KOREA'S EXPERIENCES
IN STATISTICAL QUALITY ASSESSMENT

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ABSTRACT

This paper aims to describe the KNSO's experiences in data quality assessment and introduce the strategies of institutionalization of the assessment procedure. This Paper starts with briefly describing the definition of quality assessment and quality dimensions and indicators at the national level. It introduces the current situation of the quality assessment process in KNSO and six dimensions of quality have been identified in Korea: Relevance, Accuracy, Timeliness, Accessibility, Comparability and Efficiency. Based on the lessons learnt from the experiences, this paper points out three essential elements required an advanced system of data quality assessment: objective and independent planning system for data quality assessment, competent personnel specialized in data quality assessment, and a set of appropriate indicators for quality assessment.

1. INTRODUCTION

With a growing complexity in the economic and social dimension, the decision-makers at both government departments and business enterprises have become increasingly dependent on statistics for fundamental data for decision making. As a result, national statistical offices (NSOs) are placed in a position to be serious about the quality of statistical data they produce. In effect, NSOs and international statistical organizations have paid much attention to statistical quality management and improvement since the mid-1980s. Despite the globally common effort toward the improvement of data quality, the international community finds it hard to define the theoretic aspects of statistical quality assessment, as the expected level of statistical quality varies depending upon the user group and the way to meet the quality demands differs from country to country according to the statistic development phase or statistic culture of a country.

This paper is intended to describe some recommendations for statistical quality measurement, which are based on Korean. Section 2 reviews the definition of 'statistical quality'; Section 3 introduces the kinds of statistical quality systems; Sections 4 specifies on the statistical quality assessment system in Korea; Section 5 described the plan for future activities for data quality assessment improvement in KNSO; Section 6 mentions main factors for establishing the quality assessment based on the lessons learnt from the quality assessment practices in Korea; and Section 7 provides concluding remarks.

2. DEFINITION OF STATISTICAL QUALITY

2.1 What is 'quality'?

The term 'quality' is one of the words most widely used in the modern society. And yet, the word has no single fixed concept and can be used to mean different things in different situations. The traditional concept

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of 'quality', which highlighted physical and objective characteristics such as "long-lasting, tough or strong", is simply used to mean whether a product is good or bad. However, as the progress of industrialization has brought to business managers' attention the strategic concept of quality as "satisfying customer needs", more light has been shed on subjective nature of 'quality' now. The term quality has several definitions made by academic individuals or groups, two of which are as given below:

Juran and Gryna (1980): "fitness for use"

ISO 8402-1986: "the totality of features and characteristics of a product or services that bear on its ability to satisfy stated or implied needs"

Juran and Gryna's definition as above emphasizes that quality should meet to the expectation and need of those who use the product or service. Their definition is more precisely detailed by the ISO's definition of quality, from the social viewpoint, which underlines 'the quality, as a totality, that satisfies all the needs whether expressly stated or implicitly acknowledged'.

2.2 What is 'statistical quality'?

For the past two decades, a number of national and international statistical agencies have offered presentations containing the definition of 'statistical quality', but they have not yet reached consensus on the conceptualization of the term. Nevertheless, at present a large number of countries share the view that 'improving statistical quality' means 'increasing the total utility of statistical products and services up to the level satisfactory to their users'. In addition, statistical quality is associated with multi-dimensional elements, including relevance, timeliness and accessibility, as well as accuracy of data. In addition, they agree that the quality dimension of statistical data includes mutually conflicting indicators - for example, accuracy vs. timeliness.

Although national and international statistical agencies are slightly divided over what quality dimensions should be selected, a majority of countries have in common such dimensions as accuracy, relevance, timeliness and accessibility, as shown in the following table:

Quality Dimensions used in NSIs

Canada	Netherlands	Korea	Eurostat	IMF
				Prerequisites of quality
Relevance	Relevant	Relevance	Relevance	
				Accuracy and reliability
Accuracy	Accurate	Accuracy	Accuracy	
Timeliness	Timely	Timeliness	Timeliness and Punctuality	Serviceability
Accessibility		Accessibility	Accessibility and clarity	Accessibility
Coherence			Coherence	
		Comparability	Comparability	Methodological soundness
Interpretability				
			Completeness	Integrity
	Cost-effectively	Efficiency		
	Without too Much a burden			

KNSO considers six quality dimensions (accuracy, relevance, timeliness, accessibility, comparability, and efficiency), as defined below, that should be included in the term "quality":

Relevance : The statistical concepts used for statistics are relevant if they meet users' needs. The

identification of users and their expectation are therefore necessary.

Accuracy : Accuracy is defined as the closeness between the estimation value and the (unknown) true population value. Assessing the accuracy of an estimate involves analyzing the total error associated with the estimate.

Timeliness : Most users want up-to-date figures, which are published frequently and on time at pre-established dates.

Accessibility : Statistical data have most value when they are easily accessible by users, are available in the forms the users desire and are adequately documented. Assistance in using and interpreting the statistics should also be forthcoming from the providers.

Comparability : Statistics for a given characteristic have the greatest usefulness when they enable reliable comparisons of values by the characteristic across space and over time.

Efficiency : Survey activities should be carried out in the most efficient way and work is continuously carried out to ease the burden on the respondent.

3. QUALITY SYSTEM

There are several quality control systems which are currently employed by national statistical agencies. Two representative ones are Total Quality Management (TQM) and Statistical Inspector System.

3.1 Overview on TQM

TQM may be defined as "a systems approach to management that aims continuously to increase value to customers by designing and continuously improving organizational processes and systems". TQM, which began to spread in the 1980s, goes beyond the simple focus on quality control of products at manufacturing plants in technical terms, toward ensuring competitive advantage by improving the overall quality in products, process, personnel and resources. In other words, TQM aims at the strategic and philosophical business management whereby the whole organization is involved in the commitment to better quality. Under the concept of TQM, quality means more than 'defect-free' and shall be produced so as to live up to the expectations and desires of customers. Aside from satisfying in-house specifications and standards, a company shall take a thorough review on customer requirements so that it can produce what customers really want and secure customer satisfaction.

TQM is not simply a statistic benchmark but a systematic approach in which the entire organization makes a concerted effort to bring quality to a level satisfactory to customers. Therefore, TQM is a business management system in which customer satisfaction, respect for human dignity and social contribution are highly valued. CEO's and rank and file employees are incessantly committed to making innovations, creating and improving corporate culture and achieving technological advances, in pursuit of long-term growth and development driven by strong competitiveness. The TQM, as conceived above, has been built upon the following two ideas: First, quality is defined by customers. That is, quality of products (or services) shall be specified in full consideration of customers' needs, so that the products (or services) can render customers satisfied and, furthermore, delighted. Second, human-centered business management system shall be employed to produce customer-satisfied products (services). In other words, once employees are sufficiently educated and trained into the workforce with competency, they can serve as a self-managed team performing the mechanism of continuous improvement. TQM has become now a useful means for quality management in national statistical agencies in many countries, including Sweden and Finland, although how it is applied in reality differs slightly from country to country.

In case an organization (including a business establishment) wishes to obtain a certificate from a reliable external agency in relation to the TQM system, the solution may be ISO (International Organization for

Standardization) 9000 Series, which is the first international norms on quality assurance (QA) set by ISO in 1987. This series of standards are minimum requirements that should be met by an organization with the aim of quality management. Accordingly, a producer who has obtained the ISO 9000 Certificate is regarded as being equipped with a QA system competitive in the international community. The certification procedures of the ISO 9000 Series start with the review on the quality manual of the organization concerned which prescribes policy, structure, accountability/mandate and documents for quality management. When the quality system of the applicant is confirmed to be in compliance with the given standards, a spot inspection is conducted. If the inspection reveals no disqualifying elements or detected disqualifying elements are all rectified, the written ISO 9000 Certificate is issued. As a follow-up activity intended to check if the certified organization remains compliant with the given requirements, the organization is reviewed, usually once or twice a year. The national statistical agency in the Philippines is an example that ISO 9000 Series are adopted for data quality management.

3.2 Statistical Inspector System

Statistical Inspector System refers to forming a separate organization, within a national statistical agency, for statistical quality assessment. The Statistical Inspectorate consists of those who previously worked for the Divisions of the agency and are experienced in and knowledgeable of statistical enumeration activities. The inspectors shall take a neutral stance in review and assessing the quality of individual data using the Quality Checklist and making a report on the outcome of review and assessment which will be submitted to the Division concerned and the Head of the agency. This system is in place in the Netherlands, and Korea also adopts this system for data quality management.

3.3 Peer Review System

The peer review system refers that the statistical system of a certain country assessed by independent experts from another country. Switzerland may be cited as a country where a unique model of statistical inspectorate is in use. In 1999, the Swiss national statistical organization asked the specialists of Statistics Canada, the national statistical organization in Canada, to make an overall evaluation on its statistical activities, and the external specialists released a report on the general performance of the Swiss agency. By employing professionals of another country to evaluate its statistical activities, Switzerland could win users' confidence in the outcome of data quality assessment and showcased a successful example of utilizing outside experts.

Quality management systems based on TQM, ISO 9000 Certificates and Statistical Inspectorate all have both merits and demerits. The TQM methodology, although it is a systematic approach for which a wide range of success stories are reported by business establishment, is feared to end up as a formality at a national statistical agency that can hardly come up with an across-the-board and visible indicator for quality improvement (like the 'no-defect campaign' among businesses). ISO Certificate-based system provides for an objective certification on the reliability of the statistical survey process, but the certification costs are high much and disproportionately emphasizes legitimacy of the certification procedures. The statistical inspector system is efficient and economical in that quality assessment is carried out by the specialists from the agency itself, and external users of statistical data may raise questions about the objectivity of the assessment. Meanwhile, using specialists of another country as statistical inspectors, as seen in the case of Switzerland, is desirable and efficient in terms of ensuring objectivity. At the same time, there are some limitations to evaluate the statistical quality with the peer review, because the two countries should speak the same language and have a similar statistical system for applying this system.

4. STATISTICAL QUALITY ASSESSMENT IN KOREA

4.1 Overview

It was in end-1997 when Asian countries, including Korea, suffered foreign exchange crisis that statistical quality emerged as a social issue in this country. In detail, with the financial difficulty sweeping the country, the reliability of statistical data on the financial sector, employment and other major sectors

surfaced as a social issue, which prompted KNSO to direct more attention than ever before to statistical data quality assessment.

Until recently, in KNSO, the quality improvement activities for a set of statistical data had been taken by the very Division that is responsible for collecting and releasing the data. The shortcoming of this self-controlled scheme is that serious problems which urgently need to be resolved are illusive while achievements and progressions are easily forthcoming. In an effort to address this problem, KNSO introduced a new quality assessment system in 1999 whereby quality assessment is made by a team organized separately from the Divisions responsible for data collection and compilation in the organization.

The statistical quality assessment system which is now in place in Korea can be summed up as a combination of the quality inspector system and the quality assessment checklist scheme. KNSO has set up a quality assessment section within Planning Division. This section, which is intended for quality assessment activities and research for quality management methodologies, consists of experienced staff members who have been involved in statistical survey for 10 years or longer within the KNSO. The members are to spend their full working time on quality assessment activities. The number of personnel in the section, which is currently six, is expected to grow gradually. The quality assessment of the Consumer Price Survey and the Economically Active Population Survey has been conducted on a pilot basis. The lessons learnt from the pilot assessment will be used to supplement the quality system.

4.2 The Process of Quality Assesment

The quality assessment team annually selects 3 or 4 sets of statistical data of great utility, for the purpose of quality assessment, and sets up a plan for assessment. The statistical data which are subject to the annual quality assessment include Industrial Production Index, Consumer Price Index, Economically Active Population Survey, Population and Housing Census, and such data shall be regularly assessed, that is, at least once every five years. At the time of setting up the plan for quality assessment, the team asks for opinions of the Division assessed on assessment schedule and directions before finalizing the plan.

Once target statistics are determined, the quality assessment team starts working out on quality assessment indicators for each survey. The indicators are classified by internal assessment and by external assessment. As for the internal assessment, which focuses on checking whether the general requirements for statistical enumeration have been fulfilled, specific measurement indicators are selected for each of Quality Dimensions, such as relevance, accuracy, timeliness, efficiency, accessibility and comparability. The specific assessment indicators are based on the ready-made check list of common indicators, but new indicators may be added or a part of the listed indicators may be dropped in setting up a list of quality indicators, in consideration of characteristics of the survey concerned.

The quality indicators for external assessment which takes the form of questionnaires sent to primary users of the statistical data, ask what they think about the quality, are mainly composed of indicators on convenient use of data. The quality indicators chosen by the team go through consultations with the Division assessed and survey specialists for any adjustment of the list of indicators or the measurement method, before they are finally put in practice.
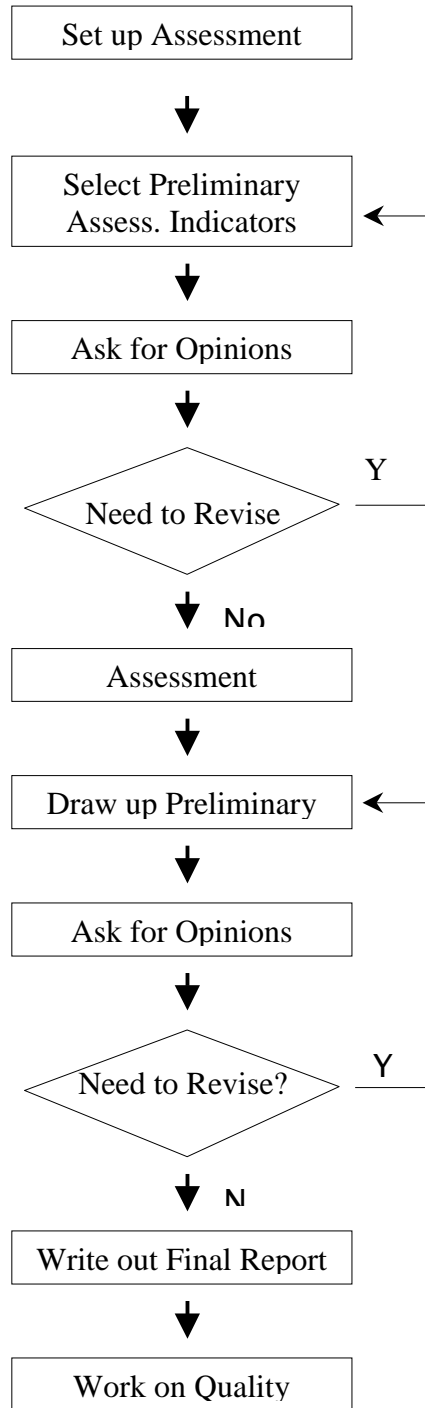
Quality assessment is conducted by reviewing the written plan, guidelines and other relevant documents for statistical enumeration kept by the Division assessed and interviewing the personnel involved. In this course, whenever necessary and appropriate, the assessment officer may be present at the site of field operations to test enumerators' understanding of the enumeration guidelines and to measure accuracy of the enumerated data.

Based on the outcome of quality assessment conducted in the aforementioned manner, the quality assessment team draws up a preliminary report on quality assessment and then sends it to the assessed Division for review. The Division reviews the results of assessment under each quality indicators and, if it finds anything incorrect in the report, requests the team to revise the report or conduct another assessment. The quality assessment team, if it determines that the requested revision is justifiable, makes adjustments to the report and writes out a final report. The finalized report is sent to the Division concerned after being

approved by KNSO Commissioner.

The Division assessed shall submit a semi-annual report to the quality assessment team on any actions taken to achieve the recommended improvements, starting from the following year of the release of the assessment report. Based on this semi-annual report, the quality assessment team checks whether the assessment is properly fed back.

Flow Chart for Quality Assessment

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            ┌─────────────────────┐
            │  Set up Assessment  │
            └─────────────────────┘
                      │
                      ▼
            ┌─────────────────────┐
            │ Select Preliminary  │◄────────┐
            │ Assess. Indicators  │         │
            └─────────────────────┘         │
                      │                      │
                      ▼                      │
            ┌─────────────────────┐         │
            │   Ask for Opinions  │         │
            └─────────────────────┘         │
                      │                      │
                      ▼                      │
                 ◇─────────◇         Y      │
                ◇           ◇───────────────┘
               ◇ Need to Revise ◇
                ◇           ◇
                 ◇─────────◇
                      │ No
                      ▼
            ┌─────────────────────┐
            │     Assessment      │
            └─────────────────────┘
                      │
                      ▼
            ┌─────────────────────┐
            │ Draw up Preliminary │◄────────┐
            └─────────────────────┘         │
                      │                      │
                      ▼                      │
            ┌─────────────────────┐         │
            │   Ask for Opinions  │         │
            └─────────────────────┘         │
                      │                      │
                      ▼                      │
                 ◇─────────◇         Y      │
                ◇           ◇───────────────┘
               ◇ Need to Revise? ◇
                ◇           ◇
                 ◇─────────◇
                      │ N
                      ▼
            ┌─────────────────────┐
            │ Write out Final Report │
            └─────────────────────┘
                      │
                      ▼
            ┌─────────────────────┐
            │   Work on Quality   │
            └─────────────────────┘
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4.3 The Framework of Quality Assessment

The framework of the KNSO statistical quality assessment is classified internal assessment and external assessment largely. The assessment team conducts internal assessment. The assessment indicators made up of six Dimensions of Quality: Relevance, Accuracy, Timeliness, Accessibility, Comparability and Efficiency, and each Quality Dimension has 3-8 quality elements, each of which, in turn, consists of specific quality indicators. Statistical data users can conduct external assessment through Internet survey.

The most important factor for feasibility of a statistical quality assessment is the quality indicators selected for the assessment. In order to evaluate quality of a certain statistical survey, comprehensive assessment should be made about all the activities involved in the survey process, such as planning, sampling, data collection, imputation of non-response editing, data analysis and publication. However, the process of selecting quality indicators has limitations in terms of resources, time for assessment and measurement techniques available to the assessment team. Moreover, it is not possible to set up quality indicators which can be generally adapted to any statistics in any country. Each statistic has a different purpose, surveyed group and survey method, and the stage of statistical development differs from country to country.

KNSO has set up a list of quality indicators which can be commonly applied to monthly business statistics, based on the experiences obtained from the quality assessments. As business statistics covers an extremely wide range, each sub-class of business statistics needs to be assessed with a specific set of quality indicators. Therefore, the indicators listed in here are applicable to any business statistics. When selecting indicators for an individual business statistics, KNSO refers to the list of common indicators and adds or subtracts several indicators in accordance with the characteristics of the statistics.

The quality indicators shown below are not permanent but open to constant supplementation and update. At the time of selecting the indicators, the highest priority was placed on applicability, not on completeness. That is to say, quite a few elements may be missing in the list, but much emphasis was given to ensuring that both the assessor and the assessed easily understand the indicators and the assessment is completed within a short time.

One of the most important aspects of data quality is to meet the expectation and need of those who use the data. In order to evaluate data quality in terms of the fitness to user, user satisfaction survey is requested. KNSO already has comprehensive target population from the list of e-mail club and publication member and list of experts and common people through statistical committee and civil service office in the organization, etc. Based on the huge target population, approximately 500 persons are usually selected as a sample for the survey. The assessment team designs and conducts the user satisfaction survey. The questionnaire consists of 10-15 questions that contains several quality dimensions such as kindness of staff, accessibility, interpretability, variety of data dissemination service, accuracy and reality, timeliness, etc. The degree of satisfaction is measured on a qualitative basis, using a five categories scale. From the results, assessment team compiles the user satisfaction index and utilizes the index to evaluate the quality of specific survey or statistical data.

 (1) Relevance

'Relevance' concerns the extent to which the statistical information complied and supplied by the statistical agency is relevant to users' needs. In assessing the degree of relevance, three factors are taken into account: the analysis of main users; users' requirements, as identified by the statistical agency; and the level of users' satisfaction with the statistical information. Difficulties in assessing relevance come from the fact that it is not easy to find out exactly who are the main users of certain statistical data and that the users' requirements may vary with time. Quality indicators concerning relevance are shown below:

Quality Indicators Concerning Relevance

Quality elements	Quality indicators
1.1 Main users	1.1.1 Are the main users of this statistics identified? (yes/no)
1.2 User requirements	1.2.1 Are the user requirements for this statistics identified? (yes/no)
	1.2.2 How much are the users satisfied with this set of statistical information?

(2) Accuracy

Accuracy indicators are viewed as the most important by a majority of users. Furthermore, they may be the most difficult to measure, considering that they are related to each and every stage of statistical activities. As accuracy is in a trade-off relationship with timeliness and costs, accuracy in reality means accuracy within the limits of available resources and time'. Although the scope of accuracy indicators may widely vary depending on the type of a statistical survey (e.g. sample survey, census, administrative statistical data, etc.) and the survey method (e.g. via mail, visits, etc.), the accuracy indicators enumerated below are applicable to most business statistics surveys conducted on a monthly basis.

Quality Indicators Concerning Accuracy

Quality element	Quality indicators
2.1 Questionnaire	2.1.1 Are the survey items clearly defined? (yes/no)
	2.1.2 Has the clarity of the survey items been tested in advance? (yes/no)
	2.1.3 Has the validity of the survey items been tested in advance?(yes/no)
2.2 Coverage	2.2.1 In case this statistic is based on a sample survey, what sample frame has been used?
	2.2.2 How complete is the sample frame?
	2.2.3 In case the sample frame used needs to be complemented, was it complemented before sampling was conducted?(yes/no)
2.3 Sampling	2.3.1 Are the users informed of a detailed sampling method?(yes/no)
	2.3.2 What is the average sampling rate? (%)
	2.3.3 Has the sampling been complemented consistently?(yes/no)
2.4 Data collection	2.4.1 What kind of data collection method is used? (e.g. interviewing, mailed questionnaire etc.)
	2.4.2 Has a pilot test been carried out?(yes/no)
	2.4.3 Is a detailed manual of survey in place? (yes/no)
	2.4.4 Were the interviewers trained about the survey? (yes/no)
	2.4.5 Is a test given to check if interviewers clearly understand the manual? (yes/no)
	2.4.6 In the case of new interviewers, are they given an opportunity to have on-the-spot experiences before field survey? (yes/no)
	2.4.7 Are a given number of samples taken at every time of enumeration to monitor the survey process?(yes/no)
	2.4.8 Is the performance of all the interviewers evaluated at least once every 2 years (in terms of household visit rate, error rate, etc.)? (yes/no)
	2.4.9 What is the average response time? (in minutes)
	2.4.10 What procedure has been used to reduce respondent errors?
	2.4.11 What procedure has been used to minimize non-response rates?
2.5 Data processing	2.5.1 Is a time schedule set for each stage of data processing? (yes/no)
	2.5.2 Are the entire questionnaire checked one by one for the editing purpose? If not, how are the data edited?
	2.5.3 What kind of data entry method is used? (key-entry, OMR etc.)
	2.5.4 What methods are used to minimize processing errors?
	2.5.5 How is the data processing monitored?
	2.5.6 What actions are taken to protect confidentiality of information obtained from survey?

2.6 Analysis	2.6.1 What sampling weight is used for estimation?
	2.6.2 In the case of time-series data, is the seasonal adjustment or the trend adjustment method used? (yes/no)
	2.6.3 Are estimated sampling errors available? (yes/no)
	2.6.4 Are the data on non-response errors available by type of error?(yes/no)
	2.6.5 What imputation method is used to adjust non-response items?
	2.6.6 Are the procedures for non-response treatment, imputation, data editing, estimation and crosschecking in written form? (yes/no)
	2.6.7 Are there any discrepancies between the results of KNSO's survey and those of a relevant survey conducted by another agency? If so, why did that happen?
	2.6.8 How much is the discrepancy between the preliminary and the finalized data?

(3) Timeliness

The terminology of timeliness contains very comprehensive meaning such as swiftness, punctuality, and periodic. The swiftness of statistical information refers the length of time between the reference period of the data and its availability. Timeliness indicators also concern whether the actual publication of certain statistical data is consistent with the schedule planned or announced in advance. As the point of time when a certain set of statistical data are needed may differ from one group of users to another, sometimes it is not easy to decide which group of users should be chosen in assessing timeliness. That is to say, one group of users may give priority to swiftness of statistical information, while another group may want the same statistical information to be accurate even at the expense of swiftness. Therefore, in the case of users' different needs, the statistical agency faces a hard decision to make. In addition, timeliness may be in a trade-off relationship with accuracy. The following shows quality indicators are related to timeliness:

Quality Indicators Concerning Timeliness

Quality element	Quality indicator
3.1 Timeliness	3.1.1 How long does it take from the ending a day of survey to release the data?
	3.1.2 What is the length of time from the end of survey to publication dissemination?
	3.1.3 In case data are amended, is the statistical DB revised promptly?
3.2 Punctuality	3.2.1 Are the users informed of the date of data release?
	3.2.2 Is the actual date of data release quite close to the presumed date of data release?

(4) Accessibility

Accessibility concerns the extent to which statistical data are available to users in a convenient and specific way. In detail, accessibility indicators are to find out : first, in which form the data is available, for example, in the form of a book, database, CD-ROM or diskettes; second, whether users are provided with information on where they can buy or locate the statistical data they want; and third, whether a contact point is designated for certain statistical data so that any question on the statistical data can be answered and users can have a better understanding of the data.

Quality Indicators Concerning Accessibility

Quality element	Quality indicator
4.1 Mode of dissemination	4.1.1 Are the compiled data available in the form of statistical database? (yes/no)
	4.1.2 Are the data available in the form of press release?(yes/no)
	4.1.3 Are the data available in the form of monthly periodical? (yes/no)
	4.1.4 Are the data available in CD-ROM or diskettes? (yes/no)
	4.1.5 Are the raw data available? (yes/no)

4.2 Data shop	4.2.1 Are the data purchasable via on-line? (yes/no)
	4.2.2 Is the information on publications and data shops available? (yes/no)
4.3 Clarity	4.3.1 Are survey goals, definitions of survey terms, contents of the survey questionnaire and the general information on the survey available to users? (yes/no)
	4.3.2 Are the users informed of the name and telephone number of the contact point for any questions for the use of statistical data? (yes/no)
	4.3.3 Is the analysis on the survey results in written form? (yes/no)
	4.3.4 Are graphs and diagrams used for users' clear understanding? (yes/no)
	4.3.5 Does the report describe what should be noted to prevent any misunderstanding of statistical data? (yes/no)

(5) Comparability

Comparability concerns whether enough information is given to users to prevent any confusion at the time of comparing statistical data. For example, when certain statistical data show considerable discrepancies with the time-series data of the past because different standards are applied, although both the sets are compiled by the same statistical agency, or when different statistical standards are applied to the same category of statistics from country to country, users of the data concerned need to be informed of the background. Comparability indicators are shown below:

Quality Indicators Concerning Comparability

Quality element	Quality indicator
5.1 Comparability over time	5.1.1 In the case where different concepts or measurement methods are applied to the statistical data of two consecutive time series, are the users informed of this? (yes/no)
5.2 Comparability over space	5.2.1 In the case where there is a difference in statistical concepts between KNSO and international statistical agency, are the users informed of this? (yes/no)

(6) Efficiency

Efficiency indicators are to measure how costs can be reduced and how much the burden on respondents can be relieved to obtain the outcome of the same level. With regard to the efficiency indicators, the amount of inputs can be measured relatively easily, while outputs are hardly measurable, which is why an indirect analysis is used as a frequent approach.

Quality Indicators Concerning Efficiency

Quality element	Quality indicator
6.1 Resources used	6.1.1 What is the total cost used to conduct this survey?
6.2 Response burden	6.2.1 What is the estimated total response time?
	6.2.2 What is the estimated per-person response time?
6.3 Output	6.3.1 What is the annual revenue from selling the statistical data?
	6.3.2 What is the number of visitors for the use of the statistical data in statistical database.

5. FUTURE ACTIVITIES FOR QUALITY IMPROVEMENT

5.1 Develop measure Indicators for each survey

KNSO will continue to refine quality assessment indicators through internal review and plan to develop detailed measurement indicators to assess the soundness of each statistical survey based on the quality

assessment.

5.2 Establish the Data Quality Assessment Committee

To assure the reliability of KNSO's data quality assessment work outside the KNSO, we are considering formulating the Data Quality Assessment Committee (tentative title) in the Statistical Council, an advisory body to the Commissioner of the KNSO. The Committee will hold meetings on a regular basis to discuss the direction of data quality assessment with KNSO staff, users and academic statisticians.

5.3 Expand data quality assessment

As Korea has a decentralized statistical system, over 100 organizations in the public ad private sectors are involved in compiling statistics, but interest in data quality assessment is limited to a handful if them, including KNSO. KNSO will cooperate with other government organizations and private organizations to share its experience in quality assessment and help them utilize it to assess work.

5.4 Assess the data quality assessment team's work

The data quality assessment team will conduct ad-hoc opinion surveys with all divisions of KNSO, which are the targets of internal quality assessment, to get their feedback. It will make efforts to build a more adequate quality assessment system by reflecting their suggestions.

6. MAIN FACTORS FOR ESTABLISHING
THE QUALITY ASSESSMENT

In the hereafter, national statistical offices and international statistical organizations will give the first priority to data quality assessment and management. The data quality awareness will be the crucial matter and the most important issues among policy makers as well as statisticians. In this context, this part describes the main factors for establishing the data quality assessment based on the experiences of KNSO during the two years.

Contents of national statistics greatly differ from country to country, especially when the statistics, although with similar characteristics, have different purposes and respondent groups. So it is not easy at all to work out quality indicators that can be uniformly applied to all the national statistics. Nevertheless, internationally applicable indicators need to be created, for setting up separate indicators for each country would result in high costs but low international comparability of national statistics. In this view, the most acceptable solution would be that an international agency selects specific quality indicators for the frequently used statistics, such as population census, consumer price index, economically active population survey and national accounts, as soon as possible and recommend individual countries to adopt the common indicators. Each nation could make adjustments to the recommended indicators, when setting up its own indicators.

In this light, the activities of IMF and Eurostat should be highly appreciated: IMF draws up and publicize specific indicators for measuring the quality of national accounts, and Eurostat creates common standards and indicators for quality assessment of major statistical data that are applicable to ECE member nations.

It would not be exaggerating to say that the success in data quality assessment largely depends on whether the quality indicators used are properly selected or not. Requirements for desirable indicators are: first, the indicators should be clearly understandable; second, the indicators should be easily measured and the measurement method should remain valid for years; third, the indicators should be measurable for an objective evaluation and allow for a time-series comparison of data quality; fourth, they should not require a large amount of time and money; and lastly, the indicators selected should be in a level of the statistical development of the country. With regard to the last requirement, in case the indicators are far ahead of the level of statistical development, both the assessors and the assessed neither will nor can be enthusiastic

about the assessment. Therefore, at the initial phase of quality assessment, such indicators as are clearly understandable and easily applicable shall be adopted and the number of indicators need to be grown on a gradual basis.

The composition of an assessment team in the national statistical agency also varies from country to country. In some cases, the team of quality measurement is wholly composed of outside specialists: in other cases, while the assessment is organized within the agency, the team consists of both inside and outside experts; and in some other cases, the team is mainly composed of the experts from within. As the question of 'who will assess' is closely related to the statistical culture of a country, it is not possible to single out a right makeup. However, it is believed that a combination of specialists from within and without is the most desirable in terms of objectivity of assessment.

Data quality assessment is to make scores for individual surveys. Therefore, it may face a strong resistance within the organization. Especially the staffs in charge of a statistical survey that last long and inflict a heavy burden on respondents. They are highly likely to be uncooperative with the assessment. Accordingly, it is necessary for the independent and objective planing system for data quality assessment to have a separate team for this job.

The legitimacy of quality assessment is secured when the assessed are convinced that the assessment is carried out in an objective and justifiable manner. This confidence, in turn, comes only when the assessment staff is sufficiently professional. Therefore, the quality assessment team needs to secure competent and knowledgeable personnel within the organization, so that their specialties when put together can cover each and every aspect of statistical activities, such as establishment survey, household survey, sample design, data analysis and data processing. In case all the specialists needed cannot be secured within the organization, bringing in specialists from outside on a contract basis may be a solution. However, in most developing countries, it is hardly possible to find such competent personnel outside the national statistical agency. It is advisable, therefore, that an international training institute for statistical studies run regular training programs or courses for data quality assessment.

The utility of data quality assessment can be proven only when the assessment results are constantly fed back to the survey process and, thereby, improve data quality. In addition, cooperation and assistance of working-level staff of the assessed division are indispensable to progress of quality assessment. In case the outcome of quality assessment immediately leads to any disadvantage of the staff in charge of the data assessed, they would be reluctant to cooperate with the assessment activity or, in extreme cases, would not accept the assessment results. Therefore, before setting out the quality assessment process, the assessment team needs to convince the staff assessed that the measurement is aimed at improving survey activities and data quality and minimizing statistical errors in advance. In this way, the assessment team can expect active participation from the assessed staff.

7. CONCLUSION

Each country may take a different approach to the issues of the makeup of assessment personnel, assessment methodology and selection of quality indicators. Because those elements are associated with the statistical culture and the level of statistical development of a country, it is not easy to assert which one is right or wrong. However, for a successful quality assessment, there are several requirements that should be met in relation to assessment personnel, quality indicators, cooperative atmosphere within the organization, and so on. For example, an assessment (or inspection) team should consist of inside or outside specialists in analyzing and measuring statistical errors.

The indicators for data quality assessment should be specific for each survey and satisfy the requirements of consistent measurability, convenient applicability, low cost and international comparability. It is very important to successfully induce cooperation and assistance from the staff assessed. It is also critical to ensure that the assessment outcome is accepted and fed back to the survey process. Meanwhile, the issues of quality indicator development and specialized training for quality measurement need to be addressed at the international level, not by individual countries. That is to say, it is advisable that an international

organization should devise and recommend standardized indicators for quality assessment and provide the training programs for producing specialists in quality measurement.

REFERENCES

Carol S. Carson (2000), What is Data Quality, Statistics Department, International Monetary Fund,

David Morganstein and David A. Marker(1997), Continuous Quality Improvement in Statistical Agencies, in Survey Measurement and Process Quality, Chapter 25, Wiley

Ivan P. Fellegi and Jacob Ryten (2000), A Peer Review of the Swiss Statistical System, Swiss Federal Statistical Office

Max Booleman and Richard van Barkel (1997), Quantifiable Quality Characteristics, Statistics Netherlands

Michael College and Mary March (1997), Quality Policies, Standards, Guidelines and Recommended Practices at National Statistical Agencies, in Survey Measurement and Process Quality, Chapter 22 , Wiley

Timo Relander (1999), Total Quality Management and Statistics, Statistical Office, Finland

Tim Holt and Tim Jones (1999), Quality Work and Conflicting Objectives, Statistical Office, UK

U.K Government Statistical Service (1997), Statistical Quality Checklist

Vera Rudddock (1999), Measuring and Improving Data Quality, U.K Government Statistical Service

Willem de Vries and Richard van Barkel (1997), Quality System and Statistical auditing, Statistics Netherlands

Yves Franchet (1999), The Quality of the ESS, Statistical Office of the European Communities