Workpackage 3

Quality Concepts: State-of-the-Art

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`http://www.cordis.lu/citizens/kick_off3.htm`

`http://kei.publicstatistics.net/`

Preface

The present deliverable on the state-of-the-art of data quality aims at presenting existent data quality definitions and outling the requirements and gaps of indicators quality. General aspects of data quality will be reviewed within chapter two. The third chapter presents data quality implementations for selected international organisations as well as national statistical institutes. Furthermore, the not explicit mentioned statistical institutions in this report are nevertheless part of the common European effort on improving and ensuring data quality. Their relevant contribution to the research, including recommendations, in LEG on Quality should be regarded as a relevant and valuable one.

The results of the deliverable will be input for deliverable 3.2 concerning the evaluation of a concept of indicator quality measurement and the quality of the KEI indicators.

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Chapter 1

Introduction

Measuring the growing internationalization, characterized by new founded unions of states, rapidly expanding international markets and trade as well as broad economic cooperation requires comparable data. It's measurement and consequently the data have to be of high quality. The basis of this requirement has to be an efficient definition of data quality allowing for the implementation of international comparable data, enforcing an innovative effort within official statistics and NSI's in the last years. The relevance of this new data quality research for the EU and its member states as well as for the work of its institutions like Eurostat and OECD is quite obvious. Doubtless, the political intention of receiving stable results while balancing the new criteria for data quality with respect to shrinking budgets and lower respondent burden could be regarded to square the circle. The leading institutions and their working groups just carried out advanced results to define data quality in a changing environment but the development of concepts and alternatives has not yet reached its end. Ongoing research in this field is going to be carried out continuously. Due to this, the following chapter of the report presents an overview to the state-of-the-art of data quality discussion and will point out possible gaps.

Especially the KEI project, dedicated to the research in the field of knowledge base economy indicators, requires comparability of the data and its sources and the indicators. To meet reliable and comparable information about several sources of international data the following common criteria of data quality is of great importance. The statistical institutions are the drivers of this new kind of user oriented as well as process oriented definition of quality. These definitions were compiled and integrated within frameworks which were developed to be suitable tools for applicable data quality measurement. Details of these relevant institutional frameworks and their structures are explained and presented in the following sections.

Thereby, the discussion of statistical quality and its main definitions have to be regarded within a frame of legal aspects concerning statistical administration as well as national traditions. Germany for example has a statistical office in each federal state and a head organization, the Federal Statistical Office (Statistisches Bundesamt). In the Netherlands there exists one Central Bureau of Statistics, CBS, in Belgium the central Institut National de Statistique with some regional divisions. Different legislative processes reflecting regional as well as traditional aspects led to different types of statistical offices and administrative structures. Thereby Eurostat is the supranational institution in the

EU coordinating the activities of the NSI's and gaining data bases of some homogeneity concerning the criteria of data quality.

Another important aspect to be considered in the quality discussion are cost constraints imposed and opposing the quality requirement. They imply paying strong attention to a permanent and sustainable balance between effort and cost. The national government intends to spend no more money on statistical services which in fact imposes saving money. Despite of rigorous austerity programs the statistical offices are enforced to shorten their budgets and to keep up high quality standards of their output in the future. Further research at international level is an unavoidable necessity to maintain sufficient quality standards of data for economic and social policy. The work within the KEI project is one of this activities financed by the European Commission to get more consistent criteria for constructing indicators.

Chapter 2

General Aspects of Data Quality

2.1 Metadata and Data Quality Reports

In order to use data, appropriate descriptions of the data sets have to be available. These descriptions should be standardized in order to furnish the user of statistics with information of interest. Such approaches of data descriptions are collected in so-called metadata published as metadata reports. These metadata reports are lists of all relevant statistical information about specific data sets. The *Guidelines for the Modeling of Statistical Data and Metadata* (United Nations, 1995) serves as an adequate basis for the generation of these reports as well as for an overview of statistical meta information.

Eurostat has already experiences with the set-up of metadata reports for its disseminated data (EUROSTAT, 2004b). One important source for Eurostat data accessible via internet is the NewCronos data base (`http://epp.eurostat.ec.europa.eu`). The statistical information on this server is accompanied with appropriate metadata reports. The reports cover the areas of data description including periodicity and timeliness, access by the public, integrity, dissemination formats and a summary methodology. In general, only the main aspects of data quality are included in such metadata. Hence, additional data quality aspects which will be presented below are sometimes covered in specialized data quality reports. If they are available, hyperlinks are given in the relevant metadata on the NewCronos data base.

In detail, the characteristics of quality reports and metadata reports will be presented in chapter 3.1.1.

2.2 Quality Management

In the past the notion data quality referred basically to the accuracy of statistical data. In the traditional context this means the evaluation of estimates resulting from data of survey sampling respecting the mean squared error (MSE) or its surrogates. Data accuracy is still an important characteristic of the statistical output. Today statistical organizations use a broader definition of data quality. Besides accuracy, additional dimensions of quality

have to be taken into consideration. This broadening of the definition is mainly due to the consideration of the needs of the users of statistical data. This change in the view on quality and the increased focus on users' interests is often explained by the emergence of Total Quality Management (TQM) and comparable management frameworks. These management philosophies are used primarily in the business sector and are now applied in official statistics. They focus on the fitness of final products and services for users and emphasize the need to integrate quality into the process of producing statistical information as well as the involvement of employees in this process (Brackstone, 1999, p. 3). Thus, the concept of data quality in statistical organizations is often regarded as a process of continuous improvement which is necessary not only to retain competitiveness, but also to adjust to new demands from users (Biemer and Lyberg, 2003, p. 13).

The common view is that data quality is generally achieved by the quality of the process. Statistical organizations have correspondingly adopted new approaches to measuring quality (Biemer and Lyberg, 2003, p. 19). These approaches refer to the management of quality or to business excellence models and are based on the general philosophy of TQM. These approaches are aimed at improving quality through a focus on customers. TQM is essentially based on explicit core values like customer orientation, leadership and the participation of all staff, process orientation, measurement and understanding of process variation, and continuous improvement (Biemer and Lyberg, 2003, p. 19).

TQM is a method of working and developing business but it does not offer guidance to its practical implementation. Business excellence models which are used as self-assessment tools are more concrete in that way. Examples of such models are the Swedish Quality Award Guidelines, the Malcolm Baldrige National Quality Award, and the European Foundation for Quality Management (EFQM) model. These models are developed for organizations to assess themeselves against the criteria listed in the model guidelines (Biemer and Lyberg, 2003, p. 19). Criteria are for example leadership, strategic planning, customer and market focus, information and analysis, human resources focus, process management, and business results. With these assessment tools it is intended to introduce an approach that is uniformly applied to all criteria in order to improve quality, to communicate good procedures to the entire organization, and to reveal weak and strong points of the organization (Biemer and Lyberg, 2003, p. 20).

Another assessment tool is the ISO-certification (International Organization for Standardization). For an organization to achieve certification it is required to produce documents on its organization of quality work, segmentation of authorities, procedures, process instructions, specifications, and testing plans (Biemer and Lyberg, 2003, p. 20). The balanced scorecard emphasizes the balance between four dimensions of business: customers, learning, finances, and processes. It is intended to strengthen the frequently undervalued dimensions as the most organizations focus on financial outcome. Statistics Finland is a typical example for the use of balanced scorecard (Biemer and Lyberg, 2003, p. 20).

The business process reengineering is a totally different approach to process improvement (Biemer and Lyberg, 2003, p. 20). It is based on rebuilding processes from ground up and replacing old systems with new ones (Biemer and Lyberg, 2003, p. 20).

Customer surveys are a tool for gathering informations about customer needs. It is important to know what product characteristics really matter to customers and how the customers perceive the quality of the products and services offered by the organization.

Another self-assessment tool are quality checklists that can be filled out by survey managers. These can consist of follow-up questions and are usually applied for the assessment of specific products and programmes. Self-assessment through audits can be either external or internal. In external audits experts evaluate a process, a survey, or parts of the organization. The audits usually lead to a series of recommendations for improvement. Internal audits are performed by the organization's staff (Biemer and Lyberg, 2003, p. 21).

The role of quality declarations or quality reports is to inform both users and producers of statistical data. This information refers to the quality of the data in terms of the several quality dimensions (especially of Eurostat): relevance, accuracy, timeliness, accessibility, comparability, coherence, and completeness. The documents are primarily intended to provide users with information about statistical products. Quality declarations can also be used in the same way as quality profiles which are intended to provide producers of statistical products with information about areas of a survey to be improved. The quality profile is usually much more comprehensive than a quality report. In practice the quality report is a mixture of quality estimates and other type of information, such as quality indicators (nonresponse rates, edit failure rates, etc.), pretest results, and metadata (questionnaires, definitions, etc.). The accuracy dimension is definitely difficult to measure. Other dimensions are easier to handle since they have a metadata character (Biemer and Lyberg, 2003, p. 372).

Current Best Methods (CBMs) play a crucial role regarding the improvement of the survey quality. CBMs are used in the survey planning process. It is intended to obtain continuous improvement by applying best practices. To apply methods that are proved to be the most successful ones to use for the corresponding processes. CBMs comprise two main components. The first component is the documentation of procedures. Many survey organizations have developed descriptions of the best practices for various survey processes, such as sampling, variance estimation, nonresponse follow-up, editing and other processes (Biemer and Lyberg, 2003, p. 359).These documented CBMs offer guidance for processes where numerous critical and difficult steps are required. Information is provided on how certain vital processes are managed in order to give assistance for decisions on current operations (Morganstein and Marker, 1997, p. 491).

Another component of the CBMs refers to the management or rather to the process of development of CBMs. The notion Current Best Method implies that the methods are subject to constant improvement. It is intended with the integration of all staff to continually develop best practices and to document them. The management plays a crucial role in the process. The development of CBMs is equally important as the use of already documented CBMs. This requires the involvement of the organization's staff. The management is supposed to convey the staff that continual improvement is valued, to provide resources needed to involve the staff into the process, and to reward adherence to valid procedures (Morganstein and Marker, 1997, pp. 490).

CBMs can be considered as some kind of systematic approach to continuous quality improvement. Under guidance of the management it is possible by the involvement of the staff, too, to document and to implement best practices. The documentation and communication/dissemination of CBMs help to achieve a higher degree of standardisation of the statistical production process. The purpose of CBMs is to ensure that best practices developed either internally on other surveys within an organization or externally by others, are used by all surveys in the organization (Biemer and Lyberg, 2003, p. 360). The

adoption of standards in the form of documented recommended practices is helpful for reducing the variation in the statistical production process and thus for the improvement of quality of the output (Morganstein and Marker, 1997, p. 490).

There exist different measures for the standardization of those practices in a statistical organization that lead to good quality. Policies that are directed by the management can be enforced through standards, guidelines or recommended practices. Quality guidelines should be obeyed as long as there exist good documented reasons.

2.3 Recommendations of the LEG on Quality in Statistics

Introduction

In 1999, Statistics Sweden proposed the formation of a Leadership Group (LEG) on Quality in statistics to attain improved quality in the European Statistical System (ESS). In the same year, the Statistical Programme Committee (SPC) decided to set up such a LEG on Quality. The LEG was chaired by Statistics Sweden and included the other LEG member NSIs France, Germany, Italy, Greece, the Netherlands, Portugal, and the UK. Two members from Eurostat attended and the remaining EU countries, together with Norway and Iceland, formed a network that was consulted at a LEG seminar held in October 2000. The ESS comprises Eurostat and the NSIs associated with Eurostat, i.e. the producers of the official statistics. The task of the LEG was to establish a quality framework, to identify key elements of quality and to obtain information on the status of these elements in the ESS, and finally to propose future actions in form of recommendations based on examples how improvements in the NSIs and the ESS could be made. The two issues, TQM philosophies and CBM, were explicitly mentioned in the proposals. Thus the recommendations are concerned with current best practices, minimum survey standards and more widely systematic quality improvements in the NSIs and the entire ESS. The LEG proposed a series of 22 recommendations and a Quality Declaration for the ESS that were formulated in the final report of the quality initiative (Lyberg *et al.*, 2001 and EUROSTAT, 2002).

Details of the LEG on Quality

Based on the initiative of Statistics Sweden the LEG on Quality was founded and dealt with issues such as the meaning of quality statistics, how to achieve good product quality, relationship with respondents and other data suppliers, quality and users, strengths and weaknesses of the ESS, CBSs and other standardization tools, dissemination of information, assessment tools, documentation and implementation of quality management systems. Statistics Sweden has worked extensively in the area of data quality for a number of years. Other countries have shown interest in analysing data quality, too. The main purpose of the proposal for LEG was to define its tasks in a more detailed way, as well as to generate and to communicate a set of recommendations for the ESS enforcing

its quality work. The results of intensive work on the LEG aspects which was done in different decentralised working groups were presented at the International Conference on Quality in Official Statistics, in Stockholm, on May 14-15, 2001 (Lyberg *et al.*, 2001). All documents were revised and the final version of the LEG document consists of five parts:

- the Summary Report,
- the Quality Declaration (Annex 1),
- the terms of reference proposed to an Implementation Group with the task of coordinating the implementation of the LEG recommendations (Annex 2),
- a separate list of the LEG recommendations (Annex 3), and
- the detailed background chapters covering the listed topics.

The Summary Report contains a detailed overview of the whole development of LEG and its results. The Quality Declaration shows the mission and the vision of the ESS as well as how this mission and vision may be realized (cf. Lyberg *et al.*, 2001, appendix A). Furthermore, the LEG document contains the terms of reference which give some more information on the features of the LEG Quality Implementation Group (cf. Lyberg *et al.*, 2001, appendix A). Finally, annex 3 of the mentioned report lists all of the 22 recommendations which were formulated by LEG (Lyberg *et al.*, 2001, appendix A):

Recommendation no. 1: Each NSI should report product quality according to the ESS quality dimensions and sub-dimensions.

Recommendation no. 2: The measurability of each ESS quality dimensions and sub-dimensions should be improved.

Recommendation no. 3: Process measurements are vital for all improvement work. A handbook on the identification of key process variables, their measurement, and measurement analysis should be developed.

Recommendation no. 4: All organizations in the ESS should adopt a systematic approach to quality improvement. ESS members should use the EFQM excellence model as a basis for their improvement work, except for those already using a similar model.

Recommendation no. 5: NSIs should strive to improve their relationships with data suppliers, and research should be conducted on how data suppliers perceive their task. A special emphasis should be placed on issues that involve a decrease of the respondent burden and enhance suppliers' awareness of the role of statistics in society.

Recommendation no. 6: ESS members should develop service level agreements for their main programmes.

Recommendation no. 7: A development project regarding the design, implementation and analysis of customer satisfaction surveys should be initiated.

Recommendation no. 8: Each ESS member should provide a report regarding the present status of its user - producer dialogue including descriptions of any user involvement in the planning process. Good practices in promoting user awareness of quality problems should be collected and made available to ESS members.

Recommendation no. 9: An in-depth analysis of the most important ESS strengths and weaknesses should be conducted. An action programme should be developed based on the findings of this analysis.

Recommendation no. 10: NSIs should develop CBMs for their most common processes. A handbook for developing CBMs covering construction, dissemination, implementation and revision of CBMs should be worked out. Existing and relevant CBMs should be collected and distributed in the ESS.

Recommendation no. 11: A set of recommended practices for statistics production should be developed. The work should start by developing recommended practices for a few areas followed by a test of their feasibility in the ESS.

Recommendation no. 12: ESS members should use the list of current good information management and dissemination practices compiled by the LEG and consider actions for internal use.

Recommendation no. 13: The user needs of the current ESS information system should be reviewed and Eurostat's current database expanded accordingly. Guidelines regarding the future management of the information system should be developed.

Recommendation no. 14: A biennial conference covering any methodological and quality-related topics of relevance to the ESS should be organised.

Recommendation no. 15: A generic checklist should be developed for a simple self-assessment programme for survey managers in the ESS.

Recommendation no. 16: The methods for auditing on different levels and for different purposes such as internal, external, one point in time, continuing or rolling, rapid, and more extensive (such as EFQM assessment) should be reviewed and recommendations should be provided to the ESS.

Recommendation no. 17: ESS members should study staff perception. One way to do this is to conduct staff perception surveys.

Recommendation no. 18: ESS members should analyse their documentation status in a report. The report should include an action plan with clear priorities for improvement and a timetable.

Recommendation no. 19: Each ESS member should make publicly available documents describing its mission statement, dissemination policy and quality policy.

Recommendation no. 20: All staff should be trained in quality work with different types of training programmes for different types of staff. Each ESS member should develop a training programme. Training on a European level should be enhanced.

Recommendation no. 21: A biennial quality award in official statistics should be established. The award could be given to a single improvement project team, for an innovative idea, to a well-performing ESS organization or to a statistical programme team.

Recommendation no. 22: There is a need to establish a LEG Implementation Group that coordinates the activities generated by recommendations approved by the SPC.

For more details on the listed recommendations please refer to Lyberg *et al.* (2001). After publishing of the Summary Report from the LEG on Quality, the recommendations have been disseminated, annual surveys on implementation have been distributed to NSIs within the ESS and five multinational development projects have been initiated (cf. Karlberg and Probst, 2004, appendix A). Up to now, a lot of the presented recommendations have already been implemented, or are going to be in implementation process in the foreseeable future (cf. EUROSTAT, 2004a). Karlberg and Probst (2004) as well as the therein mentioned references contain a detailed overview and report of the ongoing status of implementation the of the LEG recommendations.

Conclusion

During the last years, there has been done a lot of work in improving data quality. The initiative to consitute the LEG, initialised by Statistics Sweden in 1999, and the ongoing work and effort by numerous other European institutions and organisations, had and will have a sustainable impact on the quality work in Europe. In many cases the improvement achieved is clearly a consequence of the LEG on Quality initiative.

2.4 Recommendations of the Commissions of the European Communities

Introduction

On 22. December 2004, the Commission adopted a Communication to the Council and the European Parliament entitled 'Towards a European Governance Strategy for Fiscal Statistics'. (cf. Commission of the European Communities, 2005).

Within that Communication a proposal for a consistent strategy was carried out to strengthen the European governance of fiscal statistics especially by an European statistics code of practice. The Council (ECOFIN meeting) welcomed this proposal and particulary the work on the code for European standards in this field going on yet. This proposal was adopted by the Commission on March 2005. The items of this paper reinforce and clarify the status of Eurostat as the statistical authority related to the task of fiscal monitoring the deficits in the EU. The Commission took a number of measures to provide a reinforcement of the operational capacities of the Commission's services. In this context, Eurostat

has conducted an internal redeployment of staff in order to reorganize economic and fiscal accounts of the EU. Further on, the Council decided to enhance the independence of Eurostat in the performance of its tasks.

The Code of Practice on European Statistics presented in the above quoted Communication can be regarded as a self-regulatory instrument providing standards for the independence of the statistical authorities on national and Community level. This Code guarantees for the satisfactory functioning of the ESS. Further on, it can be regarded as a practical fulfillment of data quality management which is recommended by Eurostat as an efficient tool to improve data quality by organizational processes. Finally, it includes a Recommendation to promote the Code in member states as well as inside the Commission.

In its entirety, the ESS operates efficiently and in a satisfactory manner. It satisfies to a great extend the requirements of independence, integrity and accountability.(cf. Commission of the European Communities, 2005).

Additionally, the Code supports every effort improving data quality of Eurostat's and the NSI's data output, and improves reliability of the statistical information for policy purposes.

Purpose and Scope of the Code of Practice

The above already mentioned Code was prepared by the principal producers of European Statistics, especially by the NSIs.

The Code of Practice contains 15 principles. They are foreseen to be applied in connection with the production of Community statistics. The Code serves for two goals:

- to improve trust and confidence in the statistical authorities by applying effective institutional and organizational management arrangements and
- to reinforce data quality and ensure a best practice promoted by all producers of official statistics in Europe.

In its substance the Code presents an answer to the invitation of the Council from June 2004. In some parts it exceeds minimum standards that are yet existing as a basis for the data generating statistics and its qualities. The Commission wants to propose that these principles should be respected as far as Eurostat is concerned. Finally, the paper (cf. Commission of the European Communities, 2005) is aiming at monitoring and reviewing the implementation of the Codes' standards.

The Code primarily deals with the data production and data dissemination within the ESS. It should be mentioned in this context that the whole statistics processed at Community level, represent much more patterns of statistics going beyond economic and fiscal statistics. Although, the Code is addressed to the ESS it will be a source of inspiration for institutions and bodies producing public statistics on a reliable level, whether they are members of the ESS or not.

Principles, Recommendations of the Commission, and the Code of Practice

The principles reflect to a large extend the existing international standards as the Fundamental Principles of Official Statistics adopted by the United Nations Statistics to ensure a common and reliable statistical environment. The principles are grouped in three sections belonging to: Institutional reality, the statistical process itself, and the quality of outputs. One may characterize it as the principles of independence, integrity and accountability. A structure of peer reviews based on applicable indicators has been included.

For the implementation of the Code into the ESS the Commission adopted a recommendation to increase the self-regulatory mode of the Code. The Commission will monitor continuously adherence to the Code within the ESS. The monitoring of the implementation of the Code shall follow ad gradual approach over three years. The whole procedure will guide into a new situation which are characterized by enhanced organizational and quality standards within the ESS.

Additionally, there are principles existing for a rebalancing of statistical priorities. The producing of statistics of high quality and reliability requires to balance data needs with the resources made available to the statistical authorities and the burden on the respondents. Principle 9 pays attention to balancing of burden.

The Commission set up recommendations with following purposes:

- Member States should acknowledge the importance of the Code,
- Member States should take measures to ensure a correct implementation by the relevant authorities,
- Member States should promote the Code among users and data providers The commission will take appropriate actions to monitor observance of the Code within ESS, and
- within its own sphere of competence the Commission will apply similar measures to enhance the independence of Eurostat.

The objective of this catalogue of recommendations is to promote the standards contained in the Code and to recommend appropriate actions to ensure effective implementation of organizational and quality standards by the national as well as by the Community statistical authorities.15 principles are listed up in the Code. Their catch phrases are enumerated below. For details and explanations of the large catalogue of recommendations it is refereed to the Commission paper (cf. Commission of the European Communities, 2005).

- Principle 1 : Professional Independence
- Principle 2 : Mandate for Data Collection
- Principle 3 : Adequacy of Resources
- Principle 4 : Quality Commitment

- Principle 5 : Statistical Confidentiality
- Principle 6 : Impartiality and Objectivity
- Principle 7 : Sound Methodology
- Principle 8 : Appropriate Statistical Procedures
- Principle 9 : Non-Excessive Burden on Respondents
- Principle 10 : Cost Effectiveness
- Principle 11 : Relevance
- Principle 12 : Accuracy and Reliability
- Principle 13 : Timeliness and Punctuality
- Principle 14 : Coherence and Comparability
- Principle 15 : Accessibility and Clarity

This catalogue presents itself as a further development and upgraded list of criteria to ensure quality management and a conformity of data quality for the ESS. Some of the criteria already were part of the Eurostat criteria of data quality in the past. Now they are imbedded in an enlarged context of administrative and quality measures which will enhance the effort for good quality in the ESS.

A direct application to the problems of constructing reliable indicators is not intended with these principles but an indirect strong influence on data quality that touches the construction of indicators can certainly be recognized.

Conclusion

The Commission presented in 2005 Recommendations and Principles to develop the organizational and quality standards in the ESS. This will give an impulse to the NSIs to make a further effort for gaining equivalent standards of data quality in the ESS. This catalogue of principles can initiate a new round of work for data quality and organizational improvement which will be a benefit for the situation and possibilities of the whole statistics in Europe.

Chapter 3

Data Quality Concepts

3.1 International Organizations

3.1.1 Eurostat

Introduction

Eurostat began its work on quality measurement based on the experience of statistical organisations and with the explicit support of several National Statistical Institutes (NSIs) of the European Union in 1994. In recent years, Eurostat worked out a basic structure for the management of quality in statistics. A framework of reference for the definition of data quality is available today. The Management Board of Eurostat decided in 1999 to produce *Internal Quality Reports (IQR)* for all data available in Eurostat during the year 2000, aiming at covering general topics for the assessment of quality. The Eurostat quality reports concern to a *standard quality report form* that follows the structure of the seven dimensions of the Eurostat quality concept Linden and Sonnenberger (2002).

The methodological work on data quality in Eurostat based on the fundamental definition of data quality is going on and will be discussed and agreed upon with the Member States of the European Union. The results of the ongoing research are documented in papers such as EUROSTAT (2003a), EUROSTAT (2003b), EUROSTAT (2003c) and EUROSTAT (2003d). EUROSTAT (2003b) covers a detailed framework of needed and applicable criteria to fulfil the essentials of quality concepts. For practical purposes the applicability of such criteria is described detailed in this report. Recently, the Commission released new papers which deal with improved recommendations on data quality for statistical institutions (cf. Commission of the European Communities, 2005). In addition to general methodological work, Eurostat has installed ad-hoc task forces with the Member States. The task forces have been created for the measurement of quality in National Accounts, Balance of Payments statistics, Labour Force Survey, Foreign Trade statistics, and variance estimations (cf. Grünewald and Linden, 2001).

Definitions and Concepts

In the beginning quality measurement requires a definition of data quality of the statistical output for official EU statistics. Experiences with quality reports in the past led to so-called dimensions of data quality. The following six catch phrases present these dimensions (cf. EUROSTAT, 2003a and EUROSTAT, 2003b). Originally there were introduced seven dimensions; the seventh dimension *Completeness* was canceled later on and merged with *Relevance*.

- **Relevance**
  Relevance is the degree to which statistics meet current and potential users' needs. It refers to whether all statistics that are needed are produced completely and the extent to which concepts used (definitions, classifications, etc.) reflects user needs.

- **Accuracy**
  Accuracy in the general statistical sense denotes the closeness of computations or estimates to the exact or true values.

- **Timeliness and Punctuality**
  Timeliness of information reflects the length of time between its availability and the event or phenomenon it describes.
  Punctuality refers to the time lag between the released date of data and the target date when it should have been delivered.

- **Accessibility and Clarity**
  Accessibility refers to the physical conditions in which users can obtain data: where to go, how to order, delivery time, clear pricing policy, convenient marketing conditions, availability of micro or macro data, various formats, etc.
  Clarity refers to the datas' information environment whether data are accompanied with appropriate metadata, illustrations, whether information on their quality also is available, and the extent to which additional assistance is provided by the NSI.

- **Comparability**
  Comparability aims at measuring the impact of differences in applied statistical concepts and measurement tools / procedures when statistics are compared between geographical areas, non-geographical domains, or over time. There are three main approaches on which comparability of statistics is normally addressed:

  - comparability over time,
  - between geographical areas, and
  - between domains.

- **Coherence**
  Coherence of statistics is therefore their adequacy to be reliably combined in different ways and for various uses. When originating from a single source, statistics are normally coherent in the sense that elementary results derived from the concerned survey can be reliably combined to produce more complex results.

Regarding this list of dimensions one can see that Eurostats approach on data quality is user-oriented as well as output-oriented. This twofold orientation is specific for the convincing Eurostat approach which was taken over with negligible variations by several NSIs in the EU.

In addition to the definition of data quality discussed, two further components of Eurostat's work on quality are meaningful. The quality has to be documented, hence quality reports have to be installed in the dissemination process of data. An illustrative example of such a quality report on *e-Government online availability* is given in appendix A. Eurostat strives to produce a complete set of quality reports for all released data outputs. These reports contain metadata and a full description of each statistics with respect to the quality dimensions and users' need. The quality report should ideally conclude with an overall evaluation of the level of relevance of the statistical product and a statement of the main reason for lack of relevance (cf. EUROSTAT, 2003d).

The second one deals with the holistic approach of quality management within Eurostat to provide an effective organisational management on all stages of the data generating process. The catch phrase for these administrational efforts is known as Total Quality Management (cf. chapter 2.2). The NSIs of UK and Finland attach great value to TQM to improve systematically their data quality by this organisational tool.

Further items of data quality observed by Eurostat and integrated in the holistic view of data quality are *cost and respondent burden*. Cost and respondent burden, are aspects of the quality assessment task in the sense that quality of statistics cannot be regarded as isolated from them. The assessment of a cost associated with a statistical product is quite a complicated task, since there must exist a mechanism for appointing portions of shared costs and overheads and must be detailed and clear enough so as to provide for international comparisons among different structures.

Regarding response burden which cannot be easily expressed in financial terms, but rather in time spent for filling up questionnaires or responding to an interviewer. However, ONS has developed a method for measuring the response burden of enterprises in financial terms. This is presented in EUROSTAT (2003a, p. 3) and in the reference therein.

Quality Measurement

As just mentioned before, the quality of statistics is reported in standard quality reports. A method to aggregate the information of these reports is the set-up quality indicators which should be representative for the quality dimensions identified in Eurostat's definition of quality EUROSTAT (2003b). This would give the opportunity to the data producer to measure and follow over time the quality of the data produced in the European Statistical System (ESS). In addition, the indicators methodology for their computation should be well established, and the indicators should be easy to interpret.

The indicators presented below are classified against their ability to measure the quality dimension into free groups: key, supportive and indicators for further experiences. Thereby a correct balance between the different dimensions of quality and the achievement of a minimum number of indicators should be paid. In addition it is recommended to include

qualitative statements for assisting in the interpretability of the quality information and to summarize the main effects on the handling of the statistics.

Quality component	Indicator	group*
Relevance	R1. User satisfaction index	3
	R2. Rate of available statistics	1
Accuracy	A1. Coefficient of variation	1
	A2. Unit response rate (un-weighted/weighted)	2
	A3. Item response rate (un-weighted/weighted)	2
	A4. Imputation rate and ratio	2
	A5. Over-coverage and misclassification rates	2
	A6. Geographical under-coverage ratio	1
	A7. Average size of revisions	1
Timeliness and Punctuality	T1. Punctuality of time schedule of effective publication	1
	T2. Time lag between the end of reference period and the date of first results	1
	T3. Time lag between the end of reference period and the date of the final results	1
Accessibility and clarity	AC1. Number of publications disseminated and/ or sold	1
	AC2. Number of accesses to databases	1
	AC3. Rate of completeness of metadata information for released statistics.	3
Compara-bility	C1. Length of comparable time-series	1
	C2. Number of comparable time-series	1
	C3. Rate of differences in concepts and measurement from European norms	3
	C4. Asymmetries for statistics mirror flows	1
Coherence	CH1. Rate of statistics that satisfies the requirements for the main secondary use	3

*1 = key, 2 = supportive, 3 = further experience

Table 3.1: Quality components and relevant indicators

When discussion single quality indicators the question arises wether the construction of a composite indicator to assess the overall quality is feasible. Especially, when comparing indicators quality over the time as well as over different countries a composite indicator would be useful.

If the weighting scheme of the different quality dimensions is clear, a construction of such a composite using quantitative indicators is possible. However, from a conceptual and practical point of view it is not simple, as standards for all survey processes are missing and differences e.g. in the legislation or institutional settings over the time and over different countries complicate the comparability (EUROSTAT, 2003d).

Therefore the Eurostat Task Force stated: "that further developments are needed for defining a single meaningful indicator for each quality component (including guidelines for

defining the weights), before such an indicator can be recommended for use " (EUROSTAT, 2005).

Metadata

Beside Eurostats' work of defining and reporting quality, a second alignment is the publication of reference metadata files on its website in standard format since end of 2004. In 2006, more than 650 files were online. The approach of quality reports have to be distinguished from those of published metadata. From the Eurostat database NewCronos, data can be downloaded free of charge and metadata files are additional explanatory texts for the end-user to facilitate their work. In addition to the just mentioned illustrative example of a quality report for the data on *e-Government online availability*, the metadata report is also given in appendix A.

They following a standard dissemination template build on the IMF *Special Data Dissemination Standard* (SDDS) (cf. chapter 3.1.2). Such a common format has the advantage of simplifying the production and maintenance for the producer as well as the comparison of metadata from different domains for the end-user. Compared to the IMF, Eurostat produces the metadata only for the entire EU which allows only an overall assessment, the country level is not considered. Although the amount of information is limited, to provide only an overview of the quality and methodology of the data.

The metadata are splitted into a general part, the *Base Page*, providing information about the coverage, periodicity, timeliness, legal basis and other, and the more technical part, the *Summary Methodology*, informing about statistical units, reference period and other. Additional references are given in the metadata files to provide more detailed information e.g. to the quality reports published for the end-user.

A first evaluation of the quality of the metadata in 2005 monitored some problems and difficulties, e.g. a lack of clarity in the first set of guidelines, misinterpretation or non-harmonized interpretation of some metadata elements, ambiguities in the metadata elements. Especially for the technical metadata in the summary methodology, an underperformance against the average and a lack in communicating significant information by the member States was recognized. Due to this results, guiding principals were formulated for the publication of the metadata. But in general, it has to be considered, that metadata require continuous updates and quality checks as they are not static.

As just mentioned before, metadata are a second alignment in the quality discussion beside quality reports and indicators. This raises the question of the relation between both aspects. Metadata have to be splitted into *structural* and *reference* metadata. Structural metadata are identifiers and descriptors of the data, such as names of variables or dimensions of statistical cubes. Reference metadata describe the contents and the quality of the statistical data and have to be broken down into:

- conceptual metadata (describing the concepts used and their practical implementation),
- methodological metadata (describing methods used for the generation of the data),

- quality metadata (describing the different quality dimensions of the resulting statistics, such as 6 timeliness and accuracy).

The first analysis of 2005 of the metadata showed that only a part of the metadata on quality has been directly integrated (timeliness, accessibility of data and documentation, transparency of rules, plus a wide paragraph on available quality checks). Sometimes, additional information has been hyperlinked with external documents (e.g. the so-called *quality profiles* for structural indicators). This kind of linkage is a short-term solution of combining the reference metadata with the quality assessment. But Linden and Pellegrino state (EUROSTAT, 2006), that most metadata files still lack information on quality assessment. Therefore, they formulate a set of seven recommendations, among other that sufficient information on quality issues should always be available together with the data set under consideration and that Eurostat should focus more on quality assessment of aggregated data at EU level, while the individual Member States specific items can be further examined in the SDDS forms as published by IMF.

BASE PAGE	SUMMERY METHODOLOGY
General information	**Concepts, definitions and classifications**
Geographic area	Statistical concept
Statistical domain	Definition of indicators
Contact information	Classification system used
Dissemination formats	**Scope and coverage of the data**
(news releases, publications, on-line,	Geographical coverage
databases, CD-Rom,...)	Statistical units
	Statistical population
Data	**Accounting conventions**
Data description	Reference period
Time coverage	Base period
Periodicity	Recording of transactions
Timeliness	
Access	**Nature of the basic data**
Dissemination of release calendar	Data sources used
Release procedures	Type of survey
	Techniques of data collection
Integrity (practices and procedures)	**Compilation practices**
Rules on compilation and confidentiality	Compilation of European aggregates
Access to data before release	Adjustments
Commentaries on the occasion of data release	Data validation
Revision and changes in methodologies	Revision policy
Quality	**Other aspects**
References to detailed methodology and sources	Special warnings
Related data bases and information	
Quality framework and quality reports	

Table 3.2: Eurostat: reference metadata elements used in free dissemination

Linden and Pellegrino conclude that the European Statistical System is not yet able to provide users with a common set of standardized, comparable and re-usable metadata describing both European and national statistics. The discussion on the development of a coherent framework for assessing the quality of metadata and in particular the metadata on quality disseminated on the web within the ESS have to start. This should lead to improved quality reports and a reduction of the reporting burden. It should also lead to more harmonized and hopefully better documentation of quality for the users (EUROSTAT, 2006).

Conclusion

Eurostat has built up a framework of criteria and procedures to improve and ensure data quality. This framework focuses on users' needs and output orientation in a holistic sense as carried out in aggregated form in the paragraph above. Eurostat uses in this context the tools of TQM, data quality reports as well as metadata. By this means, data quality is improved stepwise over time and the users, corresponding to their needs, are able to judge upon the quality of data which are delivered from Eurostat. The discussed approach as a whole is a sound methodology to improve and ensure data quality in the EU and their NSIs.

3.1.2 International Monetary Fund (IMF)

Introduction

It is quite necessary within the KEI project and its research to look for the actual experiences of institutions which have to observe data quality as a theoretical as well as a practical task in their actual work. One of this relevant institutions which are experienced and working in this field is the IMF. It has a voluminous data base which must be updated to actuality cyclically. Additionally, a permanently ongoing research for data quality characteristics and measures takes place in IMF.

As a basis of research within KEI one has to gather information to achieve relevant components of the state-of-the-art concerning data quality. Especially, to look for data quality of variables to construct KEI-Indicators is of strong interest. Therefore, it seems necessary to examine some special relevant concepts of different institutions to judge upon the quality and possibly about their applicability. The following text will be attended to a task to analyze the IMF and especially its quality framework. The following condensed report gives an overview of the main principles of data quality in the IMF quality framework. The authors' attention mainly turned to:

- Carson (2000)
- Giovannini (2004)
- Laliberté *et al.* (2003)

as references. Other institutions will be analyzed analogously in further chapters of this report about IMF.

Definitions and Concepts

A lot of work has been done in recent years and is ongoing permanently to apply a consistent concept of quality to statistical data. IMF, Eurostat, OECD, Statistics Canada and some other NSis (see below) have identified various frameworks of quality items and dimensions.

Due to the difficulties that arise generally with strict definitions of qualitative properties the data quality is pragmatically defined as: *fitness for use in terms of user needs.*

Certainly, this kind of weak definition allows for a controversial discussion to define an efficient and operable quality framework to be applied in different practices. Different approaches exist. They are resulting from the work in this field by institutions like Eurostat, U.S. Bureau of the Census, UN/ECE, Statistics Canada, OECD, Statistics Finland, Statistics Sweden, Destatis Germany, World Bank, as well as IMF itself.

Some overlapping between the different concepts can be observed. A study in which a comparison between the Eurostat approach and IMF quality frameworks was done was carried out and published. The main results are presented in the next paragraph.

Comparison of the IMF and Eurostat approaches

The IMF framework has a view on data quality like observing a spectrum of separated spectral complexes like

- governance of statistical systems,
- core statistical processes, and
- observable feature of the outputs.

A Data Quality Assurance Framework (DQAF) addresses a wide range of questions that are captured through the so-called prerequisites of quality and five dimensions. The prerequisites deal with statistic quality affected by the

- legal and institutional environment,
- sources, and
- quality awareness in the managing structures and activities.

Additionally, so called dimensions of the quality framework are specified:

- Assurance of integrity as features to support firm adherence to objectivity in the production of statistical data and users confidence.
- Methodological soundness as a property of current practices compared with internationally agreed methodological practices for specific data sets.
- Accuracy and reliability draw the statistical adequation which portray the reality to be captured by statistical data.
- Serviceability in categories of timeliness, frequency, consistency and revision cycle.
- Accessibility of data and meta-data easily available to users to give them assistance.

The tabular below shows the structure of DQAF in an overview. (ref. Laliberté *et al.*, 2003).

Key Questions	**IMF DQAF**
How is the quality of statistics affected by the legal and institutional environment and resources. Is there quality awareness in managing activities?	**Prerequisites** of quality (*an example)*
	Dimensions
What are the features that support firm adherence to objectivity in the production of statistics to maintain users confidence?	Assurance of integrity
How does the current practices relate to the internally agreed methodological practices for data sets?	Methodological soundness
Are the source data, statistical techniques, supporting assessments, validation procedures as well as revision studies adequate to map the reality to be captured by relevant data sets?	Accuracy and reliability
How are users' needs are met in terms of timeliness of the data produces, their frequency, consistency, and revision cycle?	Serviceability
Are data and effective metadata at once available for users, and exists a helpful guidance?	Accessibility

Table 3.3: Overview of the Structure of DQAF

IMF framework focuses on process-oriented indicators and only on a strict qualitative measurement by a list of categories like good, satisfactory, small etc.

The Eurostat framework, on the contrary, focuses on the statistical outputs as judged by the users applying quantitative measurement tools. The way back to the production processes of data will only there be traced when the outputs do not yield a direct measurement.

Eurostats quality definitions have the goal to ensure that certain standards are met in aspects of statistical data production that are subject to quantitative measures.

Conclusion

The conclusion of this comparison of qualitative framework of Eurostat and IMF regarding usefulness for composite indicators is that one should clearly recognize that both frameworks are not immediately applicable to indicators and especially not to composite indicators and their methodology. Within the KEI project those approaches are of higher interest which seem to be suitable after some adaption to allow for application to the problems of indicators and composite indicators for knowledge based economies.

Nevertheless, there are several common grounds in the two approaches that may be useful to construct a specialized framework for the quality management of composite indicators. How this can be done effectively is part of the research in the KEI project using former concepts, approaches, and information.

3.1.3 Organisation for Economic Co-operation and Development (OECD)

Introduction

Over the last decade, several organisations have paid special attention to the development of quality frameworks for statistics. Especially the activities from Eurostat and the IMF are of importance (cf. Giovannini, 2004, p. 3 and 5). The approaches developed by these two organizations are described in detail in the chapters above.

The following elaboration presents a detailed overview on the main principles of data quality in the OECD data process. The authors turned their main attention to the following references.

- OECD (2003)
- Giovannini (2004)
- Nardo *et al.* (2005)

Definitions and Concepts

With respect to the interesting and useful approaches to improve national statistics the OECD decided to adopt those definitions and approaches on data quality to formulate its own approach. In 2003, the OECD developed and published the first version of its *Quality Framework and Guidelines for OECD Statistics (QFOS), OECD (2003).* It depends on the aspects achieved by the International Statistical Society, to adapt them to the OECD context. For an international organisation, like the OECD, the quality of data and statistics depends on the quality of data and statistics received from the NSIs as well as on the quality of internal structure of OECD. Therefore, the OECD decided for a quality framework which will

- provide a systematic mechanism for the ongoing identification and resolution of quality problems,
- significantly increase the transparency of processes, and
- reinforce the political role of the OECD.

The OECD Quality Framework outlined in QFOS, 2003, focuses on improving the quality of data collected, compiled and disseminated by the OECD through an improvement in the Organisations' internal statistical processes and management. However, there will be a positive influence on the data quality at national level.

The QFOS is grouped into four elements:

- definition of quality and its dimensions,
- set of broad principles on which OECD statistical activities are to be conducted and quality guidelines covering all phases of the statistical production process,
- procedure for assuring the quality of proposed new statistical activities, and
- procedure for evaluating the quality of existing statistical activities on a regular basis.

Compared with other institutions, the OECD defines dimensions how quality will be regarded. These dimensions are in detail: relevance, accuracy, credibility, timeliness, accessibility, interpretability, and coherence. Additionally, the factor cost-efficiency is still another important aspect with respect to the mentioned dimensions. These concepts indicate that quality is strongly related to *fitness for use* in terms of user needs. Apart from the criteria credibility and interpretability the listed dimensions are known from the Eurostat approach, partially with own special characteristics. The credibility of data refers to the trust that users can have in those products. The meaning of interpretability is similar to the concept of clarity. The interpretability of data products should reflect the users' benefit for properly analyses.

The Economic Commission for Europe of the United Nations adopted initially the *Fundamental Principles of Official Statistics* through which many of the quality dimensions are applied (cf. OECD, 2003, annex 1). The QFOS contains the main principles of OECD statistical activities as well as specialized versions with respect to data and metadata collection, management, and dissemination. These principles are also known as so-called *core values* (cf. Giovannini, 2004). Furthermore the OECD developed specific procedures to ensure that new and existing statistical activities are conducted in accordance with the various principles.

All these definitions of quality and all of these principles and procedures recommended by the OECD will not have any impact on quality as far as no technical, organisational or human factors will be simultaneously implemented. Therefore, the implementation of the QFOS should be associated with

- the development of corporate information and communication technology tools for collecting, processing, storing, as well as disseminating data and metadata,
- the adoption of internal rules for reviewing the way in which individual activities are carried out, and
- the investment in personal training for statisticians and initiatives aimed at reinforcing the sense of community in the context of a common process of data collection, process, storage, and dissemination.

The QFOS is completed by a wide list of quality guidelines and checklists. The quality guidelines underpin several items of OECD Quality Framework by providing a basis for the evaluation of proposed improved statistical activities. A statistical activity may be considered in terms of seven phases:

1. definition of the data requirements in general terms,
2. evaluation of other data currently available,
3. planning and design of the statistical activity,
4. extraction of data and metadata from databases within and external to the OECD,
5. implementation of a specific data and metadata collection mechanism,
6. data and metadata verification, analysis and evaluation, and
7. data and metadata dissemination.

Consequently, the guidelines for OECD statistics are classified into the seven phases listed above. Some phases may overlap and some may not be applicable. The checklists mentioned above are intended primarily as an aid memoir of the issues to be considered. The QFOS covers in such way checklists for existing statistical activities as well as for recently implemented statistical activities.

Conclusion

It should be emphasized that the concepts of OECD treated above are created along the proven state-of-the-art in data quality and its joint methodology. Due to permanent changes in statistical methods and procedures, best practices as well as national and international statistical organisations quality guidelines need to be periodically reviewed and updated. It should be useful for a sustainable quality management to improve permanently the relevant principles of data quality applied.

3.2 National Statistical Institutes

3.2.1 Office for National Statistics (ONS)

Introduction
The following condensed description gives an overview of the main principles of data quality in the ONS methods for measuring data quality. The authors' attention mainly turned to as references:

- Office for National Statistics (2004a)
- Office for National Statistics (2004b)

The ONS is the government department in UK that provides statistical and registration services. ONS is responsible for producing relevant economic and social statistics. These statistics are the basis for decision making in the political and social field and for monitoring against it.

There exists a wide spread Quality Review Programme for the statistical data and their reliability based upon a list of criteria which are the core-components of quality definitions. The programme of Quality Reviews is an important tool of ensuring that National Statistics and other official statistics in UK are fit for purpose to improve quality and value of the statistical outputs. In a five-year rolling period all key National Statistics are reviewed involving methodologists and outside expertise. The Programme was introduced in early 2000 and continuously applied to the system of National Statistics. Additionally, the programme is a key component for quality assuring National Statistics as set out in the Government White Paper *Building Trust in Statistics*.

To monitor the progress and to measure the success a Quality and Methodology Programme board has been established. It is responsible for coordinating the development and maintenance of the programme. The Board will also evaluate the effectiveness of the Review Programme in achieving its aims.

By this Review System and its coordination with the statistical institutions a high standard of up to date quality and a fitness of the statistical system will be achieved to meet the need of the users effectively.

Quality Principles and Concepts of ONS

Statistical quality is a more specialized meaning of the common understanding of quality as luxury, merit, or convenience. Often it is defined simply as *Fitness for Purpose*. To explain the statistical quality closer it is meaningful to use six dimensions like the following. This dimensions and their definitions are commonly used in the NSI's of the EU. There are no great differences to use this canon as a basis for quality assessment.

- **Relevance**
  Relevance means that the data should meet customers needs as close as possible. Relevance must be upheld and continuously improved by monitoring changes in environment and users' requirements.

- **Accuracy**
  The accuracy of data means that they should measure correctly and reliably what are they intended to measure. Every statistics must include explanations of the different types of errors that may influence their usability.

- **Timeliness and Promptness**
  Data should be recent and published in time. The release times for data should be announced in advance. This is a condition to prevent speculative use of data.

- **Accessibility and Transparency**
  The users should have a straightforward access to data which suit their needs.

- **Comparability**
  Usable statistics include comparability between units, over time, and with other domestic and international data.

- **Coherence and Consistency**
  Sets of data and statistics must be logically consistent and coherent with each other. Several concepts must be reported.

These dimensions are those agreed for use in the ESS for which Eurostat is the leading representative.

Obviously, ONS uses a user oriented approach like Eurostat and takes care to assure data quality by providing a strict system of reviewing as well as quality measurement as a specific system of total quality management (TQM) applied in UK. Office for National Statistics (2004a) is a useful tool to understand the UK-system of TQM. On each of the quality dimensions of outputs a thorough information should be given to the users to equip them with sufficient information about ONS outputs. On the one hand there are the following examples of items of the Qualitative Review Programme:

- Consultation of key suppliers to, and users of, the outputs.

- A responsible programme board for coordinating and monitoring the reviews, their development, effectiveness and maintenance.

- Implementation of all recommendations into the programme after a control.

On the other hand examples of quantitative quality measurement are:

- confidence intervals,

- standard errors,

- imputation rates,
- non-response rates,
- editing rates,
- proxy response rates,
- time lag between data collection and data release, and
- revision rates over time.

The permanent application of this dual monitoring programme to statistical data production is an effective procedure to improve quality and to control statistical data to be close related to users' needs. To install new criteria and metadata information as well as additional monitoring is possible at any time. The system is flexible and effective.

Conclusion

A framework of guiding and controlling statistical quality exists today in all comparable standards of the data producing statistics in industrial developed countries like the UK. There are no principle differences, e.g. in the leading states of the EU. The difficulties with these goals to maintain quality in permanence arise sometimes with the task to save quality over longer time and within the daily work in the different statistical organizations and their specific traditions. There should be made high efforts to avoid such signs of wear and tear.

The quality management system of ONS according to the rules presented above creates the conditions for an effective, up to date organization to built and consolidate methodological approaches, current best methods, monitoring as well as editorial systems, and last but not least continuous improvements of data quality.

Other concepts like that of Eurostat and IMF contain similar principles and rules like those of ONS, but each is compiled in a specific way. The one and the other is more designed to total quality and qualitative judgements, or on the other hand to an output oriented accuracy measuring.

For the special problems of indicators a suitable framework of quality management should be carried out along practically approved principles like that of ONS. In that kind of framework possibly a lot of the above mentioned general principles can flow into which should be pragmatically adapted to the needs of quality for indicators.

3.2.2 Statistics Canada

Introduction

> *Confidence in the quality of the information it produces is a survival issue for statistical agency. If its information becomes suspect, the credibility of the agency is called into question and its reputation as an independent, objective source of trustworthy information is undermined.*

Brackstone (1999, p. 2)

Statistics Canada as a statistical agency is highly interested how quality can be ensured. Therefore, the management of quality must play a central role in the overall management process.

Statistics Canada edits a set of quality guidelines which consolidates a set of experiences and conclusions. These experiences which, individually and in their particular contexts, have been judged to represent good practice. The relevant document is called *Statistics Canada Quality Guidelines* (Statistics Canada, 2003). The variety of measures which are used by Statistics Canada to manage the various dimensions of quality are described in another document, the so-called *Statistics Canada's Quality Assurance Framework* (Statistics Canada, 2002).

Definitions and Concepts

The Quality Guidelines edited by Statistics Canada will be useful to staff engaged in the process of planning and designing surveys and data dissemination. Basically, it is generally accepted that quality embodies a broad concept of *fitness for use*. This definition is conform to quality approaches edited by other known institutions comparable to state-of-the-art which is described in previous and following chapters. The fitness for use approach covers not only the statistical quality concepts, but also other characteristics like relevance, timeliness, etc.

With respect to the quality dimensions Statistics Canada distinguishes six constituent elements:

- relevance,
- accuracy,
- timeliness,
- accessibility,
- interpretability, and
- coherence.

The meaning of these dimensions is similar to the dimensions used by other institutions. Details are available in Statistics Canada (2002, p. 3). The six dimensions cannot be considered as isolated characteristics rather as overlapping as well as interrelated elements. Ensuring an acceptable level of data quality is the result of addressing, managing and balancing the quality dimensions over time with attention to program objectives, cost, respondent burden, and some other factors that might have influences on information quality or user expectations. In that context, Statistics Canada analyses the design of its relevant surveys. It must be pointed out that the term *survey* is used here in a broader context. It covers any activity that collects or acquires statistical data. The term *design* covers the delineation of all aspects of a survey from the demand for data until the production of final outputs (cf. Statistics Canada, 2003, p. 7).

With respect to a comparability and conjunction of the different survey data, one aspect must be to ensure that the output from each individual survey should be comparable with data on related topics derived from other surveys. Therefore, statistical standards have to be considered and respected. This includes statistical frameworks, statistical systems, as well as other concepts and definitions that specify the statistical variables to be measured. In other words, the usefulness of new statistical data depends partially on the extent that they can be utilized in conjunction with existing data as emphasized by Statistics Canada.

Statistics Canada (2003) covers the main activities of a typical survey and describes the *Scope and Purposes*, the *Principles*, as well as the *Guidelines*. The following table shows short descriptions about terms used. For more details please refer to Statistics Canada (2003, pp. 10).

Item	**Description**
Scope and Purpose	Description of the activity and indication of its potential impact on quality.
Principles	Broad, underlying policies, approaches and directions, that govern the design of the activity in question, with emphasis on those that relate to quality.
Guidelines	Known and good practices. Not all of these guidelines can be applied to every survey.

The main activities will be described as follows:

- objectives, uses and users,
- concepts, variables and classifications,
- coverage and frames,
- sampling,
- questionnaire design,
- response and non-response,
- data collection and capture operations,

- editing,
- imputation,
- estimation,
- seasonal adjustment and trend-cycle estimation,
- data quality evaluation,
- disclosure control,
- data dissemination,
- data analysis (and presentation),
- documentation, and
- administrative data use.

Details on several items are available in Statistics Canada (2003, pp. 11). Here the quality guidelines are interpreted in a management context. The management structure, policies and guidelines, consultative mechanisms, project development and management approach, and environment have been developed to facilitate and assure effective management of quality. Particularly, Statistics Canada (2002) presents an overview of the considerations regarding the management framework.

As already known, credibility of an agency would be called into question if confidence is not ensured. Therefore, the management of quality plays a central role in the overall management process of the agency and is an integral part of the management of every program. For example, the management of quality should balance the quality objectives against the constraints of financial and human resources as well as the goodwill of respondents in providing source data. Recapitulating,

> *Statistics Canada strives to build quality into all its programs and products. The quality of its official statistics is founded on the use of sound scientific methods, adapted over time to changing client needs, to budgetary circumstances, to the changing reality that the Agency aims to measure, and to the capacity of respondents to supply source data.*

Statistics Canada (2002, p. 2)

The management framework relates to the following items:

- managing relevance,
- managing accuracy,
- managing timeliness,
- managing accessibility,

- managing interpretability, and
- managing coherence.

The items listed above are in some aspects equivalent to the already mentioned quality dimensions. However, the special emphasis in this context is the accentuated importance of the management process. The following lines will give a small overview of the broad considerations. Regarding the item *managing relevance* the essential aspect deals with the translation of user needs into program approval and budgetary decisions within the agency. Processes which are considered as relevant by the management of relevance are the basis for further considerations.

With respect to these processes the management of accuracy requires main attention during three key stages of a survey process: design, implementation, and assessment. Further aspects like *managing timeliness* and *managing accessibility* find a special role in the management process. The contribution regarding accessibility covers the need of management how users can learn of the existence of data, locate it, and import it into their own working environment. In this context one should think about product definition and design, dissemination, needs of analysts, as well as efficient search mechanisms. *Managing interpretability* leads to the need, to provide sufficient information. Primarily, managing interpretability is concerned with the provision of metadata, i.e. information about information in the sense of information which allows the users properly interpreting statistical information. Finally the management process should cover *managing coherence*. Coherence of statistical data covers in that context coherence between different data items pertaining to the same point in time, coherence between the same data items for different points in time, as well as international coherence. Statistics Canada uses three different approaches to manage coherence in an adequate way. For more details on the quality dimensions and their implementation please refer to Statistics Canada (2002, pp. 5).

Conclusion

The statistical guidelines of Statistics Canada represent state-of-the-art in data quality, compared with the other leading organisations and NSIs. A special feature of the Canadian quality work is the use of the guidelines to improve the management of data generating and quality monitoring. The effort in this field has some similarity with the TQM approach established in business and recently introduced into statistical management by Statistics Finland.

3.2.3 Statistics Finland

Introduction

Generally, the production of statistical data within official statistics is based on a statistical system with its specific methodology, which can be identified as a collection of theoretical and practical procedures. Not the smallest part of such a framework is occupied by concepts, definitions and pragmatical procedures, which are relevant for the

quality management to carry out the statistical production in a valuable quality. Like other institutions on comparable level Statistics Finland has standards of data quality, which surely make a contribution to the state-of-the-art in this field. The following paragraphs will give an overview of the main principles which are characteristic for the quality approach of Finland.

Principles and Concepts

The following condensed report gives an overview of the main principles of data quality of Statistics Finland. The authors' attention mainly turned to the voluminous reference:

Laiho and Hietaniemi (2002)

The quality criteria of Statistics Finland are:

- **Relevance**
  Relevance means that the data should meet customers needs as close as possible. Relevance must be upheld and continuously improved by monitoring changes in environment and users' requirements.
- **Accuracy**
  The accuracy of data means that they should measure correctly and reliably what are they intended to measure. Every statistics must include explanations of the different types of errors that may influence their usability.
- **Timeliness and Promptness**
  Data should be recent and published in time. The release times for data should be announced in advance. This is a condition to prevent speculative use of data.
- **Accessibility and Transparency**
  The users should have a straightforward access to data which suit their needs.
- **Comparability**
  Usable statistics include comparability between units, over time, and with other domestic and international data.
- **Coherence and Consistency**
  Sets of data, statistics must be logically consistent and coherent with each other. Several concepts must be reported.
- **Documentation**
  All activities in the data generating processes should be thoroughly described in concepts, definitions and methods applied. A role-of-the-thumb for documentation is that anything that would cause considerable problems if left undocumented should be described.

TQM is the catch phrase to characterize the concept of Finlands effort to gain statistical data of high product quality. The objective of TQM is achievement of the organizations' performance excellence, and one of its central goals is the attainment of a quality that meets quality awards standards. In TQM the focus is broadened from a special product and its production to an entire system of statistics production and to its core processes.

Total quality management

Good capacity of performance in TQM is based on the following characteristics:

- results orientation,
- customer focus,
- leadership and constancy of purpose,
- managements by processes and facts,
- personnel development and involvement,
- continuous learning, innovation and improvement,
- development of partnerships, and
- public responsibility.

A quality management system according to this rules creates the preconditions for an organization to build and consolidate methodological approaches, CBMs, monitoring as well as editorial systems, and continuous improvement.

This framework of guiding and controlling statistical quality exists today in all comparable standards of the data producing statistics. There are no principle differences. The difficulties with these goals arise with the task to save quality over longer time and within the daily work in the different statistical organizations and their specific traditions.

In this context guidelines are foreseen in the statistics of Finland based upon the following three basics:

- organization level,
- core production process level, and
- statistical process level.

The following guidelines refer to the three levels as a kind of instructions to avoid misunderstandings and unnecessary difficulties.

- A cornerstone in the application of TQM is to avoid the evolution of one's own separate quality structure. The aim is the creation of an integrated management system of activities in which quality principles are incorporated into statistical production.
- Important quality goals should be transformed into strategic goals for the whole activities.
- The *Balances Score Card (BSC)* is used as the main application and measurement tool in the TQM.

- The ISO standard series provide a structure for the ongoing development of quality system consistent with BSC frameworks.
- With the help of the core processes and their sub-processes it should be installed a total quality thinking.
- Well motivated and competent personnel should take care of the strategic goals of the organization.
- Realisation of changes requires a well defined direction, solid grounding, and applicable tools.

Additionally, to these rules and instructions for the Finnish framework of Quality Management there are topics how to evaluate quality. They are fixed by the following items:

- quality planning
- quality assurance / verification, and
- quality improvement.

Quality must be evaluated continuously, often from different perspectives and levels. If errors can be located or measured to a certain stage in the statistical system, corrective measures can be applied to the data. Quality evaluations must be applicable simultaneously with the pertinent statistics and their output.

Conclusion

The total management of statistics introduced as a tool to guarantee a sufficient quality of statistical output in Finland is a framework which has sampled all principles and rules that are necessary for gaining quality. The introduced structure should be observed carefully, and also with respect for its boundaries. Although, it is a general concept which must be filled in according to special needs, e.g. of indicators, composites and their accuracy measures, one observes that there is no direct entrance into the special world of indicators and their necessities of quality. Nevertheless, this thorough framework is of great importance for the state-of-the-art regarding quality of statistic data under all relevant aspects.

Other concepts like that of Eurostat and IMF contain similar principles and rules but each is compiled in a specific way. The one and the other is more designed to total quality and qualitative judgements, or on the other hand to an output oriented accuracy measuring. For the special problems of indicators there should be carried out an own suitable framework of quality management. In that framework possibly a lot of the above mentioned general principles can flow into which should be pragmatically adapted to the needs of quality for indicators.

3.2.4 Statistics Sweden

Introduction

Statistics Sweden is the national statistical agency of the Kingdom of Sweden. Like the other mentioned agencies, Statistics Sweden makes its task to ensure data quality. Data quality or quality in a common sense may have different definitions. In Statistics Sweden (2001) one can find different approaches which might lead to alternative definitions of quality. But in general, the quality philosophy has to be dominated by the approach labelled *total quality*. More detailed, this philosophy means the user shall be in focus as well as *quality* refers to all aspects of a product which are relevant for how well it meets user's needs and expectations.

Definitions and Concepts

Compared to the other national or institutional approaches, Statistics Sweden explains quality in the sense of an *user-oriented quality concept*. This means that the data users should assess the statistics they use or they intend to use. Therefore, the producer needs a specified quality concept and has to communicate explicitly a set of quality declarations containing useful and user-friendly information. But with respect to the concrete quality concept there are two more aspects of special importance:

- quality improvement work, and
- evaluations of productivity.

One needs a solid basis for informing, improving, as well as evaluating the quality of data. By making a quality declaration the producer of data can specify the properties of data disseminated so that the data can be used in a proper way, and inform users about what quality in different respects they can count on. One needs a specified approach for adapting the data to new needs and expectations or in other words for improving. Finally, regarding an efficient data process, the quality concept provides one of the instruments for efficiency evaluation and an optimal allocation of production resources.

The quality concept for official statistics of Statistics Sweden contains the following items:

- Contents
  - Statistical target characteristics
    - Units and population
    - Variables
    - Statistical measures
    - Study domains
    - Reference times
  - Comprehensiveness

  - Overall accuracy
  - Sources of inaccuracy
    * Sampling
    * Frame coverage
    * Measurement
    * Non-response
    * Data processing
    * Model assumptions
  - Presentation of accuracy measures

- Timeliness
  - Frequency
  - Production time
  - Punctuality

- Comparability and Coherence
  - Comparability over time
  - Comparability between domains
  - Comparability with other statistics

- Availability and Clarity
  - Dissemination forms
  - Presentation
  - Documentation
  - Access to micro data
  - Information services

Some of these items are already known from other institutions. However, some aspects will be described below. Statistics Sweden provides some information for the contents of the statistics concerning the statistical target characteristics, generally. This item covers details on objects and population, study domains, reference time as well as comprehensiveness. The intention of formulating such contents is to define what a user will get in the form of a statistics, which measures he or she will receive, on which domain level the data will be available and there what kind of variables are used to form study domains and how far-going the division into study domains is. Furthermore, there are some differences in the reference time. Once the user may be interested in data referring to a special time point or otherwise the user might be interested in data referring to a period. Finally, the quality concept concerns the point of comprehensiveness, i.e. how well the output from a statistics system describes a subject matter field in its vital aspects.

The following quality aspects like accuracy, timeliness, comparability and coherence, as well as availability and clarity are basically identical to the one described in other chapters. *Accuracy* of the statistics concerns an agreement between statistics and target characteristics in the sense that the error between a statistic and the target or true value is

negligible. Under the item *Sources of inaccuracy* one may see what kind of errors are possible. *Timeliness* concerns the relation of statistics to the current state of affairs and will be described classified in the aspects of frequency, production time, and punctuality. The item *Comparability and Coherence* concerns how well different statistics can be used together. Finally the report contains the aspect of *Availability and Clarity* which concerns physical availability and intellectual clarity of statistics, i.e. how well the users can receive information and how well these information are documented.

Much more details on the aspects of the quality concept are available in Statistics Sweden (2001).

Conclusion

It should be emphasized that the concepts of Statistics Sweden treated above are created along the proven state-of-the-art in data quality and its joint methodology. Due to permanent changes in statistical methods and procedures, best practices as well as national and international statistical organisations quality guidelines need to be periodically reviewed and updated. Statistics Sweden pays special attention to the cooperation between itself as the data producer and the users. The judgement about data quality is users' part based on the thorough information communicated by Statistics Sweden.

3.2.5 U.S. Bureau of the Census

The following condensed text gives an overview on the main principles of data quality in the U.S. Census Bureau. The authors' attention mainly turned to following references:

U. S. Census Bureau (2005a)

U. S. Census Bureau (2005b)

The Census Bureau is the well-known statistical institution in Washington D.C. which is the largest statistical agency of the Federal Government of the United States. The Census Bureau is one of 10 principal statistical agencies of the Federal Government which have long been leaders in the development and implementation of quality guidelines for information products. From the past up to now the Census Bureau made continuously efforts to improve the quality of its statistical products. The well known articles of Deming (1961), Hurwitz and Pritzker (1964), Kish (1965), Dalenius (1977) and many others later on which dealt with statistical errors and their several components formed a basis for all further research and conceptual improvement in this field.

The Office of Management and Budget (OMB), compiled in 2002 an issuance of government-wide information quality guidelines. The Census Bureau as a part of joint Federal statistical agencies presented its specific response to the OMB directive on quality, including catch phrases like the following: utility, objectivity, and integrity. In October 2002 the Census Bureau carried out a report on quality guidelines which are similar in the essentials with comparable guidelines of other institutions like Statistics Canada, Eurostat, StatFin, and IMF. These Census Bureau guidelines cover information disseminated by the Census

Bureau after October 2002. They do not include archival information disseminated by the Census Bureau before October 1, 2002. Respecting this, the framework of those guidelines represents state-of-the-art.

The Census Bureau maintains the quality of its data and information products by setting high standards of performance in its activities. The performance principles for development of concepts and methods, planning and design of data collecting processes, analysis of data, and the establishment of review procedures are developed along the following items:

- **Utility**
  The Census Bureau shall ensure that information disseminated to the public shall be useful to its intended users. The requirements of utility are an ongoing task of the institution. There exists a close cooperation with the main users of information in the executive branch, the Congress, nongovernmental people and groups, advisory committees and the sponsors of its reimbursable surveys, as well as conducting ongoing surveys of data users and product reviews.

  The goals reflect the Nation's growing need for extensive, timely, and accurate data to understand the increasing complexities of its population and its growing economy. Some of the key programs, such as decennial census, are reviewed by OMB and the congress.

  The Census Bureau strives for ongoing improvement to meet our customer's expectations for easy access, quick turnaround times, simple interface mechanisms, and strong comparability among different data sources.

- **Objectivity**
  The Census Bureau shall provide information that is accurate, reliable and unbiased. It should ensure that its information products are presented generally in an accurate, clear, complete, and unbiased manner.

  The Census Bureau's commitment to quality and professional standards of practice includes:

  - The use of modern statistical theory, and practice in all technical work.
  - The development of strong staff expertise in the disciplines relevant to the mission of the institution.
  - The implementations of ongoing quality assurance programs to improve validity and reliability of data.
  - The development of a close and continuing relationship with appropriate professional organizations in the statistical field.

- **Reliable data sources**
  The Census Bureau bases its information products on reliable, accurate data that have been validated. Measurements of quality, process control, and performance are built in its data collecting processes, thereby making evident the quality and objectivity of its statistics including a thorough documentation of all processes.

- **Use of sound analytic techniques**
  The purpose of this usage of techniques is to ensure objectivity in statistical information products of the institution. The Census Bureau performs appropriate statistical tests, addressing the characteristics of the sample design, and documents measures of sampling error.

- **Pre-Dissemination Review for the release of data**
  All documents released by the Census Bureau undergo an thorough intensive review that encompasses the content, statistical and survey methodology, and policy implications of the documents.

- **Informing users of data quality and methodology**
  The Census Bureau informs users of the concepts and methodologies used in collecting and processing the data and other features of the data that may affect their use or interpretation.

  The documentation provided to users conveys key information on data quality, and engenders an awareness of quality as an essential in the proper use of the data.

  The Census Bureau provides indicators of the quality, it disseminates it to the public, along with definitions and descriptions of the concepts and methods.

- **Policy for correcting errors**
  According with the OMB guidelines, the Census Bureau has established procedures providing the public with the opportunity to seek correction of information that does not comply with the quality guidelines.

  Corrective action will vary, e.g. immediate correction on the Census Bureau website (http://www.census.gov) or revision of subsequent issues of recurring products.

- **Integrity**
  Information disseminated by the institution to the public, independent of the specific distribution mechanism, is to be safeguarded from improper access, modification or destruction.

  All electronic data disseminated to the public by the Census Bureau adheres to the standards: Security of Federal Automated Information Resources.

- **Transparency and reproducibility**
  Transparency of information is gained by accompanying information to disseminated data and statistics. Additionally, peer reviews were applied internal in some cases as well as external peer reviews in critical or highly sensitive activities of the institution.

Finally, transparency is achieved through the wide dissemination of the statistical products.

Resuming, the guidelines of the Census Bureau are a framework of different principles and methods which can be regarded as a quality management system with the possibility to work well for quality. The principles and guidelines should be approximated and shaped flexibly into operable criteria and quality measures. These guidelines of the Census Bureau are comparable to quality frameworks of other institution like IMF, Eurostat and OECD. Their standards and mutually comparable criteria indicate the recent way to gain information and data of reasonable quality. Specific guidelines for indicators' or composites' quality are not yet included in these rules.

Chapter 4

Conclusions

The aim of this report was to present the state-of-the-art of data quality and its reporting. A selection of data quality concepts from several international institutions was comparatively analysed and reviewed.

As a general result, one can observe high common grounds between the different data quality concepts. Within the ESS, the Eurostat recommendations which were turned into EU regulations form a basis for data quality reporting. The IMF approach builds a generalized framework for data quality.

This state-of-the-art report on data quality is only the primary input for the quality work on indicators and composite indicators. Discussing the quality of indicators implicates the evaluation of adequation of the considered data. This will be further investigated in deliverable D3.3.

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Chapter 5

Appendix A

EUROSTAT STRUCTURAL INDICATORS QUALITY PROFILE

Indicator (definition)	**e-Government online availability (supply side)** Online availability of 20 basic public services.
Eurostat Unit	D7 - Information Society and Services
Other Commission DGs	DG INFSO
European Statistical System Working Group (WG)	WG on Information Society Statistics
Date	October 2004

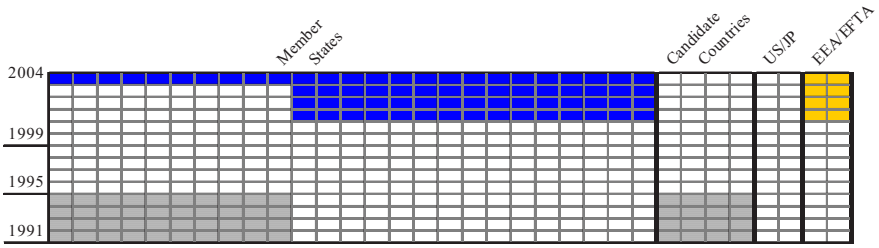
1. Objective and relevance of the indicator:

The indicator measures the online availability of 20 basic public services previously defined by the Internal Market Council. It also takes account of the degree of sophistication (ranging from simple information to full transaction) and is therefore directly influenced by policy actions.
The indicator contributes to the measurement of e-Europe/ Information Society in the context of the Lisbon strategy: "public administrations at all levels to exploit new technologies to make information as accessible as possible" (Lisbon European Council, 2000).
The Brussels European Council (2003) called for rapid progress on implementing the e-Europe Action Plan; this requires considerable efforts to ensure the Community-wide implementation of the new regulatory framework for electronic communications and the stepping-up of actions and investments, especially in the e-Government, e-Health and e-Learning sectors and as regards the development of broadband infrastructure and contents.

Restriction of the indicator's relevance and other characteristics which may lead to restriction for using it in the Spring Report

As an indicator of the supply side, it gives only a fragmented picture of e-Government as information on its effectiveness/use is missing.
This indicator is not produced by the European Statistical System, which could hamper its sustainability in the future.
Construction of the composite indicator involves a judgement on the selective impact on single services. This adds an element of subjectivity, however it should be noted that the 20 services have been selected by the Council.

2a. Data availability: overview



In general, data availability prior to 1995 cannot be expected for the new Member States and Candidate Countries

2b. Data availability: details

(t_1: earliest reference year available; t_2: latest reference year avail. in Dec. 2004)

	Member States	Candidate Countries	US and Japan	EEA-EFTA[1]
t_1	2001 – EU-15	-	-	2001
t_2	2004 – EU-25	-	-	2004

3. Overall assessment of accuracy and comparability

☒ A ☐ B ☐ C ☐ Indicator to be developed

short summary explanation: Reliability of the indicator would benefit from further improvements with regard to the validation procedure of the results by the Member States.

4. Overall accuracy

High ☒ Overall accuracy can be considered high. An external consultant conducts work, in close contact with the Member States consisting of 3 main stages: 1) Identification of which public authorities provide each of the 20 basic public services (national, regional and local levels are considered); 2) Selection of the addresses of the web-sites for each of the public services; 3) Analysis of the web-sites and classification of its level of availability measured by its degree of online sophistication. An overall composite index on e-Government availability for each country is then produced based on the analysis of all web addresses of the 20 basic public services.
The Member States validate results provided by consultant at the 3 stages and different types of errors are reported, e.g. wrong selection of web addresses, weighting of certain services inappropriate because in reality they are more interactive (so more developed) than assessed by the consultant, outdated web addresses, etc.
If any errors are identified, results are ideally corrected accordingly.

Restricted (sources, errors, methodology etc.) ☐

[1] While being a member of the EEA, Liechtenstein has complete or partial exemptions from several statistical requirements due to its size. Thus, Liechtenstein is excluded from this overview as most of the data for structural indicators are missing.

5. Comparability across countries

High	☒	Comparability across countries is high as the work is carried out by only one external consultant for all the countries, using the same concepts and methodology. Different public administration organisations are taken into account as the Member States validate results and assure the allocation of the right web-sites to the basic public services.
Restricted	☐	

6. Comparability over time

High	☒	Comparability over time is high as the concepts and methodology used were the same for all exercises (carried out by the same consultant).
Restricted	☐	

7. Development perspective for improving quality of this indicator (including as far as possible an indication of burden on Member States and respondents.)

It is planned to look for greater Member States (including the National Statistical Institutes) involvement in the validation process, e.g. from opt-in to opt-out approach where results are not published if they have not been validated previously. This may contribute as well to further improving comparability.

Relevant European legislation:

Conclusions of internal market/ consumers/ tourism Council on 12.3.2001 (setting 20 basic e-Government services and 4 stages of service delivery)

Council resolution 5197/03 on implementation of e-Europe Action Plan (setting e-Government indicators).

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Annex

Description of Quality grades

Description of Eurostat quality grades:
overall technical assessment of the indicator based on accuracy and comparability

Grade "A"

An indicator is graded "A" when all of the following conditions are fulfilled:
- Data is collected from reliable sources applying high standards with regard to methodology/accuracy and is well documented in line with Eurostat metadata standard.
- The underlying data is collected on the basis of a common methodology for the European Union and, where applicable, data for US and Japan can be considered comparable; major differences being assessed and documented.
- Data are comparable over time; impact of procedural or conceptual changes being documented.

Grade "B"

An indicator is graded "B" if
- data is collected from reliable sources applying high standards with regard to methodology/accuracy and is well documented in line with Eurostat metadata standard.
- there are EITHER some serious shortcomings with regard to comparability across countries (including the lack of data)
  OR breaks in series for several countries which seriously hamper comparison over time (including the lack of data).

  Deficiencies with regard to assessing and documenting the impact of these shortcomings might be identified.

Grade "C"

An indicator is graded "C", if one or both of the following conditions is fulfilled:
- Data might have to be interpreted with care as methodology/accuracy does not meet high quality standards.
- There are some serious shortcomings with regard to comparability across countries (including the lack of data)
  AND breaks in series for several countries which seriously hamper comparison over time (including the lack of data).

Indicator to be developed

The indicator is not ready to be used for the Spring Report.

4

e-government

Eurostat Metadata in SDDS format: Summary Methodology

GEOGRAPHICAL AREA	EU-Member States EU 15 and partly: Norway, Iceland, Switzerland, New Member States, USA, Japan
DATA CATEGORY	Key indicators on EU policy – **Structural indicators** – Innovation and Research – e-government usage by individuals (demand side) total and by gender; e-government usage by enterprises (demand side); e-government availability (supply side)
Last update:	22 November 2004

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EUROSTAT CENTRAL SUPPORT

1. Concepts, definitions and classifications

STATISTICAL CONCEPT

a) Percentage of **individuals** (aged 16-74) using the Internet to interact with public authorities (i.e. having used the Internet for one or more of the following activities; "obtaining information from public authorities web sites", "downloading official forms", "sending filled in forms").

The Community Survey on ICT Usage in Households and by Individuals carried out once a year is used as a source.

Data for countries other than EU Member States is provided directly by National Statistical Institutes.

b) Percentage of **enterprises** using the Internet to interact with public authorities (obtaining information, downloading forms, filling-in web-forms, full electronic case handling). For the sake of reducing the statistical burden, Eurostat has set a threshold number concerning both the size and the economic activity of the enterprises to be surveyed. More specifically, the survey population consists of enterprises with 10 or more full-time employees. NACE sections D, F, G, H, I, K, O are covered.

Data is collected by National Statistical Institutes based on Eurostat's annual model survey on ICT usage and e-commerce in enterprises.

For some countries data was provided directly from the respective National Statistic Institutes.

Public authorities' web sites are web sites of public authorities like central government, regional and local administration, police and social security organisations

c) This indicator measures the on-line availability of **20 basic public services**. The following **public services for citizens** were measured:

Income taxes; job search services; social security benefits [1)]; personal documents [2)]; car registration; application for building permission; declaration to the police; public libraries; birth and marriage certificates; enrolment in higher education; announcement of moving; health-related services.

The **public services for businesses** were:

Social contribution for employees; corporate tax; VAT; registration of a new company; submission of data to statistical offices; customs declarations; environment-related permits; public procurement.

[1] The service "social security benefits" is measured on the basis of the following sub-services: unemployment benefits, child allowances, medical costs and student grants

[2] The service "personal documents" is measured on the basis of the following sub-services: passports and driver's licence

The levels of sophistication

- Stage 1- Information: The information necessary to start the procedure to obtain this public service is available on-line.
- Stage 2- One-way Interaction: The publicly accessible website offers the possibility to obtain in a non-electronic way (by downloading forms) the paper form to start the procedure to obtain this service. An electronic form to order a non-electronic form is also considered as stage 2.
- Stage 3- Two-way Interaction: The publicly accessible website offers the possibility of an electronic intake with an official electronic form to start the procedure to obtain this service. This implies that there must be a form of authentication of the person (physical or juridical) requesting the services in order to reach stage 3.
- Stage 4- Full electronic case handling: The publicly accessible website offers the possibility to completely treat the public service via the website, including decision and delivery. No other formal procedure is necessary for the applicant via "paperwork".

CLASSIFICATION SYSTEM AND CONFORMITY WITH OFFICIAL STANDARDS

b) e-government usage by enterprises

Concerning economic activity standards, enterprises having their main activity in NACE sections:

D – manufacturing,

F – construction,

G – distributive trades,

H – hotels and accommodation

I – transport and communication,

K – real estate, renting and business activities.

O – (groups 92.1 – 92.2 only) – motion picture and video activities, radio and television activities.

	Aggregation of NACE subsections or two digits
1.	DA+DB+DC+DD+DE
2.	DF+DG+DH
3.	DI+DJ
4.	DK+DL+DM+DN
5.	45
6.	50
7.	51
8.	52
9.	55.1+55.2
10.	60+61+62+63
11.	64
12.	65+66
13.	67
14.	72
15.	70+71+73+74
16.	92.1+92.2

Persons employed:

- 10-49 (small enterprises)
- 50- 249 (medium enterprises)
- 250+ (large enterprises)
- 10+

2. Scope / coverage of the data

GEOGRAPHICAL COVERAGE

EU-Member States EU 15 and partly: Norway, Iceland, Switzerland, New Member States, USA, Japan

STATISTICAL POPULATION

a) e-government usage by individuals:

The population consists of individuals aged 16 to 74.

b) e-government usage by enterprises:

The target population is the group/set of enterprises with 10 or more persons employed and is located in any of the EU Member States plus Iceland and Norway and the new Member States.

c) e-government availability:

URLs of public web sites

3. Accounting conventions

REFERENCE PERIOD

a) e-government usage by individuals

In general, the data relates to the first quarter of the reference year.

b) e-government usage by enterprises

Generally data refers to the January of the reference period.

c) e-government availability

April 2002, October 2002, October 2003, October 2004.

RECORDING OF TRANSACTIONS

a) e-government usage by individuals

Data are expressed as the percentage of individuals who have used the Internet, in the last 3 months, for interaction with public authorities

b) Internet access of enterprises

Data are expressed in percentage of enterprises (10 or more employed persons, NACE D, F, G, H, I, K, O) which use the Internet for interaction with public authorities.

c) e-government availability

No data are expressed as a percentage but are a composite index of online availability where 100% = full electronic case handling.

4. Nature of the basic data

TECHNIQUES OF DATA COLLECTION

a) e-government usage by individuals

Summary for European level:

- survey period: April/May of survey year
- sampling unit: Households and individuals; individuals can be targeted when drawing the sample.
- Age limit: Lower age limit: 16 years
  Upper age limit: 74 years
  Member States can widen these age bands but should report results outside these limits separately
- sample size, stratification: The sample size should be appropriate for obtaining representative results for the socio-demographic groups shown at the end of the list of variables and for Internet users specifically.

At least 4000 filled in questionnaires are recommended to be normally collected in total per country.

Pre-test: a small pre-test of the questionnaire should be carried out by participating countries. Eurostat encourages Member States with a common language to co-operate in pre-testing.

b) Internet access of enterprises

The data are collected on the enterprise level and treated in the NACE activity classes DFGHIKO and size classes according to number of employees. Only enterprises employing at least 10 persons are covered. The main indicator is the national average over the NACE and size classes.

Summary for European level:

- survey period: First quarter 2004
- sampling unit: Enterprise (NACE sections: D, F, G, H (partially), I, K, 92 (partially, optional: E, 93). Questionnaires should be sent to IT manager of company
- sample size, stratification: the survey should provide representative results

  - for NACE D for an aggregation of subsections into 4 groups:
    a) DA, DB, DC, DD, DE,
    b) DF, DG, DH,
    c) DI, DJ,

d) DK, DL, DM, DN

e) (optional): separate NACE 22

- for NACE E (optional) at a section level
- for NACE F at a section level
- for NACE G at a two digit level
- for NACE H at a level of two digit aggregates (55.1+55.2, optional: 55.3-5)
- for NACE J at a level of two digit aggregates (to be treated separately: for piloting)
- for NACE I at a level of two digit aggregates (60-63 and 64)
- for NACE K at a level of two digit aggregates (72 and rest)
- for NACE 92 (92.1 and 92.2, optional: 92.3-7), optional : 93

c) **e-government availability**

Web based survey tool.

5. Compilation practices (data processing)

COMPILATION OF EUROPEAN AGGREGATES

a) e-government usage by individuals

The EU calculation process is done in Eurostat. On the arrival of each new record these are added to the process and new EU aggregates are calculated. An EU aggregate is calculated when country coverage is full or considered sufficient for estimation.

Results have generally been weighted by the number of individuals. EU 15 data calculations are also carried out using the same weighting procedure from data available.

b) Internet access of enterprises

Results have generally been weighted by the number of enterprises.

The EU calculation process is done in Eurostat. An EU aggregate is calculated when country coverage is full or considered sufficient for estimation.

c) e-government availability

The indicator is defined for each member state as the percentage of each of the 20 services that are fully available online. For the EU, the calculation uses all services in all member states i.e. how many of the 300 (20 basic services x 15 member states) services are fully available online.

6. Other aspects

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