CURRENT STATE OF STATISTICAL CAPACITY IN OIC COUNTRIES

OIC Outlook Series

February 2013

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Contents

INTRODUCTION

Referred to as one of the "Fathers of Science Fiction Genre", Herbert George Wells stated that *"[S]tatistical thinking will one day be as necessary for efficient citizenship as the ability to read and write."* (Wells, 1903). Encompassing both logical and analytical reasoning, statistical thinking evaluates the "whole" of a problem with its sub-components, including the processes and solutions. Statistical thinking is viewed as a philosophy of learning and action based on the following fundamental principles (Hlavacek, 2008):

- All work occurs in a system of interconnected processes,
- Variation exists in all processes, and
- Understanding and reducing variation are keys to success.

Historically, Al-Kindi is seen as the first scientist to write on statistics. In his book "*Risalah fi Istikhraj al-Mu'amma* – Manuscript on Deciphering Cryptographic Messages", he gave detailed description of how to use statistics and frequency analysis to decipher encrypted messages (AL-Kadi, 1992). From the times of Al-Kindi to today, statistics as a science has advanced both in mathematical formalism and implementation fields due to the ever changing social practice. Especially the early nineteenth century witnessed the gilded age of official statistics throughout Europe where people like Ernst Engel, Director of the Royal Prussian Statistical Bureau, strongly believed that "*statecraft, namely, the practical application of political science, is a mere sham without a statistical foundation.*" (Hacking, 1987).

Official statistics produced by National Statistical Offices (NSO) and international agencies are expected to provide information on all main parts of our daily life. However, as put forward in 1996 by Yves Franchet, Former Director General of Eurostat, that statistics produced by the NSOs are like any other product to compete with all sorts of information from various sources, and timeliness; even at the expense of accuracy, reliability, and relevance; is a vital issue for official statistics to keep its market (Kotz, 2005).

To attain the points mentioned above, the NSOs need to build a statistical capacity on a continuous basis. From the viewpoint of some international organisations, statistical capacity is defined as the ability of countries to meet user needs for good quality official statistics which are produced by governments as a public good (World Bank, 2013).

From this aspect, the Statistical Capacity Indicator (SCI) was developed to measure statistical capacity of countries. Maintained by the World Bank, the SCI for 2012 provides an overview of the national statistical capacities of 146 countries of which 50 of them are OIC countries. The SCI framework is comprised of three dimensions: statistical methodology; source data; and periodicity and timeliness. With a scale ranging from 0 to 100, these dimensions are then averaged to provide the overall SCI score (World Bank, 2012a).

In this OIC Outlook Report, we will analyse, based on the 2009 and 2012 SCI scores from the (World Bank, 2012a), the dimension indicators – that the OIC countries have still a room to perform better – and the possibility to construct country clusters based on the performances in the respective SCI dimensions. Based on the analyses carried out, this Report derives conclusions and policy implications for the OIC

Member Countries to improve their statistical capacities.

1 OVERALL STATISTICAL CAPACITY

The overall SCI score is the simple arithmetic average of the scores obtained from three SCI dimensions including statistical methodology, source data, and periodicity and timeliness. The score scale is between 0 and 100. A score of 100 indicates that a country meets all the criteria and has a perfect performance among the three SCI dimensions.

Figure 1 shows the dispersion of overall SCI scores for the OIC, Non-OIC, and All Countries in 2009 and 2012. The total number of countries for which an overall statistical capacity score exists is 146 of which 50 of them are OIC and 96 of them are non-OIC countries. From 2009 to 2012, the range of scores for all country groups shrank partly due to upwards trend in the minimum scores. The minimum scores moved from 22.8 to 26.7 for the OIC and All Countries group, and 28.9 to 31.1 for the Non-OIC Countries. As to the maximum scores, while the OIC Countries group showed an increase from 91.7 to 94.4, the Non-OIC Countries group recorded a minor decrease from 95 to 94.4 in the period 2009 to 2012. In this respect, we measured the decrease in range of scores as 1.1 (from 68.9 to 67.8), 3.9 (from 66.1 to 62.2), and 4.4 points (from 72.2 to 67.8) for the OIC, Non-OIC, and All Countries group, respectively. Besides the shrinking range of scores, we also observed that the median absolute deviation (the most typical deviation from the most typical score) narrowed by 3.3 (from 12.8 to 9.4), 1.1 (from 14.4 to 13.3), and 2.2 points (from 14.4 to 12.2) for the OIC, Non-OIC, and All Countries group, respectively.

All these findings concerning the dispersion of overall SCI score data indicate that the variation in the scores of all country groups dropped from 2009 to 2012. In addition, we can see from Figure 1 that the average overall SCI scores marked an increase for all country groups by 0.9 (from 61.5 to 62.4), 1.6 (66.1 to 67.7), and 1.4 points (from 64.5 to 65.9) for the OIC, Non-OIC, and All Countries group, respectively.

Figure 1 Dispersion of Overall SCI Scores, 2009 vs. 2012
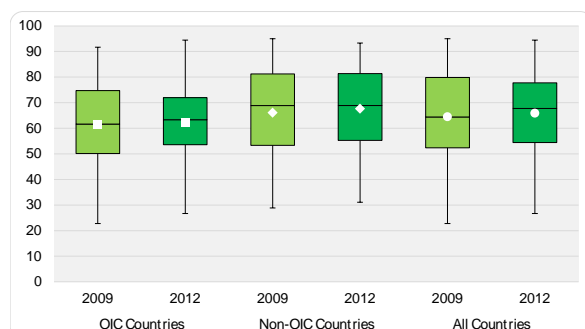
Source: SESRIC SID staff calculations; World Bank, BBSC

Figure 2 reflects in more detail the change of overall SCI scores of the OIC Countries between 2009 and 2012. We can infer from Figure 2 that the overall SCI scores in 2012 was mostly higher than those in 2009 up to 63rd percentile but could not surpass those in 2009 above that threshold.

Figure 2 Percentile Plot for the Overall SCI Scores of OIC Countries, 2009 vs. 2012
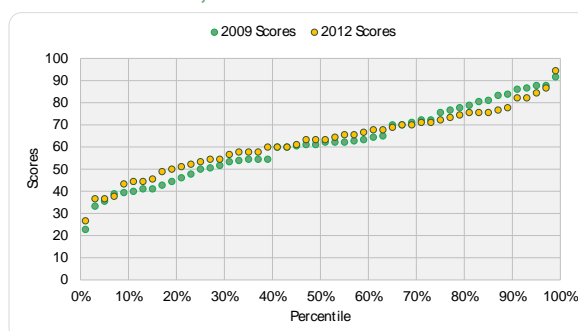
Source: World Bank, BBSC

Table 1 presents the percentages of countries in each group that decreased, maintained, and increased their overall SCI scores from 2009 to 2012. When compared with the other groups, the OIC Countries group has the highest rate of countries that recorded a score decrease and the lowest rate of countries that recorded a score increase in the same period.

Table 1 Percentage of Countries by Direction of Overall SCI Scores from 2009 to 2012

	OIC Countries	Non-OIC Countries	All Countries
▼	48.0%	42.7%	44.5%
↕	2.0%	6.3%	4.8%
▲	50.0%	51.0%	50.7%

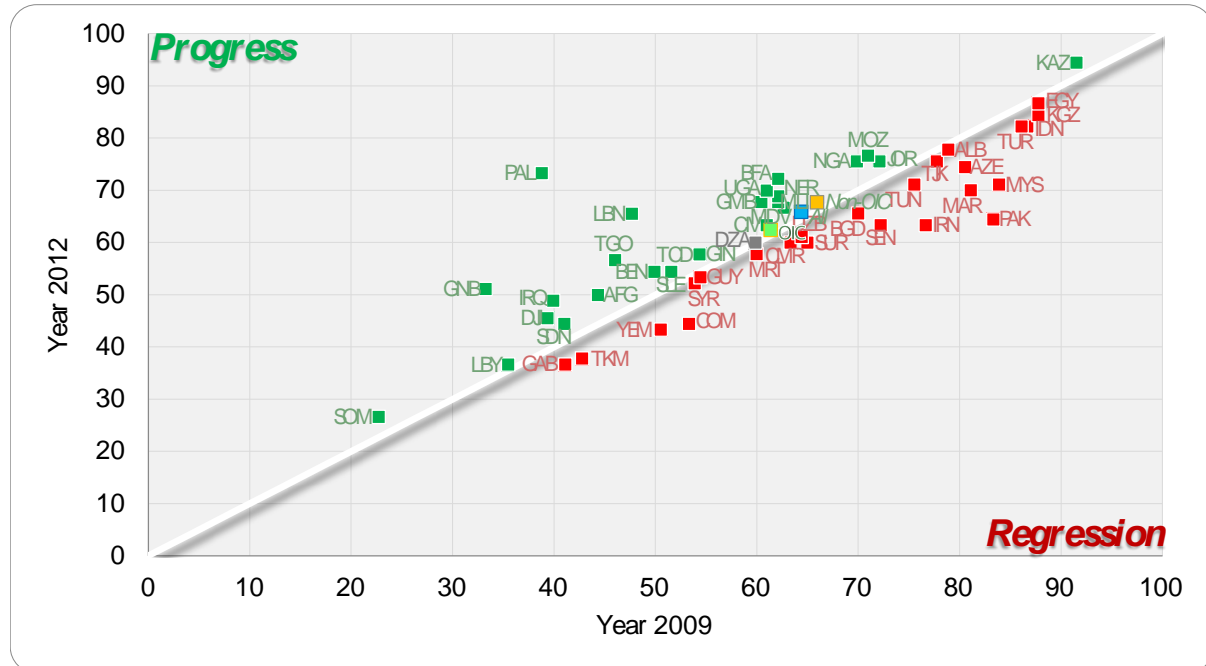*Source*: SESRIC SID staff calculations

Figure 3 shows the overall SCI scores of individual OIC Countries and the average scores of OIC, non-OIC, and all countries in 2009 (x-axis) and 2012 (y-axis) to reflect the score performances. Together with all country groups, 25 OIC Countries are observed to be in the Progress section, 24 OIC countries take place in the Regression section and 1 OIC Country (Algeria – DZA), lying over the diagonal, maintained its 2009 score also in 2012. In the same period, the 5 OIC Countries with the highest overall SCI score increase were Palestine (PAL, 34 points up), Lebanon and Guinea-Bissau (LBN/GNB, 18 points up), Togo (TGO, 11 points up), and Burkina Faso (BFA, 10 points up). The 5 OIC Countries with the highest

overall SCI score decrease were Pakistan (PAK, 19 points down), Iran and Malaysia (IRN/MYS, 13 points down), Morocco (MAR, 11 points down), and Comoros (COM, 9 points down).

Figure 3 Overall SCI Score Performance of Individual OIC Countries and Country Groups, 2009 vs. 2012

Source: SESRIC SID staff calculations; World Bank, BBSC

Figure 4 exhibits the 10 OIC Member Countries with the highest overall SCI scores in 2012. Kazakhstan had the highest overall SCI score with 91.7 points among the OIC Countries in 2012. Considering the SCI dimensions, after Morocco (33.3 points), Kazakhstan had the second highest statistical methodology score (30 points) together with Kyrgyzstan, Turkey, and Malaysia. Kazakhstan had the highest source data score (33.3 points) together with Egypt and Albania. However, Kazakhstan got placed in the 6th rank with 28.3 points in periodicity and timeliness dimension after Indonesia, Egypt, Azerbaijan, Pakistan, and Turkey. Following Kazakhstan came Egypt and Kyrgyzstan (87.8 points), Indonesia (86.7 points), Turkey (86.1 points), Malaysia (83.9 points), Pakistan (83.3 points), Morocco (81.1 points), Azerbaijan (80.6 points), and Albania (78.9 points).

Figure 4 Ten OIC Member Countries with the Highest Overall SCI Score in 2012
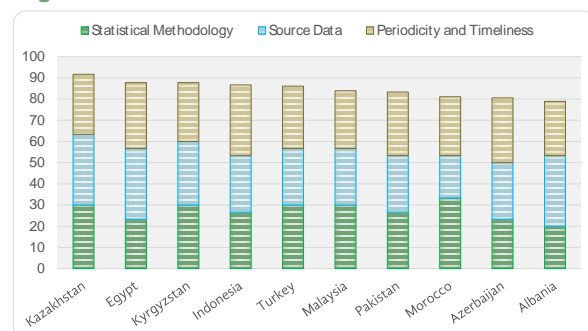
Source: SESRIC SID staff calculations; World Bank, BBSC

2 STATISTICAL METHODOLOGY

Being the first dimension of the SCI, *statistical methodology* quantifies the extent that a country follows and implements internationally recommended statistical standards and methods. The frameworks and specifications used in compilation of macroeconomic statistics, social data reporting, and estimation practices are at the centre of the evaluation of each country's statistical practice. To score this dimension, ten criteria including national accounts, balance of payments, Consumer Price Index (CPI), production index, external debt, import/export prices,

government finance, reporting to United Nations Educational, Scientific and Cultural Organization (UNESCO), vaccine reporting, and Special Data Dissemination Standard (SDDS) are equally weighted. Countries fulfilling all ten conditions can get a maximum total score of 100. However, it should be noted that some statistical methodology indicators including *Balance of payments manual in use, External debt reporting status, Government finance accounting concept, Vaccine reporting to World Health Organization (WHO), and International Monetary*

Fund's (IMF) SDDS are not directly related to statistical activities and outputs (Ngaruko, 2008).

The current SCI framework considers the following points for scoring the statistical methodology dimension (World Bank, 2012b):

1. *National accounts base year*: National accounts base year is the year used as the base period for constant price calculations in the country's national accounts. It is recommended that the base year of constant price estimates be changed periodically to reflect changes in economic structure and relative prices. Score is 1 if annual chain linking is adopted or the base year is within the last 10 years; otherwise, 0.

2. *Balance of payments manual in use*: The Balance of Payments Manual serves as an international standard for the compilation of balance of payments statistics. The manual has evolved to meet changing economic and financial environment and analytic requirements. The first edition was published in 1948 and successive editions in 1950, 1961, 1977 and 1993. Score is 1 for countries adopting the (BPM5) edition; otherwise, 0.

3. *External debt reporting status*: The principal sources of external debt statistics are reports submitted to the World Bank through its Debtor Reporting System by reporting countries. Data quality and coverage vary among countries and from year to year. The reporting status shows, for the latest series, whether data were used as reported (actual), data were preliminary and included an element of staff estimation (preliminary), or data are staff estimates (estimate). Score is 1 for actual and preliminary; otherwise, 0.

4. *Consumer price index base year*: Consumer Price Index serves as indicators of inflation and reflects changes in the cost of acquiring a fixed basket of goods and services by the average consumer. Weights are usually derived from consumer expenditure surveys and the CPI base year refers to the year the weights were derived. It is recommended that the base year be changed periodically to reflect changes in expenditure structure. Score is 1 if the base year is within the last 10 years; otherwise, 0.

5. *Industrial production index*: Industrial production index measures changes in industrial production and is widely used for the observation and analysis of the current economic activity. Monthly survey on industrial production of index allows identifying the turning points in economic development at an early stage. Score is 1 if the index is available monthly; otherwise, 0.

6. *Import and export prices*: Import and export price indexes measure changes in the price of goods and services in international trade. They are used to deflate the value of imports and exports. Import price index is also used as an indicator of future domestic inflation. Score is 1 if the index is available monthly or quarterly; otherwise, 0.

7. *Government finance accounting concept*: Government finance accounting concept describes the accounting basis for reporting central government financial data. For many countries government finance data have been consolidated into one set of accounts capturing all the central government's fiscal activities. Budgetary central government accounts do not necessarily include all central government units, the picture they provide of central government activities is usually incomplete. Score is 1 for consolidated accounts; otherwise, 0.

8. *Enrolment reporting to UNESCO*: UNESCO Institute of Statistics compiles data on education based on official responses to surveys and from reports provided by education authorities in each country. As the recommended periodicity of these data is annual, annual reporting form countries is considered a good practice. Score is 1 if the country reported at least 3 times in the last 4 years; otherwise, 0.

9. *Vaccine coverage reported to WHO/UNICEF*: WHO and UNICEF collect and review data available on national immunization coverage. Then estimates on the level of immunization coverage are made by using officially reported data, survey results, scientific literature, and by taking account of potential biases and consultation with local experts. The gap between the international estimates and the government official estimates therefore suggests that the estimation method adopted by the country differs from the internationally recommended practice. Score is 1 if the government official estimate on measles vaccine coverage is consistent with the WHO/UNICEF estimate; otherwise, 0.

10. *IMF's Special Data Dissemination Standard*: The Special Data Dissemination Standard (SDDS) was established by the IMF for member countries that have or that might seek access to international capital markets, to guide them in providing their economic and financial data to the public. Although subscription is voluntary, the subscribing

member needs to be committed to observing the standard and provide information about its data and data dissemination practices (metadata). The metadata are posted on the IMF's Dissemination Standards Bulletin Board. The SDDS is expected to enhance the availability of timely and comprehensive data and improve the functioning of financial markets. The score is 1 for subscribing countries; otherwise, 0.

Table 2 summarizes the descriptions of criteria given above for the statistical methodology dimension of SCI.

Table 2 Summary of Criteria Descriptions for Statistical Methodology

Statistical Methodology Indicators	1	0	Max. Score	Weight
1. National accounts base year	Within last 10 years or annual chain linking	Otherwise	1	10
2. Balance of payments manual in use	Balance of Payments Manual, the Fifth Edition	Otherwise	1	10
3. External debt reporting status	Actual or preliminary	Otherwise	1	10
4. Consumer Price Index base year	Within last 10 years or annual chain linking	Otherwise	1	10
5. Industrial production index	Produced and available from IMF	Otherwise	1	10
6. Import/export prices	Produced and available from IMF	Otherwise	1	10
7. Government finance accounting concept	Consolidated central government accounts	Otherwise	1	10
8. Enrolment reporting to UNESCO	Annual or missed reporting only once in the last 4 years	Otherwise	1	10
9. Vaccine reporting to WHO	Nationally reported data on measles vaccine coverage consistent with WHO estimates	Otherwise	1	10
10. IMF's Special Data Dissemination Standard	Subscribed	Otherwise	1	10
			Maximum total score is:	100

**Figure 5 Dispersion of Statistical Methodology Scores, 2009 vs. 2012**
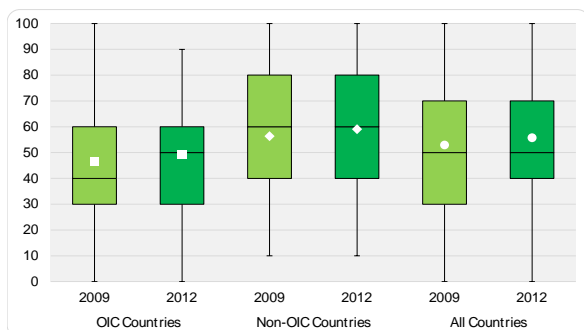
Source: SESRIC SID staff calculations; World Bank, BBSC

Figure 5 displays the dispersion of statistical methodology scores for the OIC, Non-OIC, and All Countries in 2009 and 2012. From 2009 to 2012, the range of scores for all country groups except the OIC Countries was maintained. The 10-point-decrease in the range of scores for the OIC Countries was due to the decline in the maximum score from 100 in 2009 to 90 in 2012. Despite this decline, the average statistical methodology score of OIC Countries group recorded a 3-point-increase from 46.4 in 2009 to 49.4 in 2012. The averages of Non-OIC Countries and All Countries group also increased by 2.7 (from 56.4 to 59.1) and 2.8 points (from 52.9 to 55.8), respectively, in the same period. As to the median values, the OIC Countries group recorded a 10-point-increase from 40 to 50, while there were no changes in Non-OIC

Countries (60) and All Countries groups (50). The median absolute deviation as a robust measure of the variability for the statistical methodology scores did not change for Non-OIC Countries (20 points); however, OIC Countries and All Countries showed an increase of 10 points from 10 in 2009 to 20 in 2012, which is an indication of variability increase in the same period.

Figure 6 reflects the improvement of statistical methodology scores of the OIC Countries from 2009 to 2012. Although overlapping several times, the statistical methodology scores in 2012 was mostly higher than those in 2009 up to 85th percentile by which scores of 2009 was higher than those of 2012.

Figure 6 Percentile Plot for the Statistical Methodology Scores of OIC Countries, 2009 vs. 2012
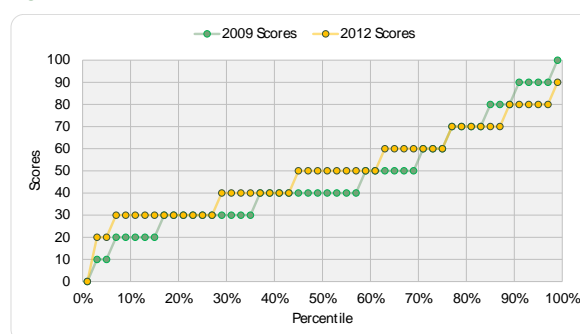
Source: World Bank, BBSC

Table 3 presents the percentages of countries in each group according to the direction of their statistical methodology scores from 2009 to 2012. When compared with the other groups, the OIC Countries group had the highest rate of countries that recorded a score decrease and increase (28% and 48%, respectively) from 2009 to 2012. In the same period, only 24% of OIC Countries maintained their scores.

Table 3 Percentage of Countries by Direction of Statistical Methodology Scores from 2009 to 2012

	OIC Countries	Non-OIC Countries	All Countries
▼	28%	24.0%	25.3%
↕	24%	38.5%	33.6%
▲	48%	37.5%	41.1%

Source: SESRIC SID staff calculations

Figure 7 Performance of Individual OIC Countries in Statistical Methodology Dimension, 2009 vs. 2012

- Countries with a Score Increase ■ Countries without Score Change
- Countries with a Score Decrease
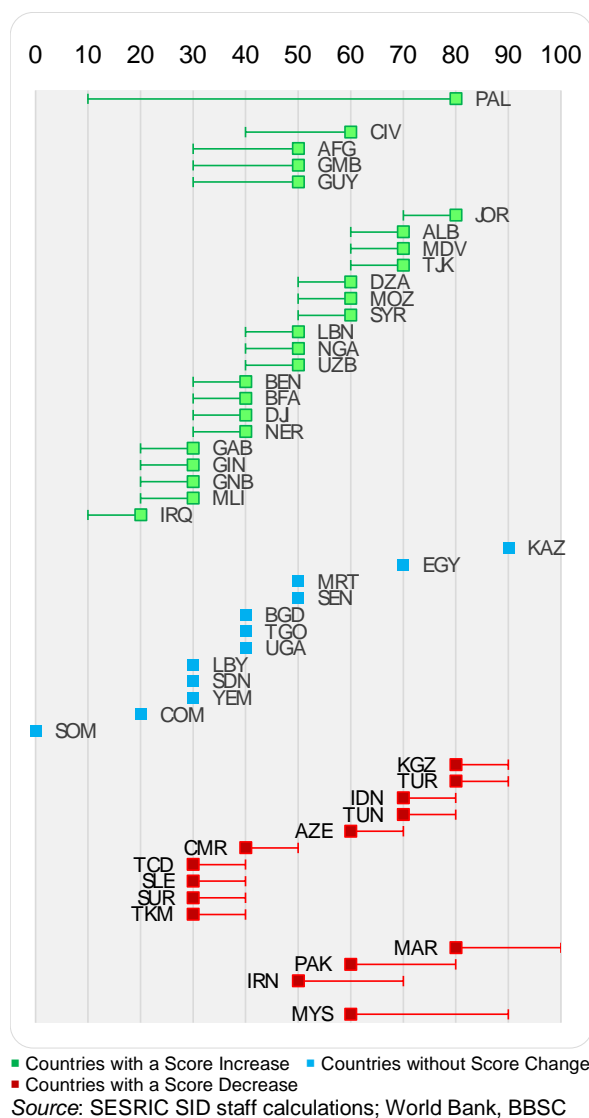*Source*: SESRIC SID staff calculations; World Bank, BBSC

Figure 7 shows the performance of individual OIC Countries in statistical methodology dimension from 2009 to 2012. Locations marked with boxes show the 2012 statistical methodology of countries. Countries which showed a progress, no change, and a regression from 2009 to 2012 have green, blue, and red boxes, respectively. In the plot, the length of whiskers gives the amount of score change from 2009 to 2012. While countries without score change have no whiskers, countries with a score increase have preceding green whiskers and countries with a score decrease have succeeding red whiskers. The OIC Countries with a score increase and decrease can be characterized in three groups each. The countries with a statistical methodology score improvement have groups of 10-point increase (19 countries), 20-point increase (4 countries) and 70-point increase (1 country). The countries with a score fall have groups of 10-point decrease (10 countries), 20-point decrease (3 countries) and 30-point decrease (1 country). The OIC Countries with no score change (12 countries) ranged between 0 and 90 points. In this respect, the 5 OIC Countries with the highest statistical methodology score increase from 2009 to 2012 were Palestine (PAL, 70 points up), and Côte d'Ivoire, Afghanistan, Gambia and Guyana (CIV, AFG, GMB, GUY, 20 points up). The 4 OIC Countries with the highest statistical methodology score decrease were Malaysia (MYS, 30 points down), and Iran, Morocco and Pakistan (IRN, MAR, PAK, 20 points down).

Figure 8 presents the 12 OIC Member Countries with the highest statistical methodology scores in 2012. Kazakhstan took the lead with 90 points and was followed by Jordan, Kyrgyzstan, Morocco, Palestine, Turkey (80 points), Albania, Egypt, Indonesia, Maldives, Tajikistan, and Tunisia (70 points).

Figure 8 Twelve OIC Member Countries with the Highest Statistical Methodology Score in 2012
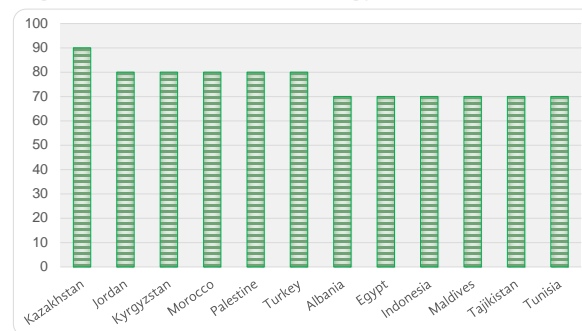

Source: World Bank, BBSC

Figure 9 compares the performance of OIC Countries in statistical methodology dimension components between year 2009 and 2012. In 2012, more than 50% of the OIC Countries managed to get a full score of 1 in 5 out of 10 statistical methodology dimension components, including balance of payments (92%), external debt (80%), reporting to UNESCO (78%), CPI (66%), and

vaccine reporting (54%). However, the OIC Countries performed weakly in the remaining 5 statistical methodology dimension components (shown with light green checkered bars), including national accounts (34%), production index (34%), government finance (30%), SDDS (20%), and import/export prices (6%). As to the change of rate in percentage point unit in the components, the largest positive change was observed in CPI with a 26-percentage-point (pp) increase followed by; reporting to UNESCO (10 pp), balance of payments (8 pp), SDDS (4 pp), vaccine reporting and production index (2 pp). From 2009 to 2012, while there was no change of rate in external debt, the change of rate in import / export prices, government finance, and national accounts was negative being -2 pp, -4 pp, and -16 pp, respectively.

Figure 9 Performance of OIC Countries in Statistical Methodology Dimension Components, 2009 vs. 2012
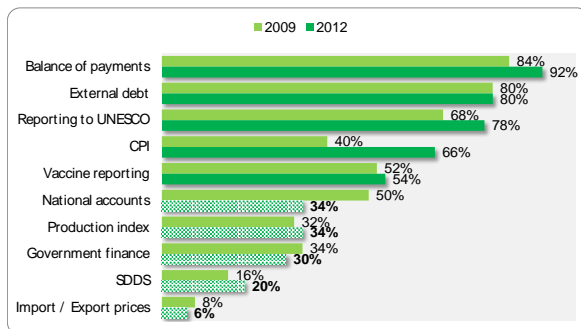
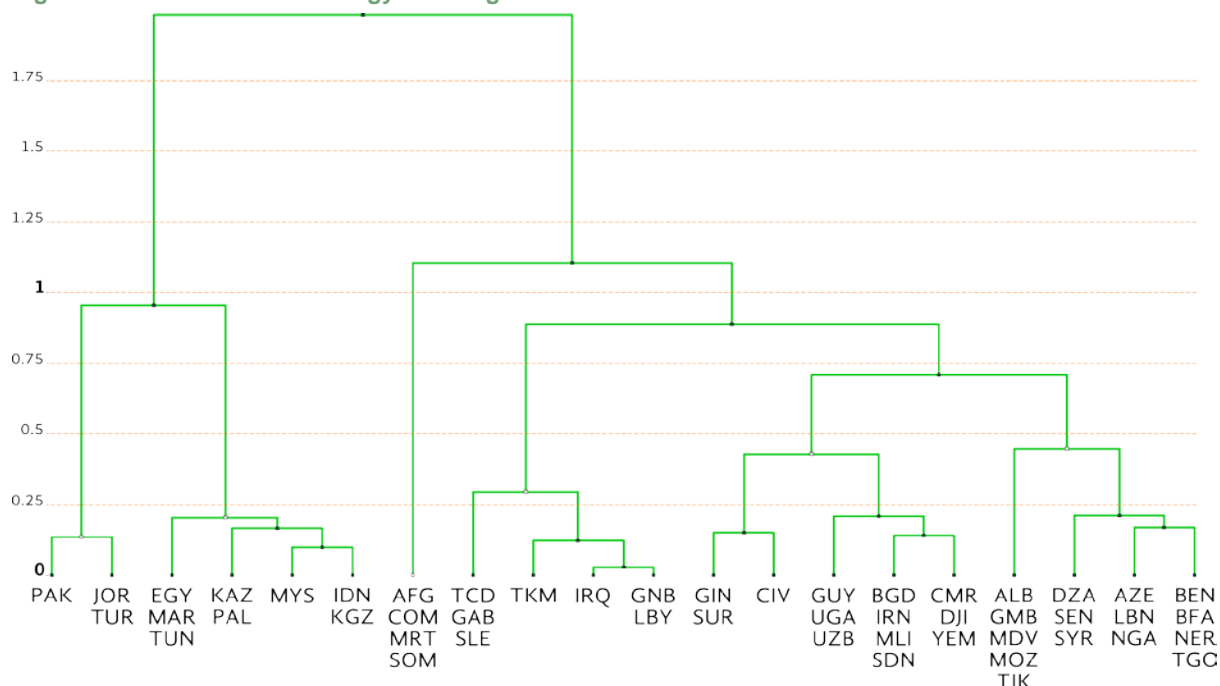*Source*: SESRIC SID staff calculations

In this section and in the upcoming sections of source data and periodicity & timeliness, we applied hierarchical agglomerative clustering (HAC) on the dimensional raw score data (matrix size of 50 x 10) in 2012 to see if OIC Countries with similar characteristics could be clustered in various groups. To carry out the analysis, we used freeware data mining software TANAGRA with version 1.4.48 (Rakotomalala, 2005).

HAC is an example of a hierarchical method for grouping observations. It uses a "bottom-up" approach to clustering as it starts with each observation as a member of a separate cluster and progressively merges clusters together until all observations are a member of a final single cluster (Myatt, 2007). HAC produces a nested sequence of partitions of the set of data points which can be displayed as a tree with a single cluster, including all points at the root and singleton clusters (individual points) at the leaves. The visualisation of a hierarchical partitioning tree is called a dendrogram (from the Greek word "dendro" which means "tree") (Markov & Larose, 2007). The dendrogram describes the ordered path of the set of operations performed during cluster analysis. It illustrates this type of classification in a very precise manner. This strictly defined approach to constructing a dendrogram is sometimes modified due to circumstances. For example, the aggregation distances of two or more successive steps may be the same and so the procedure must then be changed to make sure that the branches of the dendrogram do not get entangled (Dodge, 2008).

The main advantage of HAC is the user can guess the right partitioning by visualizing the tree. If an important variation among the nodes of the tree is observed, these nodes can be pruned. The main disadvantage is that HAC requires the computation of distances between each observation, a very time consuming task when the dataset size increases. TANAGRA implements a hybrid clustering variation for HAC. As a limited number of clusters is needed to indicate similar characteristics, the lower part of the tree is constructed through a fast clustering method.

Figure 10 Statistical Methodology Dendrogram Based on HAC Clusters

Source: SESRIC SID staff calculations

There are two steps in the new algorithm:

- First, low-level clusters are built through the application of fast clustering methods such as k-means, self-organizing map (SOM), or any other clustering algorithm that the user chooses;
- Second, HAC uses the low-level cluster information to form the final clusters and build the dendrogram.
- Last, the gap between the nodes is provided in a table, rather than the tree itself (Rakotomalala, 2008).

In the step where k-means was applied, the number of clusters was set to 20. Distance normalisation for the matrix elements was based on variance. The MacQueen's procedure was applied for average computation with standard setting for random seed generator. Then, HAC was applied on the 10 dimensional raw score data (as input) and cluster data obtained from k-means algorithm (as target). The resulting dendrogram was shown in Figure 10.

The HAC method results showed that the optimal number of clusters is 6 based on the highest gap obtained. Although partitioning into two clusters showed the highest gap value, it has been ignored. In order to assign the countries to respective HAC clusters, a group characterisation was applied on the HAC clusters. Table 4 gives the clusters and cluster members for k=6.

Table 4 Statistical Methodology Cluster Membership for 2012

Cluster No.	Cluster Members
1	AFG, COM, MRT, SOM
2	JOR, PAK, TUR
3	EGY, IDN, KAZ, KGZ, MAR, MYS, PAL, TUN
4	GAB, GNB, IRQ, LBY, SLE, TCD, TKM
5	BGD, CIV, CMR, DJI, GIN, GUY, IRN, MLI, SDN, SUR, UGA, UZB, YEM
6	ALB, AZE, BEN, BFA, DZA, GMB, LBN, MDV, MOZ, NER, NGA, SEN, SYR, TGO, TJK

Source: SESRIC SID staff calculations

Cluster #1 is the second least populated cluster after Cluster #2. Countries found in the cluster #1 had statistical methodology scores ranging between 0 and 50. Except Somalia (SOM), all Cluster #1 countries performed good at *external debt* and *vaccine reporting*. However, none of them got a score in *balance of payments*, *production index*, *import/export prices*, and *SDDS*. Except Cluster #1 countries, all other clusters performed good in *balance of payments* criterion.

Being the least populated cluster, Cluster #2 had countries with scores ranging between 60 and 80. Cluster #2 countries achieved full scores in *balance of payments*, *CPI*, *production index*, *external debt*, *import/export prices*, and *reporting to UNESCO* criteria. The criteria in which all Cluster #2 countries performed poorly were *national accounts* and *government finance*. Cluster #2 was also the only cluster whose members got a full score in

import/export prices criterion. However, Cluster #2 was also the only cluster whose members did not get a score in *national accounts* criterion.

Cluster #3 countries had scores within the range of 60 and 90. For Cluster #3 countries, while the performance in *balance of payments*, *production index*, *vaccine reporting* and *SDDS* was strong, *import/export prices* was the only criterion in which none of them got a score. Cluster #3 was also the only cluster whose members got a full score in *vaccine reporting* and *SDDS* criteria.

Cluster #4 countries had a range of statistical methodology scores between 20 and mostly 30. *Balance of payments* was the only criterion in which all Cluster #4 countries got a full score. On the other hand; *production index*, *import/export prices*, *government finance*, *reporting to UNESCO*, and *SDDS* were the criteria without a full score for all Cluster #4

countries. Cluster #4 was also the only cluster whose members did not get any scores in *reporting to UNESCO* criterion.

Cluster #5 is the second most populated cluster after Cluster #6. Countries in Cluster #5 got scores ranging between 30 and 60. While *balance of payments* was the only criterion in which all Cluster #5 countries got a full score; *import/export prices* and *SDDS* were the two criteria in which Cluster #5 countries could not get a score.

Being the most populated cluster, Cluster #6 had countries with scores ranging between 40 and 70. Cluster #6 countries obtained full scores in *balance of payments*, *CPI*, *external debt*, and *reporting to UNESCO* criteria. Yet, none of the Cluster #6 countries achieved any scores in *import/export prices* and *SDDS* criteria.

3 SOURCE DATA

The source data is the second dimension of the SCI and reflects whether a country takes into consideration the internationally recommended periodicity in its data collection activities, and whether data from administrative systems are available and reliable for statistical estimation purposes. The periodicity of population and agricultural censuses, the periodicity of poverty and health related surveys, and completeness of vital registration system coverage are equally weighted in source data dimension to score the countries. Of those, completeness of vital registration system coverage relates to the statistical capacity aspects of countries. The remaining four criteria focus on a country's statistical activities and outputs (Ngaruko, 2008). Countries satisfying all five conditions can get a maximum total score of 100.

The current SCI framework considers the following points for scoring the source data dimension (World Bank, 2012b):

1. *Periodicity of population census*: Population censuses collect data on the size, distribution and composition of population and information on a broad range of social and economic characteristics of the population. It also provides sampling frames for household and other surveys. It is recommended that population censuses be conducted at least every 10 years. Score is 1 if the country had a census at least once in the last 10 years; otherwise, 0.
2. *Periodicity of agricultural census*: Agricultural censuses collect information on agricultural activities, such as agricultural land use, employment and production, and provide

basic structural data and sampling frames for agricultural surveys. It is recommended that agricultural censuses be conducted at least every 10 years. Score is 1 if the country had a census at least once in the last 10 years; otherwise, 0.
3. *Periodicity of health survey*: Health surveys collect information on various aspects of health of populations, such as health expenditure, access, utilization, and outcomes. They typically include Demographic and Health Surveys, Core Welfare Indicator Questionnaire surveys, Multiple Indicator Cluster Survey, Integrated Surveys, Living Standard Measuring Surveys, Priority Surveys and other health related surveys. It is recommended that health surveys be conducted at least every 3 to 5 years. Scores are 1, 1/2, and 0 if a survey is conducted at a frequency of 3 years or less, 5 years or less, and over 5 years, respectively.
4. *Periodicity of poverty survey*: Poverty surveys collect data on household income, consumption and expenditure, including income in kind. They typically include income, expenditure, and consumption surveys, household budget surveys, Integrated Surveys, Living Standard Measuring Surveys, and other poverty related surveys. It is recommended that poverty surveys be conducted at least every 3 to 5 years. Scores are 1, 1/2, and 0 if a survey is conducted at a frequency of 3 years or less, 5 years or less, and over 5 years, respectively.
5. *Completeness of vital registration system*: Vital registration systems record the

occurrence and characteristics of vital events pertaining to the population and serve as a main source of vital statistics. Countries with complete vital statistics registries may have more accurate and timely demographic indicators. Score is 1 if the country is judged to have complete registries of vital (birth and death) statistics by the United Nations Department of Economic and Social Information and Policy Analysis, Statistics Division; otherwise, 0.
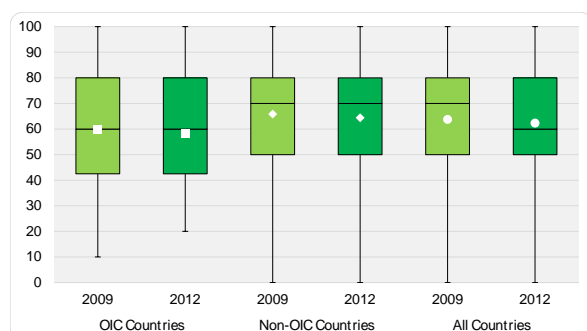
Table 5 summarizes the descriptions of criteria given above for the source data dimension of SCI.

Table 5 Summary of Criteria Descriptions for Source Data

Source Data Indicators	1	1/2	0	Max. Score	Weight
1. Periodicity of population census	≤10 years		Otherwise	1	20
2. Periodicity of agricultural census	≤10 years		Otherwise	1	20
3. Periodicity of poverty related surveys (IES, LSMS, etc.)	≤3 years	≤5 years	Otherwise	1	20
4. Periodicity of health related surveys (DHS, MICS, Priority survey, etc.)	≤3 years	≤5 years	Otherwise	1	20
5. Completeness of vital registration system	Complete		Otherwise	1	20
			Maximum total score is:		100

Source: SESRIC SID staff calculations; World Bank, BBSC

Figure 11 gives a comparison for the dispersion of source data scores for the OIC, Non-OIC, and All Countries in 2009 and 2012. While the range of scores for the Non-OIC and All Countries groups were maintained in the respective period, a 10-point-decrease was observed for the OIC Countries group due to the increase of minimum score from 10 in 2009 to 20 in 2012. In contrast to this increase in minimum score, the average source data score of OIC Countries group recorded a 1.4-point-decrease from 59.8 in 2009 to 58.4 in 2012. A similar downwards trend in the same period was also observed for the Non-OIC and All Countries groups whose decreases in average source data scores were measured as 1.5 (from 65.8 to 64.4) and 1.4 (from 63.8 to 62.3) points, respectively. Except a 10-point decrease (from 70 to 60) in the median source data score values of All Countries group, the groups of OIC and Non-OIC maintained their median source data scores at 60 and 70, respectively between 2009 and 2012. The variability of source data scores in terms of median absolute deviation from median showed no change for the OIC and Non-OIC Countries groups in the period 2009-2012, being 20 and 10, respectively, whereas, All Countries group had a 10-point median absolute deviation increase from 10 in 2009 to 20 in 2012.

Figure 12 shows a slight decrease from 2009 to 2012 in source data score of the OIC Countries. Except the 1st percentile, 2009 scores were better off in the 13th, 15th, 57th, 67th, 69th, 93rd, and 95th percentiles. In 42 out of 50 cases, there was an overlap for the scores of 2009 and 2012 on a percentile scale basis.

Figure 12 Percentile Plot for the Source Data Scores of OIC Countries, 2009 vs. 2012
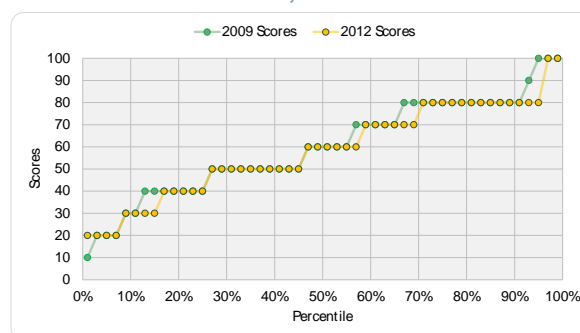
Source: World Bank, BBSC

According to Table 6, among others the OIC Countries group had the highest percentage of countries that recorded a decrease (42%) and an increase (26%) in source data dimension from 2009 to 2012. While 12.5% of the Non-OIC Countries and 17.1% of All Countries were observed to increase their source data scores, 21.9% of the Non-OIC Countries and 28.8% of All Countries had a score decrease. The percentage of OIC Countries that showed no data score change in the same period was only 32% which was less than that of the Non-OIC Countries (65.6%) and All Countries (54.1%) group.

Table 6 Percentage of Countries by Direction of Source Data Scores from 2009 to 2012

	OIC Countries	Non-OIC Countries	All Countries

Figure 11 Dispersion of Source Data Scores, 2009 vs. 2012

▼	42%	21.9%	28.8%
⬍	32%	65.6%	54.1%
▲	26%	12.5%	17.1%

Source: SESRIC SID staff calculations

Figure 13 displays the performance of individual OIC Countries in source data dimension from 2009 to 2012. Locations marked with boxes show the 2012 source data of countries. Countries which showed a progress, no change, and a regression from 2009 to 2012 have green, blue, and red boxes, respectively. In the plot, the length of whiskers gives the amount of score change from 2009 to 2012. While countries

Figure 13 Performance of Individual OIC Countries in Source Data Dimension, 2009 vs. 2012
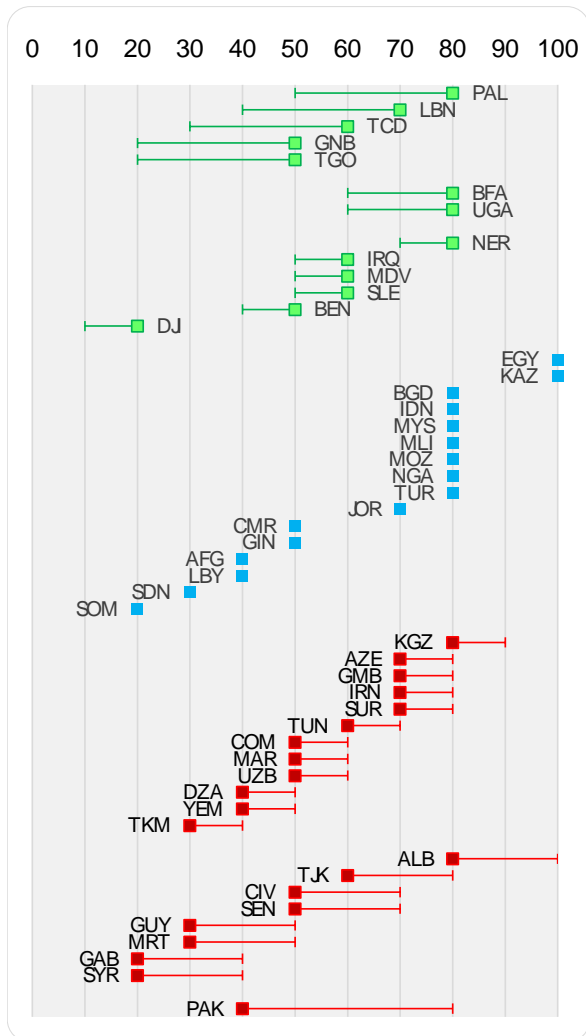

■ Countries with a Score Increase ■ Countries without Score Change
■ Countries with a Score Decrease
Source: SESRIC SID staff calculations; World Bank, BBSC

without score change have no whiskers, countries with a score increase have preceding green whiskers and countries with a score decrease have succeeding red whiskers. The OIC Countries with a score increase and decrease can be characterized in three groups each. The countries with a source data score

improvement have groups of 10-point increase (6 countries), 20-point increase (2 countries) and 30-point increase (5 countries). The countries with a score decline have groups of 10-point decrease (12 countries), 20-point decrease (8 countries) and 30-point decrease (1 country). The OIC Countries with no score change (16 countries) ranged between 20 and 100 points. In this respect, the 5 OIC Countries with the highest source data score increase from 2009 to 2012 were Palestine, Lebanon, Chad, Guinea-Bissau, and Togo (PAL, LBN, TCD, GNB, TGO, 30 points up). The 9 OIC Countries with the highest source data score decrease were Pakistan (PAK, 40 points down), and Albania, Tajikistan, Côte d'Ivoire, Senegal, Guyana, Mauritania, Gabon, and Syria (ALB, TJK, CIV, SEN, GUY, MRT, GAB, SYR, 20 points down).

Figure 14 exhibits the 15 OIC Member Countries with the highest source data scores in 2012. Egypt and Kazakhstan took the lead with 100 points and was followed by Albania, Bangladesh, Burkina Faso, Indonesia, Kyrgyzstan, Malaysia, Mali, Mozambique, Niger, Nigeria, Palestine, Turkey, and Uganda (80 points).

Figure 14 Fifteen OIC Member Countries with the Highest Source Data Score in 2012
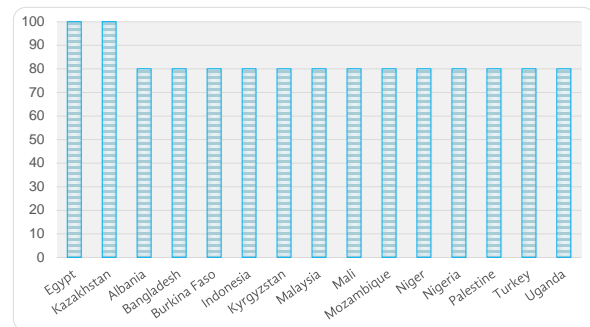
Source: World Bank, BBSC

Figure 15 depicts the performance of OIC Countries group in source data dimension components in the period 2009 and 2012. Among the indicators, only the periodicity of population census indicator showed a 2 pp improvement from 78% in 2009 to 80% in 2012 on a full score equivalent basis. While the indicators of periodicity of agricultural census (54%) and completeness of vital registration system (24%) showed no change, declines of 7 pp (from 82% in 2009 to 75% in 2012) and 2 pp (61% in 2009 to 59% in 2012) were observed in the periodicity of health and poverty survey indicators, respectively in the same period. Setting the achievement of 50% full score equivalent for the OIC Countries group as a threshold, we observe that the completeness of vital registration system indicator for the majority of OIC Countries has still room for taking concrete actions to close the gap with the rest of the world.

Figure 15 Performance of OIC Countries in Source Data Dimension Components, 2009 vs. 2012
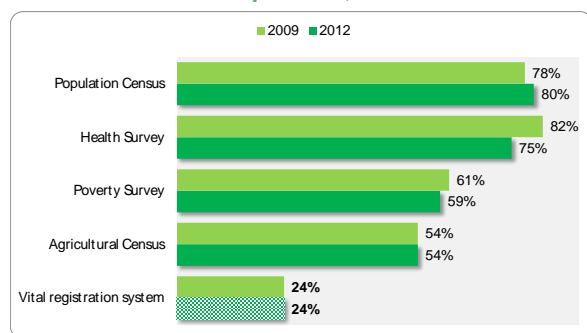
Source: SESRIC SID staff calculations

As to the hybrid clustering process, the number of clusters for k-means was set to 14. HAC was applied on the 5 dimensional raw score data (as input) and cluster data obtained from k-means algorithm (as target). The resulting dendrogram was shown in Figure 16.

The HAC method results showed that the optimal number of clusters is 4 based on the highest gap obtained. In order to assign the countries to respective HAC clusters, a group characterisation was applied on the HAC clusters. Table 4 gives the clusters and cluster members for k=4.

Table 7 Source Data Cluster Membership for 2012

| Cluster No.	Cluster Members
1	AFG, CIV, GIN, IRQ, LBN, MRT, PAK, SOM, TKM, UZB
2	COM, DJI, DZA, GAB, GUY, LBY, SDN, SYR, YEM
3	ALB, AZE, EGY, IRN, KAZ, KGZ, MDV, MYS, SUR
4	BEN, BFA, BGD, CMR, GMB, GNB, IDN, JOR, MAR, MLI, MOZ, NER, NGA, PAL, SEN, SLE, TCD, TGO, TJK, TUN, TUR, UGA

Source: SESRIC SID staff calculations

With 10 members, Cluster #1 is the second least populated cluster after Cluster #2 and #3. Cluster #1 countries had source data scores ranging between 20 and 70. Except Turkmenistan (TKM) with a partial score, all Cluster #1 countries got a full score in *periodicity of health survey* criterion. However, it is notable that among other clusters, Cluster #1 was the only cluster whose members did not get a score in *periodicity of population census* criterion.

Being one of the least populated clusters, Cluster #2 had countries with source data scores ranging between 20 and 50. The performance in *periodicity of population census* brought all Cluster #2 countries full scores in 2012. Cluster #2 was also the only cluster whose members performed poor in the *periodicity in poverty survey* criterion. Additionally, together with Cluster #4, Cluster #2 was also one of the two clusters whose members did not get a score in the *completeness of vital registration system* criterion.

Being the other least populated cluster with 9 members, Cluster #3 had countries that scored within the range of 60 and 100. All Cluster #3 countries achieved full scores in the criteria of *periodicity of population census* and *completeness of vital registration system*. Cluster #3 was also the only cluster whose members successfully obtained full scores in the latter criterion.

Cluster #4 countries had a range of source data scores between 50 and mostly 80. All Cluster #4 countries managed to get full scores in *periodicity of health survey* (except Jordan [JOR] with a partial score) and *periodicity of population census* criteria. None of the Cluster #4 members could get a full score for the *completeness of vital registration system* criterion as previously mentioned in the Cluster #2 countries.

Figure 16 Source Data Dendrogram Based on HAC Clusters
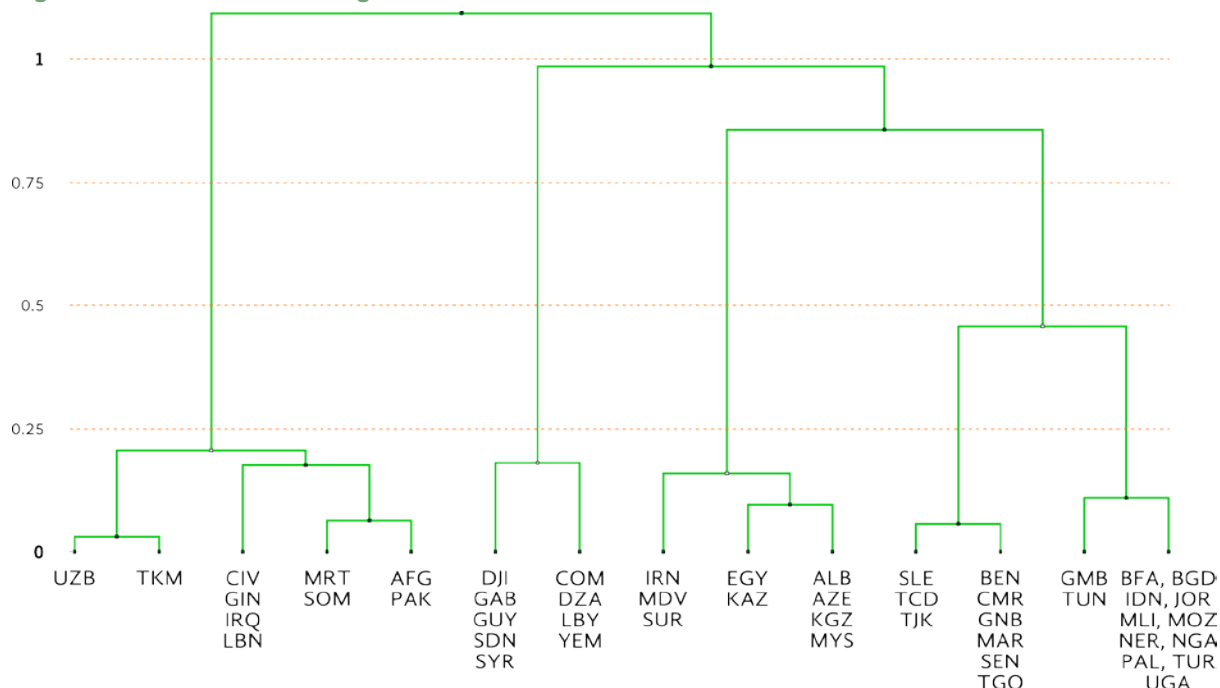
Source: SESRIC SID staff calculations

4 PERIODICITY AND TIMELINESS

The third and last dimension of the SCI, periodicity and timeliness, focuses on the availability and periodicity of ten components; most of which are Millennium Development Goals (MDG) indicators. The periodicity and timeliness dimension tries to measure the extent to which data are made accessible to users through transformation of source data into timely statistical outputs. Periodicities of the indicators including income poverty, child malnutrition, child mortality, immunization, HIV/AIDS, maternal health, gender equality in education, primary completion, access to water, and GDP growth are the ten criteria used for calculating the periodicity and timeliness score of countries. Of those ten criteria, all of them relate to the statistical activities and outputs of countries, not their statistical capacity aspects (Ngaruko, 2008). Countries satisfying all of the ten conditions can get a maximum total score of 100.

The current SCI framework considers the following points for scoring the periodicity and timeliness dimension (World Bank, 2012b):

1. *Income poverty (proportion of population below US$1.25 a day)*: Proportion of population below US$1.25 a day is the percentage of the population living on less than $1.25 a day at 2005 international prices. The US$1.25 poverty line is compared to consumption or income per person and includes consumption from own production

and income in kind. This poverty line has fixed purchasing power across countries. This indicator measures progress toward the reduction of extreme poverty and relates to the first MDG goal to eradicate extreme poverty and hunger. Scores are 1, 2/3, and 1/3 if the periodicity of the indicator is 3 years or less, 5 years or less, and more than 5 years, respectively; otherwise, 0.

2. *Child malnutrition (prevalence of underweight children under five)*: Prevalence of underweight children under-five years of age, also known as prevalence of child malnutrition (weight for age), is the percentage of children under-five whose weight for age is less than minus two standard deviations from the median for the international reference population ages 0 to 59 months. The data are based on the World Health Organization's new child growth standards released in 2006. Child malnutrition is linked to poverty, low levels of education, and poor access to health services. Sufficient and good-quality nutrition is therefore critical for development, health, and survival of current and succeeding generations. This indicator monitors nutritional status and health in populations and relates to the first MDG aiming at reducing poverty and hunger. Scores are 1, 2/3, and 1/3 if the periodicity of the indicator

3. *Child mortality (under-five mortality rate)*: Under-five mortality rate is the probability that a new-born baby will die before reaching age five, if subject to current age-specific mortality rates. The probability is expressed as a rate per 1,000. The indicator measures child survival. Survival of a child is closely linked to the provision of primary health-care services; but poverty, malnutrition, a decline in breast-feeding, maternal education, use of improved water, and inadequacy sanitation and health facilities are all associated with high child mortality. The indicator relates to the fourth MDG calling for reducing child mortality. Score is 1 if a national or international estimate is available for reference years; otherwise, 0.

4. *Child immunization (proportion of one-year-old children immunized against measles)*: The proportion of one-year-old children immunized against measles is the proportion of children aged one who received one dose of measles vaccine. A child is considered adequately immunized against measles after receiving one dose of vaccine. Immunization is an essential component for reducing under-five mortality, and it serves as a proxy to measure the coverage and the quality of the child health care system. This indicator is also related to the fourth MDG aiming at reducing child mortality. Score is 1 if the periodicity of the indicator is annual; otherwise, 0.

5. *HIV/AIDS (prevalence of HIV, total [% of population ages 15-49])*: HIV prevalence at any given age is the difference between the cumulative numbers of people who have become affected with HIV up to this age and the number who died, expressed as a percentage of the total number alive at this age. The basis of measuring infection is the incidence of HIV among people aged 15-49. HIV/AIDS is one of the world's most important killers and has its greatest impact on poor countries and poor people. This indicator relates to MDG number six to combat HIV/AIDS, malaria, and other diseases. Score is 1 if a national or international estimate is available in the last 3 years; otherwise, 0.

6. *Maternal health (births attended by skilled health staff)*: Births attended by skilled health staff are the percentage of deliveries attended by personnel trained to give the necessary supervision, care, and advice to women during pregnancy, labour, and the postpartum period, to conduct deliveries on their own, and to care for the new-borns. High maternal mortality rates in many countries are the result of inadequate reproductive health care for women and inadequately spaced births. The indicator monitors the ability of the health system to provide good antenatal and postnatal care for women and relates to the fifth MDG aiming at improving maternal health, with a target of reducing by three-quarters, between 1990 and 2015, the maternal mortality ratio. Scores are 1, 2/3, and 1/3 if the periodicity of the indicator is 3 years or less, 5 years or less, and more than 5 years, respectively; otherwise, 0.

7. *Gender equality in education (gross enrolment rate of girls to boys in primary and secondary education)*: The indicator is defined as the ratio of the gross enrolment rate of girls to boys in primary and secondary education levels in both public and private schools. Women have an enormous impact on the well-being of their families and societies, but their potential is sometimes not realized because of discriminatory social norms, incentives, and legal institutions. Although their status has improved in recent decades, gender inequalities persist. Education is one of the most important aspects of human development, and eliminating gender disparity at all levels of education would help to increase the status and capabilities of women. This indicator provides a measure of equality of educational opportunity and relates to the third MDG that seeks to promote gender equality and the empowerment of women. Scores are 1, 2/3, and 1/3 if the indicator is observed for 5, 4-3, and 2-1 out of the 5 latest years, respectively; otherwise, 0.

8. *Primary completion (primary completion rate)*: Primary completion rate (PCR) is the number of students successfully completing the last year of (or graduating from) primary school in a given year, divided by the number of children of official graduation age in the population. Because of difficulties with developing data based on this definition, data analysis is generally based on the PCR proxy indicator which is the number of children reaching the last year of primary school (as defined by a country) net of repeaters. The indicator, which monitors education system coverage and student progression, is intended to measure human capital formation and school system quality and efficiency and relates to the second MDG to achieve

universal primary education. Scores are 1, 2/3, and 1/3 if the indicator is observed for 5, 4-3, and 2-1 out of the 5 latest years, respectively; otherwise, 0.

9. *Access to water (access to an improved water source)*: Access to an improved water source is currently defined as the percentage of the population that can obtain at least 20 litres per person per day from an "improved" source that is within one kilometre of the user's dwelling. Improved water sources include household connection, public standpipe, borehole, protected well or spring, and rainwater collection, but do not include water provided through vendors, tanker trucks, unprotected wells, unprotected springs, and bottled water. Unsafe water and lack of basic sanitation is the direct cause of many water-related diseases in developing countries. This indicator monitors access to improved water sources based on the assumption that improved sources are likely to provide safer water and relates to the seventh MDG to ensure environmental sustainability. Scores are 1 and 1/2 if primary estimates are observed for at least 2 and 1 out of the 6 latest years, respectively; otherwise, 0.

10. *GDP growth (GDP per capita growth)*: GDP per capita is the sum of gross value added by all resident producers in the economy plus any product taxes (less subsidies) not included in the valuation of output, divided by mid-year population. Growth is calculated from constant price GDP data in local currency. Sustained economic growth increases average incomes and is strongly linked to poverty reduction. GDP per capita provides a basic measure of the value of output per person, which is an indirect indicator of per capita income. Growth in GDP and GDP per capita are considered broad measures of economic growth. Scores are 1, 2/3, and 1/3 if the periodicity of the indicator is annual, 1.5 years or less, and more than 1.5 years, respectively; otherwise, 0.

Table 8 summarizes the descriptions of criteria given above for the periodicity and timeliness dimension of SCI.

Figure 17 Dispersion of Periodicity and Timeliness Scores, 2009 vs. 2012
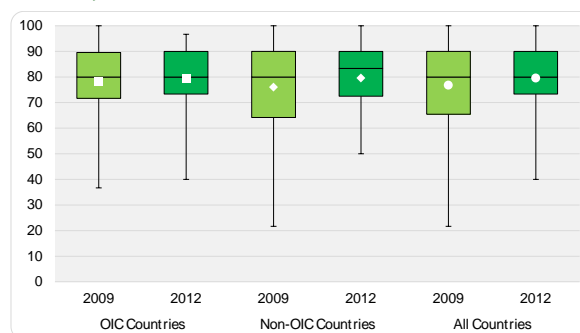
Source: SESRIC SID staff calculations; World Bank, BBSC

Figure 17 shows the dispersion of periodicity and timeliness scores for the OIC, Non-OIC, and All Countries in 2009 and 2012. The range of scores was observed to decrease for all groups; being 6.7 (from 63.3 in 2009 to 56.7 in 2012) for OIC Countries, 28.3 (from 78.3 in 2009 to 50 in 2012) for Non-OIC Countries, and 18.3 (from 78.3 in 2009 to 60 in 2012) for All Countries group. While the decrease in the range of scores for the OIC Countries was due to a regression in maximum (from 100 in 2009 to 96.7 in 2012) and an improvement in minimum (from 36.7 in 2009 to 40 in 2012) periodicity and timeliness scores, the groups of Non-OIC Countries and All Countries recorded only improvements in their minimum scores (from 21.7 to 50 and from 21.7 to 40, respectively) from 2009 to 2012. The largest positive average periodicity and timeliness score change was in the Non-OIC Countries group with 3.6 points up from 76.1 in 2009 to 79.6 in 2012; whereas, the OIC Countries group slightly increased their average score by 1.2 points from 78.3 in 2009 to 79.5 in 2012. The average periodicity and timeliness score for All Countries recorded a 2.8-point increase from 76.8 in 2009 to 79.6 in 2012. The median periodicity and timeliness scores of the OIC Countries and All Countries Group were the same, 80, both in 2009 and 2012. However, the Non-OIC Countries group managed to increase their median periodicity and timeliness score by 3.3 points from 80 in 2009 to 83.3 in 2012. The median absolute deviation from median for the periodicity and timeliness scores did not change for the All Countries group (10) for the period-in-concern. Though, the OIC Countries group recorded a 2-point increase (from 8 in 2009 to 10 in 2012) in the variability of periodicity and timeliness scores; whereas, the Non-OIC Countries group managed to decrease the variability by 5 points (from 12 in 2009 to 7 in 2012).
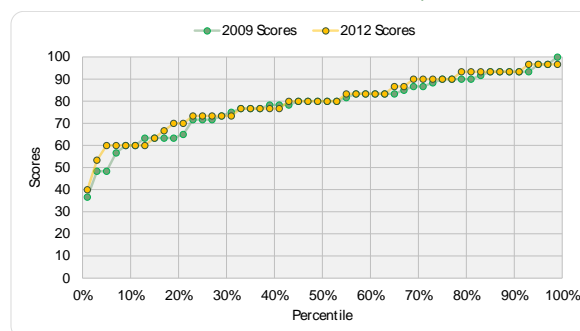
Figure 18 presents the improvement of periodicity and timeliness scores of the OIC Countries from 2009 to 2012. On a percentile scale basis, the periodicity and timeliness scores of the OIC Countries in 2012 were higher than those of 2009 in 21 cases, the same as

those of 2009 in 24 cases, and less than those of 2009 in 5 cases out of 50.

Source: World Bank, BBSC

Table 8 Summary of Criteria Descriptions for Source Data

Periodicity and Timeliness Indicators	1	2/3	1/2	1/3	0	Max. Score	Weight
1. Periodicity of income poverty indicator	≤3 years	≤5 years		>5 years	N/A	1	10
2. Periodicity of child malnutrition indicator	≤3 years	≤5 years		>5 years	N/A	1	10
3. Periodicity of child mortality indicator	National or international estimates available				N/A	1	10
4. Periodicity of immunization indicator	Annual				Not annual or N/A	1	10
5. HIV/AIDS indicator	National or international estimates available for at least one year out of the last 3 years				N/A	1	10
6. Periodicity of maternal health indicator	≤3 years	≤5 years		>5 years	N/A	1	10
7. Periodicity of gender equality in education indicator	Observed for at least 5 out of 5 latest years	Observed for at least 3 out of 5 latest years		Observed for 1 out of 5 latest years	N/A	1	10
8. Primary completion indicator	Observed for at least 5 out of 5 latest years	Observed for at least 3 out of 5 latest years		Observed for 1 out of 5 latest years	N/A	1	10
9. Access to water indicator	Observed for 2 out of 6 latest years		Observed for 1 out of 6 latest years		N/A	1	10
10. Periodicity of GDP growth indicator	Annual	≤ 1.5 years		>1.5 years	N/A	1	10
					Maximum total score is:		*100*

Based on the information given in Table 9, similar ratios were observed for each direction of periodicity and timeliness scores. 36% of the OIC Countries group had a decline in their periodicity and timeliness scores, the largest ratio in the period 2009 and 2012 when compared to those of the Non-OIC and All Countries groups, being 35.4% and 35.6%, respectively. While around 52% of countries in each

group improved their periodicity and timeliness scores in the same period, the percentage of countries that showed no data score change was around 12% for each country group.

Table 9 Percentage of Countries by Direction of Periodicity and Timeliness Scores from 2009 to 2012

	OIC Countries	Non-OIC Countries	All Countries
▼	36%	35.4%	35.6%
↓↑	12%	12.5%	12.3%
▲	52%	52.1%	52.1%

Source: SESRIC SID staff calculations

Figure 19 exhibits the performance of individual OIC Countries in periodicity and timeliness dimension from 2009 to 2012. Locations marked with boxes show the 2012 periodicity and timeliness scores of countries. Countries which showed a progress, no change, and a regression from 2009 to 2012 have green, blue, and red boxes, respectively. In the plot, the length of whiskers gives the amount of score change from 2009 to 2012. While countries without score change have no whiskers, countries with a score increase have preceding green whiskers and countries with a score decrease have succeeding red whiskers. The OIC Countries with a score increase and decrease can be characterized in eight groups each. The countries with a periodicity and timeliness score improvement have groups of 13.3-point increase (3 countries), 11.7-, 10-, 8.3-point increase (2 countries each), 6.7-point increase (8 countries), 5-point increase (3 countries), 3.3-point increase (4 countries), and 1.7-point increase (2 countries). The countries with a score decline have groups of 1.7-point decrease (2 countries), 3.3-point decrease (6 countries), 6.7-, 8.3-point decrease (2 countries each), 20-point decrease (8 countries), 10-point decrease (3 countries) and 11.7-, 13.3-, 16.7-point decrease (1 country each). The OIC Countries with no score change (6 countries) ranged between 76.7 and 96.7 points. In this respect, the 5 OIC Countries with the highest periodicity and timeliness score increase from 2009 to 2012 were Mauritania, Lebanon, Guinea-Bissau (MRT, LBN, GNB, 13.3 points up), and Gambia, and Somalia (GMB, SOM, 11.7 points up). The 6 OIC Countries with the highest source data score decrease were Comoros (COM, 16.7 points down), Bangladesh (BGD, 13.3 points down), Yemen (YEM, 11.7 points down), and Chad, Uzbekistan, and Iran (TCD, UZB, IRN, 10 points down).

Figure 19 Performance of Individual OIC Countries in Periodicity and Timeliness Dimension, 2009 vs. 2012

■ Countries with a Score Increase ■ Countries without Score Change ■ Countries with a Score Decrease

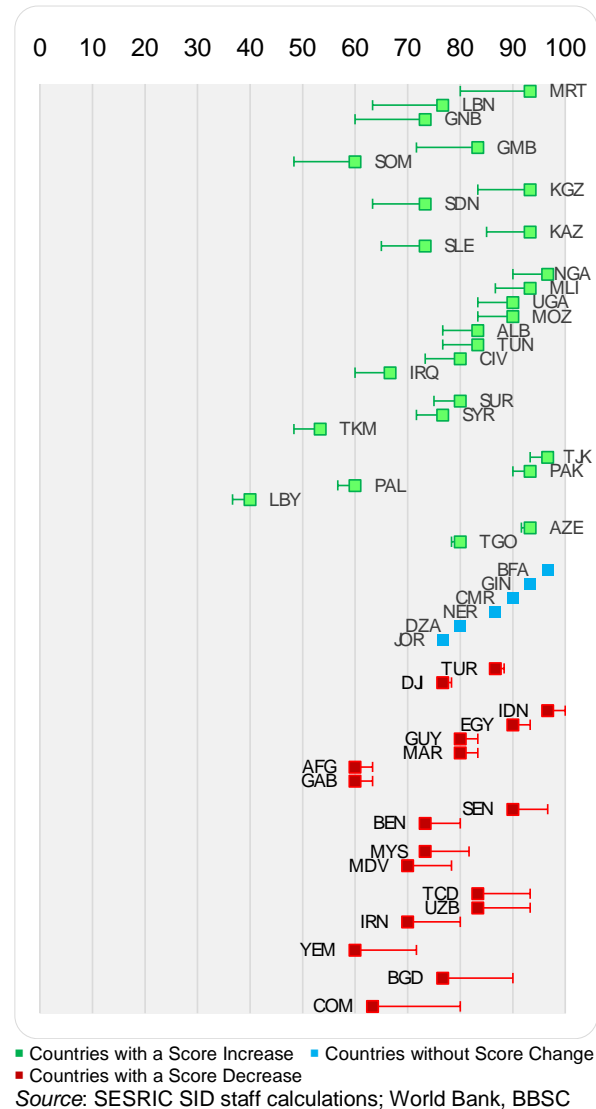*Source*: SESRIC SID staff calculations; World Bank, BBSC

Figure 20 presents the 11 OIC Member Countries with the highest periodicity and timeliness scores in 2012. Burkina Faso, Indonesia, Nigeria, and Tajikistan took the lead with 96.7 points and Azerbaijan, Guinea, Kazakhstan, Kyrgyzstan, Mali, Mauritania, and Pakistan followed with 93.3 points.

**Figure 20 Eleven OIC Member Countries with the Highest Periodicity and Timeliness Score in 2012**
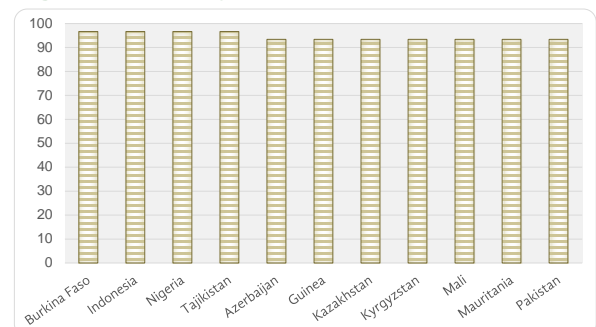
Source: World Bank, BBSC

Figure 21 compares the performance of OIC Countries group in periodicity and timeliness dimension components in the period 2009 and 2012. Based on a full score equivalent basis, all periodicity and timeliness dimension indicators were observed to be over 50% in both years. Among the indicators, improved water source showed the biggest improvement, a 22 pp increase from 76% in 2009 to 98% in 2012, and followed by improvements of 6 pp in attended births and 4 pp in malnutrition under 5 indicators. All OIC Countries continued to report mortality under 5 indicator on a periodic and timely basis (less than or equal to every 3 years) which earned them 100% of full scores. Although no change was observed, 98% of all OIC Countries maintained their periodic and timely reporting on measles immunization under 1 in both years. The same case was also valid for the periodic and timely reporting on HIV adults aged 15-49 indicator in which 82% of all Countries got an equivalent full score in the same period. Yet, a serious decline by 14 pp was observed in the ratio of girls to boys in primary and secondary education, being 73% in 2009 to 59% in 2012. The

periodicity of primary completion and GDP per capita growth reporting recorded declines of 4 pp (from 69% in 2009 to 65% in 2012) and 3 pp (from 95% in 2009 to 92% in 2012), respectively, in the same period.

Figure 21 Performance of OIC Countries in Periodicity and Timeliness Dimension Components, 2009 vs. 2012
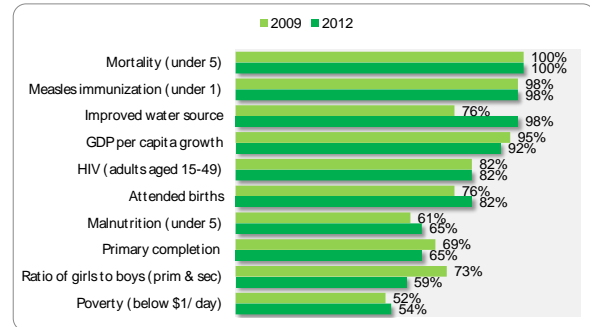
Source: SESRIC SID staff calculations

For the hybrid clustering, the k-means cluster number was set to 18. HAC was applied on the 10 dimensional raw score data (as input) and cluster data obtained from k-means algorithm (as target). The resulting dendrogram was shown in Figure 22.

Figure 22 Periodicity and Timeliness Dendrogram Based on HAC Clusters
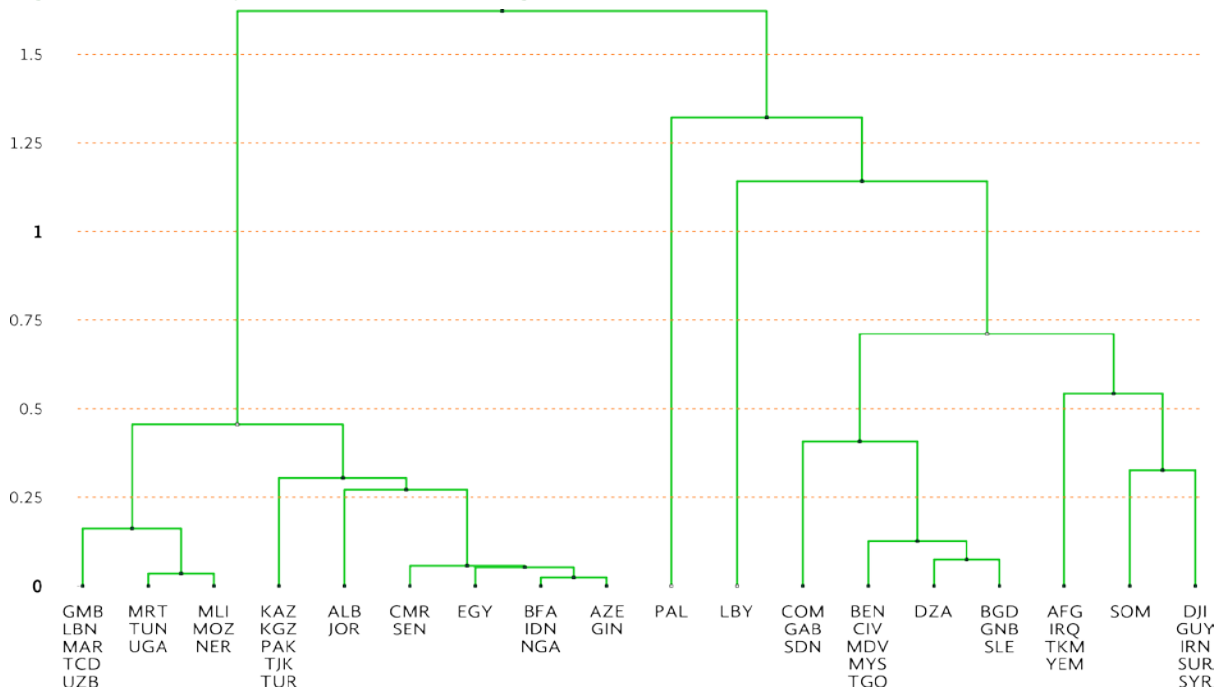
Source: SESRIC SID staff calculations

The HAC method outputs showed that the optimal number of clusters is 4 based on the highest gap obtained. In order to assign the countries to respective HAC clusters, a group characterisation was applied on the HAC clusters. Table 4 gives the clusters and cluster members for k=4.

Cluster #1 is the most populated cluster with 26 members with periodicity and timeliness scores ranging between 76.7 and 96.7. It is noteworthy that Cluster #1 countries all achieved a full score in the indicators of *periodicity of mortality (under 5)*, *periodicity of measles immunization (under 1)*, *improved water source*, and as the only cluster whose members all achieved full scores in *periodicity of GDP*

per capita growth. Except Jordan (JOR) and Albania (ALB) without a score, all Cluster #1 countries had a full score in *HIV (adults aged 15-49)* criterion in 2012.

Table 10 Periodicity and Timeliness Cluster Membership for 2012

Cluster No.	Cluster Members
1	ALB, AZE, BFA, CMR, EGY, GIN, GMB, IDN, JOR, KAZ, KGZ, LBN, MAR, MLI, MOZ, MRT, NER, NGA, PAK, SEN, TCD, TJK, TUN, TUR, UGA, UZB
2	PAL
3	LBY
4	AFG, BEN, BGD, CIV, COM, DJI, DZA, GAB, GNB, GUY, IRN, IRQ, MDV, MYS, SDN, SLE, SOM, SUR, SYR, TGO, TKM, YEM

Source: SESRIC SID staff calculations

Cluster #2 and #3 had only one member each, being Palestine (PAL, 60 points) and Libya (LBY, 40 points), respectively. Palestine obtained full scores in *periodicity of mortality (under 5)*, *periodicity of*

attended births, Periodicity of gender equality in education, and *improved water source* indicators. For the *periodicity of measles immunization (under 1)* and *HIV (adults aged 15-49)* indicators, Palestine did not get a score in 2012. As to Libya, full scores were achieved only in two indicators: *periodicity of mortality (under 5)* and *periodicity of measles immunization (under 1)*. In 2012, Libya could not get a score for *periodicity of income poverty*, *HIV (adults aged 15-49)*, *primary completion* and *improved water source* indicators.

With 22 members, Cluster #4 countries had a range of periodicity and timeliness scores between 53.3 and 80. All Cluster #4 countries managed to get full scores in *periodicity of mortality (under 5)*, *periodicity of measles immunization (under 1)* and *improved water source* indicators. With the exception of 6 countries with partial scores, Cluster #4 countries were also very close to get full scores in the *periodicity of GDP growth* indicator in 2012.

CONCLUSION AND RECOMMENDATIONS

From the times of Al-Kindi, statistics as a science and decision making tool has developed thanks to the advancements in mathematical formalism and social practice. Maintaining timely, accurate, reliable, relevant and quality data to users is not an easy task, which requires sustainable financial, technological and human resources. National Statistical Offices, as the main producers and coordinators of official statistics, need to make the best and optimal use of these resources to raise their capacity to provide information for evidence based policy making.

This Outlook Report used the statistical capacity indicator (SCI) developed by the World Bank which defined statistical capacity as the ability of countries to meet user needs for good quality *official statistics* which are produced by governments as a public good. The SCI is comprised of statistical methodology, source data, and periodicity and timeliness. On the one hand, the developers of the SCI claim the SCI provide an overview of the national statistical capacities, on the other hand, there are researchers like (Ngaruko, 2008) arguing that the SCI does not fully reflect the statistical capacities of countries, instead the statistical activities and outputs mostly.

When the performance in the overall SCI score in 2012 is considered, the OIC Countries group was behind the average scores of the Non-OIC and All Countries groups. When we look in detail at the SCI dimensions of statistical methodology and source data, the OIC Countries group on average performed weaker than the Non-OIC and All Countries groups. The OIC Countries as a group attained almost the

same average in 2012 only in the periodicity and timeliness dimension.

Regarding the performances of the individual OIC Countries in 2012, Kazakhstan took the lead in overall SCI, statistical methodology, and source data (together with Egypt) scores; second place in periodicity and timeliness score. The lead in periodicity and timeliness score was taken by Burkina Faso, Indonesia, Nigeria, and Tajikistan in 2012.

Given this state of affairs, the following recommendations are proposed for enhancing the statistical capacity development both at the member countries and OIC level:

1. At the SCI dimension level, the following indicators require sound actions to enhance the capacity of OIC Member Countries:

   a. Statistical Methodology: Import/Export prices, SDDS, Government finance, Production index, and National accounts;

   b. Source Data: Completeness of vital registration system; and

   c. Periodicity and Timeliness: Periodicity of gender equality in education indicator.

2. The criteria listed in the following dimension clusters present a good cooperation opportunity between the OIC Countries with expertise in the

respective criterion and those with need to strengthen their statistical capacity:

a. Statistical Methodology: (i) Cluster #1: *Balance of payments*, *production index*, *import/export prices*, and *SDDS*; (ii) Cluster #2: *National accounts*, *government finance*; (iii) Cluster #3: *Import/export prices*; (iv) Cluster #4: *production index*, *import/export prices*, *government finance*, *reporting to UNESCO*, and *SDDS*; (v) Cluster #5: *Import/export prices*, and *SDDS*; and (vi) Cluster #6: *Import/export prices*, and *SDDS*.

b. Source Data: (i) Cluster #1: *Periodicity of population census*; (ii) Cluster #2: *Periodicity of poverty survey, completeness of vital registration system*; (iii) Cluster #4: *Completeness of vital registration system*.

c. Periodicity and Timeliness: (i) Cluster #2: *Periodicity of measles immunization (under 1)*, *HIV (adults aged 15-49)*; (ii) Cluster #3: *Periodicity of income poverty*, *HIV (adults aged 15-49)*, *primary completion*, *improved water source*.

3. The NSOs of OIC Countries should actively participate in the OIC-StatCom sessions and working groups regarding statistical capacity development issues. Apart from that, the NSOs of OIC Countries with relevant expertise should keenly seek ways to become a member in the expert groups of United Nations Statistical Commission and other pertinent international statistical organisations to better voice and reflect their demands and needs.

4. As statistical capacity development cannot be thought separate from the human capital formation, the NSOs of OIC Countries should work closely with the relevant OIC institutions and the recently established OIC Statistical Commission (OIC-StatCom) to strengthen their human resources by duly assessing their current situation and maintaining open channels with the aforementioned institutions to communicate their capacities and needs for enhancing their human capital.

5. In this respect, the human capital formation efforts of OIC Member Countries and OIC institutions should not only be restricted with the NSOs but also involve the citizens by encouraging the design of statistical outreach and awareness initiatives.

6. Based on the diminishing budgets of international organisations allocated for physical statistical capacity building programs, online delivery of these programs have emerged as a powerful way. Considering the fact that virtual statistical systems are more static and mature as a delivery platform, the Massive Open Online Courses (MOOC) can be used to experiment the content and delivery of the official statistical curricula in association with the efforts mentioned above. In this aspect, development of a MOOC module can be initiated by the Islamic Development in close collaboration with the OIC-StatCom and with support from experts in the NSOs of OIC Countries to act as a bridge between the experiences gained from the MOOC module and the to-be-established virtual statistical system at the OIC level.

7. On top of the MOOC initiative, the traditional education techniques should also be diversified. In this perspective, interested OIC Countries can pay study visits to other OIC Countries with a sound established level of higher education institutions in official statistics, such as the STIS under the administration of BPS–Statistics Indonesia.

8. To foster the statistical capacity, various universities in different OIC Countries with a sufficient level of infrastructure should be supported in financial, technological and human resources to initiate post-graduate degree programmes in official statistics comprehending a mutually agreed common curricula with additional course topics specific to the needs of the country of establishment.

9. To properly assess the statistical capacities of the OIC Countries, an OIC-StatCom Expert Group can be established to study the feasibility to construct a more comprehensive Statistical Capacity Indicator.

COUNTRY ACRONYMS

AFG	Afghanistan	GAB	Gabon	MYS	Malaysia	SDN	Sudan
ALB	Albania	GMB	Gambia	MDV	Maldives	SUR	Suriname
DZA	Algeria	GIN	Guinea	MLI	Mali	SYR	Syria
AZE	Azerbaijan	GNB	Guinea-Bissau	MRT	Mauritania	TJK	Tajikistan
BGD	Bangladesh	GUY	Guyana	MAR	Morocco	TGO	Togo
BEN	Benin	IDN	Indonesia	MOZ	Mozambique	TUN	Tunisia
BFA	Burkina Faso	IRN	Iran	NER	Niger	TUR	Turkey
CMR	Cameroon	IRQ	Iraq	NGA	Nigeria	TKM	Turkmenistan
TCD	Chad	JOR	Jordan	PAK	Pakistan	UGA	Uganda
COM	Comoros	KAZ	Kazakhstan	PAL	Palestine	UZB	Uzbekistan
CIV	Côte d'Ivoire	KGZ	Kyrgyzstan	SEN	Senegal	YEM	Yemen
DJI	Djibouti	LBN	Lebanon	SLE	Sierra Leone		
EGY	Egypt	LBY	Libya	SOM	Somalia		

REFERENCES

AL-Kadi, I. A., 1992. The Origins of Cryptology: The Arab Contributions. *Cryptologia,* 16(2), pp. 97-126.

Dodge, Y., 2008. Dendrogram. In: *The Concise Encyclopedia of Statistics.* s.l.:Springer Science + Business Media, pp. 157-159.

Hacking, I., 1987. Prussian Numbers. In: L. Krüger, L. J. Dasten & M. Heidelberger, eds. *The Probabilistic Revolution, Vol. 1: Ideas in History.* Cambridge(Massachusetts): MIT Press, pp. 377-394.

Hlavacek, D., 2008. *Statistical Thinking Past, Present and Future.* [Online]
Available at:
http://www.asqstatdiv.org/documents/FTC%202008%20Stat%20Think%20PastPresentFuture_100208.pdf
[Accessed 31 12 2012].

Kotz, S., 2005. Reflections on Early History of Official Statistics and a Modest Proposal for Global Coordination. *Journal of Official Statistics,* 21(2), pp. 139-144.

Markov, Z. & Larose, D. T., 2007. Chapter 3: Clustering. In: *Data Mining the Web: Uncovering Patterns in Web Content, Structure, and Usage.* Hoboken, New Jersey: John Wiley & Sons, p. 63.

Myatt, G. J., 2007. Hierarchical Agglomorative Clustering. In: *Making Sense of Data: A Practical Guide to Exploratory Data Analysis and Data Mining.* Hoboken, New Jersey: John Wiley & Sons, p. 111.

Ngaruko, F., 2008. The World Bank's Framework for Statistical Capacity Measurement: Strengths, Weaknesses, and Options for Improvement. *The African Statistical Journal,* November, 7(2), pp. 149-169.

Rakotomalala, R., 2005. TANAGRA: Un logiciel gratuit pour l'enseignement et la recherche. *Actes de EGC'2005, RNTI-E-3,* Volume 2, pp. 697-702.

Rakotomalala, R., 2008. *Tanagra - Data Mining Tutorials: Clustering.* [Online]
Available at: http://eric.univ-lyon2.fr/~ricco/tanagra/fichiers/enHAC_IRIS.pdf
[Accessed 17 January 2013].

Wells, H. G., 1903. *Mankind in the Making.* London: Chapman and Hall.

World Bank, 2012a. *Bulletin Board on Statistical Capacity.* [Online]
Available at: http://data.worldbank.org/data-catalog/bulletin-board-on-statistical-capacity
[Accessed 1 December 2012].

World Bank, 2012b. *Note on the Statistical Capacity Indicator.* [Online]
Available at:
http://siteresources.worldbank.org/INTWBDEBTSTA/Resources/Note_on_Statistical_Capacity_Indicator_BBSC_Nov2012.pdf
[Accessed 8 January 2013].

World Bank, 2013. *Improving Statistical Capacity.* [Online]
Available at: http://go.worldbank.org/XQX0H70220
[Accessed 8 January 2013].