

Chapter 13 QUALITY MANAGEMENT AND REPORTING

Introduction

1. Consumer price indexes (CPI) are one of the most important and widely used of macroeconomic indicators. Besides informing economic policy, they are used for indexation of welfare benefits, pensions, salaries and wages, gilts and securities, and also for escalation clauses in private contracts. Accuracy and reliability are particularly paramount for a statistic as important as a CPI.
2. This chapter addresses the issue of quality management and reporting. It gives an overview of the processes and procedures that can be used for quality control of the CPI production process and the quality indicators that can be used to measure the extent to which the computed index meets the prescribed concepts and methodologies which underlie and define the target index. It begins by providing an overview in the context of the IMF's Data Quality Assessment Framework (DQAF) and then describes various quality management systems and key aspects and processes of quality management with reference to the on-going production of a CPI.
3. The CPI should be produced in accordance with the UN *Fundamental Principles of Official Statistics*¹. The ILO *Guidelines concerning dissemination practices for labour statistics* should also be respected².
4. The IMF Data Quality Assessment Framework (DQAF) identifies quality-related features of governance of statistical systems, statistical processes, and statistical products. It is rooted in the UN Fundamental Principles of Official Statistics and grew out of the Special Data Dissemination Standard (SDDS) and General Data Dissemination System (GDDS), the IMF's initiatives on data dissemination. The DQAF provides a structure for assessing existing practices against best practices, including internationally accepted methodologies. It has proved to be useful to national statistics office in undertaking self-assessments of the quality of their CPIs and whether they are fulfilling their obligations to compute a fit-for-purpose CPI, as well as in guiding data users in evaluating data for policy analysis, forecasts, and economic performance.
5. The DQAF covers governance, processes, and products. It is organized around a set of prerequisites and five dimensions of data quality—assurances of integrity (institutional integrity, transparency, ethical standards), methodological soundness (concepts and definitions, scope, classifications), accuracy and reliability (adequate data sources and statistical techniques), serviceability (periodicity, consistency, revisions policy), and accessibility (data and metadata accessibility, assistance to users). For each dimension, the DQAF identifies 3-5 elements of good practice, and for each element, several relevant indicators. The focus of this chapter is methodological soundness and, more particularly, accuracy and reliability. The DQAF for a CPI is described in the section that follows. The DQAF for the CPI provides an assessment at a detailed level. For instance, a specific sub-category under the heading of accuracy and reliability relates to sample design and whether the estimation procedures are soundly designed to represent the survey universe. More specifically, whether scientific random sampling techniques and/or cut-off sampling are used to select geographic areas, items, outlets, and product varieties and where sampling frames are not adequate to support statistical sampling, judgmental sampling is used as a second-best procedure with well-defined and published criteria for selection. Also under the same heading is addressed the issue of revision studies, as a gauge of the reliability of the published CPI, and the corresponding policy on revisions.

Data Quality Assessment Framework (DQAF) for a Consumer Price Index

6. A conceptually based and systematically executed approach to data quality assessment is essential to achieve a high-quality CPI. But the IMF's Data Quality Assessment Framework (DQAF) for a

¹ <http://unstats.un.org/unsd/dnss/gp/fundprinciples.aspx>.

² Sixteenth International Conference of Labour Statisticians, 1998.

Consumer Price Index³ is not mechanistic, rather it provides a flexible structure specifically for the qualitative assessment of a consumer price index in a country context. The DQAF covers the various quality aspects of data collection, processing, and dissemination.

7. The Framework is organized in a cascading structure that progresses from the abstract/general to the more concrete/specific details. For example, under the headings of methodological soundness and accuracy are listed a number of sub-headings.
8. The methodological soundness dimension is assessed against the guidelines outlined in the *System of National Accounts 2008 (2008 SNA)* or the *European System of Accounts 1995 (1995 ESA)*, and the *CPI Manual*. The concepts and definitions from the *2008 SNA* are used as guidelines with regard to coverage and valuation, and the methods and procedures from the *CPI Manual* are used as guidelines for compiling the CPI. The *2008 SNA* and *1995 ESA* are viewed as interchangeable whenever reference is made in this document to the *2008 SNA*. *1993 SNA* concepts and definitions hold for countries still using these standards. The sub-headings are concepts and definition, scope, classification/ sectorization, basis for recording. Similarly, the accuracy and reliability dimension is assessed against whether the source data and statistical techniques are sound and statistical outputs sufficiently portray reality. The considerations are wide ranging. For example, with respect to source data the appraiser is asked to assess whether the sample and the estimation procedures are soundly designed to represent the survey universe. This covers both 1) sampling and whether scientific random sampling techniques and/or cut-off sampling are used to select geographic areas, items, outlets, and product varieties and 2) where sampling frames are not adequate to support statistical sampling, judgmental sampling is used as a second-best procedure with well-defined, and published, criteria for selection (see earlier reference). Similarly, for statistical techniques the assessment is based on a wide range of indicators relating to whether the statistical techniques employed conform to sound statistical procedures. Sound statistical procedures include specific issues that arise in index construction and the CPI, such as the treatment of quality change for matched samples and the alternative methods of measurement of owner occupier housing costs and also index construction. On the latter, more specifically that the arithmetic mean of price relatives (Carli) is not used to calculate the elementary (item) level indexes due to its bias, that the ratio of arithmetic mean prices (Dutot) is only be used for homogeneous item and that the geometric mean of price relatives (equivalent to the ratio of geometric means) is adopted as the preferred measure.
9. Further explanation is given at Appendix 12.1
10. The DQAF is broad in terms of its inclusions. For example, it also addresses whether appropriate statistical methods are used to handle missing prices and to facilitate the introduction of new products that are within the scope of the CPI. Thus, the compiler is asked to confirm: that prices for temporarily missing products are appropriately handled (e.g. a price is imputed based on the month-on-month price changes of a higher group, or a more targeted sub-group when judged, and prior data show, it is more suitable, sample sizes permitting); the imputed price is posted in the database; a limit as to how long (two months, say) prices for “temporarily” missing items are established and adhered to. For seasonal products also the compiler is asked to indicate that prices are imputed using the higher group price change or a more targeted sub-group when judged (based on prior data) that it is more suitable, sample sizes permitting. Fixed weight formulas are generally advised. Imputed prices are recorded in the data base and, where there is no quality change, directly compared with the new season’s price to facilitate the self-correcting nature of the procedure.

Quality management and quality management systems

11. For most national statistical institutes, quality control of production will be an area which represents a high risk, given the complexity of the process from price collection to index computation and the financial implications of an error in the index. This is so regardless of the institutional arrangements

³ Data Quality Assessment Framework (DQAF) for the Consumer Price Index. Real Sector Division, International Monetary Fund 700 19th Street N.W. Washington, D.C. 20431. Telefax: (202) 623 6028. E-mail: realsta@imf.org

and formal processes in place for auditing. It follows that a priority area in the quality management of a CPI is quality control of the production process.

12. At a more basic or general level a common thread is customer focus and the effective dissemination of relevant, accurate and timely statistics. Thus, the implementation of an effective quality management system requires a high level of understanding of customer needs and the translation of this into a coherent statistical and quality framework. Such a framework is also necessary for putting together criteria for judging success. User needs can be canvassed either formally through negotiation of contractual obligations that may or may not be legally binding, or less formally through talking to customers on a one-to-one basis or through customer surveys. The overall objective underpinning user engagement and communication, is to identify and where possible address user needs, for example in terms of the publication of a family of indexes or CPIs at a sub-national level, and also to build user understanding and confidence in the CPI.
13. In addition, it can be argued that quality management should include effective customer education on the use of such statistics. In these terms, success can be measured not only by the achievement of a high level of satisfaction amongst well-informed users but also their proper use of statistics. The accessibility to users of relevant meta-data has an important role in this. The NSI or related authority has the responsibility to monitor the use of the CPI and identify instances where it is being incorrectly used.
14. In many countries, issues relating to the governance of the national statistical institute are set down in a “framework” or similar document. This defines the functions and responsibilities of the national statistical institute or other related authorities with a role in official statistics, and generally guides and directs the work of the office. For instance, an objective stated in the framework document “to improve the quality and relevance of service to customers – both in government and the wider user community”- provides a powerful statement for determining work-plans.
15. This recognition of the importance of quality can be further endorsed by a published vision of the national statistical institute as a key supplier of authoritative, timely and high-quality information. Such a vision can be encapsulated by publishing objectives in an annual business plan. These objectives can include improving quality and relevance, thereby increasing public confidence in the integrity and validity of outputs.
16. As indicated in the earlier discussion of the IMF's DQAF, performance can be measured against a combination of a number of factors, including accuracy, timeliness, efficiency and relevance. There are a number of quality management systems at the disposal of the CPI compiler.

Quality management systems

17. A quality management system is a formalized system that documents processes, procedures, and responsibilities for achieving quality policies and objectives. A quality management system helps coordinate and direct an organization's activities to meet customer and organization requirements and to comply with regulatory requirements and to improve its effectiveness and efficiency on a continuous basis.
18. A number of best-practice standards, available to be exploited to help organizations to improve quality management, have the advantage of being internationally recognized.
 - a. *Total quality management.* Total quality management (TQM) is more closely identified with a management philosophy rather than a highly specified and structured system. The characteristics associated with TQM and an effective culture of quality in an organization to fulfil operational objectives efficiently and effectively, include.
 - i. Clearly defined organizational goals.
 - ii. Strong customer focus.
 - iii. Strategic quality planning.
 - iv. Process orientation.
 - v. Employee empowerment.

- vi. Information sharing.
- vii. Continuous quality improvement.

Total quality management requires a commitment by all relevant parts of a production system to define their starting points, procedures and endings. Revilla (2004) describes four dimensions of total quality management: consumer satisfaction; constant improvement; fact based management; people based management.

TQM has a broad focus ranging from an individual statistical product and its production to the entire system of statistics production and to other core processes, and from there on to the entire management system, personnel, partnerships and resources. By systematic management of these aspects one can create an operating system that emphasises quality and thereby also improves the quality of end products.

- b. *Benchmarking*. Benchmarking is a process of comparing with others, and learning from them about what you do and how well you do it, with the aim of bringing about improvements. Areas that can be considered when benchmarking a CPI collection may include.
 - i. Timelines, accuracy and coverage of collection.
 - ii. Benefits of index methodologies for various items, e.g. seasonal items. Frequency of collection and publication.
 - iii. Cost of collection per unit of commodity, etc.

A number of general observations can be made about benchmarking.

- i. Initial discussions between benchmarking partners, prior to the process itself, can provide a useful tool issues through informal self-evaluation for the identification of potential.
- ii. The value of benchmarking is not restricted by the limited range of performance indicators that may be available, discussion can extend beyond the directly measurable to why different national statistical offices adopt different approaches to some aspects of index construction.
- iii. Benefits more often than not continue to accrue beyond the benchmarking exercise. For example, from follow-up action points. Benchmarking is the beginning rather than the end of the process of improvement;
- iv. Correspondingly, the further exploration in greater detail of issues raised during the course of the initial benchmarking can pay dividends. The general experience is that work becomes more focused on specific issues as the benchmarking progresses and the issues of concern become more apparent.
- v. Longer-term benefits also include the subsequent opportunity for networking.
- vi. Financial and management information compiled specifically for benchmarking can be useful management information in its own right.
- vii. Performance indicators are a necessary ingredient of the process of continuous improvement and are not just short-term management tools.

A number of general factors can be identified that contribute to successful benchmarking: most particularly, benchmarking is dependent on trust and mutual respect between the parties involved.

- c. *European Foundation for Quality Management Excellence Model*. The Excellence Model constructed by the European Foundation for Quality Management (EFQM) is a diagnostic tool for self-assessment. The model has been widely used by governmental organizations across Europe to improve quality and performance. It may be described as a tool that drives the philosophy of TQM.

The EFQM Excellence Model focuses on general business areas and assesses performance against two sets of criteria – the first consists of five criteria covering what

the business area does (the enablers: leadership; people; policy and strategy; partnership and resources; and process), and the second consists of four criteria on what the business area achieves (the results: people results; customer results; society results; and key performance results). Evidence based on feedback from focus groups, questionnaires and personal interviews is used to score performance, and a resulting action plan for improvement is introduced, which is then included in the business plan.

Underlying the EFQM Excellence Model is the realization that business excellence – measured through customer satisfaction – is achieved through effective leadership which drives policy and strategy, allocates resources compatible with that policy, and manages employees in such a way as to enable them to manage the processes.

In the case of national statistical institutes, where some procedures are governed by statute or regulation, the use of the EFQM Excellence Model enables continuous improvement to be taken forward across a range of processes and functions. To work effectively and to contribute to the production of a high quality CPI, the Excellence Model needs the commitment of senior managers, who must be responsible for leading any self-assessment. However, unlike ISO 9001, where assessment is carried out by qualified auditors often from outside the work area (see below), the EFQM Excellence Model relies on input from all staff.

- d. *ISO 9001*. ISO 9001 sets out the criteria for a quality management system that can be applied to any field of activity including the computation of a CPI. This standard is based on a number of quality management principles including a strong customer focus, the motivation and implications with respect to management, the process approach and continual improvement. The International Standard ISO 9001 is an international quality standard for management systems. A quality system is a common-sense, well-documented business management system that is applicable to all business sectors. It helps to ensure consistency and improvement of working practices, including the products and services produced. Users of ISO 9001 add value to their activities and improve their performance continually by focusing on the major processes within the organization. There is a closer alignment of the quality management system with the needs of the organization and the process reflects the way an organization runs its business activities. By meeting the ISO 9001 standard, an organization will come more into line with TQM and the EFQM Excellence Model.
19. A coordinated use of these and other quality management techniques at a strategic level in fields of statistics where the focus is on international comparability is encouraged. This is particularly so with statistics that are compiled for treaty purposes, for example by Member States of the European Union following detailed methodological guidelines laid down in legislation. The arguments are fivefold.
- a. It is paramount that such important non-optional statistics whose production and uses are enshrined in legislation have the full trust of users.
 - b. The quality of international comparisons is dependent on the weakest link, thus good-quality statistics from one country may be of little value if not matched by statistics of equally good quality from other countries.
 - c. There is a potential for misleading analysis and conclusions arising from differences in the application of standard methodology.
 - d. Empowerment in ensuring the establishment of adequate control processes is reduced when production is delegated to member States.
 - e. There is limited scope for centralized validation and quality management when production is decentralized.

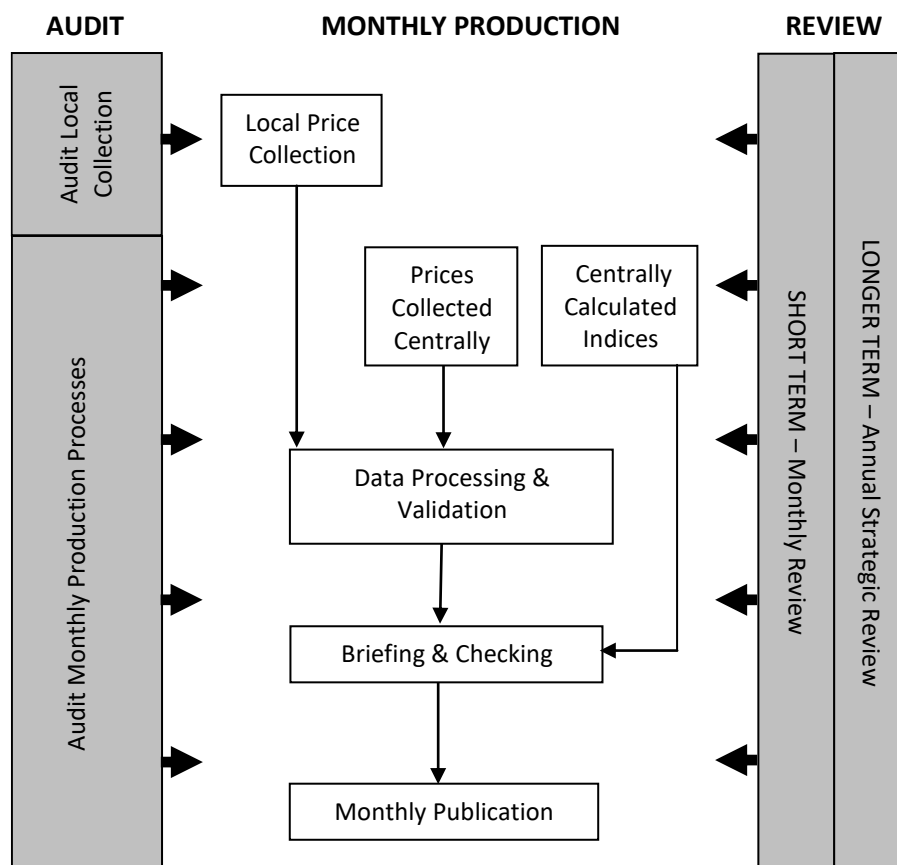
Overview of a quality management system

20. A prototype of a quality management system for the monthly collection of prices and compilation of the CPI is given in Figure 12.1. It covers all aspects of CPI data collection and compilation including the auditing of prices, validation of the production cycle itself and an annual review process which focuses on strategic and longer term issues. The latter is strongly encouraged because it is a major

way of learning from past experiences and of identifying and taking forward actions which will improve the future quality of the CPI.

21. A conscious decision needs to be taken on whether to include in the main quality management system, periodic review processes such as chain linking and the updating of the CPI basket and technical development work such as the introduction of better sampling techniques and methods of quality adjustment for replacement goods. Such work should be managed using project management techniques, if not included in the main quality management system.
22. Each aspect of a quality management system should be seen as inter-dependent and an integral part of the whole. For instance, a good quality CPI depends both on the accuracy and reliability of the source data and on the methodological soundness of the index computation, and the computation of the index relies on the delivery of an accurate, accessible and timely database. The precise outline of such a system will depend on the detailed arrangements and approach to price collection. For instance, the diagram below allows for the possibility that some prices data is collected directly from the headquarters of large supermarkets or other chain stores (sometimes referred to as central shop prices) and that some price indexes are calculated using price and sales information provided by a central authority, such as for energy prices or telecommunications, or are based on special methodologies requiring tailor-made index calculations such as for owner-occupier housing costs (sometimes referred, generically, as centrally calculated indexes).

Figure 12.1. Quality Management System for the CPI



Documentation

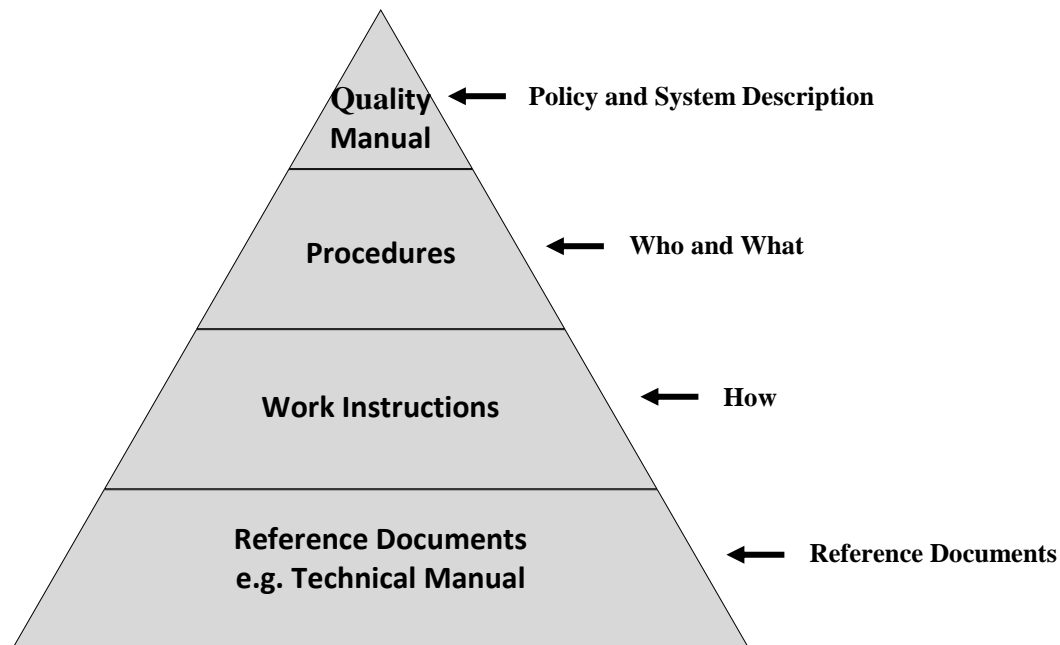
Overview

23. Good documentation is important as it can reduce the risk of errors from ambiguities and from misunderstandings and it can also identify aspects of methodology and compilation which warrant a review. There are four levels of documentation which underpin a quality management system. Figure 12.2 shows a typical structure for documentation relating to a CPI.
- a. *Level 1 - The Quality Manual*. This document defines the Quality Policy and gives a general description of the system. It also describes the organisation of staff involved in producing the CPI, the division of responsibilities for the management of all aspects of the production cycle, and the general structure of the lower levels of documentation.
 - b. *Level 2 - Procedures*. These are a set of mandatory procedures, covering all aspects of the production cycle. They explain in broad detail the different parts of the monthly processing cycle and outline the responsibilities of the staff involved.
 - c. *Level 3 - Work Instructions*. The work instructions give full details on exactly how a task should be carried out.
 - d. *Level 4- CPI Technical Manual*. The CPI Technical Manual describes the procedures used to produce the Consumer Price Index and the price indexes derived from it. It is aimed at users of the CPI who want to know how the data are collected and analyzed and what formulae are used in the calculation together with other methodological detail.

Documentation control

24. All documents in the Quality Management System should be subject to document control. The procedures on Documentation Control should explain how the document control works to ensure that all staff have access to the most up-to-date version when carrying out their work. In some NSI offices this is done by storing such documents as the Quality Manual, Procedures and Work Instructions electronically in a database managed by a document control custodian and using numbered versions to identify the latest copy.
25. An electronic system of documentation storage and control is recommended where the necessary technical infrastructure exists because it has four benefits over a manual system.
- a. *More efficient production* of documentation as it helps with initial compilation and reduces the need to print and circulate paper copies.
 - b. *Better informed staff* because they have immediate electronic access to *latest* documentation including desk instructions with search facility by subject and author.
 - c. *Better quality control* as authors, with the involvement of the document control custodian, can readily amend, date stamp and reference number updates and, just as importantly, access to non-authors is restricted to “read only”.
 - d. *Better search facility*, for example if staff are looking for cross references to a particular subject such as “chain-linking” or “weights”.
26. Where a national statistics institute does not have the necessary IT infrastructure to operate an electronic system, it is still important that a document control custodian is appointed with the task and authority to keep a record and quality assure the most up-to-date paper documentation. The same principles of good documentation management apply whether the documents are stored electronically or are kept in paper folders.
27. A form for a document control template is given at Appendix 12.2.

Figure 12.2 Documentation



Internal audits of production processes

Overview

28. In the context of a CPI an internal audit is a systematic and independent examination of the agreed processes undertaken to compile the index, as defined, through examination, the obtaining of evidence, and an evaluation of performance against the measurement objective i.e. of producing a reliable, accurate and timely CPI that adheres to the stated scope and definition. Quality audits are performed to verify conformance to standards through a review of objective evidence but can also be used to verify the effectiveness of a quality management system. Recommendations with action points are given in the audit report and should systematically be followed up (see later reference). The advantage of internal audits compared with a less formal approach is that they provide a standardised, systematic and transparent process for assuring achievement of objectives.
29. The auditing function is represented by the left-hand column of Figure 12.1. Note that the auditing of price collection is specifically addressed in Chapter 6. It is strongly advised that internal audits of the entire production process are carried out regularly according to a systematic timetable and that they are conducted by an internal audit team. Audits should cover all aspects of the monthly and annual processing cycle to ensure that the management systems are fully implemented and provide effective controls for Quality Assurance. The purpose of each audit should be to verify that operational procedures and controls comply with the documented procedures and to determine their effectiveness in delivering a consumer price index which is fit for purpose. Thus, an audit should aim not only to ensure that the index compilers adhere to the agreed procedures but that the procedures are improved where found lacking.
30. Audits should be conducted by personnel having appropriate training and experience to do so, ideally by people who are sufficiently detached from day-to-day operations to take an independent and objective view unhindered by close involvement in the production and compilation of the consumer price index. Too much familiarity can lead to unwarranted assumptions about the appropriateness of the procedures and the extent to which they are followed.
31. What follows is a description of the standard processes associated with performing an internal Audit and producing an Audit Report, with illustrative examples of the associated documentation.

32. To achieve external accreditation, such as ISO 9001(2000), additionally requires the organization to undergo an external audit twice a year by the appropriate accreditation body. The advantages of obtaining external accreditation are that.
- a. It gives a discipline to reviewing and specifying production procedures and to properly documenting and quality controlling them.
 - b. It can provide the efficiencies associated with a ready-made standard for documentation and quality control and the added trust associated with a well-tested system. It minimizes risks of errors by adding effective controls including a framework for the initiation, evaluation and implementation of change.
 - c. It increases public confidence in the CPI, for instance as an index produced in accordance with internationally recognized standards.
 - d. It provides a basis for more effective training of experienced staff and the induction of new staff.
33. Internal audits can provide the same level of objectivity and discipline where external accreditation is not an option and can be used on their own or in conjunction with external audits. It is recommended that internal audits are undertaken by people who are at arms-length of the processes being audited. Other options include external audits carried out by CPI compilers from another statistical institute – in effect a form of peer group appraisal.

The role of an audit team and the responsibilities of its members

34. It is recommended that an “audit team” is assembled which at a minimum consists of a Quality Manager and an internal auditor, each with a distinct, well-defined and complementary role. Where this is not possible because of resource constraints the two roles can be combined or the roles can be undertaken in conjunction with other responsibilities. In some statistical offices the role of auditing is undertaken by a methodology branch whose responsibilities extend beyond auditing to the development and introduction of better statistical techniques, or by an external government body. Whatever arrangement is adopted, it is important that sufficient numbers of staff, qualified in auditing, are available in order to carry out these audit functions.
35. The Quality Manager should be responsible for.
- a. Producing an Audit Schedule, managing it and ensuring it is updated as necessary.
 - b. Agreeing and specifying the objectives and scope of the audit.
 - c. Managing implementation of the audits specified in the Schedule.
 - d. Ensuring the auditor is properly trained.
 - e. Ensuring that, where possible, the auditor is independent of the function being audited.
 - f. Ensuring Review Reports are written.
 - g. Ensuring audit action points are implemented.
36. The Quality Manager should prepare a schedule of audits covering all aspects of the CPI production processes. This schedule should take account of.
- a. The importance and complexity of the different stages involved in the compilation of the CPI.
 - b. The results and concerns arising from previous audits and any issues which have arisen since.
 - c. The time since the previous audit.
37. An example of a pro-forma for an audit schedule is given in Appendix 12.3. The Internal Auditor should be responsible for.
- a. Undertaking any necessary pre-audit investigation which will help determine the audit schedule and the focus and scope of investigation.
 - b. Conducting the audit itself.

- c. Producing and circulating the audit reports.
- d. Updating documentation where necessary.
- e. Taking responsibility for monitoring and following-up actions from the audits themselves.

Objectives of an Audit

38. The objectives of an audit need to be clearly defined and agreed before it starts. The precise objectives will depend on local circumstances, but may be stated in general terms as follows.
- a. To assess compliance with documented procedures.
 - b. To provide assurance to senior management that the agreed Quality Management System is being implemented, and is effective and relevant.
 - c. To identify improvements required and any necessary corrective actions and preventive measures. This includes taking action to prevent problems occurring in future.
 - d. To ensure activities are in accordance with the Quality Management System. This includes identifying whether there are any activities being undertaken which affect the quality of the index but which are not included in documented procedures.
 - e. To ensure the procedures are adequate.

Auditing procedures and techniques

39. The success of an audit relies not only on clear objective setting and well trained auditors but also on the use of effective auditing procedures and techniques including a review of documentation and the carrying out of structured interviews with index compilers.
40. It is recommended that audits should incorporate the following procedures as standard.
- a. *Before the audit.*
 - i. Review documentation for completeness and that it is up-to-date and indexed properly. Where applicable, check that updates are signed off correctly, and that minutes, action points and other documentation are correctly filed.
 - ii. Trace action points from previous audits and any reviews that have taken place, for example, compilation procedures.
 - iii. Prepare checklists to help facilitate the structured interviews.
 - b. *During the audit.*
 - i. Conduct structured interviews.
 - ii. Ask to be shown documentary evidence (spreadsheets, signatures on spreadsheets) to support staff responses to questions.
 - iii. Identify issues as they arise and advise the index compiler.
 - c. *After the audit.*
 - i. Produce a report, with recommendations.
 - ii. Provide compilers with the opportunity to comment and then agree on an action plan.
 - iii. Try and resolve any disagreements and where appropriate include the index compilers comments in the report.
 - iv. Note opportunities for improvement to current procedures as well as non-compliance with them.

Audit report

41. It is recommended that similar issues identified in several areas are grouped under the same heading and documented as one audit observation. Clear and succinct headings should be used for each issue identified and a short description given of what was found. Observations can either be made in order of the most significant ones first or they can follow a logical sequence, generally the order in which the work activities underlying the compilation of the index are carried out.

42. For each audit observation, suitable remedial action should be recommended together with a statement of who is responsible for carrying out the remedial action and the date when the action should be complete. It is important to check that action points are carried through and that this is recorded with any further issues that arise.

Risk Assessment

43. In order to prioritize follow-up actions it is recommended practice to attribute an overall score to the risk associated with the issues arising from the audit. This can also be done individually for each issue identified and is a decision to be made by the NSI.
44. The results of an audit may be categorized as.
- a. *Low Risk* if the issues which have been identified are unlikely to arise and if they did would not result in major difficulties for the published CPI, such as errors in the published index.
 - b. A *High Risk* categorization will be justified if there is a significant chance that unless addressed the issue could lead to an error in the index, that is, the error will be of high impact and there is a significant chance of it happening.
 - c. The results of all other audits should be deemed to be of *Medium Risk*.
45. If judged appropriate, the Quality Manager may issue an instruction for a follow-up audit. The proposed date for this audit should be added to the Schedule for Follow-up Audits and Progress Checks, and the actual date of the audit should be added to the schedule of internal audits. Whenever possible, the follow-up audit should be carried out by the same auditor who undertook the initial audit.
46. Appendix 12.4 gives an example of a template for an audit report and the recording of follow-up actions.

Review systems

47. This is represented by the right-hand side of diagram 12.1. A review system not only provides a check on current operational procedures but also helps to inform decisions on the introduction of longer-term improvements so that the Quality Management System continues to be up-to-date and relevant and to ensure that business risks are kept to the necessary minimum. It is for this reason that national statistics institutes are encouraged to put in place monitoring arrangements to track performance, supplemented by both short-term and longer-term review procedures.

Monitoring performance

48. Underlying what follows is the important principle that the effective management of the process of producing a CPI relies on an agreed set of objectives which, where possible, are supplemented by measurable targets.
49. Targets for the delivery of a CPI may cover both quality (data and statistical methodology) and timeliness and may encompass both the tracking of the data collection and compilation processes and the quality of the final output - the CPI. The national statistics institute will need to decide which are the most relevant for its CPI. Possible targets for monitoring monthly performance in terms of the process of compiling the CPI and maintaining its relevance, that is the intermediary steps in compiling a CPI and the subject of this chapter, can include.
- a. *Timeliness* - process delivery times meeting the agreed schedule. For example, whether the prices data was entered on to the computer and edited to the agreed timetable or whether index compilation took place on time so as not to potentially compromise publication.
 - b. *Accuracy* – This might include the proportion of prices which are found to be wrong, the number of prices collected compared with target sample, errors in the compilation of elementary aggregates. Accuracy and timeliness are interconnected. It is important that the quality of the index is not compromised by, for example, not allowing sufficient time for data editing and for checking of the index calculation prior to publication.
 - c. *Delivery* – This might include the delivery of planned reviews of specific sub-indexes and methodological reviews.

50. Clearly, an agreed monthly schedule of tasks associated with the compilation of the CPI is required in order to be able to measure performance as well as being required for the management of the processes.
51. Quality measures should be set for each stage of the compilation process. These measures, which should be as quantitative as possible, should be evaluated against pre-determined targets on an ongoing basis. Problems should be flagged during the production process allowing immediate corrective action to be taken if necessary.

Short-term monthly Reviews

52. It is good practice to hold an internal meeting of the CPI production team at the end of each month which focuses on quality and operational issues which have arisen during the course of the most recent production cycle against agreed business objectives. It would be wrong to be too prescriptive about the format of these meetings. The meetings can be fairly informal and involve a gathering of the whole team to exchange experiences and raise issues for resolution or more structured to include a general session where management presents a monthly performance report and where team members have the opportunity to react to or raise particular concerns. The format will reflect local circumstances, including the size of the team producing the CPI and the management arrangements. Depending on the issues which arise it may be useful to follow up these meetings by smaller ad-hoc groups of staff brought together to tackle specific issues. Seminars and presentations may also be given.
53. Monthly reports on errors observed at data collection, data entry, editing, coding and data cleaning stages together with any compilation issues should be circulated to relevant members of staff with a view to taking action to minimize such errors in future.
54. The monthly review meeting should also include a forward look at issues arising over the next cycle so that appropriate working arrangements and solutions to other issues arising can be put in place. Thus, the focus should be both on learning from past experience, for example to avoid problems repeating themselves, and on anticipating future issues for forward planning.
55. Action points should be recorded and individuals identified to follow them up. Recommendations to senior management should also be recorded as appropriate.
56. The monthly review should also be used as a basis for a continuous improvement processes. As an example, field workers can be encouraged to analyze the root causes of pricing errors and develop individual development plans to correct these.

Longer-term annual Reviews

57. A longer-term element of a quality review system takes a higher level strategic look at objectives and should be conducted through the annual planning cycle, where such a cycle exists, and should address both the quality of outputs assessed against user needs and the processes by which quality is achieved. Ideally, the latter should be laid down in an annual Quality Management Action Plan annexed to the main CPI work program.
58. The objectives of an annual review and the activities to be covered need to be stated with clarity. For example.
 - a. The overall aim may be to successfully complete the following processes.
 - i. The re-weighting of the CPI.
 - ii. The updating of the basket of goods.
 - iii. The compilation of the item list.
 - iv. The updating of the new items list on the computer system.
 - v. The re-writing of existing computer programs to incorporate the new items.
 - b. The objective would be to.
 - i. Improve the quality and accuracy of the CPI.
 - ii. Ensure that the CPI reflects consumer expenditure patterns.

- iii. Enable data collection to be more effective and efficient.
 - iv. Ensure a standardized approach for introducing improvements.
- c. To achieve this the review may cover three main areas.
- i. Locally collected items.
 - ii. Centrally collected items.
 - iii. Weights.

Quality reporting and improving the CPI: frameworks, checklists and work programs

59. The focus of this section is on quality reporting. It provides guidance on reporting mechanisms for generating the metadata an NSI needs to determine whether it is fulfilling its international obligations and meeting the needs of users and to enable it to put in place a program of desirable improvements. Such metadata should cover the basic characteristics of the CPI, and its quality and statistical integrity and also wider issues such as accessibility and dissemination.
60. In particular, it looks at the use of quality frameworks and checklists. Two such examples of the former are the International Monetary Fund's enhanced General Data Dissemination System (e-GDDS) and Special Data Dissemination Standards (SDDS)⁴. Other examples include the OECD Quality Framework and Guidelines for OECD Statistical Activities and Eurostat's Quality Framework for European Statistics. There is also the IMF Data Quality Assessment Framework (DQAF). The latter, already referred to earlier in the chapter, provides a flexible structure for the qualitative assessment of a CPI which can be used in a variety of contexts, including self-assessments performed by national statistical offices, central banks, and other data producing agencies. Details of the IMF's DQAF are given earlier in this chapter. Reporting arrangements will depend on the governance structure which is in place and this can vary across countries. But as a generality the expectation should be that quality reports should be made public with opportunity given to users to react.
61. Data dissemination standards enhance the availability of timely and comprehensive statistics which contribute to sound macroeconomic policies and the efficient functioning of financial markets. The IMF's e-GDDS is designed to assist participants in improving data transparency and governance by publishing essential data for the analysis of macroeconomic conditions. It provides a framework for developing a clear roadmap to achieving higher data dissemination standards at a pace consistent with evolving statistical capacity. It focuses on publication of the data through a standardized platform to improve efficiency in data sharing, while identifying critical gaps to help prioritize technical assistance and donor support. IMF members that participate in the e-GDDS agree to.
- a. Commit to using the e-GDDS as a framework for statistical development.
 - b. Designate a country coordinator.
 - c. Prepare descriptions of current statistical production and dissemination practices and plans for their improvement for posting on the DSBB⁵.

⁴ The IMF has taken steps to enhance member country transparency and openness, including setting voluntary standards for dissemination of economic and financial data. The Special Data Dissemination Standard (SDDS) was established in 1996 to guide IMF members that have, or might seek, access to international capital markets in providing their economic and financial data to the public. The General Data Dissemination System (GDDS) was established in 1997 for member countries with less developed statistical systems as a framework for evaluating their needs for data improvement and setting priorities. In 2012, the SDDS Plus was created as an upper tier of the IMF's Data Standards Initiatives to help address data gaps identified during the global financial crisis. In 2015 the enhanced GDDS (e-GDDS) replaced the GDDS. Details can be found on <https://www.imf.org/en/About/Factsheets/Sheets/2016/07/27/15/45/Standards-for-Data-Dissemination>

⁵ The IMF's Dissemination Standards Bulletin Board (DSBB) provides access to the Special Data Dissemination Standard Plus (SDDS Plus), the Special Data Dissemination Standard (SDDS), the Enhanced General Data Dissemination System (e-GDDS), and the Data Quality Reference (DQRS) sites. The Data Quality Reference Site (DQRS) has been created to foster a common understanding of data quality. It provides access to contributions in the field and includes a selection of articles and other sources related to data quality issues.

62. Many countries use participation in the e-GDDS as a step towards subscription to the SDDS. The SDDS is a global benchmark for disseminating macroeconomic statistics to the public. Countries that subscribe to the SDDS agree to follow good practices in four areas: coverage, periodicity, and timeliness of data; public access to those data; data integrity; and data quality. Subscribing countries commit to.
- a. Disseminating the data required by the SDDS punctually and with the prescribed periodicity and timeliness on a national webpage, the National Summary Data Page (NSDP), which is hyperlinked to the Dissemination Standards Bulletin Board). Provide to the IMF an advance release calendar containing release dates for the current month and at least the following three months for each prescribed category of data for posting on the DSBB.
 - b. Provide detailed information about their statistical practices, or metadata, for dissemination on the DSBB. The metadata follow the rigorous format of the Data Quality Assessment Framework (DQAF).
 - c. Certify the accuracy of the metadata on an annual basis.
 - d. Use standardized electronic reporting procedures to monitor more effectively their observance of the SDDS is also a required undertaking for SDDS subscribers.
63. SDDS Plus emphasizes stronger data dissemination practices to enhance data transparency and help strengthen the international financial system. It includes nine additional data categories including of greater relevance, financial soundness indicators.
64. Using one of the internationally recognized frameworks for reporting on the CPI is recommended because it has a number of advantages.
- a. It has the authority associated with an internationally agreed framework and benefits from the experience of different countries.
 - b. It allows comparisons on a like-for-like basis with CPIs produced by other countries.
 - c. It is readily available.
 - d. It fulfills the reporting obligations to international organizations.
 - e. It provides the basis for reporting to users.
 - f. It provides a benchmark for future developments, particularly when carried out in conjunction with a checklist.
65. Such frameworks are generic in nature and not specific to CPIs, apart from Eurostat's quality reporting framework for the European Harmonised Index of Consumer Prices (HICP). The latter is based on the IMF's Special Data Dissemination Standards (SDDS) specifically adapted for the HICP.
66. Appendix 12.5 gives an example of a model "quality" report document based on the reporting framework for the HICP. Quality is defined as "fitness for use" in terms of user needs and extends beyond the statistical accuracy of the index to its definition and coverage, effective dissemination and the transparency of the statistical system.
67. The general principles underlying the publication of "quality" reports on the CPI, as with all official statistics, are that.
- a. The reports should be easy to access and use by all interested parties.
 - b. The contents should be sufficiently detailed to allow users to assess fitness for particular purposes. Qualitative (and where possible quantitative) measures of quality should be included to help users to understand better the strengths and the limitations of the CPI and associated series and the corresponding implications for interpretation and appropriate use.
 - c. Quality measures and detailed technical information should be supplemented by guidance on interpretation to help users assess fitness for purpose.
 - d. Clear statements should be given on the degree of compliance with agreed definitions, methods and practice - including both those determined nationally and those laid down in the 2003 ILO Resolution on CPIs - and any known reasons for deviations.
 - e. Where possible, the presentation of information on quality will be tailored to meet the needs of different types of users, with more comprehensive information being prepared for expert users. This may indicate separate quality reports directed at different user groups.

- f. Producers should systematically review at regular intervals the documentation relating to the CPI and update it to reflect up-to-date methods and processes.
- 68. For operational purposes relating to internal work programs, a quality report can be usefully supplemented by a more detailed check list of issues arising and the corresponding corrective actions that need to be taken.

Work programs: programming, planning and reporting

- 69. The general principles underlying a programming, planning and reporting system are that there should be clear and transparent governance arrangements relating to.
 - a. The allocation of responsibilities for monitoring and reporting on the production and dissemination of the CPI and on its development.
 - b. The setting of protocols relating to the scope and definition of the CPI and the methodological detail which supports the latter.
 - c. Putting in place and managing the day-to-day operational arrangements.
- 70. Transparency is built on the free flow of relevant non-confidential information directly accessible to users of the CPI - enough information for users to understand and properly use the index. Transparency generates trust.
- 71. The operational arrangements should be consistent with the governance arrangements and should.
 - a. Incorporate an effective process for consulting with users.
 - b. Provide a mechanism for regularly reporting, say annually, to users and other relevant parties on the answers to three questions.
 - i. What has been done to maintain the integrity of the CPI over the past year?
 - ii. What are the outstanding shortcomings and issues?
 - iii. What does the NSI intend to do during the next year to address these questions?

Appendix 12.1: Data Quality Assessment Framework for the CPI

The elements within the respective dimensions are described below.

- 0. Prerequisites of quality:** Although not itself a dimension of quality, this group of “pointers to quality” includes elements and indicators that have an overarching role as prerequisites, or institutional preconditions, for quality of statistics. Note that the focus is on the agency, such as a national statistical office, central bank, or a ministry/department. These prerequisites cover the following elements:
 - 0.1 legal and institutional environment,
 - 0.2 resources available for the statistical program,
 - 0.3 relevance, and
 - 0.4 other quality management.
- 1. Assurances of integrity:** This dimension relates to the adherence to the principle of objectivity in the collection, compilation, and dissemination of statistics. The dimension encompasses institutional arrangements that ensure professionalism in statistical policies and practices, transparency, and ethical standards. The three elements for this dimension of quality are the following:
 - 1.1 Institutional Integrity (statistical policies and practices are guided by professional principles),
 - 1.2 transparency (the terms and conditions under which statistics are collected, processed, and disseminated are available to the public and meet international best practice), and
 - 1.3 ethical standards (guidelines supporting appropriate staff behavior to sustain a strong culture for maintaining ethical standards, which discourage political interference, are in place and are well known to the staff.
- 2. Methodological soundness:** This dimension covers the idea that the methodological basis for the production of statistics should be sound and that this can be attained by following internationally accepted standards, guidelines, or good practices. This dimension is necessarily dataset-specific, reflecting different methodologies for different datasets. This dimension has four elements, namely:
 - 2.1 concepts and definitions,
 - 2.2 scope,
 - 2.3 classification/sectorization, and
 - 2.4 basis for recording.
- 3. Accuracy and reliability:** This dimension covers the idea that statistical outputs sufficiently portray the reality of the economy. This dimension is also data specific, reflecting the sources used and their processing. The five elements of this dimension cover the following:
 - 3.1 source data,
 - 3.2 assessment of source data,
 - 3.3 statistical techniques,
 - 3.4 assessment and validation of intermediate data and statistical outputs, and
 - 3.5 revision studies.

4. **Serviceability:** This dimension relates to the need that statistics are disseminated with an appropriate periodicity in a timely fashion, are consistent internally and with other major datasets, and follow a regular revision policy. The three elements for this dimension are as follows:
 - 4.1 periodicity and timeliness,
 - 4.2 consistency, and
 - 4.3 revision policy and practice.
5. **Accessibility:** This dimension relates to the need for data and metadata to be presented in a clear and understandable manner on an easily available and impartial basis, that metadata are up-to-date and pertinent, and that a prompt and knowledgeable support service is available. This dimension has three elements, namely:
 - 5.1 data accessibility,
 - 5.2 metadata accessibility, and
 - 5.3 assistance to users.

For the Methodological Soundness dimension of Quality the four elements - concepts and definitions; scope, classifications and sectorization, basis for recording - each have associated good practices and indicators. For instance, for concepts and definitions the good practice is that the *Concepts and definitions used are in accord with internationally accepted statistical frameworks*. Similarly, for Scope the good practice is that the *scope is in accord with internationally accepted standards, guidelines or good practice*. The indicators for the latter include that the household transactions included in the CPI are selected components of the following 2008 SNA aggregates: final consumption expenditure; fixed capital formation in the form of residential structures, as applicable.

Appendix 12.2: Documentation Control Template

DATE ISSUED	DOCUMENTATION	REF	DETAILS OF CHANGE	REASON FOR CHANGE	NAME OF ISSUER
XX/XX/XX	Calculating CPI food item weights (non-seasonal)	2.1	Change in process with effect from...	CPI Technical Board has agreed that in the future weights should be taken from National Accounts.	Ms Smith, Consumer Price Statistician
XX/XX/XX	Calculating and updating price index for telecommunications services	2.5	Change in process with effect from...	Methodology changes in pricing structures for mobile telephones – new methodology agreed by CPI Technical Board. Reflects changing market	Ms Smith, Consumer Price Statistician
XX/XX/XX	Desk instructions for checking and editing of prices	3.1	Additional checks to be carried out based on month-on-month price change.	Last audit indicated current checks inadequate resulting in incorrect prices entering the CPI.	Mr. Brown, CPI Operations Manager

Appendix 12.3: Pro-forma for an audit schedule

		SCHEDULED AUDIT		LAST AUDIT				
PROCESS AND/ OR DOCUMENT TO BE AUDITED	Ref	DATE AUDIT DUE	AUDIT ALLOCA TED TO	LAST AUDITOR	DATE OF AUDIT	RISK ASSESSME NT (High, Medium or Low)	FOLLOW UP REQUIRE D? (Y/N)	TARG ET DATE
<i>Calculating CPI food item weights (non- seasonal)</i>	<i>2.1</i>	<i>January</i>	<i>Ms Graham</i>	<i>Ms Jones</i>	<i>XX/XX/X X</i>	<i>HIGH</i>	<i>N</i>	<i>N/A</i>
<i>Calculating and updating price index for telecommunicati ons services.</i>	<i>2.5</i>	<i>January</i>	<i>Mr. Smith</i>	<i>Ms Graham</i>	<i>XX/XX/X X</i>	<i>MEDIUM</i>	<i>Y</i>	<i>April</i>
<i>Desk instructions for checking and editing of prices.</i>	<i>3.1</i>	<i>January</i>	<i>Ms Jones</i>	<i>Mr. Smith</i>	<i>XX/XX/X X</i>	<i>LOW</i>	<i>Y</i>	<i>April</i>

Appendix 12.4: Audit Report Template

AUDIT REPORT – CONSUMER PRICE INDEX					
Audit No:	50	Date:	XX/XX/XX	Document Ref:	2.1
Process Audited:	<i>Calculating CPI food item weights (non-seasonal)</i>				
Owner:	<i>CPI Statistician (name)</i>				
OBSERVATIONS/FINDINGS					
1. <i>The CPI Technical Board has agreed that, in the future, weights should be taken from National Accounts – this will lead to various changes to the processes.</i>					
2. <i>The process document needs updating in order to reflect changes in methods</i>					
3. <i>It was agreed that the initial detailed instructions should be written at the same time as carrying out the process.</i>					
ACTION REQUIRED				DUE:	TAKEN:
1. <i>Changes made to the process documentation to reflect new methods.</i>				XX/XX/XX	XX/XX/XX
2. <i>Follow-up Audit</i>				XX/XX/XX	XX/XX/XX
RECOMMENDATIONS FOR FUTURE QUALITY IMPROVEMENTS					
1.					
2.					
3.					
AUDITOR:	<i>Mr. Graham</i>			AUDIT DATE:	XX/XX/XX
FOLLOW UP AUDIT – DETAILS OF ACTION TAKEN					
1.					
2.					
3.					
AUDITOR:				AUDIT DATE:	

Appendix 12.5: Model Quality Report Document for the CPI

	SUB-HEADINGS: SPECIFIC TOPICS FOR INCLUSION	ILLUSTRATIVE RANGE OF ISSUES WHICH MIGHT BE COVERED
DATA	Coverage	<ul style="list-style-type: none"> Population (e.g. treatment of institutional households, rich/poor households) Basket of goods and services (any exclusions e.g. owner-occupied housing, informal markets) Expenditure (e.g. final household monetary consumption, treatment of foreign visitors, expenditure of resident population abroad, own-account production)
	Periodicity	<p>Weekly (all or some prices only)</p> <p>Monthly (all or some prices only)</p> <p>Quarterly or half-yearly (all or some prices only)</p> <p>Point in time or spread over month</p>
	Timeliness	<p>Time-lag between price collection and index publication</p>
	Range of published indexes and other residual statistics	<p>Lower level sub-indexes, special indexes (e.g. excluding volatile prices such as petrol), regional price-level comparisons.</p>
ACCESS	Public access	<p>Pre-announcement of publication date.</p> <p>Simultaneous release to all.</p>
	Dissemination format	<p>Electronic/paper.</p>
	Pre-release access	<p>Protocols on any pre-release arrangements.</p>
INTEGRITY	Transparency	<p>Protocols on compilation and dissemination of CPI are published and readily accessible.</p> <p>Protocols comply with UN Fundamental Principles.</p>
	Revisions	<p>Statement of revisions policy, revisions clearly marked.</p> <p>Advance notice given of methodological changes, numerical impact given.</p>
QUALITY	Publication of information needed by users to assess quality	<p>Dissemination of documentation on methodology.</p> <p>Confidence intervals calculated and disseminated with other information on quality/accuracy of CPI.</p>