Attributes of Quality Reports

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Explanation of symbols

.	= data not available
*	= provisional figure
**	= revised provisional figure
x	= publication prohibited (confidential figure)
–	= nil or less than half of unit concerned
–	= (between two figures) inclusive
0 (0,0)	= less than half of unit concerned
blank	= not applicable
2010–2011	= 2010 to 2011 inclusive
2010/2011	= average of 2010 up to and including 2011
2010/'11	= crop year, financial year, school year etc. beginning in 2010 and ending in 2011
2008/'09–2010/'11	= crop year, financial year, etc. 2008/'09 to 2010/'11 inclusive

Due to rounding, some totals may not correspond with the sum of the separate figures.

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Attributes of Quality Reports

Peter W.M. van Nederpelt

Summary: This paper shows that 19 relevant attributes of quality reports can be distinguished. These attributes are useful if we want to systematically manage the quality of quality reports and were established through analysis of documents about quality reporting and the minutes of the SQ-ESAC workshop about quality reporting. Each attribute is defined, but according to the Object-oriented Quality Management model more steps can be taken. Requirements can be formulated for each attribute and causes and effects of problems can be analyzed. Based on these requirements and risk analysis, measures can be taken to assure the quality of quality reports.

Keywords: quality reports, quality management, quality assurance, Object-oriented Quality Management

Table of content

1. Introduction

Quality reporting on statistical products is an important issue for statistical authorities[1] in the European Statistical System (ESS)[2] as the next four examples show. First, in 2009 Eurostat issued two reports about quality reporting, the Handbook for Quality Reports (Eurostat, 2009a) and the Standard for Quality Reports (Eurostat, 2009b). Second, at the European Conference on Quality in Official Statistics in Helsinki in 2010 one session was dedicated to quality reporting. Presentations were given and papers were written about this subject by Austria, Czech Republic, Germany and Slovenia. Third, a paper about quality reporting was offered to the Sponsorship on Quality (SQ) an advisory body of the ESS Committee[3]. Fourth, on 29 October 2010, a meeting took place between the European Statistical Advisory Committee (ESAC), the user group of Eurostat, and the SQ. The subject of that meeting was the needs of users of quality reports. In the short (one morning), fruitful meeting, the participants raised a number of issues regarding quality reports.

Little distinction has been made between the various attributes[4] of quality reports and the quality[5] of quality reports has yet not been made explicit. Only Zaletel et al. (2010) mention the expression 'quality of quality reports'. On the other hand, attributes of statistical output (relevance, accuracy, timeliness, punctuality, comparability, accessibility and clarity) are well known and widely accepted by the ESS community. All these attributes are even established in the Statistical Law (Eurostat, 2009d) and the European Statistics Code of Practice (Eurostat, 2005). Hence, the ESS is used to the phenomenon of attributes.

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[1] A statistical authority is, at national level, the National Statistical Institute (NSI) and other statistical bodies in charge of producing and disseminating European Statistics and, at Community level, Eurostat (Eurostat, 2010b).

[2] The European Statistical System (ESS) is the partnership comprising Eurostat, National Statistical Institutes and other national statistical bodies responsible in each Member State for producing and disseminating European Statistics (Eurostat, 2010b).

[3] The European Statistical System Committee (ESSC) is established in the Statistical Law (Eurostat, 2009d). The European Commission (Eurostat) can consult the ESSC on various subjects as stated in the Statistical Law.

[4] Synonyms of the term attribute are quality dimensions, quality components, quality criteria and characteristics. The term quality component is used as well as attribute by Eurostat (Eurostat, 2010a).

[5] Quality is here defined as the set of attributes of an object, where an object is anything that has attributes. Eurostat's definition of quality is less neutral i.e. the degree to which a set of inherent characteristics fulfills requirements (Eurostat, 2010b).

The aim of this paper is to identify attributes of quality reports, because distinguishing these could help to systematically manage the quality of quality reports, allowing focus on one attribute at a time in the discussion of what the requirements of quality reports are. In addition it will be easier to determine which measures or actions should be taken to assure the quality of quality reports. The main findings are that 19 attributes of quality reports can be distinguished and that there are similarities in the attributes of quality reports and statistical output e.g. relevance. Moreover, the concept of quality reports is, in some cases, split into sub concepts, for example the content of quality reports and the release of quality reports.

A quality report is defined as a report conveying information about the quality of a statistical product or process (Eurostat, 2010b). It contains text, one or more quality indicators or a combination of both and it can be recorded on paper, in a file or a database. A quality report can refer to statistical output but also to intermediate results in which case the quality report can be used as input for the next process in the chain.

The next section of this paper explains the method used in the research which is desk research using a top-down and bottom-up approach. Section 3 presents the results of the research. A set of attributes are selected as relevant for quality reports. Each selected attribute is illustrated by one of more issues. Section 4 discusses the results and comment is added which is, first, that quality reports do not stand alone. They are part of a family of metadata associates with statistics which are conceptual metadata[6], paradata[7] and contextual data[8]. Second, quality indicators can be regarded as separate object with an own set of attributes. Quality indicators are, however, part of a quality report. Third, the Object-oriented Quality Management model could add value to the discussion about quality reports. In section 5, the conclusion is drawn that distinguishing attributes is useful to manage the quality of quality reports.

2. Method

In our desk research, both a bottom-up and a top-down approach were used. We first describe the bottom-up approach. The conclusions of the SQ-ESAC workshop

[6] Description of the units, the population, the variables, the subpopulations (classifications) and reference period.
[7] Description of the statistical process.

(Eurostat, 2010; SQ-ESAQ, 2010) were analysed. We examined whether the issues raised by the participants of the SQ-ESAC workshop could be associated with a quality area[9]. In the same process we considered whether the object is quality report or whether the object could be further specified, for example content of quality reports and release of quality reports. In the bottom-up approach we also used the three other sources as mentioned in the introduction, papers presented in Helsinki (Kron et al., 2010; Seljak et al, 2010; Prokop, 2010; Burg, 2010), a paper presented to the SQ (Zaletel et al., 2010) and the Handbook for Quality Reports (Eurostat, 2009a). In the top-down approach, we used a list of possible attributes (Van Nederpelt, 2009). For each attribute we considered if the attribute could be collocated with the noun quality report. A few attributes were added by the author to that list.

The two approaches resulted in a sets of attributes which were integrated in one set. Doubles and less relevant attributes were removed and some attributes were clustered because they had a similar meaning. The most current attribute was chosen as the main attribute, e.g. attributes of statistical output because the ESS is already used to these terms. For each quality area that did not originate from the bottom-up approach we searched for possible issues, using our own experience in the field. In a final step attributes were removed from the set that were considered less relevant. For each quality area in the set a definition was proposed usually beginning with the words 'the degree to which…'. In this step, dictionaries and glossaries were used to look for the definition of the attribute. The definition of the quality area was derived from the definition of the attribute, because the definition of accuracy of quality reports is more specific than the definition of the term accuracy alone. For each quality area we searched for issues in the sources as mentioned before to illustrate the importance of these quality areas.

3. Results

The list of 19 attributes found that can be associated with quality reports is in alphabetical order: accessibility, accuracy, appropriateness, clarity, compliance with standards, comparability, completeness, consistency, costs, duration, familiarity, frequency, language, punctuality, relevance, timeliness, transparency, unambiguity

[8] Interpretation of the statistic.

and usability (table 1, column attribute). Six objects related to the object quality report were identified: the set of quality reports, the format of quality reports, the content of quality reports, the production process of quality reports, quality reports as a product and the release of quality reports (table 1, column object). The right combination of objects and attributes are mentioned in table 1. If an attribute was not selected, the related main attribute was indicated (appendix, table 2). An attribute was related if it had a similar or opposite meaning. Less relevant attributes were authenticity, continuity and reproducibility (appendix, table 2) and are not included in the list.

Table 1 Attributes of quality reports

No	**Quality Area**	
	Attribute	**Object**
1.	Accessibility	QR
2.	Accuracy	Content
3.	Appropriateness	Format
4.	Clarity	Content
5.	Compliance with standards	Format
6.	Comparability	Set
7.	Completeness	Set, Format, Content
8.	Consistency	Content
9.	Costs (burden)	Production
10.	Duration	Production
11.	Familiarity	QR
12.	Frequency	Release
13.	Language	QR
14.	Punctuality	Release
15.	Relevance	Format
16.	Timeliness	Release
17.	Transparency	QR
18.	Unambiguity	Content
19.	Usability	QR

QR = Quality Report as product

[9] The expression ‘quality area’ is a new concept. It is the combination of an attribute and an object, e.g. ‘relevance of quality reports’ (Van Nederpelt, 2009). In this last example the object is ‘quality report’ and ‘relevance’ the attribute.

All attributes of quality reporting selected are elaborated in this section. Some attributes are the same as for statistical output i.e. relevance, accuracy, comparability, consistency, timeliness, punctuality, accessibility and clarity. This does not mean, however, that they have the same meaning. The accuracy of quality reports has a different meaning than the accuracy of statistical output. Each description of an attribute starts with a definition.

3.1 Attributes of a set of quality reports

Attributes of a set of quality reports are completeness and comparability.

Completeness

Completeness of the set of quality reports is the degree to which quality reports cover statistics over time and domains. Related attributes are coverage and scope.

Comparability

Comparability of a set of quality reports is the degree to which a set of quality reports can be compared over time, between domains and across countries. Zaletel et al. (2010) stated that quality indicators should be comparable between member states (of the EU), candidate countries (of the EU) as well as the United States and Japan. Furthermore, indicators need to be comparable from one year to another. A similar requirement could be formulated for quality reports. Slovenia uses a database for quality reports (Seljak et al., 2010) enabling them to internally analyse the quality across domains and over time. Comparability in time of quality reports means that the user can see how the quality of a particular statistic develops. Compliance with (national or international) standards is a prerequisite for comparability.

3.2 Attributes of the format

Attributes of the format of quality reports are relevance, completeness, appropriateness and compliance with standards. In this context, format means the set of subjects covered by the quality report.

Relevance

Relevance of the format of the quality report is the degree to which the format of the quality report meets the needs of the user. This is an analogous definition to the definition of relevance of statistical output. Related attributes are

comprehensiveness, effectiveness, orientation, serviceability, usefulness and utility. Some prefer the term utility above relevance (Q2010).

Quality reports for producers (i.e. Eurostat) and for users are distinguished up front. Users are, however, not a homogeneous group (SQ-ESAQ, 2010). There are different categories of users like researchers, business, policy makers, the media and the public. This means that one quality report can not really serve the needs of all categories of users. On the basis of the wide range of users (also internal users) we would need a wide range of user-oriented reports (Kron et al., 2010). Making quality reports fit for use would require both short and basic quality reports at one end of the spectrum, and long and comprehensive quality reports at the other hand. It was assumed that, for example, the media are less interested in quality reports and more interested in statistical output alone (SQ-ESAQ, 2010), because they rely on the image of the statistical authority as a brand. On the other hand policy makers are heavy users of quality reports. They want to know how far they can rely on the data.

It is even possible that quality reports will used as input by the next process in the chain of statistical processes. This next process in the chain could check if the quality of the data is sufficient. Only very specific data will be relevant for this process.

The relevance of the quality report also depends on the statistic involved (Eurostat, 2010a). At Eurostat, three levels of statistics are distinguished. Level 1 statistics are direct input for a process of ‘mechanical’ decision making e.g. budget deficit. For this level, statistics have only one premium user and the requirements are well known. Level 2 statistics are multipurpose, well known, mature statistics with a heterogeneous user group. Level 3 statistics are experimental statistics, where various issues are still to be resolved, like the concept of the statistics and the methodology. In case of level 1 statistics, it is relatively easy to compile a relevant quality report, because the requirements are well known. The quality report shows the degree to which the requirements of the statistical output are met. In case of the budget deficit statistics, two sections are very relevant, accuracy of the output and comparability across countries. The need for exhaustive quality reports were high in case of experimental statistics. Users want to know what the strengths and weaknesses are of the experimental statistic.

It is desirable that quality indicators (in quality reports) cover all quality dimensions of statistical output (Eurostat, 2010a). Priority was given to indicators relating to relevance (rate of available statistical results), accuracy (sampling error indicators, non-response rates, average size of revision), punctuality and comparability (length of comparable time series). Accuracy is still the centre of quality and research for developing methods for measuring accuracy is one of the big challenges for official statistics (Burg, 2010). As in some quality reports attributes of statistical output were reported one by one, but nothing was said about the relationship between attributes, e.g. the trade-off between timeliness and accuracy of statistical output (SQ-ESAQ, 2010), while this can be relevant too. The purpose of quality reports is manifold. If used for improving the quality of statistics, the report is even relevant for the producer of the statistic. A second purpose is to give account to the principal. Finally the user is able to decide the extent to which the statistic suits his purpose. For some users, it is relevant to see the required quality (ex ante) as well as the realized quality (ex post) in the quality report. Concluding whether the requirements are met is then possible. In the last case, the required quality needs to be defined. Seljak et al. (2010) stated that quality reports are a demanding part of documentation that is mostly appropriate for most experienced and highly motivated users.

Appropriateness

Appropriateness of the format of quality reports is the degree to which quality metadata can put in place in the quality report. In Slovenia the template for quality reports which was initially designed for the purpose of 'classical surveys' didn't fully fit for the purpose of surveys based on administrative sources (Seljak et al., 2010). Therefore some adjustments were needed for quality reports in case of the last surveys.

Compliance with standards

Compliance with standard of formats of quality reports needs no definition. Related attributes are coherence, standardization and uniformity. EU standards are, for example, the Handbook for Quality Reports[10] (Eurostat, 2009a) and recommendation 2009/498 on reference metadata[11] (Eurostat, 2009c). There are also standards specific to certain domains and national standards. Kron et al. (2010) noticed that both standards (ESQR and ESMS) overlap but also show some differences. Zaletel et al. (2010) stated that it is necessary to achieve full

[10] Abbreviated as ESQR.
[11] Also called Euro SDMX Metadata Structure (ESMS)

harmonization in quality reporting for the statistics covered by European regulations and to establish how this harmonization could be implemented. Austria (Burg, 2010) developed Standard Documentation and analysed the differences with the Handbook for Quality Reports (Eurostat, 2009a). Seljak et al. (2010) reported an average of 50% alignment between quality reports for Eurostat and quality reports for Slovenia Statistics as perceived by staff who prepare the quality reports. The values range from less than 10% up to 100%.

Completeness

Completeness of the format of quality reports is the degree to which the format of the quality reports cover time, domains and/or items. The more items are covered, the more complete the quality report is. Examples of items are quality dimensions, quality indicators and the statistical concepts of ESMS (Eurostat, 2009c). Related attributes are coverage, scope, level of detail and level of aggregation.

The scope of a quality report can be narrow or wide, from dealing with a specific indicator and the process that produced it, to the whole ESS (Eurostat, 2009a, p24). The SQ-ESAC workshop recognized that some users want very specific information while other users are happy with rough, aggregate information. In the case of European statistics, whether quality reports should contain information on country level was an issue (SQ-ESAQ, 2010). Therefore, there is relationship between completeness and relevance. The Handbook on Quality Reports (Eurostat, 2009a, p25) focused on the most comprehensive form of report commonly prepared, i.e. a full scale report with qualitative and quantitative information, dealing with all important aspects of processes and quality measurements and also quantitative quality measures or assessments and discussions of how to deal with deficiencies.

3.3 Attributes of the content

Attributes of the content of quality reports are accuracy, clarity, consistency, transparency, unambiguity and language.

Accuracy

Accuracy of the content of the quality report is the degree to which the report portrays the reality of the quality of the statistical process and its output. This was not discussed at the SQ-ESAC workshop. It does not, however, need explanation that the accuracy of quality reports must be assured. Related attributes are credibility, integrity, objectivity, reliability and validity.

Completeness

Completeness of the content is the degree to which the format is filled in. Related attributes are level of detail and level of aggregation.

Clarity

Clarity of the content of quality reports is the degree to which quality reports are readable and understandable. Related attributes are readability and complexity. It was a challenge to make a quality report interesting to read (SQ-ESAQ, 2010). For example, a lot of references to annexes reduced the clarity of quality reports. One of the issues regarding the content of quality reports was how to express the quality of statistical output (SQ-ESAQ, 2010). Three different ways can be distinguished: as a story (qualitative), as quality indicator (quantitative) or as grades (e.g. A, AA, AAA). Although grades appear attractive, they cannot always be implemented. Grades were relative to the criteria of the user and each grade needs to be precisely defined. In addition, in a quality report visual components like charts and graphs could be used as well as indicators to improve the clarity of the quality report.

Consistency

Consistency of the content of quality reports is the degree to which content of quality reports are free of contradictions. Consistency i) within one quality report internal, ii) consistency between a quality report and other sources and iii) consistency between quality reports of the same statistic for different users can be distinguished. There is a risk of internal inconsistency if quality reports contain details as well as summaries. A related attribute of external consistency is plausibility. In case of quality reports of the same statistic for different users, the risk of inconsistency can be reduced by deriving these reports from one source (file, database).

Transparency

Transparency of the content of quality reports is the degree to which quality reports show possible improvements of the statistic. Showing weaknesses of statistics in quality reports (SQ-ESAQ, 2010) is a sign of strength and of transparency about the quality of the statistical process and the statistical output. According to Kron et al. (2010), length and detail of quality reports often correlate with the amount of information about the weaknesses of a statistic. The Handbook on Quality Reports

(Eurostat, 2009a, p25) states that the most comprehensive form of quality reports discuss how to deal with deficiencies.

Unambiguity

Unambiguity of the content of the quality report is the degree to which the content can be interpreted in one way. Since unambiguity can decrease clarity, there is a trade-off between them.

Language

The language of the quality reports needs no definition. Since 2008 in Slovenia annual quality reports started to be regularly published on the website, also in English (Seljak et al., 2010).

3.4 Attribute of the production process

Attributes of the production process of quality reports are costs and duration.

Costs

Costs of the production process of quality reports is the capacity needed to produce quality reports. A related attribute is efficiency. There is a trade-off between the number of items and the level of detail of quality reports on one hand and the costs involved in producing the quality report at the other hand. The costs allowed for the production of quality reports will always be limited, and are dependent on the size of the domain, experience of the statistician and the number of staff involved in preparation of the quality report (Seljak et al., 2010). The average time spent on annual reports in Slovenia were 17 hours and 57 hours for an exhaustive report, prepared every five years. However, detailed methodological documentation, a template for quality reports, organisation of workshops and a coordinating function for the preparation of quality reports facilitate the production process of quality reports. Kron et al. (2010) state that statisticians are overloaded with reporting requirements so that time for other quality assurance activities was lost. The statisticians could not understand why they should report quality in several different structures. Czech Statistics is developing a new quality metadata system (Prokop, 2010) which aims to increase the efficiency in reporting on statistical quality.

Duration

Duration of the production process of quality reports it the length of time needed to produce a quality report.

3.5 Attributes of the quality report as a product

Attributes of quality reports as a product are accessibility, usability and familiarity.

Accessibility

Accessibility of the quality report is the degree to which users easily can access quality reports. In the first place, the quality report should be easy to find in connection to the related statistic (Seljak et al., 2010). Furthermore, the accessibility depends on the media in which quality reports are available (paper, DVD/CD, file). The technical format is also relevant (Word, Excell, PDF, HTML, XML/SDML). Related attribute are findability (on the Internet or website) and availability which is a prerequisite for accessibility. Indicator 15.6 of the Code of Practice (Eurostat, 2005) states that "users are kept informed on [..] the quality of statistical output with respect to the ESS quality criteria" which means that quality report should be available to users.

Usability

Usability of quality reports is the ease of use of a quality report. This refers to quality reports published on the Internet. Accessibility is a prerequisite for usability. A plea was made for better use of Internet (Eurostat, 2010a). The usability of quality reports could be improved if quality reports have a layered or cascading structure. The use of hyperlinks could also be beneficial to the usability of quality reports. An important question remained: what should the content of the top layer be? In the long run, storing all relevant information in one database could allow users to either use pre-structured reports or even allow them to select the information they are interested in (Kron et al., 2010).

Familiarity

The familiarity of quality reports, the degree to which users know that quality reports are available, is not very high. Some participants of the workshop (SQ-ESAQ, 2010) were surprised that quality reports even exist. Seljak et al. (2010) state that their first step would be now to improve the strategy of the dissemination of the existent quality reports and to inform relevant user groups (e.g. advisory committees, researchers) more intensively about the existence of quality reports.

3.6 Attributes of the release of quality reports

Attributes of the release of quality reports are frequency, timeliness and punctuality.

Frequency

The frequency of releases of quality reports is the number of quality reports released in a certain period. The Handbook on Quality Reports (Eurostat, 2009a, p26) states that quality reports may be prepared for every cycle of the statistical process, annually, or periodically. Typically the more frequent the report, the less detail. Slovenia, for example, prepares exhaustive standard quality reports every five years and short annual quality reports every year (Seljak et al., 2010).

Timeliness

Timeliness of the release of quality reports is the length of time between the end of the reference period of the associated statistic and the moment of release.

Punctuality

Punctuality of the release of quality reports is the time lag between the planned release date of the quality report and the realized release date.

4. Discussion

The result of the study shows that relevant attributes of quality reports can be found in the sources used. Distinguishing a extensive set of attributes of quality reports is new because in other sources subsets of attributes are explicitly mentioned. It can be used to systematically manage the quality of quality report and came up to our expectations, because similar studies has been carried out at Statistics Netherlands for other objects than quality reports. In order to manage the quality of quality reports for each attribute, a set of standard steps can be taken (Van Nederpelt, 2009). The most important steps are 1) formulating the definition of the quality area, 2) defining the requirements of the quality area, 3) analysing possible problems, causes of problems and effects of problems with quality areas and 4) determining measures/actions to assure the quality area. Less important steps are formulating for each quality area, 5) the chances for the organization, 6) the history of the quality area, 7) available documentation and tools, 8) importance, 9) related quality areas

and 10) indicators (for the quality of quality reports). Definitions are already proposed in this article.

In addition the following remarks can be made. First, quality reports are member of a family of metadata: conceptual metadata, paradata and contextual data. Conceptual metadata are descriptions of the unit used in the statistics, population, data items, classifications and reference periods, without which statistics are meaningless. Paradata is information about the statistical process. The third and last category, contextual metadata, is information about the phenomenon described by the statistic. In the SQ-ESAC workshop (SQ-ESAQ, 2010) it was agreed that this kind of information should be provided by subject matter experts who may not be statisticians, but member of the user community. Question is what attributes can be associated to these other types of metadata.

Second, quality reports contain qualitative (text) as well as quantitative information (indicators). Attributes of quality indicators can be distinguished. A similar article could be composed on this subject in which it can be expected that the attributes will quite similar as those for statistical output, because indicators and statistics are both data items (variables).

Third, Statistics Netherlands recently used the list of attributes effectively in order the define a list of requirements for quality report to be published on the Internet.

5. Conclusion

Aim of the study was to identify attributes of quality report. A list of 19 attributes are found associated with six objects that are closely related to quality reports. The distinction of attributes of quality reports is the first step in order to systematically manage the quality of quality reports.

About the author

ir. Peter W.M. van Nederpelt EMEA EMIA RO (1951) works at Statistics Netherlands as an auditor and researcher since 2002. His background is applied mathematics, business administration and auditing. Peter is member of the Working Group on Quality of Eurostat.

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Appendix : List of quality areas

Table 2 Quality areas in alphabetical order, sources, main attribute and relevance

Quality area		S1	S2	S3	S4	Main attribute	Low relevance
Attribute	**Object**						
Accessibility	QR	X	X		X		
Accuracy	Content						
Appropriateness	Format	X			X		
Authenticity	QR	X					X
Availability	QR	X				Accessibility	
Clarity	Content	X	X				
Coherence	Format				X	Compliance with standards	
Comparability	Set	X	X		X		
Completeness	Set, Format, Content	X	X				
Complexity		X				Clarity	
Compliance with standards	Format				X		
Comprehensiveness		X				Relevance	
Confidentiality		X				Transparency	
Consistency	Content	X	X				
Continuity	Production	X					X
Costs (burden)	Production				X		
Duration	Production	X					
Coverage		X				Completeness	
Credibility		X				Accuracy	
Ease of use		X				Usability	
Effectiveness		X				Relevance	
Efficiency		X				Costs	
Familiarity	QR		X		X		
Findability	QR					Accessibility	
Flexibility		X				Usability	
Format, technical		x				Accessibility	
Frequency	Release				X		
Friendliness		X				Usability	
Integrity		X				Accuracy	
Language	QR			X	X		
Level of detail	Content		X	X		Completeness	
Medium		x				Accessibility	

Quality area		S1	S2	S3	S4	Main attribute	Low relevance
Attribute	**Object**						
Objectivity		X				Accuracy	
Orientation		x		X	X	Relevance	
Plausibility		X				Consistency	
Punctuality	Release	X	X				
Readability		X				Clarity	
Relevance	Format	X	X		X		
Reliability		X	X			Accuracy	
Reproducibility	Content	X					X
Scope	QR, Set	X		X		Completeness	
Serviceability		x				Relevance	
Standardization		x			X	Compliance	
Timeliness	Release	X	X				
Transparency	QR	X					
Unambiguity	Content	X					
Uniformity		X				Compliance	
Usability	QR	X					
Usefulness		X	X			Relevance	
Utility					X	Relevance	
Validity		X				Accuracy	

Legend

S1: A New Quality Management model (Van Nederpelt, 2009)
S2: SQ-ESAC Workshop (Eurostat, 2010; Van Nederpelt, 2010)
S3: Handbook for Quality Reports (Eurostat, 2009a)
S4: Papers (Kron et al., 2010; Zaletel et al., 2010; Seljak et al., 2010; Prokop, 2010; Burg, 2010; Q2010)
QR = Quality Report
Grey: Unselected attributes