

Quality Sheet: Documentation of Quality Indicators at Statistics Austria

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1. Introduction

During the last few years, Statistics Austria has developed a system of standard documentations which serve as format for quality reports for each statistical product (Burg, 2004; Hackl, 2004). The 50 to 100 pages of the Standard Documentations give detailed information on all phases of the generation of the product and describe the statistical concepts and the applied methodology. A special chapter deals with the various dimensions of quality as suggested for summarising the quality of statistical products by Eurostat (2005).

As has turned out, users and producers of statistics are interested not only in the detailed description but also in concise quantitative and non-textual qualitative information based on a certain set of quality indicators. Such indicators that give comprehensive and concise information on the relevant quality dimensions could provide the interested persons with a quick overview and add to transparency and accessibility of the statistical products.

In this sense, the Austrian Statistical Council recommended to supplement the Standard Documentations for statistical products by quality indicators. Similarly, the peer review on Statistics Austria's compliance with the principles of the European Statistics Code of Practice (Laux et al., 2006) gives the recommendation to include quality indicators in the Standard Documentations.

Following these recommendations, a Quality Sheet was developed that contains all relevant information in condensed form. This "quality at a glance" has two main objectives in mind:

- The user should be provided with quick and easily understandable insights into the most relevant aspects of the product, following the ESS quality dimensions.
- The producers should be enabled to identify improvement potentials within the involved statistical processes.

The quality aspects that are taken into account in the Quality Sheet follow the ESS quality dimensions as discussed by Eurostat (2005):

- Relevance
- Accuracy
- Timeliness and punctuality
- Accessibility and clarity
- Comparability
- Coherence

The weight given to these dimensions and the corresponding indicators is varying and follows the intensity of interest of users. Most weight is given to the dimension Accuracy, a quality attribute of a statistical product that has the probably highest effect on its usability. One dimension, Accessibility and Clarity, has been omitted;

both, Accessibility and Clarity refer to the conditions of access to the statistical product and the corresponding metadata. However, descriptive information on accessibility of statistical results is covered in a special chapter, “Publication (Accessibility)”, of Statistics Austria’s Standard Documentations.

Not only needs of external users are taken into account when designing the Quality Sheet. The Quality Management Unit had also the members of Statistics Austria in mind who are responsible for or are internal users of a statistical product. Filling numbers into the Quality Sheet will increase the awareness of quality aspects and remind on open quality issues. Looking at the condensed information on certain quality aspects might increase the sensitivity for the corresponding problems. Monitoring these indicators over time might suggest certain actions and help to understand the effects of such actions. A thorough discussion of the Quality Sheet with staff members from all areas of Statistics Austria helped to tailor the content appropriately and also to keep the size of the Quality Sheet in a manageable format.

Chapter 2 of the paper describes the Quality Sheet in detail and reports considerations concerning the selection and the definition of the used quality indicators. The final chapter describes how the Quality Sheet will be implemented and integrated in the system of Standard Documentations for the communication with internal and external users. We also give an outlook on planned or intended extensions.

2. The Quality Sheet for Statistical Products of Statistics Austria

Before describing the Quality Sheet in detail some problems to be solved when developing a Quality Sheet are sketched.

Quantification of quality dimensions

A statistical product has a range of quality dimensions. Some but not all of them can be characterized with quantitative indicators; examples are sampling error, non-response rate and many other aspects of Accuracy. However, for many dimensions of quality, the definition of quantitative indicators is not straightforward. This is certainly true for the dimension Relevance and Coherence.

Product diversification

Standard documentations are needed not only for survey based statistics, but also for other statistical products, such as synthetic products like national accounts, mixed mode products where survey data are complemented by administrative sources, and products based purely on administrative data. The diversity of statistical products has to be taken into account when designing the Quality Sheet.

Conciseness and comprehension

Nowadays, a huge amount of metadata and quality information is available for any statistical product, typically in well structured and detailed quality reports. A Quality Sheet has to be concentrating on the relevant information and has to avoid redundancies.

The burden for the producer

The workload for employees in a NSI has grown in the last decades. To require additional quality information means a new task for the person responsible for a statistical product. To minimize this additional burden it is necessary that the information to be included in the Quality Sheet can be extracted easily (for instance from the details given in the quality report). However, the transformation process to distil the relevant information can not be taken away from the producer.

The Quality Sheet

Several collections of quality indicators can be taken as model for the Quality Sheet. An early example of a short list is the Quality Sheet for business statistics at INSEE¹. Another example is the QIP developed by Statistics Portugal², mainly focusing on accessibility and clarity. EUROSTAT has defined so-called European standard indicators³; see Table 1. This proposal might be seen a good basis for developing a Quality Sheet that fits the purpose of a certain NSI. However, the suitability and the feasibility of each of the proposed indicators is disputable; this certainly applies for all indicator sets.

Table 1: The Quality Indicators proposed by EUROSTAT

Quality component	Indicator	1=Key 2=Supportive 3=Further experience
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
Comparability	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 <http://www.unece.org/stats/documents/2000/10/sde/12.e.pdf>

² http://circa.europa.eu/Members/irc/dsis/qis/library?l=/meeting_26-27_2001/quality_indicators/_EN_1.0_&a=d

³

http://epp.eurostat.ec.europa.eu/pls/portal/docs/PAGE/PGP_DS_QUALITY/TAB47143233/STANDARD%20QUALITY%20INDICATORS.PDF

Actually, the Quality Sheet of Statistics Austria has not much in common with other examples of quality reports like those mentioned above. The Quality Sheet was developed with the intention to supplement the structure of the Standard Documentation with a comprehensive and detailed quality report. The final chapter of the Standard Documentation is dedicated to quality aspects, mainly structured according to the EUROSTAT definition: Relevance, Accuracy, Timeliness, Comparability and Coherence. Three of these quality dimensions are covered by the current version of Statistics Austria’s Quality Sheet:

- Accuracy
- Timeliness
- Comparability

In Statistics Austria measurable indicators of Relevance and Coherence are not available on the level of statistical products. Concerning Relevance information on user satisfaction is available - based on customer/user satisfaction surveys - only for statistical domains.

As already stated, the dimension Accessibility and Clarity is not covered within the quality chapter of the Standard Documentation, but information on Accessibility is provided in a separate chapter “Publication”. Indicators that measure the dimension Clarity are not easy to find and data for those indicators difficult to obtain. Another dimension which is not accounted is Punctuality; this dimension is rather related to the internal project planning than to user relevance.

General Information

The first part of the Quality Sheet (see Figure 1) deals with administrative information: The name of the product along with the type of statistics and the reference period (or due day) provide the user with the necessary general information related to the product.

Figure 1: The Quality Sheet: General information

Quality Information (Overview) - Quality Indicators	
For product:	<input style="width: 80%;" type="text" value=" < Statistics >"/>
Type of product: :	<input style="width: 80%;" type="text" value=" < Options >"/>
This information is related to reference period / due day:	<input style="width: 60%;" type="text"/>
<i>Detailed information if necessary is available in chapter 6 of the corresponding standard documentation.</i>	

Accuracy

Accuracy can be seen as the kernel of the Quality Sheet. Some call this dimension the most measurable one; literature suggests quite a variety of indicators for accuracy, some of them even having a mathematical background. Accuracy can also be decomposed into subcomponents. The Quality Sheet present indicators structured into the sections and subsections as shown in Figure 2 together with the numbering as used in the Quality Sheet:

Figure 2: The Quality Sheet: Structure for Accuracy

<ul style="list-style-type: none">2. Accuracy<ul style="list-style-type: none">2.1. Sampling errors (in case of random sampling)2.2. Non-sampling errors<ul style="list-style-type: none">2.2.1. Data editing (steps carried out)2.2.2. Coverage2.2.3. Non-response<ul style="list-style-type: none">2.2.3.1. Unit non-response / missing units2.2.3.2. Item non-response / missing items2.3. Application of model based estimation
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The section 2.3 is added in order to cover non-survey based product types.

Sampling effects

Statistical products can be based on data that are collected in a variety of survey designs. Sampling effects require random sampling at any stage of data collection; the producer shall specify in this section what kind of data collection design (cut off sample, full scope survey, purely administrative etc.) applies. Otherwise this section remains empty.

For statistical results derived from a random sample survey (or a survey involving random sampling at any stage) two indicators are of interest: The sample size and the sampling error. The sampling error – in percentage of the estimator – is reported for a selected number of key estimators; the Quality Sheet allows reporting four sampling errors, a number that will be sufficient in most cases. However, if users might be interested in more details the producer can add such information that is accessible via the corresponding link. As the actual survey design might not coincide with the planned one, the differences between sampling errors that are actually obtained and those that correspond to the planned survey are of high interest, e.g., due to legal requirements for accuracy, and therefore reported.

The sampling error is based on the standard error of an estimator which is defined as the square root of its variance. To achieve a certain confidence level the sampling error is defined as the standard error multiplied by a specific factor (for instance 1.96 for the confidence level of 95%). The interpretation of sampling errors has to take this confidence level into account. For reasons of uniform interpretability we selected a default of 95%. This makes also sense because in most social science reports this level is used.

Figure 3: Quality Sheet information on Accuracy: Sampling effects

2. Accuracy

2.1. Sampling errors (in case of random sampling)

not applicable because no random sampling but:

(proceed to 2.2. Non-sampling errors)

Population: Gross sample-size: Achieved sample-size: Unit:

Relative **sampling error** at a confidence level of % for the following estimators (totals, means, proportions ...)

Estimator (Key variables, main results)	relative sampling error in %	
	survey (ACTUAL)	planned (TARGET)

If necessary more estimators (Link):

Finally, the level of aggregation is indicated for which reliable results can be derived. The regional aggregation is here of main interest; the producer can also indicate other classifications (e.g., branches of economic activity or commodity classes).

Non-Sampling effects

This section covers effects that are structured into three subsections:

- Data editing, evaluation of data sources
- Coverage
- Non-response

Data editing

Data editing is a key element of the statistical process and crucial for the quality of a statistical product. Due to the variety and complexity of editing methods, a great number of articles discuss related quality indicators (see, e.g., <http://www.unece.org/stats/publications/editing/SDE3.htm>). As shown in Figure 4, the Quality Sheet only indicates which editing steps were performed and what reason can be given if a step was not carried out.

Figure 4: Quality Sheet information on non-sampling effects: Data editing

2.2. Non-sampling errors			
2.2.1. The following steps were carried out:			
Validation of surveyed/used data	<input type="checkbox"/> yes	<input type="checkbox"/> no, because:	< reason >
- Micro editing:	<input type="checkbox"/> yes	<input type="checkbox"/> no, because:	< reason >
- Macro editing:	<input type="checkbox"/> yes	<input type="checkbox"/> no, because:	< reason >

Coverage

Coverage issues are very important for statistical products. The Standard Documentations contain detailed information on coverage. Hence, the Quality Sheet gives only a rough assessment of under- and over-coverage.

Figure 5: Quality Sheet information on non-sampling effects: Coverage

2.2.2. Coverage			
Quality deficits by the following coverage errors:			
Under-coverage:	<input type="checkbox"/> no / negligible	<input type="checkbox"/> marginal	<input type="checkbox"/> considerable
	<input type="checkbox"/> not known	<input type="checkbox"/> not applicable	
Over-coverage:	<input type="checkbox"/> no / negligible	<input type="checkbox"/> marginal	<input type="checkbox"/> considerable
	<input type="checkbox"/> not known	<input type="checkbox"/> not applicable	

Non-response

Non-response and the absence of units and/or items is of growing importance due to the fact that the participation of more and more surveys is voluntary. The subsection is divided into two parts:

- Unit non-response or missing units
- Item non-response or missing items

Unit non-response or missing units

Here like earlier in other parts, the Quality Sheet distinguishes survey-based statistics and statistics that make use of data that have been collected in another context. In Figure 6, the left column covers the case of survey-based statistics; information is given how the total number of sample units shrinks due to various causes for non-response to the set of units that can be used for calculating the results. Corresponding numbers for non-survey-based products are shown in the right column. Details like in the left column are not given as reasons of missing data are usually not known.

Figure 6: Quality Sheet information on non-sampling effects: Unit non-response

2.2.3.1. Unit non-response / missing units		Unit: <input type="text"/>	
		Population/total volume (quantity): <input type="text"/>	
Direct survey (sample survey or full population survey)		Use of non-survey based data sources	
	Quantity		Quantity
Gross sample size/ total number of survey units	<input type="text"/>	Included units from data source(s)	<input type="text"/>
Missing units		Missing units	<input type="text"/>
Survey units not used	<input type="text"/>	Missing units in data source(s)	<input type="text"/>
No contact possible	<input type="text"/>	<input type="checkbox"/> not known	
Non-respondents	<input type="text"/>		
Other reasons	<input type="text"/>		
Actual number of survey units	<input type="text"/>	Actual number of units	<input type="text"/>
Only for direct surveys (sample survey or full population survey):			
		in %	
Unit non-response rate	<input type="text"/>	<input type="checkbox"/> not applicable	
Rate of eligible records	<input type="text"/>	<input type="checkbox"/> not applicable	

A further part of this section reports two unit non-response rates, classical quality indicators for survey based statistics: (1) The portion of non-response units among the number of contacted units, and (2) the portion of responding units among the planned sample units.

Item non-response or missing items

Information on item non-response can be of interest for many of the whole set of Items in a survey. Like for sampling errors the producer has to select key items for which information on item non-response is given. The Quality Sheet (see Figure 7) assumes that information on five items will be sufficiently informative, but allows the extension to a larger set of items via a link. For each of the key items, the percentage of item non-response rate is given. Since imputation is very often used to correct for item non-response, in addition the imputation rate is reported if imputation is applied. In most cases, the item non-response rates and the imputation rates will be the same.

Figure 7: Quality Sheet information on non-sampling effects: Item non-response

2.2.3.2. Item non-response / missing items no not applicable

Item (key variables, most important items):	Item non-response rate in %:	Imputation?	Imputation rate in %:
		<input type="checkbox"/> yes <input type="checkbox"/> no	<input type="checkbox"/> not specified
		<input type="checkbox"/> yes <input type="checkbox"/> no	<input type="checkbox"/> not specified
		<input type="checkbox"/> yes <input type="checkbox"/> no	<input type="checkbox"/> not specified
		<input type="checkbox"/> yes <input type="checkbox"/> no	<input type="checkbox"/> not specified
		<input type="checkbox"/> yes <input type="checkbox"/> no	<input type="checkbox"/> not specified

If necessary more item non-response rates (link):

If necessary more imputation rates (link):

Application of model-based estimation

In the last decade model-based methods for deriving statistical results became more and more important for official statistics. Among the reasons for the need to introduce such methods is narrowing resource situation that urge official statistics to reduce data collection activities and make use of available data in a more sophisticated way. Another reason is the reduction of dissemination deadlines.

Figure 8: Quality Sheet information on model-based estimation

2.3. Application of model based estimation

Generation of synthetic micro data yes, quantity: no not applicable

Estimation on aggregate level yes no not applicable

Weighting (Grossing up) yes

Weights:

Minimum	
Maximum	
Standard deviation	
Mean	
Median	

no not applicable

Application of other models/estimation procedures yes, please specify:

no

The quality Sheet (see Figure 8) illustrates three areas. The first part reports on estimation of certain subsets of the data. For some products of Statistics Austria,

data for some observation units are synthetically generated; e.g., for small enterprises in Structural Business Statistics (SBS). Another example is the estimation of aggregates for national accounts. The second part gives information on the distribution of weights if grossing up is a topic for the product by taking some univariate statistics of the unit weights. The third part provides a short specification if another model based estimation is applied.

Timeliness

Timeliness measures the difference between the availability of statistical results and the end of the reference period of the phenomena to be described. The Quality Sheet (see Figure 9) distinguishes between preliminary and final results.

Figure 9: Quality Sheet information on Timeliness

3. <u>Timeliness</u>		* t = End of reference period or due day							
Preliminary results	1 st prel. results are published: 2 nd prel.results are published: 3 rd prel.results are published:	t* +	Monthly results			Annual results			
			days	months	years	days	months	years	
			t* +	days	months	years	days	months	years
			t* +	days	months	years	days	months	years
Final results are published:	t* +	Monthly results			Annual results				
		days	months	years	days	months	years		

For publication dates of most recent results see: [< Link to official publication calendar >](#)

Since there are cases where preliminary results are published more often than once three possible publication dates are foreseen. The final information is a link to the publication calendar, available on the homepage of Statistics Austria.

Comparability

Comparability of a statistical product is one of the key demands of the user. The Quality Sheet covers two aspects of this dimension. The first aspect is the comparability over time: The Quality Sheet focuses on the availability of time series of the statistics. The Quality Sheet gives the date since when the statistics is published and an assessment since which time point the time series are comparable in relation to the actual one.

Figure 10: Quality Sheet information on Comparability

4. Comparability					
Comparability over time					
In principle available since:		Electronically available since:			
totally comparable since:		mostly comparable since:		partly comparable since:	
Regional comparability					
<u>National level</u> (within Austria)					
<input type="checkbox"/> totally	<input type="checkbox"/> mostly	<input type="checkbox"/> partly	<input type="checkbox"/> not at all	<input type="checkbox"/> unratable	<input type="checkbox"/> not applicable
<u>EU level</u>					
<input type="checkbox"/> totally	<input type="checkbox"/> mostly	<input type="checkbox"/> partly	<input type="checkbox"/> not at all	<input type="checkbox"/> unratable	<input type="checkbox"/> not applicable
<u>Further international level</u> (e.g.: OECD, UN, ...)					
<input type="checkbox"/> totally	<input type="checkbox"/> mostly	<input type="checkbox"/> partly	<input type="checkbox"/> not at all	<input type="checkbox"/> unratable	<input type="checkbox"/> not applicable
Comparability in (other) domains					
Comparability is limited for:					

The second aspect concerns the regional decomposition. Again, cf. the dimension Relevance, the Quality Sheet focuses on three levels: the national level (within Austria), the EU-level, and other international level(s).

Of course, other aspects of comparability might be of interest for the user. Corresponding information can also be given in the Quality Sheet.

The Quality Sheet ends with a section in which the producer can give some final remarks if he wishes to do so.

3. Implementation and Further Plans

In a first step of the implementation, the concept of the Quality Sheet developed by the quality management unit in close cooperation with the methods unit was discussed internally in May 2008. Objectives and content of the proposal were presented and discussed with statistical subject matter experts, especially with regard to the feasibility of measuring the proposed quality indicators. Recommendations for improvements of the concept were carefully discussed and the redraft was presented in a top management meeting in June 2008.

After discussion of the Quality Sheet in this meeting, it was decided that each of the subject matter directorates should select some of their statistics for a pilot implementation phase. This phase started in summer 2008 and was intended to cover the whole range of statistical products.

As already mentioned, the Quality Sheet is considered as an important completion of the existing documentation system for statistical products of Statistics Austria in that

it provides a comprehensive set of quantitative and qualitative quality indicators. Hence, it is obvious to envisage the integration of the Quality Sheet into the Standard Documentations provided by Statistics Austria, as regards both content and technical aspects. This suggests linking the descriptive information within the quality chapter of the Standard Documentations to the Quality Sheet provided for different reference periods of the statistical product. Thus, the system will enable users to have targeted access to specific quality information. Annual updates of the Quality Sheet are foreseen, notwithstanding of the periodicity of a particular statistical product.

Statistics Austria is working on an “Integrated Metadata System (IMS)”. An overall plan for adopting such an information system in the form of sub-projects was conceived within an IT project (Zettl 2007). In implementing the Quality Sheet, also the architecture and requirements of the IMS have to be taken into account.

One of the IMS sub-projects has the objective of integrating the contents of the currently existing Standard Documentations into a database within the IMS. Consequently, also the Quality Sheet information and the quality indicators will be included in this database. At the same time, SDMX (www.sdmx.org) requirements for the exchange of statistical data and metadata recommended and sponsored by Eurostat and several international organisations (e.g. ECB, IMF, OECD, UN) have to be taken into account.

The implementation of the Quality Sheet as a standard tool will be an important step in providing users of statistical products with the relevant information to allow them the assessment of the quality and value of statistical products of Statistics Austria.

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