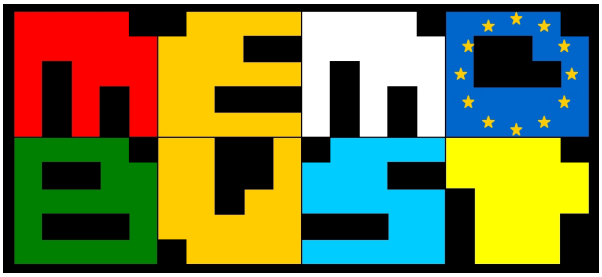

This module is part of the

Memobust Handbook

on Methodology of Modern Business Statistics

26 March 2014

Theme: Quality and Risk Management Models

Contents

General section

1. Summary

This module describes models for quality and risk management that are used in statistical institutes and their relevance for this handbook.

2. General description

Several models are used by statistical institutes for quality and risk management. These models include the following:

1. European Foundation for Quality Management Excellence Model (EFQM, 2013)
2. ISO 9001 (2008)
3. European Statistics Code of Practice (CoP) (Eurostat, 2011b)
4. Quality Assurance Framework of the European Statistical System (ESSQAF) (Eurostat, 2012).
5. Object-oriented Quality and Risk Management (OQRM) (Van Nederpelt, 2012)

In the next subsections we will describe these models briefly.

2.1 EFQM

The EFQM model distinguishes nine 'criteria':

1. Leadership
2. People
3. Strategy
4. Partnership & Resources
5. Process
6. People Results
7. Customer Results
8. Society Results
9. Key Performance Results

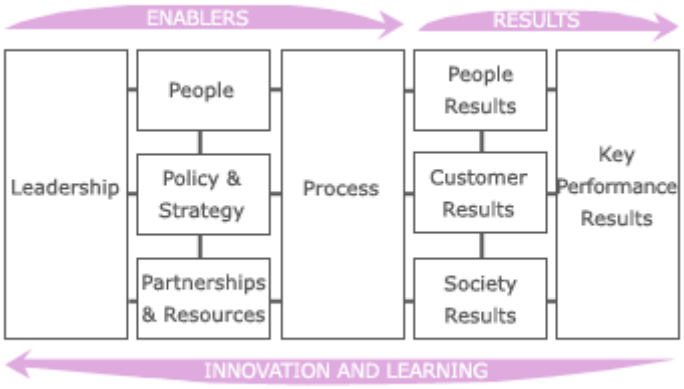

Figure 1. Nine criteria of the EFQM Excellence Model

These nine criteria are subdivided into sub criteria and recommendations respectively. To facilitate the integration of the prevailing ESS quality frameworks, namely the Code of Practice and the EFQM model, Eurostat mapped the Code of Practice on the EFQM Excellence model (Eurostat, 2005). Principal 7-15 regard statistical processes and statistical output and are relevant at the level of business statistics. The other principles of the CoP are at institutional level. As figure 2 shows, there is an overlap between indicator 7.1, 7.2, 7.7 (sound methodology), 8.5 (appropriate processes), 12.1-12.4 (accuracy and reliability), 15.1 and 15.2 (accessibility and clarity) and the EFQM Excellence model.

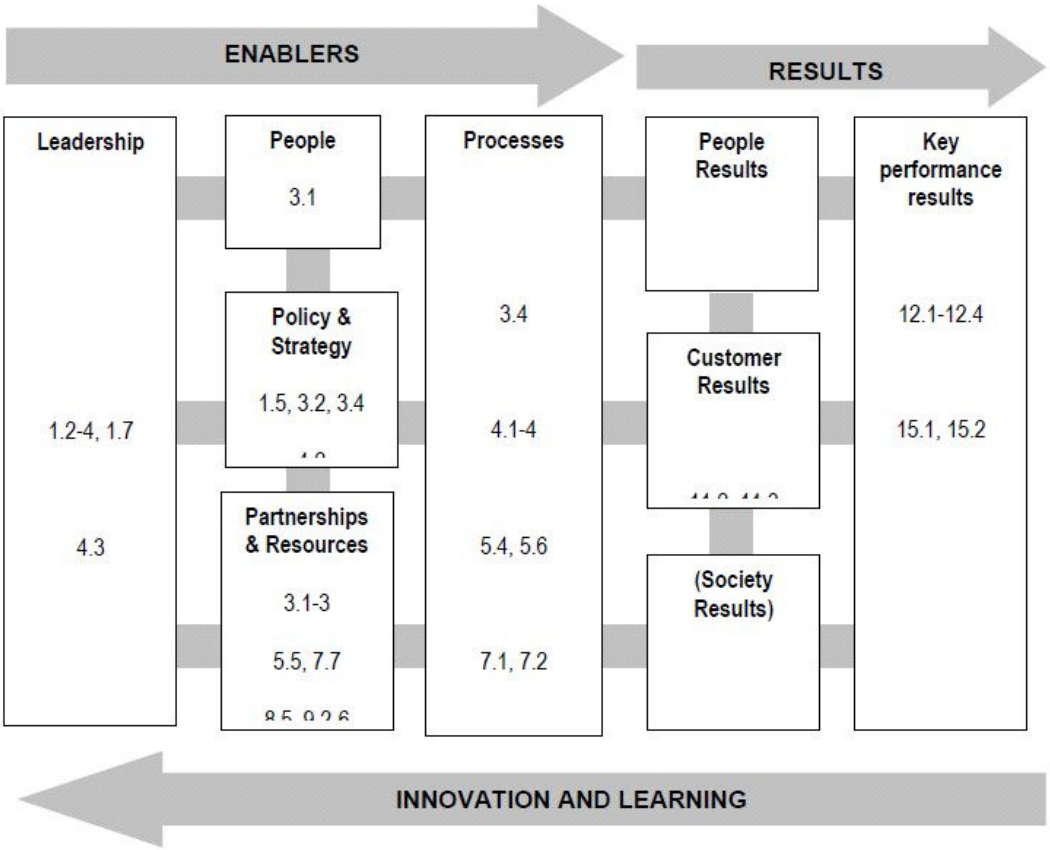

Figure 2. Mapping of the indicators of de Code of Practice on the EFQM Excellence Model

2.2 ISO 9001

ISO 9001 (2008) is a set of requirements for a quality management system (QMS). A QMS consists according to ISO 9001 of a number of elements. Some of them may be usefull for business statistics such as:

- Requirements. Requirements related to the product are determined (ISO 9001, 2008, 7.2.1).
- Quality objectives. In planning product realisation quality objectives are determined (ISO 9001, 2008, 7.1.a).
- Characteristics of the product. The characteristics of the product are monitored and measured to verify that product requirements are met (ISO 9001, 2008, 8.2.4).
- Preventive action. Action is taken to eliminate the causes of potential nonconformities in order to prevent recurrence (ISO 9001, 2008, 8.5.3).
- Corrections and corrective actions. Necessary corrections and corrective actions are taken without undue delay to eliminate detected nonconformities and their causes (ISO 9001, 2008, 8.2.2).
- Records. Records of the result of the verification and any necessary actions are maintained (ISO 9001, 2008, 7.3.5).
- Training. Trainig is provided or other actions are taken to achieve the necessary competence (ISO 9001, 2008, 6.2.2).

ISO 9001 is widely accepted in the world of quality management and is applied by several NSIs too. However, the ESS QAF (Eurostat, 2012) is suitably adapted to quality management of statistics.

2.3 Code of Practice

The Code of Practice (Eurostat, 2011) is a set of 15 principles for statistical institutes that produce European statistics. This principles are divided in three categories: institutional, process and output. Each principle is subdivided into ‘indicators’. The CoP is adopted by the European Statistical System Committee.

The principles of the CoP about output (11 until 15) distinguish eight quality dimensions of statistical output. These dimensions are generally recognised within the European Statistical System and are elaborated in the theme Quality of Statistics.

Principle 7 of the CoP about the soundness of methodology is especially relevant in the context of this handbook (figure 3) although the requirements are formulated at a high level of abstraction.

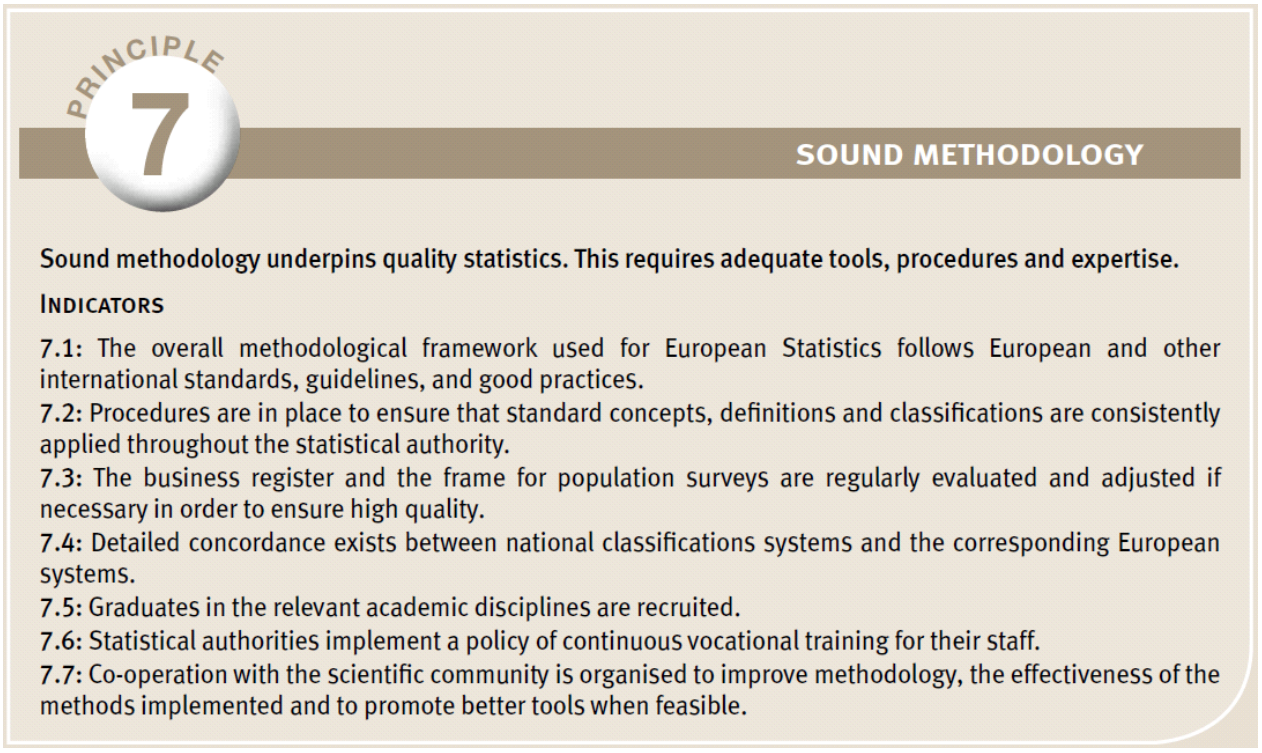

Figure 3. Principle 7 of the Code of Practice

2.4 ESS QAF

The ESS QAF (2012) is a set of good practices ('methods') for each indicator of the CoP (Eurostat, 2011). The QAF distinguished methods on institutional level and methods on process level. The methods on process level regarding principle 7 and 11-15 are relevant for business statistics.

2.5 Object-oriented Quality and Risk Management model

The OQRM model is meant to manage quality and risk. Important concept of the model that the quality of a product is dependent on the quality of other 'objects' such as processes, methods and data.

About the OQRM model and its applications, several papers have been published and a book (Van Nederpelt, 2012) . The model has been presented at international conferences and can be used in any organisation, at any scale and in any field of expertise.

The OQRM model can be characterised as an 'empty' model. It is generic and does not contain any domain knowledge. The structure of the OQRM model is 'rich'. This model is, therefore, suitable for this handbook.

The model can be applied to objects like *output, processes and documentation* where an object is defined as everything that can be perceived or conceived. In this document, the model is only applied to the objects *statistical output* and *statistical methods*. The quality of *statistical output* is for a large part dependent on the quality of *statistical methods*

Each object has a specific set of attributes (also called characteristics or quality dimensions). Each combination of an object and one associated attribute is called a focus area. An example of a focus area is *accuracy of estimates wh*ere *estimate* is the object and *accuracy* the attribute. In this document

objects, attributes and focus areas are written in italic. The model also allows attributes that are not associated with quality like *costs, duration and capacity*.

OQRM defines the quality of an object as "the set of attributes of an object". This is slightly different from the ISO 9000 (2005) definition: "the degree to which a set of inherent characteristics fulfils requirements". The OQRM definition emphasises that attributes are associated to an object. It also uses the more general word attribute rather than characteristic. Finally, OQMR does relate quality to the required quality in separate steps in the model and not in the definition of quality.

A focus area is a unit that can be managed by taking the right measures (= actions, steps). The aim is to be or to get in control of a focus area. An organisation is in control of a focus area if the requirements for a focus area are met and/or an acceptable risk is taken regarding an objective like the quality of the *output*.

The OQRM model can be used to develop frameworks and to integrate existing frameworks. Requirement can be grouped by object respectiviely focus area. This improves the adaptability of the framework.

The model can also be used for quality assurance. It can help to find the right measures to control selected focus areas. By using the OQRM model, measures can be determined in a structural, analytical manner to get or to be in control of a focus area. This happens by taking the steps shown in figure 4. It can also be put that OQRM is a meta language that is valid in the area of quality and risk management.

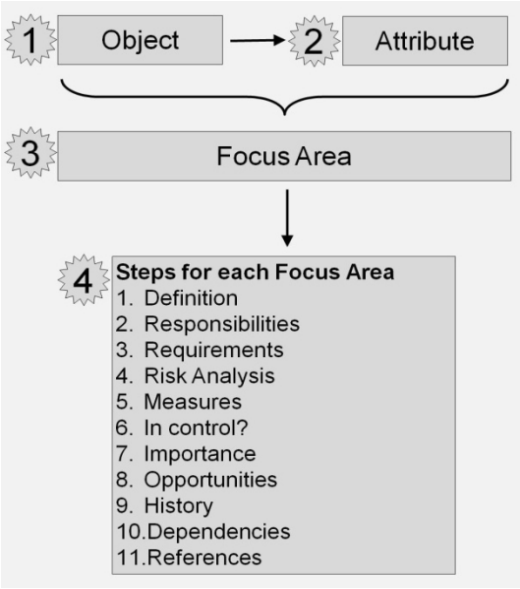

Figure 4. OQRM at a glance

Steps that will be applied in this document, are

- Step 1: Define what a focus area means.
- Step 3: Formulate requirements which a focus area must comply with.
- Step 4: Analyse the possible causes for problems with a focus area. Determine the possible effects of problems with a focus area.

- Step 5: Determine which measures have already been implemented, are still in progress or are already planned. We can distinguish four three of measures: signalling measures, preventive measures and curative measures.
    - A quality indicator is a signalling measure. It can detect a quality problem which can be followed-up by a curative measure to solve this problem.
    - A preventive measure is meant to avoid quality problems.
    - In case of a curative measure a quality problem has already occurred. The curative measure is meant to solve the quality problem.
- Step 7: Determine how important a focus area is for achieving certain objectives.
- Step 10: Determine what relationships there are with other focus areas.
- Step 11: Determine which references there are on a focus area.

The other steps (2, 6, 8, and 9) are less relevant for this handbook, because these steps are only applicable in a specific case.

2.5.1 Example of the application of the OQRM model

The OQRM model is in this subsection applied to the focus area *accuracy of estimates.* In this case *estimate* is the object and *accuracy* the attribute. Each step of the model is elaborated.

Step 1: Definition

Accuracy of an estimate is defined as closeness of computations or estimates to the exact or true values that the statistics were intended to measure (SDMX, 2009). Accuracy includes both bias and variance.

Step 3: Requirements

The CoP (principle 7) requires that "European Statistics accurately and reliably portray reality". In practice this requirement could be defined more specifically like the mean square error is less than a specific value.

Step 4: Risk analyses

Problems with the *accuracy of estimates* are caused by errors. Examples of these errors are sampling errors, measurement errors and processing errors. In case of secondary data collection errors in the data sources can be added too. Another category of source of errors are inadequate methods. We will call this 'method related errors'. This category is relevant in the context of this handbook.

Theoretically, in each step of the statistical process errors can occur. In the logistical and publication process errors can happen too. Originators of all kind of errors are the statistical agency, respondents and data suppliers.

Step 5: Measures

Possible measures to manage or control *accuracy of estimates* are multiple. An important measure is to implement the right *methods* and to implement the *methods* right.

Another possible action is to measure the quality of the *data*. The ESS Committee determined and elaborated a set of quality indicators (Eurostat, 2011a) concerning the *accuracy of estimates*. These quality indicators are meant for reporting purposes but can be used to improve the quality of the output too.

1. Sampling error – indicator
2. Over-coverage – rate
3. Unit non-response – rate
4. Item non-response – rate
5. Imputation – rate
6. Common units – proportion
7. Data revision – average size

Not all indicators are related to a method (2, 3, 4, 6 and 7). These indicators also do not cover all categories of errors, e.g., assumption errors and method related errors.

Other possible actions to assure the required *accuracy of the estimate* are to develop good software and test it, hire competent staff and train them, put monitoring processes in place, check the quality of the data sources. These measures are not elaborated in this handbook.

Step 7: Importance

There is no doubt that *accuracy of estimates* is a very important focus area for a statistical agency. It will certainly be an objective of a statistical agency to compile statistics that are sufficiently accurate.

Step 10: Dependencies

Accuracy of estimates is dependent on the quality of a list of objects, i.e., *data sources, processes, methods, software and staff*. In the module "General Observations – Methods and Quality", we will focus on the object *method*.

Step 11: References

References about the focus area *accuracy of estimates* can be found in the reference list (SDMX, 2009; EU, 2009; Eurostat, 2011b).

3. Design issues

4. Available software tools

5. Decision tree of methods

6. Glossary

For definitions of terms used in this module, please refer to the separate "Glossary" provided as part of the handbook.

7. References

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Interconnections with other modules

8. Related themes described in other modules

1. General Observations – Methods and Quality
2. General Observations – Logging
3. Quality Aspects – Quality of Statistics

9. Methods explicitly referred to in this module

1.

10. Mathematical techniques explicitly referred to in this module

1.

11. GSBPM phases explicitly referred to in this module

1.

12. Tools explicitly referred to in this module

1.

13. Process steps explicitly referred to in this module

1.

Administrative section

14. Module code

General Observations-T-Quality and Risk Management Models

15. Version history

Version	Date	Description of changes	Author	Institute
0.1	02-10-2013	first draft	Peter van Nederpelt	Statistics Netherlands
0.1.1	31-01-2014	all EB's comment d.d. 22 January 2014 processed	Peter van Nederpelt	Statistics Netherlands
0.1.2	04-02-2014	preliminary release		
1.0	26-03-2014	final version within the Memobust project		

16. Template version and print date

Template version used	1.0 p 4 d.d. 22-11-2012
Print date	21-3-2014 17:21