

**OIC ACCREDITATION CERTIFICATION
PROGRAMME FOR OFFICIAL STATISTICS**

Islamic Countries Organization

**QUALITY FRAMEWORKS AND MEASUREMENT OF
THE STATISTICAL SYSTEMS AND OFFICES
PERFORMANCE**

**ORGANISATION OF ISLAMIC COOPERATION
STATISTICAL ECONOMIC AND SOCIAL RESEARCH AND TRAINING
CENTRE FOR ISLAMIC COUNTRIES**

Quality Frameworks and Measurement of the Statistical Systems and Offices Performance

Introduction

The importance of official statistics in any country comes from being the primary source for decision-makers in the social and economic planning processes and in various sectors and development areas, especially in the provision of national requirements by the degree of importance and priorities through which the decision-makers take executive decisions and follow-up the achievements until the targets are met entirely or partially with the need for a feedback summarizing the main development conclusions and recommendations and follow-ups in the next phase. Thus, the decisions must be based on data, information and statistics of high and reliable quality, be available to all users at the same time and at the right time and be provided by Official Statistical Agencies, in collaboration with the various ministries or government or semi-government institutions, research centres and universities and other civil and charitable sectors.

This guide aims to develop the knowledge and skill of participants to these topics, including the comprehensive quality concepts, as well as methodologies, techniques and frameworks in place to ensure the quality of statistical systems and offices, where it requires the availability of a quality management system in those statistical systems and offices, which is based on the international standards and at the same time meets the requirements of national and local needs as the main objective of the quality is the continuous improvement in performance at all levels, either administrative and technical in order to meet the requirements of the data users or the interested in. With simple terms, the quality system is a system to manage the working methods, to reduce the error possibilities and improve the chances of success and it is also a management, responsibilities, procedures, processes and resource management structure in addition to managing the implementation of the principles and lines of action necessary to achieve the quality objectives in the National Statistical System.

This training enables the trainees to access a broad and thorough information on the subject of quality, where they will develop their knowledge and skills in this regard, including the special quality concepts, as well as methodologies, techniques and frameworks in place to ensure the quality of statistical systems and offices, which is based on the international standards and at the same time meets the requirements of national and local needs as the main objective of the quality is the continuous improvement in performance at all levels, either administrative and technical in order to meet the requirements of the data users or the beneficiaries. With simple terms, the quality system is a system to manage the working methods, to reduce the error possibilities and improve the chances of success and it is also a management, responsibilities, procedures, processes and resource management structure in addition to managing the implementation of the principles and lines of action necessary to achieve the quality objectives in the National Statistical System.

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FIRST CHAPTER

National Statistical System Components and Indicators

1. National Statistical System Components

The National Official Statistical System in every state is composed, in general, of three basic components:

- 1.1 Administrative Records
- 1.2 Sample Surveys
- 1.3 Censuses

The following is a detailed explanation of the basic characteristics of the Official National Statistical System for these sources:

1.1 Administrative Records:

It is the data that result from routine works carried out by ministries and government institutions legally responsible for the administration and operation of the various activities of multiple registration systems which result from the routine operations they carry out. Such as, population register, education register, commercial business register, workforce register, tax register, handicapped register, health register, births and deaths register and criminal register and others.

These records require a legal focal point to compel citizens of these laws which apply to them in order to work with, an official authority either a Ministry or an Institution that follows the registration process in one of the fields.

In general, these registries are marred by a lack of registration coverage, registered information accuracy and quality and, at the same time, are not updated usually at the right time until the citizen requires a service in this area. In developing countries, these registries need to be continuously developed, particularly in terms of enacting laws and legislation and organizing the registration process and its procedures accurately and with acceptable comprehensiveness.

1.2 Sample Surveys:

It is the data that result from actions by government statistical agencies, research centres, universities and researchers to collect data on a specific subject or area by using a random sample representative of the community and that in the various economic, social, demographic, environmental areas and other.

1.3 Censuses:

The census is defined as the total process of collecting, compiling, processing, analysis, evaluation, dissemination and providing statistical data on population numbers and distribution by basic demographic, social and economic characteristics in a specified reference period for all persons within the state borders and citizens who are inside the state borders on a temporary basis.

Usually, the censuses are carried out every ten years and the states and statistical agencies hold the responsibility and supervision of their implementation as the censuses are considered to be a form of sovereignty over the land.

This implies that every individual of the individuals alive within the state borders in a specific moment in time and a certain date, and that its demographic, social and economic characteristics are registered in its time reference separately from the characteristics of other family members. The censuses aim mainly to:

1. Collection and dissemination of demographic, social and economic data about the population in order to provide the formal requirements of the state in terms of population, housing and establishments data which are required for national development plans and the requirements of decision-makers, planners and researchers, in addition to providing data according to international recommendations and requirements.
2. Provide and update the preview framework to all entities, especially for economic, social and demographic surveys.
3. Conduct specialized statistical researches which are conducted in a sampling method, such as labour force surveys, household expenditure and income survey, demographic surveys and researches as fertility, mortality and migration, health and education researches, housing related researches and any surveys carried out by other entities.
4. Creating a broad database and use it for a reliable basis in the conduct of studies and researches that development programs will require.
5. Providing demographic data and indicators periodically to measure the change in demographics over time, conducting local, regional and international comparisons and reviewing and evaluating population projections and future estimates and forecasts.
6. Updating the preview frameworks

The difference between the surveys, censuses and administrative records

The following table represents the difference between administrative records, censuses and surveys:

Source Property	Records	Censuses	Surveys
Cycle	Continuous	Every 10 years for population and housing, and every five years for establishment censuses	Monthly, quarterly seasonal, annual
Comprehensiveness	According to enrolment completion rate	Comprehensive inventory of the counting units	Random or intentional sample
Precision degree	Lack of registration	Lack of comprehensiveness	Sampling error
Time reference	Continuous /dynamic	Fixed datum (midnight of the counting day)	Data collection period

The states vary in the extent of use of these sources and their quality accuracy

2. Statistical Variables, Indicators and Concepts:

2.1 Statistical Indicators and Concepts

The statistical indicator or variable is defined as a concept property (value) or properties observation and observations vary from item to another. The variable is contrary to the constant and statistics only study variables such as income and age.

2.2 The use of statistical indicators:

Indicators are used in various fields, especially in:

- Indicators are the cornerstone in monitoring and evaluating the development effort, development programs, economic and social well-being and measuring their change and determine the reasons for it.
- Future projections calculation
- Identify reality and trends in the values and goals
- Study of factors affecting the phenomenon and defining their effects and build time series
- Develop plans and policies and decision-making in the various economic, social and demographic fields.
- Conduct international comparisons
- The use of indicators contributes to reduce the cost and national burden at long-term

2.3 Indicators Types:

1. The Indicator of the Statistical Term:

It is a compilation of abstract knowledge of things properties, such as unemployment, illiteracy and others and it is a manual signifier for this property including a clear definition of

this term. The indicator is a digital element that reflects statistical data for a specific concept in a specific time or a specific reference period, a specific place, a specific calculation mechanism, for a specific category and any other specific properties. The concept must reflect the answer to the following items:

- What? Calculating unit, frame and comprehensiveness
- How? Classification(s)
- Where? Geographical representation
- When? Time reference/datum
- In general, the number of indicators that can be extracted is boundless and can be calculated based on one or more variable or by focusing on the most important indicators that are measured through time for the same place and statistically, the indicator calculated for several periods is treated as a statistical variable.

2. When dealing with several indicators, the attention should be paid to the following considerations about the indicator:

- The indicator is not just a number but represents the properties or characteristics of people or things, opinions and positions on various phenomena.
- Used concept and time reference
- Geographical location and circumstances
- Take into account the analysis unit and measurement unit
- Rounding boxes
- Multiplicity of sources and variation of data collection methodology

3. Other divisions of indicators types

- Absolute numbers such as the number of the population in a given year in the state.
- Percentages, total of 100 for all ratios.
- Mean or Average: such as the arithmetic mean, consumption mean per capita and the notes average of a student in a given year.

4. Measurement forms and units

Variable values are based on the scale used to express the value type and it results in the identification of possible calculations type on the data based on the scale level where there are four types of metrics, namely are:

4.1 Nominal Scale:

Here, the values reflect names used only for the classification and the distinction and we can not perform mathematical operations (calculations) on those numbers, such as the building number.

4.2 Ordinal Scale:

The values are given a certain order to reflect the difference in the ranks or grades and the differences between the values of successive ranks are not necessarily equal, such as: I, II, III, and such strongly OK, OK, neutral, disagree, strongly disagree. Which are commonly used in opinion polls.

4.3 Interval Scale :

The differences between the successive values are equal and the starting point (zero) is placed random and the variable is not lacking at zero, such as the height and temperature measurement.

4.4 Ratio Scale:

A digital variable where the differences between the successive values are equal and attributed to an origin point where there is no character. Such as the measurement of height, weight, age, income and other.

5. Other variables divisions:

- Connected and separate variable: such as age, room number
- Basic and derived variable such as family size, mean number of individuals in the family.
- Quantitative and qualitative variable: Quantitative such as: vehicle weight, building height, Qualitative: such as long and short.
- Dependent and independent variable: the dependent variable is that which value depends on the independent variable.

SECOND CHAPTER

The Quality and Its Elements Definition

2.1 Quality Definition

The quality generally refers to a measure standing on a basis leading to a particular good or service compared to other goods and services. In the framework of the official statistics, the item is the statistical product or the published and publicly available statistics and the service is a certain statistical service, hence the statistics data quality refers to all areas concerning the statistics extent of meeting the users' requirement and responding to their expectations in terms of content, form, presentation, accuracy and timeliness.

The first attempt to develop a definition for the concept of total quality management was by the BQA (British Quality Association) where TQM is known as "The management philosophy

of the organization, which gets through it to the achievement of both the consumer requirements as well as the objectives of the project together". While the Scientist John Oakland has defined it as "Means by which the organization is managed by in order to develop its effectiveness, flexibility and competitive position on the work scope as a whole".

From the American point of view, the definition of TQM is as follows: (Total Quality Management is a philosophy, guidelines and principles that show and guide the organization to achieve continuous development and it is quantitative methods in addition to the human resources that will improve the use of available resources as well as services so that all the processes within the organization seek to satisfy the requirements of existing and potential consumers).

According to the Royal Mail, the total quality is defined as the comprehensive way or means of work which encourages employees to work within a team and thus working on creating an added value for satisfying the consumers' requirements. According to the definition of British Rail ways board, the Total Quality Management is a process that seeks to achieve all of the special consumers' requirements by satisfying external as well as internal consumers' requirements in addition to the suppliers.

Cole (Cole, 1995) identified also the concept of total quality management as (an administrative system that puts the satisfaction of the workers at the top of the priorities list instead of focusing on short-term profits as this trend achieves profits in the long term, more consistent and stable compared with the short time term). Tunks (Tunks 1992) defined it too as the involvement and commitment of the management and the employee in the rationalization of the work by providing what is expected by the work or exceeds its expectations. Omachonu (1991 Omachonu) has defined it as the customer uses associated with the quality and its experience context within it.

Therefore, the data quality represents a set of features and properties in the statistical product or service that meets the requirements of beneficiaries or users or concerned and achieves their satisfaction. The TQM (Total Quality Management), in essence, it is an administrative guide to long-term success through customer satisfaction by total quality management from all members of an organization and those involved in improving procedures, products, services and prevalent culture in the workplace, where the implementation methods of this approach are from the teachings of such quality leaders as Philip B. Crosby, W. Edwards Deming, Armand V. Feigenbaum, Kaoru Ishikawa and Joseph M. Juran.¹

The quality is also known as the integrated regulation (total) of the production quality and it is a comprehensive and integrated system by which it is possible to assemble the work of the various units within the plant or facility that works in the areas of quality development and improvement, so as to ensure the production of products with appropriate degree of quality that satisfies the consumer desires with the lowest costs.

¹https://ar.wikipedia.org/wiki/%D8%A5%D8%AF%D8%A7%D8%B1%D8%A9_%D8%A7%D9%84%D8%AC%D9%88%D8%AF%D8%A9_%D8%A7%D9%84%D8%B4%D8%A7%D9%85%D9%84%D8%A9

2.2 Timeliness and Punctuality:

The data is made available in time to be used as timeliness refers to the time period between the date of availability of the data for the user and the occurrence of the event or phenomenon described by these data, while punctuality refers to the period between the issuance date of the data and the actual date on which the data must be delivered. The statistical agencies are facing a challenge with the improvement of the timeliness so that the data is disseminated in a timely manner while maintaining the high accuracy:

6. **Neutrality:** make data available to all users, stakeholders and all public without bias.
7. **Clarity & Availability:** availability indicates to the ease and the circumstances in which statistical data are accessed to, so that they are easy to use and convenient for the user in terms of form and content, while the concept of clarity refers to the information environment related to data, in terms of pairing it with suitable descriptive data and explanations such as graphs and maps, as well as provide information about the quality of these data. This dimension is measured using several indicators.
8. **Users' dialogue:** a dialogue is set with users and interested parties and their questions are being answered.
9. **Coherence:** this dimension is related to the compatibility extent of accumulated statistics by different methodologies and for multi-purposes within each other, and the existence extent of comparable methodologies that lead to similar results in terms of measurements in the different statistical system pillars, including primary and secondary data sources. This dimension is measured using several indicators.
10. **Completeness:** This dimension focuses on the availability of all the necessary statistics and the completeness extent of statistics in terms of the comprehensiveness of indicators, geographic coverage, timing coverage and coverage in terms of target groups and other related things.

When talking about the comprehensive statistical system and its outputs, the following² characteristics and criteria represent the basic elements of TQM in this system, namely:

1. **Relevance:** This dimension is related to the extent to which data meet the real requirements of the users, since these requirements reflect the topics and areas required by the users.
2. **Accuracy:** This dimension is related to the consistency extent between the data and the reality of the phenomenon, and the extent to which the data meet the real requirements of users in terms of indicators soundness of the research topic.
3. **Timeliness:** This dimension indicates the period between the time reference of the data and the date of publication and making them available to users knowing that the statistical agencies are facing a challenge with the improvement of the timeliness so that the data dissemination is done in a timely manner to users while maintaining a high accuracy for it.

² <http://asq.org/learn-about-quality/total-quality-management/overview/implementing-tqm.html>

4. **Accessibility:** This dimension refers to the ease for the users to gain access to the agencies statistical data, so that being easy to use and convenient in terms of form and content.
5. **Comparability:** This dimension refers to the possibility of comparing statistical data across time and space as well as between community subsets.
6. **Coherence:** This dimension is related to the existence of comparable methodologies that lead to similar and consistent results in terms of measurements in the different statistical system pillars, including primary and secondary data sources.
7. **Completeness:** This dimension focuses on the statistics in terms of indicators comprehensiveness, geographic coverage, timing coverage and coverage in terms of target groups and other related things.

2.3 Other Basic Elements in TQM

According to the US Institute of quality, total quality management can be summarized as a management system, of an organization focusing on customer requirements, based on the fact that all employees are working to provide continuous improvement and uses strategies, data and effective communication for the merging and integration of quality competence in the organization culture and activities. Thus, the basic elements in total quality management are:

1. **Focusing on customeres:** the customer ultimately determines the level of quality. Regardless of what the organization exert to promote the quality improvement, train the staff, integrate the quality in the design process and increase the computers and software specifications or buy new measurement instruments, the customer is the one who determines whether the efforts are worthwhile or not. Therefore, statistical agencies have to consult with the users of statistical data about their requirements of statistical indicators and periodicity, and a minimum of quality so as to fit for use for the purposes of planning and decision-making.
2. **Total participation of staff:** all employees participate in the work in order to achieve common goals. The full commitment of the employee only happens when the fear is removed from the workplace, he is enabled within his duties and the management secures the adequate environment. High-performance working systems are those which integrate continuous improvement efforts within the normal operations. Teams that are self-administered are a form of empowerment.
3. **Pivotal procedures.**
4. **Integrated system.**
5. **Systematic and strategic orientation.**
6. **Continuous Improvement.**
7. **Decisions-making based on facts.**
8. **Communication.**

2.4 On the other hand, Kwa, Makoni and Schroeder have identified in their paper [6] nine elements summarizing the TQM, namely are:

1. Job transit product design
2. Action Management
3. Resouce quality management
4. Customer engagement
5. Information and benefit
6. Committed leadership
7. Strategic Planning
8. Job transit training
9. Staff participation

2.5 Characteristics and Features of Statistics issued by Statistical Systems and Offices :

1. **Accuracy:** indicators should be issued with high soundness and accuracy, and be valid for decisions-making where the data accuracy reflect the extent of the (matching) of calculations and estimates with the actual or real values, which the statistics meant to measure. This dimension is measured using several indicators and the checking of the data includes multiple aspects in the survey, the most important are the statistical errors due to the use of the sample, as well as non-statistical errors due to the working crew and survey tools in addition to the survey response rates and their impact on the estimates.
2. **Relevance:** it should reflect the answer to user requirements in terms of their relevance to reality.
3. **Official:** statistics agencies are officially in charge of the preparation and dissemination of statistical figure for the state.
4. **Timeliness and Punctuality:** The data is made available in time to be used as timeliness refers to the time period between the date of availability of the data for the user and the occurrence of the event or phenomenon described by these data, while punctuality refers to the period between the issuance date of the data and the actual date on which the data must be delivered. The statistical agencies are facing a challenge with the improvement of the timeliness so that the data is disseminated in a timely manner while maintaining the high accuracy.
5. **Neutral:** is to make data available to all users, stakeholders and all public without bias.
6. **Clarity & availability:** availability indicates to the ease and the circumstances in which statistical data are accessed to, so that they are easy to use and convenient for the user in terms of form and content, while the concept of clarity refers to the information environment related to data, in terms of pairing it with suitable descriptive data and explanations such as graphs and maps, as well as provide information about the quality of these data. This dimension is measured using several indicators.

7. **Users' dialogue:** a dialogue is set with users and interested parties and their questions are being answered.
8. **Coherence:** this dimension is related to the compatibility extent of accumulated statistics by different methodologies and for multi-purposes within each other, and the existence extent of comparable methodologies that lead to similar results in terms of measurements in the different statistical system pillars, including primary and secondary data sources. This dimension is measured using several indicators.
9. **Completeness:** This dimension focuses on the availability of all the necessary statistics and the completeness extent of statistics in terms of the comprehensiveness of indicators, geographic coverage, timing coverage and coverage in terms of target groups and other related things.

2.6 Other Definitions of TQM

The first attempt to develop a definition for the concept of total quality management was by the BQA (British Quality Association)³ where TQM is known as "The management philosophy of the organization, which gets through it to the achievement of both the consumer requirements as well as the objectives of the project together". While the Scientist John Oakland has defined it as "Means by which the organization is managed by in order to develop its effectiveness, flexibility and competitive position on the work scope as a whole". From the American point of view, the definition of TQM is as follows: (Total Quality Management is a philosophy, guidelines and principles that show and guide the organization to achieve continuous development and it is quantitative methods in addition to the human resources that will improve the use of available resources as well as services so that all the processes within the organization seek to satisfy the requirements of existing and potential consumers). According to the Royal Mail, the total quality is defined as the comprehensive way or means of work which encourages employees to work within a team and thus working on creating an added value for satisfying the consumers' requirements. According to the definition of British Rail ways board, the Total Quality Management is a process that seeks to achieve all of the special consumers' requirements by satisfying external as well as internal consumers' requirements in addition to the suppliers. Cole (Cole, 1995) identified also the concept of total quality management as (an administrative system that puts the satisfaction of the workers at the top of the priorities list instead of focusing on short-term profits as this trend achieves profits in the long term, more consistent and stable compared with the short time term). Tunks (Tunks 1992) defined it too as the involvement and commitment of the management and the employee in the rationalization of the work by providing what is expected by the work or exceeds its expectations. Omachonu (1991 Omachonu) has defined it as the customer uses associated with the quality and its experience context within it.

³https://ar.wikipedia.org/wiki/%D8%A5%D8%AF%D8%A7%D8%B1%D8%A9_%D8%A7%D9%84%D8%AC%D9%88%D8%AF%D8%A9_%D8%A7%D9%84%D8%B4%D8%A7%D9%85%D9%84%D8%A9

THIRD CHAPTER

Quality Policy and Goals

3.1 General Model for TQM application

The integrated and comprehensive control of the outputs quality is a comprehensive and integrated system whereby, the work of the various units within the statistical offices which operate in the areas of quality development and improvement of statistical data and indicators can be assembled, in order to ensure the comprehensiveness and quality accuracy of the outputs with an appropriate and acceptable level so that will satisfy the data users requirements with the lowest costs and in a timely manner.

In general, the application of total quality management in statistical offices requires in advance the following basic steps:

1. Top management of the organizations or offices learns about and decides to commit to total quality management. TQM is identified as one of the organization strategies.
2. The management assesses current culture, customer satisfaction and quality management systems.
3. The management identifies core values and principles to be used and communicates them.
4. The management develops a TQM master plan on the basis of steps 1, 2 and 3.
5. The organization identifies its priorities, the customers requirements and aligns appropriate products and services to meet those requirements.
6. The Management maps the critical processes through which the organization meets its customers requirements.
7. The management oversees the formation of teams for process improvement efforts.
8. The momentum of the TQM efforts is managed by the Steering Committee.
9. Managers contribute individually to the efforts through planning, training or the development of other methods.
10. Daily process management and standardization take place.
11. Progress assessment and adjustment of the plan as needed.
12. Constant employee awareness with high level transparency on any processes or feedback on status or in the case of rewarding or punishing some people.

3.2 International Data Quality Systems

The statistical agencies should examine the possibility of applying one or more of the quality measurement tool systems and mechanisms for improvement and development. The following are the most important quality measurement tools and systems and updates:

1. Apply the private system of quality management in the European Union EFQM
2. Apply a quality management system ISO 9001.
3. Apply the quality form by the European Charter of good practices COP.
4. The European Self-Assessment Checklist for Survey Managers DESAP.
5. Application of the General Data Dissemination System GDDS.
6. Application of the Special Data Dissemination System SDDS.
7. Statistical data evaluation by specialized methods such as demographic analysis.
8. Prepare reports, research and scientific and evaluative studies related to surveys and censuses data quality.
9. Compared the same survey or census with other censuses or surveys in a different time period or in other various geographic areas or even with other countries.

3.3 Strategic Requirements to achieve the Total Quality

Total quality management can be summarized as an organization management system that focuses on customers, so that the system includes continuously all employees in quality improvement and uses a strategy that enables effective information, data and communication and integration of quality control in the organization culture and activities. Therefore, quality improvement policy includes the following requirements⁴:

1. **Designated to customers:** the customer is the one who ultimately determines the acceptable quality level he needs for the product or service that he requires to get regardless of what the organization is doing to encourage employees to improve the quality. So, it is necessary to integrate quality in the design and development operation of goods and services provided to customers in future programs where customers are the ones who determine whether these efforts to improve the quality worthwhile or not.
2. **Fully engage the employees:** when all the employees are involved in the work in order to achieve common goals, a full commitment from them can be obtained after they feel safe in the workplace and remove the fear from it and when empowerment is happening with the provision of proper environment and high-performance work systems by the management, the continuous improvement efforts will be integrated with regular business operations and the self-managed work teams will be a form of empowerment.
3. **Pivotal process:** focusing on the pivotal process is an essential part of total quality management. This process is a steps series that takes inputs from suppliers (internal or external) and turns it into the main outputs that are delivered to customers. The required steps for the implementation process are determined and monitored continuously in accordance with the performance standards in order to detect unexpected differences.
4. **Integrated system:** Although the organization may combine much diversity in various disciplines and functions, it is often organized in vertical circles, while the horizontal processes are connecting these jobs, which are the focus of Total Quality Management. The micro-processes are processes that add as many up to wider

⁴ <http://asq.org/learn-about-quality/total-quality-management/overview/implementing-tqm.html>

operations and assemble all the operations in the necessary business operations for the identification and implementation of the strategy.

Everyone should also understand the quality vision, mission and principles as well as objectives, policies and the organization critical operations. The business performance and communication should be consistently monitored according to an integrated system that may consist of similar standards as Baldrige National Quality Program and/or integrate **ISO 9000** standards or the European Total Quality **EFQM** standards which the researcher recommends to adopt or others depending on the country requirements and the stage it reached as each organization has a unique culture in the work and it is almost impossible to achieve excellence in products and services if it did not promoted a culture of quality assurance and good quality supply. Thus, get an integrated system that links the elements of continuous improvement in the quality of goods and services in an attempt to surpass the customers, employees and other stakeholders' expectations.

5. **Strategic and systematic approach:** an important part of quality management is a strategic and systematic approach to achieve the organization's vision, mission and major goals which wants to achieve, not a short-term goal of progress. This process is called strategic management or strategic planning, including the formulation of a strategic plan that integrates quality as an element and an essential component as this strategic plan includes the following visions, approach and goals:

- 5.1. **Continuous Improvement:** The main objective of total quality management is a process of continuous improvement, which is leading the organization to develop analytical and creative abilities alike and finding ways to become more competitive and more effective in meeting the expectations of stakeholders.

- 5.2. **Make decisions based on facts:** in order to know the extent of the organization's success and progress, it must adopt plans and draw its policies and take decisions based on the underlying performance metrics and derived of facts, information and data with high accuracy and quality rather than random guesses. This requires the total quality management in the organization to collect and analyse the data continuously in order to improve the accuracy of plans and decision-making process, achieve a consensus and allowing the prediction based on past history.

- 5.3. **Continuous communication:** a constant communication must be between all parties and all operations especially those related to each other in addition to taking into account the organizational change periods in the organization as effective communications plays a major role in maintaining the morale and motivate employees at all levels.

- 5.4. **Effective communication:** communication plays a big role in maintaining the morale and motivate employees at all levels, thus contributing to job satisfaction and safety. The communication strategies include the style and timing of the

communication process, so as to keep the satisfaction of the employees at high levels.

These elements are essential for TQM knowing that many of the organizations and institutions determine a set of core values and principles to their employees for which the organization and its staff have to work with. When all the personnel is involved in the work in order to achieve common goals, a full commitment from them can be obtained after they feel safe in the workplace and remove the fear of it, and when empowerment happens, with the provision of proper environment and high-performance work systems by the management, the continuous improvement operations efforts are integrated with normal business operations and the self-managed work teams are being a form of empowerment and strength of the organization.

3.4 Other strategies and methodologies for the development of TQM process

Strategy 1: TQM Element Approach (TQM):

The TQM element approach (TQM) takes the key business processes and organizational units and uses the TQM tools to foster the improvements. This method was widely used at the end of the last century as companies tried to implement parts of the TQM as they learned them. Examples of this approach include statistical process control, Taguchi methods and quality function deployment.

Strategy 2: Guru Approach

The Guru Approach uses the teachings and writings of one or more of the leading quality thinkers as a guide against which to determine where the organization has deficiencies. Then, the organization makes the appropriate changes to remedy those deficiencies. For example, managers may study Deming 14 points or attend a training course on the subject, then work on implementing the learned approach.

Strategy 3: Organization Model Approach

In this approach, Individuals as experts or working teams visit organizations that have taken a leading role in the TQM and identify their processes and reasons for success. They then integrate these ideas with their own ideas to develop the appropriate organizational model adapted for their specific organization. This method was used widely in the last two decades of the last century and is exemplified by the initial recipients of the Malcolm Baldrige National Quality Award.

Strategy 4: Japanese Total Quality Approach

Organizations using the Japanese total quality approach examine the detailed implementation techniques and strategies used by Deming Prize-winning companies and use this experience to develop a long-range master plan.

Strategy 5: Award Criteria Approach

When using this model, an organization uses the Quality Award criteria, for example: Deming Prize, European Quality Award, or the Malcolm Baldrige National Quality Award, to identify the areas for improvement. Under this approach, the TQM implementation focuses on meeting the specific criteria for the award.

3.5 When any organization gets the TQM certificate, this indicates the organizational excellence and lead to achieve direct and indirect benefits:

The most important of those benefits are as follow:

1. Strengthening the competitive position of the organization.
2. Adaptation ability to market conditions change, government regulations, and others.
3. Increase productivity.
4. Enhance the market image.
5. Eliminating defects and waste.
6. Reduce costs and improve cost management.
7. High profitability.
8. Improve customer focus and satisfaction.
9. Increase customer loyalty and retention.
10. Increase job security.
11. Improve the employees morale
12. Enhance stakeholders' participation and value.
13. Increase improvement and innovative operations.
14. The benefits of TQM are endless as they help your organization to get the results.

3.6 Official statistics fundamental principles

Principle 1:

Official statistics is an indispensable element in the information system of a democratic society, serving the government, the economy and the public of data on the economic, demographic, social and environmental situation. In order to achieve this, the concerned official statistics agencies should collect what have evidence of practical utility of official statistics and make them available to citizens impartially fulfilling their right to seek information.

Principle 2:

To retain trust in official statistics, it is necessary that the statistical agencies, according to strictly professional considerations, including scientific principles and professional ethics,

identify the methods and procedures for statistical data collection, processing, storage and presentation.

Principle 3:

Facilitating a correct interpretation of the data, the statistical agencies, according to scientific standards, provide information on the statistics sources, methods and procedures that apply to them .

Principle 4:

Statistical agencies have to comment on erroneous interpretation and misuse of statistics.

Principle 5:

Data may be obtained, for statistical purposes, from any source, whether statistical surveys or administrative records. Statistical agencies while choosing a source should take into account the quality, timeliness, costs and the burden on respondents.

Principle 6:

A full confidentiality must be given to data on individuals which are collected by statistical agencies for statistical compilation, whether they refer to natural or legal persons and are to be used exclusively for statistical purposes.

Principle 7:

Make the laws, regulations and measures under which the statistical systems work publically available.

Principle 8:

Coordination among statistical agencies within countries is essential to ensure the consistency and efficiency of the statistical system.

Principle 9:

Using international concepts, classifications and methods by statistical agencies in each country promotes the consistency and efficiency of the statistical systems at all official levels.

Principle 10:

Bilateral and multilateral cooperation in statistics contributes to the improvement of official statistics systems in all countries.

<http://unstats.un.org/unsd/methods/statorg/FP-Arabic.pdf>

FORTH CHAPTER

Evaluation of Statistical Data Quality

4.1 Introduction

The importance of the statistical data quality rises from the need to provide accurate demographic data, social and economic, distributed according to different characteristics, especially age and sex for the purpose of preparing population projections and the use of data for forecasting, planning and decision-making in the various economic, social, demographic and geographical areas.

The quality of statistical work varies from one person to another, from one region to another, from time to time and from a subject or area to another knowing that the efforts may go in vain if the data is of poor quality and the use of the data for planning, decision-making and scientific researches by all beneficiaries will become doubtful.

So, the data quality must be ensured during the preparatory and implementation phases especially the data collection and computerization, in addition to the use of different methods of examination and evaluation of the data after being processed in order to achieve the highest level of data comprehensiveness and accuracy when used for the purposes of the comprehensive development planning and decision-making.

Quality control process is designed to prevent errors or reduce them the most possible and disclose them if they occur in order to take appropriate measures to correct them knowing that without following this, statistical data may contain many errors leading to a lack of suitability for use or considerable uncertainty in the results of their uses.

4.2 Types of errors that statistical data are exposed to:

The quality of statistical data in general are exposed to two types of errors, namely are:

4.2.1 Statistical errors:

Errors that are present in the sample surveys as a result of the sample selection from the community and not found in the censuses. They are easy to measure and the sampling error rate can be estimated easily as these errors are caused by errors in the sampling only.

4.2.2 Non-statistical errors:

Their occurrence is possible in any stage of the implementation of censuses and surveys, both in the preparatory or field phases or in the data processing, dissemination and analysis.

In general, the non-statistical errors that the statistical data are experiencing can be classified into two main sections: coverage or inclusiveness errors and content errors.

4.2.2.1 Coverage or Inclusiveness Errors

Those are errors related to the completion extent of coverage and enumeration, or omission or duplication in the data collection as the researcher could project some or the entire of the household members for one reason or another and involved individuals may also not report some vital events leading to a shortage in the registration. From the errors that may occur in enumeration deficiencies, the undercount of households and individuals for a complete enumeration area or a group of households or a member and more from the household or a group of individuals from several households. In contrast, the enumeration of a household or more can be duplicated as well as the enumeration of members in the household via counting them in more than one household “overcount”.

4.2.2.2 Content Errors

The second type of errors are content errors and are the incorrect classifications of a section of individuals properties. These errors can arise at any stage of the statistical work and the most important types of content errors is the age misreporting, for example, by the respondents, and one of its causes is ignorance of age called by the wrong age estimate as a person estimates his age without the use of official documents, facts or specific events. Such as giving estimations, or exaggerating/diminishing the age or errors that result from certain age heaping, such as ages ending with zero or five.

There are also other errors, such as measurement errors caused by the researcher or the respondent, or errors in the design of the form, or the surrounding environment, in addition to the errors of data or information processing systems, in the collection and entry, transfer or data conversion, checking errors, coding, error in processing errors or in different data sources (administrative records, censuses, surveys) or historical sources or in the used tools, hardware and software.

4.3 Ensuring the Statistical Data Quality

To ensure access to data of a great accuracy of statistical data, it is necessary to establish procedures to ensure quality in all statistical phases of the statistical project starting from the preparatory phase, then the field phase and finally by the phase of data processing and dissemination. Each phase is given the time and measures to ensure the achievement of the quality and the high reliability of data.

4.3.1 Quality assurance mechanism in the preparatory phase

In the preparatory phase of the statistical project, the timetable for the project implementation is set up, in addition to the preparation of definitions, instructions and coding manuals so that it fits with national requirements and international recommendations for the comparison purposes. At this stage, an experiment control process is being implemented also for all tools,

forms and handheld devices, means, mechanisms and models and for all data collection, processing and dissemination processes. The forms are designed with an extent that ensures the data transfer with high quality and a way that will ensure that all records and forms have been received and stored, a way that will ensure the input programs quality of the forms data, in addition to the use of training and coding guides and follow-up models for the work and achievement quality. This in addition to the field and desk review processes and ensure their quality, measuring comprehensiveness, as well as examining the printing quality of forms, manuals and models and all the other tools and devices used for data collection, processing and dissemination.

At this stage, the estimates of human, material needs and time schedule to complete the tasks and activities are being calculated also in advance.

4.3.2 Control mechanism in the fieldwork phase

The selection and training of personnel: When selecting staff, the choice of the best talent, especially those with academic qualifications is taking into consideration as well as for the selection of field staff from the same locality and that for the easy inference on households as much as possible, and to easily learn the area, the itinerary and inference on all buildings, facilities and households.

Data collection: a posteriori study is being implemented by 4% of the enumeration areas in order to examine the inclusion of individuals and households where a full re-counting of all households and individuals in the selected enumeration areas is done and the study showed a lack of the inclusion of individuals by 2.7%.

Refusals: Many of the mechanisms have been designed to cope with refusals by some respondents. From these mechanisms, field visits by members of the central operations chamber to handle these cases and the participation of officials from various official bodies to reduce these cases.

4.4 Assessment of Data Comprehensiveness and Quality

The assessment process of censuses and surveys results through the estimation of the errors values and trends is considered a necessary process to answer questions related to the comprehensiveness and quality of statistical surveys and censuses data in order to defend the credibility of the results in front of the doubters. There are several methods and tools to evaluate statistical data quality in terms of coverage and content which include either a single source of data (the census itself) or multiple sources. The use of multiple sources style, in turn, is performed by one of two ways: either by comparing the individual records or by comparing the total values.

The examination of statistical data quality program includes several methods to measure the data comprehensiveness, quality and trends which is concentrated in several areas, including:

4.4.1 Implementation of a posteriori study (matching individual records)

A posteriori study is a sample survey being conducted shortly after the census for an essential goal which is the assessment of censuses comprehensiveness. Posteriori study usually consists of two types of corresponding studies: A matching study in order to measure coverage errors and re-interview survey for the purposes of content errors assessment in the census data with regard to demographic indicators.

Usually, the posteriori study method is the only method relied upon to measure inclusion errors in censuses in developing countries and that if we take into account the fact of the lack of accurate administrative records in most of these countries and the limited availability of accurate demographic data about fertility, mortality and internal migration. **In addition, this method, and through the individual matching style of records, it offers the possibility of obtaining separate estimates** about each of inclusiveness errors and errors of content which is not feasible to achieve in studies that do not support individual matching style of records.

In the posteriori study, the data quality control is easier due to the limited field of study being conducted on a sample of areas. In contrast, the posteriori study includes additional process not included in the census, namely the matching process between the census records and the posteriori study records. This additional step will include non-statistical errors why necessary needs of dedicated and qualified enumerators and technical supervisors should be provided so that the ratio of supervisors to enumerators will be (1 to 5 or less). Distinguished matching officials must also be nominated and conduct adequate training and a good follow-up at all stages.

Although the posteriori study was not designed to be completely independent of the general census, where census enumeration areas are used as initial sampling units of the posteriori study, the following points must be taken into account which would lead to an independence in the practical measures through the following activities:

- Return all census forms from the field before starting the enumeration in the posteriori study.
- Enumeration of the posteriori study areas by the same crews of the fieldwork for the census except those working as enumerators where the census supervisors and observers to work in the posteriori study to take benefit of their experience, considering their designation to work in other areas than those they have worked in during the census.
- Staff does not acquire any initial information in the posteriori study on the census results in the enumeration areas they will work in. By the same logic, the census staff does not know any enumeration areas where the posteriori study will be carried out later.
- The posteriori study data are being processed separately from the census data processing.

- Based on the posteriori study, the inclusiveness rates for each of the households and individuals is being evaluated at the national level and the enumerator results are being used after calibrating it with inclusion shortage, if any.

4.4.2 Examination of the internal data consistency

Given the magnitude of the data available in the statistical agencies and the multiplicity of areas and topics for each of the censuses or surveys or administrative records, there must be programs, tools and mechanisms to deal with most of the consistency errors and the non described as much as possible, especially if the non described ratio is high, which limits the ability of decision-makers on census planning and policy-making. Thus, those who works on the data quality must give utmost importance to the subject of the examination of the data and their quality by all possible means, foremost of which are the internal data consistency, comparison of the results with other sources and extraction of error payroll and fix them. Based on that, instructions and mechanisms that ensure access to high quality data must be set during the field implementation and develop control mechanisms and models of their supervision and follow-up.

After inputing data, payrolls are being extracted to make sure of the entry inclusion of all enumeration areas and all buildings, condominiums, households and individuals and examine the internal data consistency.

4.4.3 Examination of the external data consistency

The new statistical data are compared with the previous censuses and surveys indicators that have common indicators using same definitions, as a comparison is made between the derived main indicators and ratios between each other in several areas, where the comparison is made also with the various surveys indicators for the same year, or with previous censuses or with the population projections..

4.4.4 Dealing with the non described

The non described is dealt with in principle by coding it using the figure (9) according to the number of digits for each question if a firm presumption was not listed to choose the correct answer, such as sex, relationship to the paterfamily in the houehold and housing conditions, building type, owner variables, owner property, the use of the building variables and use the housing unit in the building form .

4.4.5 Using demographic analysis methods

The use of demographic analysis to assess the population data of censuses is considered one of the most common methods to assess the quality of their data, as through it, the age, age and sex structure in the society is assessed by the calculation of demographic metrics to examine and assess the age and sex data.

Age and sex data is exposed in the census to non-statistical errors resulting from errors by respondents whether relying on memory or not knowing the age exactly or not knowing the birth year especially the elderly or not understanding the question or error in the calculation of age or non-use of official documents. In addition to errors by field researchers in the enumeration or registration upon the filling of the form or the errors resulting in the data processing stage especially data input and cleaning errors.

The degree to fall into these errors vary from country to country depending on the availability of registration and quality systems, the time period in which these systems began to work, the means of quality control, the means of data cleaning by hand or automated correction, a mechanism to deal with the non described and methods of compensation for the non described.

For conducting demographic assessment purposes, computer programs must be used such as PASS program (Population Analysis Spread Sheets) or RAPID or SPECTRUM in the process of calculating all the age and sex data standards on multiple geographical levels.

The focus is on the extraction of some indices to measure Age Groups data accuracy and individual old favorites such as calculating the proportions of different age groups, calculating the proportion of sex at a certain age groups, calculating Whipple index, Myers index and UN age and sex accuracy index⁵.

4.4.6 Sex and age distribution ratio

Sex and age ratios Analysis:

Age and sex distribution data of the community population is considered to be of importance while the planning process for the economic and social development and the source of this distribution is usually the population censuses (comprehensive enumeration). The sex ratio is defined as the number of males per hundred female and can not be changed except in narrow limits. Usually, every 100 female births meet 105 male births especially at birth and the ratio is limited in the range of 102-107 and data that fall outside these limits need enough justification.

However, the age ratio is calculated when the number of population is tabulated in age groups of equal length and that "by dividing the number of population in each age group (or at every age) by the average number of population in the previous and subsequent groups and multiply the result by 100". The expected pattern for the age rates under normal circumstances of the country is the simple deviation from 100 with exception for the advanced ages. The following table represents the proportion of sex and age by age groups in 2007.

4.4.7 Whipple index

⁵ See (Shroyck and Siegel 1976: 114-119).

This index shows the degree of individuals' preference for ages ending by zero or five in the age range from 23 to 62 years, and the formula used to calculate the Whipple index is :

$$\text{Whipple Index} = \frac{5 \times \text{Total population with ages ending by five or zero between 23 – 62 years}}{\text{Total population within age group of 23 – 62}}$$

This index is a scale of the quality and accuracy of registration of ages in the census and shows the preference degree for ages in numbers ending with zero and five degrees. This method is considered limited because of the age preference being not only for ages ending with zero and five, but also for those between the digits from zero to nine. The value of Whipple index or scale is between (1.00, 5.00), if the value is 1.00 that indicates that there is no bias or preference for zero and five digits, but if the value is 5.00 (in theory) that indicate, however, that the terminal digit of all reported ages ends with zero or five (0, 10, 5.55 etc).

The following classification of the data accuracy degree is suggested with respect to Whipple Index:

- Less than 1.05 very accurate
- From 1.05 to 1.099 relatively accurate
- From 1.10 to 1.249 ok
- From 1.25 to 1.749 inaccurate (bad)
- From 1.75 absolutely inaccurate (very bad)

This index is characterized by the easiness of enumeration, but it is faulted by being not countable if the data were not tabulated in single ages. For single age accuracy scale and preference for terminal digits of (0 or 5), the results show that the Whipple index is equal to 1.01 for the Palestinian territories, which indicates the presence of a weak preference for the zero or five digits.

4.4.8 Myers index

This index shows preference or avoidance aspects for each of the ten terminal digits from zero to nine. The value of Myers index is between zero and 180. If the value is less than 40, the age data is then accurate, but if the value of Myers index is between 40-80 then the accuracy is medium and if the value of Myers index is more than 80, the age data is bad and inaccurate.

4.4.9 UN age-sex accuracy index

This index is based on calculating the proportion of sex and age at the same time and it is summed up in a single value that reflects the age and sex together. The method is characterized by the possibility of application when data are not available on the single age distribution and also being affected at the same time by coverage errors and age errors in addition to the preference for a specific ages and so it reflects a clearest picture of the accuracy extent of age and sex composition in general. However, this method is faulted by the

resulting figure providing only a general idea of the error degree. The UN index is calculated for age and sex accuracy by following these steps:

1. Sex ratios are calculated in five-year age groups.
2. Successive differences of age groups sex ratios and the sum of successive differences regardless of the reference (+ or-) are obtained and from this total the average of differences is calculated.
3. Age distribution in the five-year age groups is calculated for both sexes. Then deviations from 100 are derived and the average of age ratio deviations is calculated for both sexes as stated in (2) above.
4. To find the value of the UN index, the difference average of sex ratios is multiplied by the digit (3) and the result is added to the deviation average of male and female age ratios, this indicator is usually referred to as the "common index". The result of the index is explained as follows:
5. If the index value is less than 20, this indicates that the age and sex data are accurate.
6. If the number is between 20 to 40, this indicates that age and sex data are moderately bad
7. But if the index value is more than 40, this means that the age and sex data are inaccurate and suffer from age misreporting problems. Noting that the number being inaccurate does not necessarily indicate a problem in reporting, **but may reflect the fact and circumstances experienced by the community.**

It is noted that the UN index is equal to 24 in the state of Palestine, which shows that the age and sex data are moderately bad at the level of the State of Palestine. However, it is close to twenty in many provinces of the West Bank (Ramallah, Jericho, the holy j1, Bethlehem, Hebron), which means being close to the fact that age data are accurate, while noting that this index is more than 30 is the provinces of the northern West Bank (Jenin, Tubas, Tulkarem, Nablus, Qalqilya) (with the exception of Salfit province), and this shows that the age and sex data in the central and southern West Bank are better than the provinces of the north.

While the value of the UN index of Gaza Strip is more than thirty for all the provinces in the Strip, and this shows that the age and sex data in the West Bank are higher than in the Gaza Strip in general.

Noting that the highest quality of age data according to this index is in the provinces of Bethlehem, Hebron and Ramallah, and the lowest quality of age data is in the provinces of Rafah and Deir al-Balah and Khan Younis.

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