Introducing a Framework for Process Quality in National Statistical Institutes

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Abstract
One of the key areas of the ESS Vision2020 is the promotion of the efficiency in production processes. Such an objective calls for strengthening and enhancing the quality framework on statistical processes. At the beginning of 2000, the Leadership Expert Group (Leg) on Quality had already acknowledged the importance of quality in statistical processes by defining some characteristics that processes should have. Notably, one area of the ES Code of Practice focuses on statistical processes and introduces the principles they should follow for ensuring the quality of European statistics. However, whereas in the area of statistical output the quality framework is highly structured, this does not appear to be the case for the statistical processes. The aim of this paper is to contribute to the establishment of a framework for process quality in National Statistical Institutes. Processes are first defined and classified according to their different nature, e.g. statistical vs. organizational ones, taking into account the GAMSO (Generic Activity Model for Statistical Organizations) model recently endorsed by the UNECE High-Level Group for the Modernisation of Statistical Production and Services, including the GSBPM (Generic Statistical Business Process Model) model for statistical processes. Then, the desirable quality dimensions are defined, by analysing those introduced by the Leg on Quality (efficiency, effectiveness, robustness, flexibility, transparency and integration), assessing their suitability to be applied to the different types of processes of a statistical organisation and adding new relevant characteristics, such as "identified", which means that the process is mapped, the responsibilities are assigned and the procedures are defined, and "controllable", meaning that it can be monitored and assessed against targets.
The framework proposed represents a precondition for the definition of quality indicators and assessment methods for process quality at different levels of a statistical organisation.

Keywords: Process quality

1. Introduction

The European Statistical System (ESS) can rely on a consolidated quality framework for assuring high quality statistics. The framework was developed over the last decades to respond to the requirements of the stakeholders and users of official statistics.

The European Statistics Code of Practice (ES CoP), (Eurostat, 2011) represents a cornerstone for quality activities of the European National Statistical Institutes (NSIs) and the other Statistical Authorities. As known, it encompasses the following areas: *i)* institutional environment, *ii)* statistical processes and *iii)* statistical products. The ESS Quality Assurance Framework (QAF) (Eurostat, 2013) suggests methods and tools both at institutional level (meaning the entire organization) and at process/product level in order to support the implementation of the CoP and its principles.

Nevertheless, the European quality framework is more developed with regard to product quality (i.e. the outputs of statistical production) than for process quality (i.e. the way by which outputs or products are produced). As a matter of fact, Eurostat quality dimensions clearly define the requirements for product quality that have to be satisfied in order to meet users' needs (Eurostat, 2011). Furthermore, standard Quality and Performance Indicators have been defined in order to assess and communicate product quality to users (Eurostat, 2014).

The CoP addresses the need that statistical processes are based on "sound methodologies", adopt "appropriate statistical procedures", place "non-excessive burden on respondents" and are conducted in a "cost-effective" way. However, quality requirements and standard quality measures specifically designed to measure the *process in itself* have not been fully developed so far. In 2001, the Leadership Expert Group (Leg) on Quality, for the first time acknowledged the importance of a Total Quality Management approach based on continuous quality improvement. The Leg defined some characteristics that the statistical process should follow and recommended to measure key process variables in order to improve statistical processes (Lyberg *et al.*, 2001).

Recently, the attention to process-oriented approaches and the focus to organizational issues has increased (CES, 2015). It has also been recognised the importance to consider the other

processes that contribute to the production of statistical outputs, besides statistical processes (Unece, 2015). Even though statistical processes have a direct impact on the outputs thus affecting their quality characteristics, it is true that statistical production occurs in a wider context where other processes such as administrative, IT, knowledge management processes, are becoming more and more influential.

This paper provides some inputs for the development of a framework for process quality. The aim is twofold: *i)* to define process quality requirements starting from the work done by the Leg on Quality as a first step to develop appropriate quality measures for processes and *ii)* to extend the quality framework to other processes beyond statistical ones, recognizing the growing importance of such processes in the modernisation of official statistics.

2. Review on process definitions and process quality

A *Process* can be defined as "sequence of interdependent and linked procedures which, at every stage, consume one or more resources (employee time, energy, machines, money) to convert inputs (data, material, parts, etc.) into outputs. These outputs then serve as inputs for the next stage until a known goal or end result is reached"[1]. Essential factors of a "generic" process are then input(s), output(s) and a set of steps or activities that transform inputs into outputs.

A process classification widely used in the management control (Anthony, 1965) identifies: *i) Strategic processes*; *ii) Management processes*; *iii) Operational processes*. They include the activities of strategic planning, management control and operational control, respectively. Strategic processes are those aimed at medium-long term planning of the organisation. Management processes are those that support the translation of the medium-long terms objectives in the short terms (annual) programs, and permit the control of the fulfilment of the objectives. Their clients are internal to the organisation**.** Operational processes are those concurring to the objectives achievement, and respond to clients' needs "external" to the institution.

[1] http://www.businessdictionary.com/definition/process.html

In other words operational processes correspond to *Business* processes. Nowadays, this terminology is commonly used also in the statistical context.

In manufacturing, the relevance of process quality has been recognised decades ago and methodologies for Statistical Quality Control (SQC) of industrial processes are well developed and currently used (Grant and Leavenworth, 1996). The underlying hypothesis is that improving process quality leads to better quality outputs. Indeed, SQC techniques such as Pareto diagrams or control charts, consist in monitoring *key variables* that, by definition, represent the quality of the output, while the process is ongoing and, if needed, appropriately act on the process to have an improving effect on the output. Thus, the focus is always on the output quality and the process is considered as a mean to obtain the output. Product should meet specifications, any variation from specifications can be due to common (expected and unavoidable) causes or special (extra and unexpected) causes acting on the process. The process should be "stable", i.e. all special causes are removed, and "capable", i.e. the specifications should be met (Ryan, 2000).

3. Proposal for a framework on process quality

3.1 Scope of the framework

A comprehensive list of the different activities in a statistical organisation is reported in the Generic Activity Model for Statistical Organizations - GAMSO (Unece, 2015), and summarised in Figure 1. As it can be observed, GAMSO approach is not distant from the classification introduced in section 2, where the sub-activities under the *Strategy and Leadership* area are Strategic Processes, those in the *Capability Management* and *Corporate support* are Management Processes and the *Production activities* are, obviously, the Business Processes whose description is provided by the Generic Statistical Business Process Model – GSBPM (Unece, 2013).

The GSBPM was developed some years before GAMSO and it is becoming the main reference model for describing "the set of business processes needed to produce official statistics". It provides "a template for process documentation, for harmonizing statistical

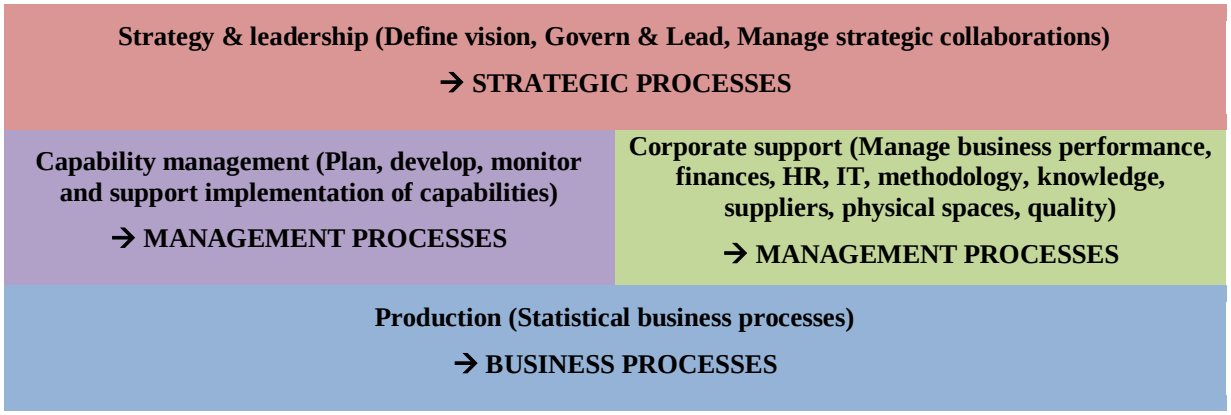
computing infrastructures", and "a framework for process quality assessment and improvement" (Unece, 2013).

One of the goals of GAMSO is to extend and complement the GSBPM "by adding additional activities needed to support statistical production" (Unece, 2015). These activities are important in the modernization of official statistics since "statistical production occurs within a broader context of corporate strategies, capabilities and support" (Unece, 2015).

Strategy and leadership area has a straightforward correspondence to Strategic Processes as described in section 2. Capabilities and corporate support are Management Processes that aim at different purposes. Capability management concerns the planning, development, monitoring and supporting the implementation of the "capabilities that underpin an organization's ability to conduct its business" (Unece, 2015). Corporate support encompasses "the cross-cutting, functions required by the organization to deliver its work programme efficiently and effectively" (Unece, 2015) covering activities such as Business and performance, finances, human resources, IT, methodology, information and knowledge, consumers, data suppliers, physical spaces, and last but not least quality.

Thus, GAMSO distinguishes the area where capabilities, e.g. re-use or sharing of infrastructures and technologies, are planned and developed from the area where its corporate implementation is accomplished (i.e. corporate support area).

Figure 1. Strategic, management and business process mapped in GAMSO



In an holistic perspective each activity and related processes is relevant for quality, thus it can be monitored and assessed according to a process quality perspective. This idea is not new for business processes, even though the focus was more on the output quality than on the process itself (see section 1).

Aim of this paper is to introduce a framework for process quality applicable to the business processes and the subset of management processes represented by the GAMSO's activities in the Corporate support area.

3.2 Process quality dimensions

"The product is generated by an underlying process. It is unlikely that the product will have good quality if the underlying process is not up to par" (Lyberg *et al*. 2001). Analogously to the quality framework for product quality, we can also define quality dimensions for the process. As already mentioned, several characteristics and requirements for process quality have already been identified by Leadership Group on Quality (Lyberg *et al.*, 2001)[2].

In this section, we suggest an extension of the quality requirements that a statistical business process should satisfy in order to ensure an adequate level of output quality starting from those already proposed by the Leg on Quality. Some quality requirements are gaining importance in the context of the modernization of official statistics and in the application of the international standards developed more recently (as GAMSO and GSBPM).

The following set of requirements is proposed for business and corporate support processes of a statistical organisation: *identified*, *transparent*, *reproducible*, *reliable and robust*, *effective*, *efficient*, *controllable*, *flexible*, *integrated* and *secure*. These requirements may be related to the process as a whole or to its components, i.e. phases and sub-processes following GSBPM terminology.

Identified. *The process/phase/sub-process is well defined and mapped to a standard model or tool*. In order to be identified, a process should be specified according to well-known rule of 5

[2] The aims of process quality are to gain efficiency, effectiveness, robustness, flexibility, transparency, and integration (LEG on Quality, 2001)

W (who, what, when, where, why) or even to the 8 elements of St. Thomas Aquinas (quis, quid, when, ubi, cur, quantum, quomodo, quibus auxiliis) from which the rule of 5 W derives, as specified in table 1.

Table 1. Eight elements of St. Thomas Aquinas

Element	**Meaning**
"Quis" (Who)	who is responsible and who carries out the process/phase/sub-process
"Quid" (What)	what is done in each process/phase/sub-process
"Quando" (When)	each process/phase/sub-process has a starting and ending dates (time length)
"Ubi" (Where)	where the process/phase/sub-process is carried out, e.g. internally or externally; centralised or decentralised
"Cur" (Why)	aim of the process/phase/sub-process
"Quantum" (How many, how much)	volume of input and output for each process/phase/sub-process
"Quomodo" (How)	methodologies, techniques, procedures, software and tools (e.g. protocols, agreements, contracts, …) for each process/phase/sub-process
"Quibus auxiliis" (by which means)	human, technical and financial resources necessary in every process/phase/sub-process

Transparent. *The process/phase/sub-process is documented in a clear, complete, accurate and updated way and the documentation is easily accessible to users and stakeholders*.

Reproducible. *The process/phase/sub-process produces the same output if replicated on the same input.*

Reliable and robust. *The process/phase/sub-process is reliable if its correct functioning is guaranteed*. For example reliability could be measured as the probability that an IT system does not break down. *The process/phase/sub-process is robust if it achieves results against unexpected situations.*

Effective. *The process/phase/sub-process is successful in delivering the desired outcomes.*

Efficient. *The process/phase/sub-phase produces the expected outputs cost-effectively*. Gains in efficiency are obtained when a process delivers the expected results with the same quality but with less resources (in terms of personnel, costs or both).

Controllable. *The process/phase/sub-process is monitored and assessed against targets.*

Flexible. *The process/phase/sub-process is readily adaptable to changing needs and demands*.

Integrated. *The process/phases/sub-process can be easily combined with other processes/phases/sub-processes*.

Secure. *The risks associated to process/phase/sub-process are analysed and prevented.* For business processes risk analysis should also refer to possible loss of data (input and output). Data confidentiality should be guaranteed in each process step.

It is worthy to notice that a process which is identified, transparent and reproducible in all its phases/sub-processes allows for the traceability of the data along the whole statistical business process.

The proposed process quality dimensions seem to apply to any kind of process/phase/sub-process within a statistical business and a corporate support process. Particularly, they have been analysed with respect to two sub-processes: *i)* the selection of an outsourcing company for the Computer Assisted Telephone Interviewing and *ii)* the Classify and code. The first sub-process is a corporate support process, the second one is part of the business process. Most process quality dimensions are straightforward for both processes, for example: *identified, transparent, reproducible, effective, efficient, controllable* and *flexible*. Other dimensions, such as *reliable and robust* may as well apply, but may be more relevant for those sub-processes performed via IT.

Finally, process quality dimensions may assume different relevance depending on the type of process/phase/sub-process and organizational factors. For example, the dimension *integrated* can become highly relevant in the context of the modernization of statistics, where some services are centralized.

4. Concluding remarks

In this paper, starting from the work laid down by the Leg on Quality (Lyberg *et al.*, 2001), a set of process quality characteristics has been proposed. They are the pillars for developing a structured framework for quality assessment and monitoring, encompassing proper measurements, and monitoring methods. Given the growing importance of the organizational activities, well acknowledged in GAMSO (Unece, 2015), the framework has been extended to corporate support processes so far not considered from a quality perspective, as far as we know.

Similarly to what happens for statistics quality dimensions, it is expected that quantitative measures will be more easily available only for a subset of dimensions, and not for all of them. In addition, the measures for some dimensions will be the same independently if referred to a statistical business process or to a corporate support one. A trivial example is the duration of the process/phase/sub-process. In other cases, the measures might be more dependent on the nature of the process/phase/sub-process.

A starting point to identify monitoring methods can be found in Aitken *et al.* (2004): the handbook on process variables developed on the basis of Leg on quality recommendation n.2[3] in which Statistical Quality Control methods developed in manufacturing are applied to statistical business processes.

As a final goal every organisation should be able to introduce and maintain a quality management based on measurements and assessment of tailored indicators for both business and corporate support processes in a holistic approach.

[3] "Process measurements are vital for all improvement work. A handbook on the identification of key process variables, their measurement, and measurement analysis should be developed."

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