001.
- Federal Committee on Statistical Methodology: Measuring and Reporting Sources of Error in Surveys, Statistical Policy Working Paper 31, Washington DC 2001.
- Statistics Canada (ed.): Statistics Canada Quality Guidelines, Ottawa 1998 .
- Statistische Ämter des Bundes und der Länder (ed.): Richtlinien und Anleitungen zur Gestaltung von Erhebungsvordrucken der amtlichen Statistik, Wiesbaden 1996.
- Statistische Ämter des Bundes und der Länder (ed.): Richtlinien zur Gestaltung statistischer Tabellen für die Verbundprogrammierung. Arbeitskreis Veröffentlichungen der Statistischen Landesämter (AKV), Wiesbaden 1997.
- Statistischer Beirat: Neuordnung der amtlichen Statistik. Vorschläge des Statistischen Beirats für ein Rahmenkonzept, Wiesbaden 1996.

Statistischer Beirat: Empfehlungen zur Weiterentwicklung der amtlichen Statistik. Bericht des Statistischen Beirats an die Bundesregierung, Wiesbaden 1999.

Statistischer Beirat: Empfehlungen zur Weiterentwicklung der amtlichen Statistik. Bericht des Statistischen Beirats an die Bundesregierung zur 14. und 15. Legislaturperiode, Wiesbaden 2002.

Statistische Ämter des Bundes und der Länder (ed.): Leitlinie für die Gestaltung von Graphiken, Kamenz 2000.

Statistisches Bundesamt (ed.): Demografische Standards. 4th edition, Wiesbaden 2004.