

Establishment of the Quality Documentation System in the Croatian Bureau of Statistics

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Abstract

The main goal of the Croatian Bureau of Statistics (hereinafter: CBS) in recent years was to establish a widely accepted general framework for quality assessment and quality improvement of CBS's statistical processes and products. The CBS adopted the Total Quality Management (TQM) approach as the general model for quality management, quality assessment and quality improvement.

The CBS also established a quality documentation system for statistical products and processes. This database of quality information became a key tool for quality assessment, quality documentation and quality reporting for CBS surveys. The database contains an exhaustive list of quality information, which is based on two widely accepted ESS structures, ESMS and ESQRS, divided in two parts: numerical information (quality indicators) and descriptive (textual) information. The CBS has also decided to implement Generic Statistical Business Process Model (GSBPM) for documenting statistical processes, because it exhaustively describes and defines a set of business processes needed to produce official statistics.

Keywords

Quality Reporting, Quality Documentation, Quality Database

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INTRODUCTION

The Croatian Bureau of Statistics (hereinafter: CBS) has a long tradition of producing good quality data. Actually, the whole Statistical System of the Republic of Croatia is oriented towards production of relevant statistics by following quality requirements prescribed by the Regulation on European statistics.

CBS's activities regarding quality improvement of statistical processes and products were focused on the development of all their quality aspects. CBS's quality management is the basic prerequisite for the stable development of statistics while at the same time it strengthens the reputation of the entire national and European statistical system.

Since 2010, when a brief review of the implementation of the European Statistics Code of Practice was carried out in Croatia (called Light Peer Review²), the number of new quality reports for CBS's statistical outputs

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² PeerReview is an control instrument of the national statistical system applied in the European statistical system. This instrument assesses the application of the Code of Practice of European statistics. The purpose of the Code of practice, i.e. its application, is to increase confidence in the independence, integrity and accountability of the national statistical authorities and Eurostat and the credibility and quality of the statistics they produce and disseminate. Furthermore, the purpose of the Code is to promote the application of best international statistical principles, methods and practices of all producers of European statistics.

increased significantly, as well as the number of handbooks and methodologies for assessing and monitoring quality. All these quality reports, handbooks and methodologies establish a quality documentation system.

What the CBS was missing all the time was a systematic approach to quality management, especially in preparation and implementation of quality management models. The CBS has therefore implemented a project on establishing a system for the quality documentation of statistical processes and statistical products, which includes the preparation and establishment of a model that will enable quality management in the CBS, in line with the European standards.

CBS's quality improvement activities are focused on all quality aspects of statistical processes and products that are being continuously developed and improved in line with ESS recommendations.

Availability of high-quality and timely statistical information is necessary for developing and monitoring of specific policies, particularly in relation to their impact and fulfilment of their objectives. After joining the European Union, besides national development goals, the Republic of Croatia directed its efforts to the achievement of common strategic objectives of the EU, which represents an additional challenge in terms of quality and structural characteristics of statistical data.

As a member of the European statistical system, the CBS is committed to provide the optimal level of quality of statistical processes and products, to use statistical methods and processes in accordance with internationally recognised principles and standards, and to continuously conduct analyses with the aim to improve the quality of those processes and products. During the adoption of the European Statistics Code of Practice, the CBS (as well as the other national statistical institutes of EU Member States) directed all its efforts to comply with the principles and standards necessary for the production and distribution of quality statistical products.

The European Statistical System Committee (ESSC) adopted the European Statistics Code of Practice and published its directions on the independence, integrity and accountability of the national statistical offices and institutions of the EU in the Commission Recommendation (2005) in February 2005. The European Statistics Code of Practice is based on 15 principles covering the institutional environment, statistical production processes and statistical results. The objective within the ESS system is not only to ensure that the data produced is statistically relevant, timely and accurate, but also to ensure that they are in accordance with the principles of professional independence, impartiality and objectivity. A set of indicators of good practice for each of the 15 principles provides a reference for measuring and implementing the Code. The ESSC adopted the revised Code on 28 September 2011. Shortly after, the CBS adopted the European Statistics Code of Practice, which is fully in line with the UN Fundamental Principles of Official Statistics, as well as with the national and European legislation. In accordance with the Code of Practice of European Statistics, the goal of CBS is to strengthen confidence in the independence, integrity, accountability, credibility and quality of the statistics that are produced and disseminated. The CBS seeks to implement the best international statistical principles, methods and practices to ensure the production and dissemination of representative, relevant and internationally comparable statistical data. Therefore, it is of crucial importance to monitor the quality of data and to quality control all statistical processes that CBS is dealing with. Data quality is a multi-dimensional concept that applies not only to the statistical accuracy of data but also to the comparability, relevance, punctuality and timeliness, availability and clarity of information.

The CBS thus established a quality documentation system for statistical products and processes. A database of quality information was established and it became a key tool for quality assessment, quality documentation and quality reporting for CBS's surveys. The database contains an exhaustive list of quality information based on two widely accepted ESS structures – ESMS and ESQRS – divided in two parts: numerical information (quality indicators which represent the most demanding part of the list of quality information which is gathered through the survey process) and descriptive (textual) information which refers directly to the survey quality assessment.

For documenting statistical processes the CBS has also decided to implement Generic Statistical Business Process Model (GSBPM) because it exhaustively describes and defines a set of business processes needed to produce official statistics.

Dimensioning the quality management documentation system based on our organizational needs is essential for a functional quality management system. Moreover, properly structured documentation will make our operations much easier, while incorrect documentation will bring us nothing but trouble.

Regarding establishment of the quality management system, the CBS had two main goals: to establish a quality management documentation system and to train CBS's staff in activities regarding quality management. The CBS initially started with the preparation and collection of documentation on the quality control of all statistical processes and products in 2013. These three main activities were defined afterwards in order to establish strong quality management documentation system in the CBS:

- Activity 1: Establishing quality management documentation system,
- Activity 2: Selecting six pilot surveys for testing quality and establishing links to Croatian metadata repository (CROMETA),
- Activity 3: Training a number of CBS staff in preparing quality reports.

1 THE BEST AVAILABLE MODEL FOR QUALITY MANAGEMENT FRAMEWORK CHOSEN AND DOCUMENTED

Having studied different models and experiences of EU Member States used for quality monitoring of statistical processes and statistical products, the CBS decided to use Total Quality Management – TQM. This model offers a high degree of flexibility, while in adjoining countries (Austria, Slovenia) it has already proven its functionality and efficiency.

In order to establish the highest quality level, the CBS set up a management model in accordance with the Total Quality Management – TQM principles. For each of these general aims, specific actions are foreseen, while plans for their implementation are described in a strategic document. When the first version of the document was finished, it was given over to broader “public discussion” to get useful comments and suggestions for further development. This comprehensive document about the TQM deals with quality throughout the entire CBS organisational structure.

Principles and main goals of CBS according to TQM are as follows:

1. Statistical processes and products of good quality,
2. Satisfied statistical data users,
3. Reduction of the response burden of respondents (including establishment of good communication with the respondents),
4. Effectiveness of statistical processes (internal productivity),
5. Vocational guidance of staff (education, motivation and satisfaction).

The first form of the TQM is already developed in the CBS, but it is still part of a development process, with the aim for it to be continuously improved. Specific projects and measures for achieving the goal are defined for every TQM section. The CBS uses the standard documentation prepared in accordance with the Eurostat's recommendations. Detailed documentation is prepared for internal purposes in the Croatian language, while the information provided to the users is available in Croatian and English. The information on concepts, definitions, and methods used, as well as on the quality level of statistical data (meta information) is provided in standardised format.

By adopting these documents based on the multidimensional concept compliant with EU standards (such as relevance, accuracy, comparability, timeliness and punctuality, accessibility and clarity, and coherence) the CBS created a basic framework of good quality for ongoing internal and external evaluation of statistical processes and products. In order to introduce systematic quality management

of statistics, the CBS, also established an organisational unit for general methodology and quality that would take care of quality management in a centralised and systematic way.

The TQM requires continuous improvement that consists of project planning activities which need to be defined, implemented and finally tested. Dealing with quality improvement in the CBS is an ongoing challenge in which all employees are included.

2 DATA QUALITY ASSESSMENT METHODS AND TOOLS DEFINED

CBS's experts have developed different data quality assessment methods and tools in last two years. They are the most important part in establishing the quality documentation system in the CBS. Some of the most important ones are:

- a) *Glossary of the quality terms*. Commonly agreed and accepted terminology is one of the basic conditions for further development. Therefore, the CBS created a glossary of the terms from the quality area. Approximately 300 terms are included in the glossary. The Croatian translation is provided for each English term, together with a short description of the term (in both Croatian and English).
- b) *Database of quality information (DBQI)*, which became a key tool for quality assessment, quality documentation and quality reporting for CBS's surveys. The database content is based on an exhaustive list of quality information, which is further based on two widely accepted ESS structures, ESMS and ESQRS.
- c) *Methodological handbook on quality indicators*. Quality indicators are numerical values which indicate the level of quality attained in statistical surveys. From the methodological point of view, quality indicators represent the most demanding part of the list of quality information gathered through the survey process.

Quality indicators are used in the quality reports, especially by management. Sometimes a quality indicator will show that something is wrong and that there is a need for action. An example can be steadily decreasing response rates of some surveys. Management discussions on the development of performance and quality indicators must be constructive and actively consider and suggest improvement possibilities.

Some more thorough explanations and guidelines were needed in order to ensure a standardized and harmonized procedure of calculating indicators in all surveys. The handbook for each of the quality indicators provides the following sections:

- Definition of the indicator,
- Calculation procedure,
- Example(s).

The main goal of the document is to ensure a more standardized methodology of calculation of quality indicators in CBS's surveys. When the handbook was finalised, the CBS organised a workshop with the survey managers and described the content and practical usage of the handbook.

- d) *Standard list of response statuses*. Correct calculation of some of the quality indicators (e.g. response rate, over-coverage rate) largely depends on the correct response statuses of each observational unit. With the "response status" we here refer to information which clearly indicates what the status of the unit is after the collection phase. Roughly three main groups could be defined: Responding units; Non-responding units; Ineligible units. These main groups can then be further divided according to different reasons. To enable standardized calculation of the above mentioned quality indicators the CBS needed a standardized list of response statuses which should be used in all CBS's surveys and could become a basis for standardized procedure of the calculation of quality indicators. Two separate lists were drafted: one for business surveys and one for social surveys.
- e) *Standard template for quality report*. One of the functionalities of the database of quality information is easy and user-friendly creation of CBS's quality reports that should be publicly available

on our website. The National Statistical Institutes (NSIs) produce quality reports required by several international organisations and deliver them together with the data. Many NSIs produce different types of standardised documentation which are user or producer oriented. In order to avoid such duplication of information in different quality reports, the CBS created a standard template, which includes a list of quality information requested both by users and producers. The template comprises an exhaustive list of quality information. This list is now divided in two parts: information which is part of the report and information with lower priority (the inclusion of which was decided upon later, in a testing phase). The level of detail in these reports is an issue. The extent and complexity of the reports tends to increase over time, and we should realise that the target group in practice are mostly demanding users. For example, producers will always need more comprehensive documentation linked to the standard report. On the other hand, users need simplified information linked to or directly integrated in the text following the release of statistics. The standard template for quality report is continuously being developed by taking into account comments and suggestions for improvements from survey managers of the pilot surveys.

3 SELECTING SIX SURVEYS FOR TESTING QUALITY AND ESTABLISHING LINKS TO NATIONAL METADATA REPOSITORY CROMETA

To enable applicability and usability of the tools developed through the project, all the developments should be carried out with a strong connection to the survey practice. For this purpose the CBS selected six surveys which would serve as pilot surveys. The six chosen pilot surveys are:

- Survey on Income and Living Conditions (EU-SILC),
- Monthly Survey on Industrial Production,
- Structural Business Statistics of Enterprises (SBS),
- Annual Survey on Information and Communication Technology Usage in Enterprises (ICT-ENTR),
- Final Energy Consumption in Households,
- Services Producer Price Indices for Cleaning Activities.

The list of pilot surveys can be divided into two groups:

1. The first four surveys are existing surveys which have been carried out in CBS for a long time. Testing in these surveys is already finalised and the survey managers have gathered the required information which was later inserted into the database. Several meetings with the survey managers were organised in order to clarify unclear or ambiguous concepts and definitions.
2. The last two surveys will be developed within other components of the project. These surveys will be included in the testing process in the next phase of project implementation.

4 ESTABLISHMENT OF THE QUALITY DOCUMENTATION SYSTEM

When people think of quality management system documentation they usually envision loads of documents, and unnecessary and bureaucratic procedures. This is because companies often go overboard when documenting their Quality Management Systems (hereinafter QMS). However, this need not be the case. The QMS documentation can consist of different types of documents. It usually includes documents such as quality policy, quality manual, procedures, work instructions, quality plans, and records.

The purpose and the benefits of QMS documentation are manifold. The QMS provides a clear framework of the operations in an organization, allowing consistency of processes and better understanding of the QMS, while at the same time providing evidence for achievement of objectives and goals. When designing QMS documentation, we should all focus on efficiency and create processes and documents that are applicable in your organization.

CBS's experts have thus established two parts of quality documentation system. The first one is the already mentioned database of quality information and the second is strictly used for documenting statistical processes.

4.1 Database of quality information (DBQI)

DBQI became a key tool for quality assessment, quality documentation and quality reporting for CBS' surveys. Database content is based on an exhaustive list of quality information, which is further based on two widely accepted ESS structures, ESMS and ESQRS, divided in two parts: numerical information (meaning quality indicators which represent the most demanding part of the list of quality information which are gathered through the survey process) and descriptive (textual) information which refers directly to the survey quality assessment.

All the information in the database can roughly be divided in two parts:

- 1) Numerical information, also called quality indicators. The whole list of quality indicators is divided in two parts: key indicators, which should be mandatory and calculated in all the surveys for which the quality assessment will be performed, and supportive indicators, which will be calculated if the survey manager considers them important for the quality assessment of a particular survey.
- 2) Descriptive (textual) information. This list can also be divided in two parts: information not directly connected to the quality assessment but aimed at describing the important characteristics of the survey, and information which refers directly to the survey quality assessment.

To achieve the usefulness of this tool, the database itself had to be upgraded with a user-friendly application that enables easy inserting of information and management of inserted information. The first phase of development was devoted to the physical creation of the database and development of this user-friendly tool. The second phase is then devoted to the development of the management tool. At the beginning of the second phase we defined requirements for the output functionalities. These functionalities can be summarized as follows:

- Survey manager authorization. Each survey manager should have the right to edit only specific surveys and view data from any survey. Survey manager must be checked before they start working with the application. This functionality is implemented by using Croatian metadata repository – CROMETA – web service.
- Formatting of quality indicators into a readable (formatted) form. Application should enable creation of formatted tables from indicator values. This functionality is especially important for the sub-annual surveys. In these cases the table should summarize the values for the whole year.
- Filling out the template for standard quality report. A quality report provides information on the main quality characteristics of a product for its users. Quality reports are normally based on quality indicators describing these characteristics and are important for both the producers and the management. The requirements of users and producers are different but a standard structure is preferable, so the application enables automatic transfer from the DBQI into the template for Standard Quality Report. Textual information from the database of quality information should be transferred unchanged, while the indicators should first be formatted into tables. One of the functionalities of the database of quality information is also easy and user-friendly creation of CBS's quality reports, which should be publicly available on our website.
- Development of the basic analytical tool for comparative analyses of quality indicators. This tool should enable comparison for a selected reference period and for a selected indicator between all surveys. The comparison should be performed only on the level of the whole survey (no domains included). The tool should provide a list of indicator values for all the surveys for which the certain indicator is available on demand.
- Creating XML for the National Reference Metadata Editor (NRME) – export from one system to another. This application should enable automatic transfer from the DBQI into NRME editor as well as vice versa, from NRME editor into DBQI. Textual information from the database of quality information should be transferred unchanged, while the indicators should first be formatted and then transferred into the NRME editor.

- Supplementation of the information in the database (Documentation). The first part of the database, which contains textual information, should be supplemented with the information derived from documenting the statistical process. The list of items for this part is already prepared and consists of 36 sub-processes while each sub-process is further divided into 4 standard elements.
- Integration with metadata repository "CROMETA". Static lists added from CROMETA should be replaced with dynamic lists retrieved from CROMETA via web services. If any change appears in CROMETA it is automatically updated in the DBQI.
- Development of the advanced analytical tool for comparative analyses of quality indicators. The application should enable two types of comparative analyses for a particular quality indicator:
 1. Analyses through time. When a user selects a starting and ending date as a reference period, the application provides a time series of a selected quality indicator. The series are presented in the form of tables and line charts.
 2. Analyses between domains. The application should enable two different domain comparisons. The first one takes into consideration the specific indicator values and specific reference period between the indicator values for a chosen domain in a specific survey (e.g. response rate for different regions in LFS in 1st quarter 2012). The second one enables a comparison between the different (selected) surveys. The values are presented in tabular and bar chart form.

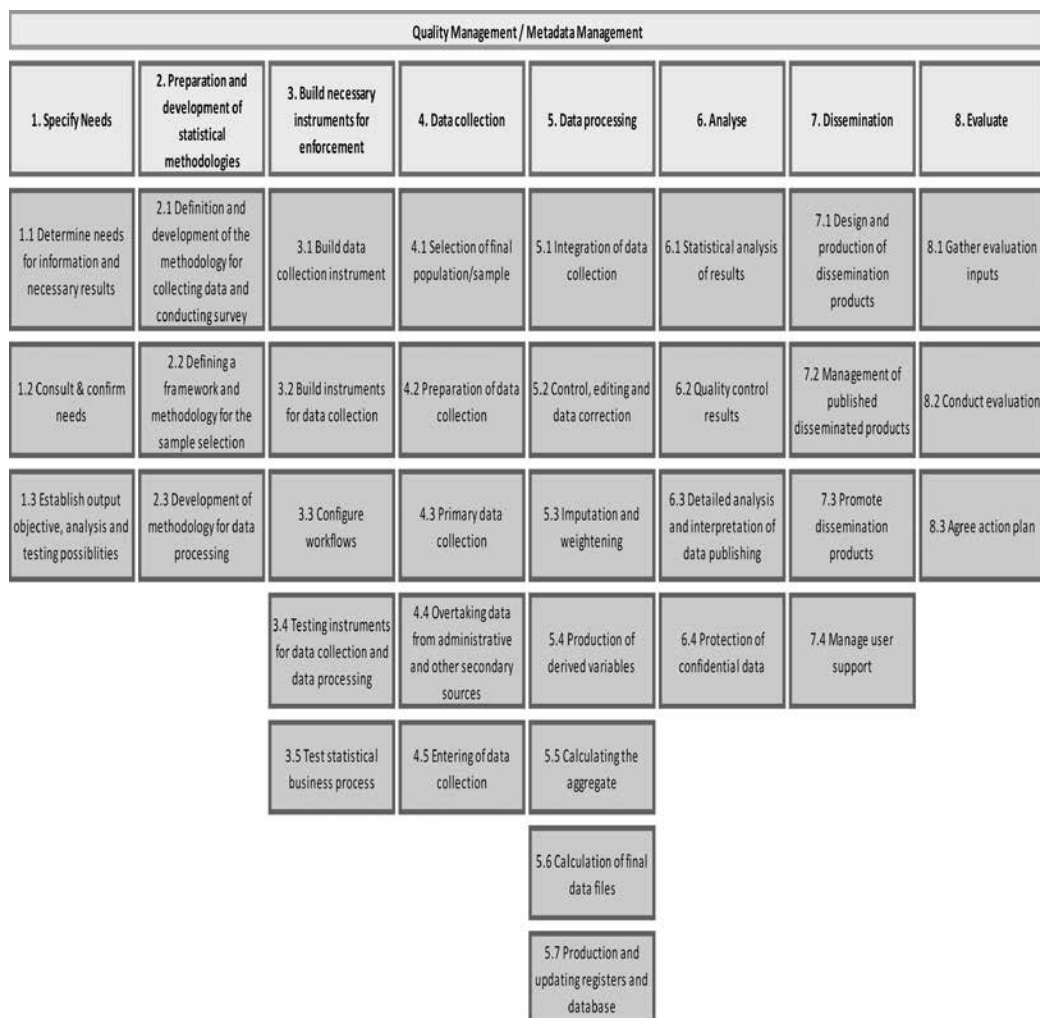
4.2 Documenting processes according to GSBPM model

Because the CBS is process orientated, all CBS employees are aware that we can obtain better quality results and better cost-efficiency only with transparent statistical processes and clearly documented procedures. Having in mind all statistical quality aspects, the CBS has decided to implement Generic Statistical Business Process Model (GSBPM), as it exhaustively describes and defines a set of business processes needed to produce official statistics. It provides a standard framework and harmonised terminology to help statistical organisations modernise their statistical production processes, and share their methods and components. The GSBPM can also be used for integrating data and metadata standards, as a template for process documentation, for harmonizing statistical computing infrastructures, and to provide a framework for process quality assessment and improvement. Based on the GSBPM structure the CBS has carried out analysis of how this model can be implemented in practice in the Croatian statistical system. On the basis of this analysis, we prepared a slightly adjusted CBS process model (Figure 1). The adjusted model was then used as a basis for the creation of a standard template for preparation of survey documentation. This template is now used for describing and documenting every statistical survey in a standardised and harmonised way. In this way, the GSBPM is adjusted to the needs of the Croatian statistical system and designed as a model independent of the data source, so that it can be used for describing and evaluating the quality of the processes based upon surveys, censuses, administrative records and other non-statistical or combined data sources. Such a business model, combined with an organizational structure for coordinating quality work, constitutes the necessary infrastructure for systematic quality work in a statistical institution.

The statistical business process usually involves the collection and processing of "raw" data for producing statistical results. The GSBPM is applicable in cases where existing data is revised or time series are re-calculated. In such cases, the input is taken as previously published statistical data which is then processed and analysed to obtain revised results (outputs). In such cases there is a possibility to skip several sub-processes and some work stages.

Besides the fact that the model is applicable to processes that provide statistical results, the GSBPM can also be applied to the development and maintenance of statistical registers in which the input is similar to the statistical production and the results are usually frames of data set and then used as input for other processes.

Figure 1 GSBPM model adjusted to the needs of the Croatian statistical system



Source: Croatian Bureau of Statistics

The GSBPM is not designed as a strictly defined framework in which all steps must be applied in the same order, but as a model that identifies steps in a statistical business processes and acknowledges the interdependencies between them. Although the presentation of the model shows the logical sequence of work phases in most statistical business process, model elements can appear in a different order. Therefore the GSBPM is a simple and widely applicable model.

The model includes the following activities:

- Quality management – This process includes mechanisms for evaluation and quality control, and recognizes the importance of evaluation and feedback during the statistical business processes.

- Metadata management – Metadata is created and handled within each phase and there is a strong requirement to ensure that the appropriate metadata retains the links with information during the application of GSBPM.
- Statistical framework management – It includes the development of standards, such as methodologies, concepts and classifications applicable through many processes.
- Statistical programme management – It includes systematic monitoring, controlling of resulting information requirements for these liabilities, and changing of data sources across all statistical areas. This can result in the definition of new statistical business process or a redesign of existing ones.
- Knowledge management – It ensures repeatability of statistical processes, mainly by maintaining the documentation of processes.
- Data management – This includes process-independent aspects of the process, such as general data security, custody and ownership of data.
- Process data management – It includes management of data and metadata derived from all parts of the statistical business processes and providing information about them.
- Provider management – This includes managing the burdens that are transferred from process to process, as well as topics such as profiling and data management for the contact (closely related to the statistical business processes that maintain registers).
- Customer management – It includes general marketing activities, promoting statistical literacy and treatment of non-specific customer feedback.

To estimate which level of data quality has been achieved by a statistical survey, it is necessary to study the information and procedures applied in detail, as well as to look at the input and output of the implemented statistical process. It includes an analysis of the methodology and implemented statistical production process (how the data were collected, statistically treated, processed and analysed). It also includes a comparison of results achieved towards the relevant standards with alternative sources of information, prior knowledge or logical expectations. Of course, all these quality aspects are of high importance.

CONCLUSION AND FUTURE DEVELOPMENTS

As it was described in this paper in detail, the key outcomes of the activities carried out in this period of quality management implementation in the CBS were:

- Creation of the TQM strategic document,
- Creation of the glossary of the quality terms,
- First version of the database of quality information developed and tested,
- Creation of the methodological handbook on quality indicators,
- Creation of the standard list of response statuses,
- Survey managers of pilot surveys educated about the main concepts in the field of quality assessment and trained to collect the required quality information,
- Seminar on Quality Management and Quality Assessment Frameworks carried out,
- Workshop on Quality assessment Methods and Tools carried out.

From the previous sections, it is clear that good progress has been made for each of these minimum expected outputs of the quality documentation system implementation. There is no reason to expect that this process will not continue to deliver and possibly exceed in some areas, as has already happened with CBS's attendance at the seminar and workshops, which was one of the activities in implementing the quality management system. Although not specified above as an output, the quality work will also provide a quality database containing a number of agreed quality indicators for the CBS. For all outputs full documentation and an active approach to training of the CBS in the quality procedures developed in the project will be made available. It is also recognised that including practical examples in the training materials about quality processes would be very beneficial to CBS's staff. A clear priority in development

will be to ensure sustainability. It is important that the resource requirements of the new quality work are put in place in this project to match the resources CBS is able to devote to this work.

The CBS will often need to prepare a range of reports and data to support the sustainability of the quality of work. Clear examples of this are the quality indicators that need to be calculated before being added to the quality database. This will place an overhead of costs on the CBS staff, although this overhead will be the highest in early days of preparing these indicators and will afterwards start gradually reducing. It will be important that the CBS ensures that their experts meet this overhead cost in populating the quality dataset. If this requirement is not met, the very quality of the indicators themselves will be threatened. An important action by the CBS management in ensuring the sustainability of work quality is to ensure that the outputs produced by the CBS staff are actively studied by management and have some impact on management decisions concerning the organisation and allocation of CBS's resources. So, the outputs from the work in this project on quality will help the management of the CBS in their strategic and operational policy work to identify and address priority quality issues across the statistical activities of the CBS.

In terms of progress in quality area, key outcomes in the last months include focus on the development of the Quality Database and its testing through pilot surveys. As it has been noted above, this progress has led to pressure for more development work – especially in terms of outputs from the system. As all quality documentation components are well received by the CBS, they will continue to be developed throughout time and at the focus can lie with the Quality Database, the work on TQM strategy, the glossary of quality terms or the methodological handbook. During the remaining period of the project the focus will be on drawing the activities to a close and to the full satisfaction of the CBS.

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