

June 2018

# **SAMIKSHYA**

(DE&S Journal of Socio-economic Issues)

*Theme :*

**Quality Assurance in Official Statistics**

**12<sup>th</sup> Statistics Day, 2018**

DIRECTORATE OF ECONOMICS AND STATISTICS, ODISHA  
PLANNING AND CONVERGENCE DEPARTMENT  
Government of Odisha, Bhubaneswar

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*June 2018*

# **SAMIKSHYA**

*(DE&S Journal on Socio-economic Issues)*

**12<sup>TH</sup> STATISTICS DAY, 2018**

*Special Issue*

*on*

*Quality Assurance in Official Statistics*

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## **Foreword**

The 12<sup>th</sup> issue of Annual journal of Directorate of Economics and Statistics, Odisha "SAMIKSHYA" is placed before you. Samikshya made a humble beginning a decade back in its intellectual pursuit to inspire the planners, professionals & academia as users. DES continues to preserve mines of data by way of collection, acquisition, dissemination and analysis since 1950s. Its access & delivery of outputs to Users are par excellent. SAMIKSHYA symbolizes the ingrained contribution of DES outputs in the form of scholarly papers and research based analysis. To be specific, the journal makes an independent assessment of the Odisha's economy with contemporary problems and policy issues. This year journal embodies a special issue on the current year theme of Statistics Day 2018 i.e. Quality Assurance of Official Statistics. The theme will be the enabling factor to instill confidence and reliability among planners, implementers, and development activists and outreach target groups. The research papers of the journal expect to give justice to the theme. Our State is emerging as a diversified economy. The workshop on Statistics Day is the appropriate forum to think globally and act locally in the area of quality statistical products. SAMIKSHYA,2018, as a mirror journal of DE&S, Odisha attempts not only to quantify the quality of statistics but also finds way to new horizon of improvement in the area.

I acknowledge with sincere thanks the valued contributions of Paper writers and concerted efforts of Editors and Reviewers of the Journal in preparing and releasing the DE&S Journal "SAMIKSHYA,2018" within a short span of time period.

I extend my special thanks to Sri Sarat Chandra Sahoo, Assistant Statistical Officer for his untiring efforts for preparing the journal.

I wish SAMIKSHYA,2018 a great success.

***(Dushasan Behera)***  
***Director***

## ***Editorial Board***

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### ***Editors' Pen...***

*SAMIKSHYA 2018 attempts to deliver the desired outcome of economic and statistical fields with research insights. It provides new opportunities and possible solutions with new area of activities and interventions on different sectoral issues. The experts from statistics and economics fields contributed significantly on the special issue "Quality Assurance in Official Statistics" to enrich the contents of SAMIKSHYA. The views expressed in the journal are those of the individual writers. Their valued contributions are gratefully acknowledged. The constructive views of esteemed Readers shall be highly appreciated. We extend our sincere appreciations to the enriched contributions of expert faculties & professionals in the field of economics, statistics and other social sciences. The constructive views of esteemed Readers to improve the quality of the Journal are humbly welcome.*

***Editorial Board***

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# ***Prof. P.C. Mahalanobis: The Father of Indian Statistics***

***Sri Dushasan Behera***

Professor Prasanta Chandra Mahalanobis (born June 29, 1893, Calcutta [now Kolkata], India—died June 28, 1972, Calcutta), was an Indian scientist and applied statistician. He belonged to a revolutionary family that showed the path of Bengal renaissance as founder activist of Bramha Samaj. His grandfather and father were the founder and activist of Brahmo Samaj . His mother, Nirod Basini, belonged to a family of academician.

This Physicist- Mathematician turned Statistician laid the strong edifice of Indian administrative statistical system with his unending innovative and phenomenal contributions to the theories, principles and applied side of statistics at local, regional, national and international level between 1912 and 1970. That made him rarest visionary in the field of Statistics. That gave him global recognition with numerous honour of highest order as Statistician at national and international level. His vision, innovation, reformation and contribution put him as the Founder Father of Indian Statistical System. He was the first Chief Statistical Advisor to Government of India.

Born into an academically oriented family in late 19th century, he was encouraged to pursue his intellectual interests from an early age. After completing his schooling he went to study at the Presidency College, Calcutta. Brilliant and ambitious, he moved to England for further study at the King's College, Cambridge. There he met the eminent Indian mathematical genius Srinivasa Ramanujan and was deeply influenced by him. After completing his education he worked for a while at the Cavendish Laboratory with C. T. R. Wilson. There he took a break to return to India where he was asked by the Principal of Presidency College to take classes in physics. He returned to England after a short stay in India. During this time he discovered the 'Biometrika', a journal published by Oxford University Press for the Biometrika Trust which primarily focuses on theoretical statistics. He became fascinated with the subject and was intrigued by the utility of statistics in understanding problems in meteorology and anthropology. After some time he returned to India and joined as Professor of Physics at Presidency College in 1922 and continued for the next three decades. But being a Professor of Physics did not deter him from pursuing his new found interest in statistics. He also had many colleagues who were equally passionate about statistical studies. With them, he first set up a Statistical Laboratory in his room at the

Presidency College, Calcutta. The formation of this group eventually led to the establishment of the Indian Statistical Institute (ISI) which was formally registered in 1932. The institute is today regarded as one of the oldest and most prestigious institutions of international repute focused on statistics. One of his major contributions to statistics was the concept of Mahalanobis distance during 1936. A measure of the distance between a point P and a distribution D, it is a multi-dimensional generalization of the idea of measuring how many standard deviations away P is from the mean of D. As a statistician he made several remarkable contributions to the field, which was instrumental in formulating newly independent India's strategy for industrialization with the objective of providing comprehensive socio-economic statistics. Mahalanobis established the National Sample Survey in 1950 and also set up the Central Statistical Organization to coordinate statistical activities in India. He introduced innovative techniques for conducting large-scale sample surveys and calculated acreages and crop yields by using the method of random sampling. He devised a statistical method called fractile graphical analysis, which could be used to compare the socio-economic conditions of different groups of people. He also applied statistics to economic planning for flood control.

One of the first tasks after India gained independence was to reassess the size and nature of the Indian economy and the person chosen as the Head of the mission was Prof. Mahalanobis along with eminent scientists like Rao and Gadgil. Prof. Mahalanobis' administrative qualities and the ability to convince people resulted in him playing a leading role in creating a statistical edifice for the country. He was also a member of the Planning Commission of India from 1955 to 1967. The Planning Commission's Second Five-Year Plan encouraged the development of heavy industry in India and relied on Mahalanobis's mathematical description of the Indian economy, which later became known as the "Mahalanobis model".

Prof. Mahalanobis held several national and international portfolios. He served as the Chairman of the United Nations Sub-Commission on Sampling from 1947 to 1951 and was appointed as the Honorary Statistical Adviser to the Government of India in 1949. He received the Weldon Memorial Prize from the University of Oxford in 1944. He was made an Honorary Fellow of the Royal Statistical Society, UK, in 1954, and of King's College, Cambridge in 1959. For his pioneering work, he was honored with two prestigious awards in 1968—Padma Vibhushan and Srinivasa Ramanujam Gold Medal—in recognition of his contributions to statistics.

Although remembered today largely as the architect of India's five-year plan model, Mahalanobis, as the Honorary Statistical Adviser to the Cabinet, had a greater contribution in building a new statistical architecture for the country. He was totally dedicated to his profession and remained active with his research work till the very end of his life. He died on 28 June 1972, a day before his 79th birthday. He was a truly visionary leader of his times and the path shown by him has not lost its relevance even today. With the advancement of study and research on statistics in ISI over the years, Prof. C.R. Rao has very rightly called ISI a mighty monument of Prof. Mahalanobis' handicraft.

This was the magnanimity, synergy and rare intellect of Professor Prasanta Chandra Mahalanobis as an Economist and Statistician. We salute this towering complete personality with humble respect.



*“Statistics’ real contribution to society is primarily moral, not technical”.*

*Steve Vardeman and Max Morris*

# *Official Statistics – Quality Assurance*

*Sri Lokanath Sarangi*

## **Abstract**

*This is a descriptive paper highlighting on the role of reliable data base for development plans. Also it emphasizes the points for quality assurance that errors in the data whatever little it be has a multiplication effect in estimation. The main applicable points of the paper is “Only to find fault is meaningless unless steps are taken to overcome the errors through proper supervision and expertise knowledge on the core subject matter and survey techniques while conducting survey work in the field as well as undertaking supervisions.” Some experiences of the ex-Directors of DES in field of quality assurance has been described in this paper.*

**Keywords :** *Quality Assurance, Sampling Error, Non-Sampling Error, Eligible Couple Register*

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With a view to enjoying desired levels of development opportunities, we prescribe various development norms in different development sectors from time to time. Existing values of development norms are examined and development plans are formulated and programmes implemented with a view to filling in existing gaps in a phased manner. Not only development norms but also various kinds of socio-economic data form the basis of our planning process. While administrative data are collected from official records, all other socio-economic data are factual information collected from the field through physical observation by means of census or surveys as the case may be and put to use for different purposes on different occasions.

In this context, much depends on the reliability of the data collected and the database maintained at different points of time. Needless to mention that errors in the data whatever little it be has a multiplication effect when we try to build up any statistic based on a set of erroneous data. In view on this, much more care is needed at the stage of data collection to see that the data collected is free from errors. Once data is released in public domain, there is hardly any scope for taking any corrective measures on the data collected and end users will be resting on erroneous data released for ever. Even if data released is withdrawn and fresh data is released with due corrective measures that will add to serious confusion which

is not desirable at all. The producers of data and the database will, therefore, remain answerable to the public and more particularly the end users for any kind of erroneous data or the database for all time to come.

In conducting a census, a survey or a statistical study we are supposed to come across some kind of error or other. One need not be worried about this and there is nothing to be panic. This is usual in every process. Despite all out efforts our data may not be totally free from errors due to obvious reasons, but the only question is, how best we can minimize errors in our process to the extent possible.

Much has been deliberated on the question of reducing or minimizing errors in the process of sample surveys and census in different forum on different occasions. As we know, there are two kinds of errors that may creep into our result i.e. (a) sampling error and (b) non-sampling error. Sampling error is caused due to adoption of inappropriate sampling and coverage techniques at the very initial stage that does not take care of entire target population in question in the process of selection or enumeration. Sampling errors can be minimized through ensuring an exhaustive frame as well as application of appropriate sampling technique suiting to spread of the population.

The other kind of error during data collection refers to non-sampling errors. Non-sampling errors usually occur due to (i) errors due to inappropriate coverage, sometimes called as coverage error or frame error, (ii) errors due to non-response, and (iii) measurement errors. Coverage error takes place when we either ignore deserving units from the purview of our study or include undeserving units due to lack of clarity or otherwise. By this we are going to commit a fundamental mistake in our survey or study. In the second comes an error due to non-response that happens when we do not get desired information from the respondent despite repeated contacts either through personal contact or through correspondence. By this our study remains incomplete to a certain extent. Third one, the measurement error, is associated with the tools used for collection of information from the respondents and the manner we administer tools on the respondents. Take the case of questionnaire to be administered on respondents. In this case, the questionnaire need be drafted preferably in local language; questions should be simple, precise and unambiguous; questions need not require much of recall and calculations; if necessary, questions should refer to local calendars and the many; in any case, we have to assist the respondent to furnish correct information.

In the process of data collection from field, the Investigators and the Supervisors have to play a quite responsible role. Data collection in the field is not only time consuming but also tedious. If at all we are sincere to our job, we have to see to the suitability of the respondents. Supervisors shall have to provide technical guidance to investigators as well as see to smooth progress of the survey in the field. A Supervisor is not supposed to check the work in respect of one and all individual units. Supervision should, therefore, be made selectively in such a manner so that it will have bearing on all other units.

A Supervisor should have good knowledge on the core subject matter as well as his expertise on survey techniques. He should possess adequate experience and exposure to field surveys so that he can visualize areas of deficiencies wherein he can intervene and give his guidance for further improvements in the study as a whole rather than improving the result of an individual unit. In this context, I recall my early days of job in the Directorate of Economics and Statistics, Odisha more than 45 years back when I was an Assistant Director. In addressing one of our meetings, the then Director, Dr. Chakradhar Mishra gave a brief account of our job responsibilities. He said, you will be holding different positions at different points of time and your job responsibilities will be mostly supervisory in nature. Be it administrative or technical, you should not aim at finding faults only but to taking corrective measures. In regard to supervision of field work, he advised to pick and choose specific areas or units in an exemplary manner rather than supervising the case of large number of units so that it will reflect certain improvements on the survey as a whole. He further explained that a set of statistical observations come from a population having certain parameters and observed values of parameters will be more or less around the population parameters for large sample. This should always be kept in mind while conducting survey work in the field as well as undertaking supervisions. He finally concluded that apart from expertise and experience there is no alternative to robust common sense.

From 1982-87, I was working under the then Directorate of Family Welfare, Odisha as Deputy Director (Monitoring and Evaluation). Once, I had been to a Primary Health Centre (PHC). I wanted to see the accuracy of the Eligible Couple Register (E C Register) maintained under the PHC. Eligible Couple means a currently married couple wherein the wife is in the reproductive age (i.e.15-49 yrs of age). These couples are in need of family planning services. The E C Register is required to be updated annually by addition of new eligible couples and deleting couple who have crossed the reproductive age or otherwise left the village and this work was done by ANMs in charge of villages. The PHC Medical Officer arranged for my visit to one or two villages to physically verify the position. I did not want to go to only one or two villages and verify the factual position in few cases selectively.

Immediately, the advice given by our Director, Economics and Statistics, Odisha during my early service period came to my mind. The number of eligible couples per 1000 population in India was approximately 160-180. Instead of going to villages, I went through few registers and found that there has been no new addition of eligible couples in certain registers during recent years as well as no deletion also. I felt curious about this. I asked few social questions to the ANM concerned to which she answered very enthusiastically. To my questions she replied that she is maintaining good relation with the villagers, they invite her to their social functions, 6-8 daughter-in-laws have come to these villages anew due to marriage during last two year etc. Immediately after, it struck to her mind that she has not taken care to add these new couples in the E C Register at the appropriate time and realized her own mistake. This kind of interrogation was well taken by the PHC Medical Officer and the ANM concerned and that had bearing on all other E C Registers under the PHC.

During my said tenure under the Directorate of Family Welfare, Odisha, I came across a Base Line Survey conducted through a team of personnel specially recruited and trained for the purposes. Among other things, the survey was intended to assess the infant mortality rate (IMR). In course of examination of survey result in the field, it was revealed that there has been reported one infant death each in two families, one male and the other one female, whereas no maternal and child health care facilities were provided to the expectant mothers. These births and deaths have not also been registered. As a result, serious doubt arose regarding authenticity of the information collected. On verification of Eligible Couple Register, it was revealed that there was no eligible couple in these two families. This increased further doubt. It was, therefore, necessary to visit these families to ascertain the factual position. On a visit to these two families it was revealed that there were no eligible couples in these families. They have kept few cows. Their cows had given birth to one calf each in these families and they have expired before completing one year of age. This was really a serious measurement error in the process of conducting surveys and collecting data. On further discussion with the survey team on different aspects it was revealed that the team was lacking in its expertise and experience and it lacked in its acumen to extract appropriate information through field surveys. Therefore, apart from good measuring tools, personal acumen of Investigators to extract factual information is all the more necessary which was not seen with this team. Otherwise, it will end up with a situation like “workman quarreling with his tools”.

These are only few examples on the question of collecting reliable data and releasing the same in public domain. Statistical data on different counts are being released over time and space by different agencies regularly. If and only if everything goes smooth and all

conditions fulfilled then there is possibility of getting reliable data to a reasonable extent. In view of this, the question of getting reliable data is a big challenge before us.

In this context, it is good news that there has been developed world-wide consciousness in regard to quality assurance in statistical products. It has come to our knowledge that after Global Consultation, a National Quality Assurance Framework (NQAF) has been evolved and endorsed by the United Nations Statistical Commission (UNSC) in 2012 and encouraged countries to use it. Government of India have also decided vide Notification No.M-12014/1/2018-CAP dated 06.04.2018 of the Ministry of Statistics and Programme Implementation to promote implementation of the Framework on a voluntary basis in a phased manner enlisting the support of Central Ministries / Departments and the States / Union Territories. Government of India have also issued a Circular in this regard on 25.04.2018 on the subject "General Guidelines on Quality Assurance for Official Statistics" and requested all concerned offices at the Centre and in States / UTs to access the guidelines for compliance to improve the quality of their official statistical product. This is definitely a welcome step in the area of Official Statistics. Since this development is very recent one, details regarding this is yet to be known to many and more particularly to me. However, we should volunteer promoting this Framework at all levels and expect some tangible results relating Quality of our Official Statistical Products at all levels.



*"We must be careful not to confuse data with the abstractions we use to analyse them."*

*William James*

# *Ensuring Quality in Official Statistics*

*Dr. Priyaranjan Dash  
Dr. Kunja Bihari Panda*

## *Abstract*

*This paper contributes the conceptual idea regarding the meaning of Official statistics and the principles and quality criteria indicators followed by the globe. The UN Fundamental Principles of Official Statistics has been elaborately described. At conclusion it suggested some points to ensure quality which can meet users' needs through different quality assurance arrangements.*

**Keywords :** *Quality, Accuracy, Reliability, Clarity, Statistical System, Standard Error*

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## *Introduction*

Official statistics are the public information which are published by the government agencies or by other public bodies for the benefit of the society. These are the quantitative and qualitative information on all major areas relating to the living of common people such as socio-economic development including health, education, living conditions as well as the environment. According to the Organization for Economic Cooperation and Development, "Official statistics are statistics disseminated by the national statistical system, excepting those that are explicitly not to be official".<sup>1</sup>

At present, India follows a decentralized statistical system. The structure is based on the federal constitution where the Union and the State Governments share the responsibility and cost of collection of data for the items covered under the Union and the State lists, respectively. As for the items covered under the concurrent list, both central and state Governments work parallel to fulfil their respective requirements of data. The Central Statistical Organization (C.S.O.) acts as the advisory and coordinating body to regulate the data collection and compilation efforts of centre and states.

The Statistical System in India, being one of the largest Statistical Systems of the world, conducts large-scale socio-economic surveys, collects huge official statistics on

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<sup>1</sup>OECD. Online Glossary of Statistical Terms <http://stats.oecd.org/glossary/index.htm>

various aspects of human life or otherwise and processes them. In all these steps, it is highly essential that we ensure quality. Before we take recourse to quality in our system, it is apt to look at it globally.

### ***Quality Criteria Indicators around the Globe***

Official statistics comply with international classifications and methodologies and meet the principles of impartiality, reliability, relevance, cost-effectiveness, confidentiality and clarity. Official statistics are crucial for planners and decision makers, but what is actually meant by “quality in official statistics” has been debated in the statistical community for decades. Since the official statistics is providing data which are used for planning and development at different levels, it is barely essential to produce data of high quality and its assurance. We can find different quality guidelines and standards specified by different provinces. These quality standards define quality assurance methods and procedures for all phases of producing official statistics (*e.g.* data collection, processing, and dissemination) which ensure compliance with the guidelines.

### ***Quality Indicators in European Union***

The heads of the European Statistical System (ESS) have established common quality principles for official statistics are regulated by the quality criteria established in the European Statistics Code of Practice. The Quality Declaration, signed by all the authorities of the Member States of the European Statistical System, underscores and confirms the commitment to quality.

The quality of a statistical product can be defined as the fitness for purpose of that product. More specifically, it is the fitness for purpose with regards to the following five quality dimensions: relevance, accuracy and reliability, timeliness and punctuality, accessibility and clarity, and coherence and comparability. There are several quality indicators for measuring accuracy and reliability, with the most important ones being standard error and the coefficient of variation. The aggregates and average values calculated based on sample data are estimates of the actual aggregates and average values, which are generally unknown, unless we interview all items of the total population. The similarity of the estimate to the actual value is indicated by the estimate's standard error and/or coefficient of variation. The smaller they are, the more exact the estimate. Other indicators reflecting the quality of statistics include the response rate, imputation rate, errors due to under- and over-coverage.

## ***Quality Criteria in Finland***

The Advisory Board of Official Statistics of Finland has in 2010 updated the criteria that should be fulfilled by statistics in the Official Statistics of Finland (OSF) series. These criteria have been harmonised with the quality criteria of Eurostat. The purpose of the criteria is to develop and maintain the usability of OSF statistics in order to meet society's information needs. They are based on the European Statistics Code of Practice (CoP).

### ***a) Impartiality and transparency***

The principles adhered to in the production and reporting of statistics are based on professional statistical considerations and ethics independent of external interest perspectives. The principles are public and detected errors are corrected visibly. The statistics are accessible to everybody under equal conditions.

### ***b) Quality control***

The quality of statistical data is monitored continuously with recognised procedures and it is adequately reported. The minimum requirement in quality reporting is an up-to-date quality description approved by the Advisory Board of Official Statistics of Finland. The aim is that approved procedures for quality assurance are in place for all OSF statistics.

### ***c) Confidentiality***

The data obtained from data providers are only used for the purpose they have been told they would be used for and their privacy and trade secrets are efficiently protected.

### ***d) Efficiency***

Statistics are produced with adequate resources and mandates, professionally and as efficiently as possible while minimising the response burden of the data providers.

### ***e) Relevance***

OSF statistics contain essential and nationally comprehensive data on the topic they describe to serve the needs of their users.

### ***f) Accuracy and reliability***

OSF statistics describe the examined phenomena, their state and its changes, in an accurate and reliable manner. Clear descriptions are presented of the used statistical methods

and revisions in them. Their effects on the obtained results and other possible factors causing uncertainties in the statistics are analysed and reported. The measures for correcting possible errors in the statistics comply with the recommendations approved by the Advisory Board of Official Statistics of Finland.

***g) Timeliness and punctuality***

The data of OSF statistics are as up-to-date as possible. The times of their release are made known in advance. Their publisher must maintain a release calendar in accordance with the guidelines issued by the Advisory Board of Official Statistics of Finland (OSF release guidelines).

***h) Coherence and comparability***

OSF statistics are coherent and as comparable as possible over time and regionally. General and established, primarily internationally approved concepts and statistical classifications are used in OSF statistics. The factors affecting the coherence and comparability of the statistics are documented and explained in the quality descriptions of the statistics. Definitionally deviating data describing the same phenomenon are clarified by using different concepts.

***i) Accessibility and clarity***

OSF statistics are presented in a clear, transparent and understandable form, and disseminated in a suitable and convenient manner. The data and the supporting metadata, as well as guidance for the users are made impartially accessible. The statistics are presented in a form that facilitates their proper interpretation and comparisons. The basic data of the statistics are made available for research purposes without compromising confidentiality. Custom-designed analyses can be produced from the statistics for the needs of an individual user or group of users.

***UN Fundamental Principles of Official Statistics***

United Nations Statistical Commission at its Special Session of 11-15 April 1994 adopted the set of principles – as the United Nations Fundamental Principles of Official Statistics. On 29 January 2014, these principles were modified, which have applied worldwide since 1994. These are

- **Principle 1.** Official statistics provide an indispensable element in the information system of a democratic society, serving the Government, the economy and the public

with data about the economic, demographic, social and environmental situation. To this end, official statistics that meet the test of practical utility are to be compiled and made available on an impartial basis by official statistical agencies to honour citizens' entitlement to public information.

- **Principle 2.** To retain trust in official statistics, the statistical agencies need to decide according to strictly professional considerations, including scientific principles and professional ethics, on the methods and procedures for the collection, processing, storage and presentation of statistical data.
- **Principle 3.** To facilitate a correct interpretation of the data, the statistical agencies are to present information according to scientific standards on the sources, methods and procedures of the statistics.
- **Principle 4.** The statistical agencies are entitled to comment on erroneous interpretation and misuse of statistics.
- **Principle 5.** Data for statistical purposes may be drawn from all types of sources, be they statistical surveys or administrative records. Statistical agencies are to choose the source with regard to quality, timeliness, costs and the burden on respondents.
- **Principle 6.** Individual data collected by statistical agencies for statistical compilation, whether they refer to natural or legal persons, are to be strictly confidential and used exclusively for statistical purposes.
- **Principle 7.** The laws, regulations and measures under which the statistical systems operate are to be made public.
- **Principle 8.** Coordination among statistical agencies within countries is essential to achieve consistency and efficiency in the statistical system.
- **Principle 9.** The use by statistical agencies in each country of international concepts, classifications and methods promotes the consistency and efficiency of statistical systems at all official levels.
- **Principle 10.** Bilateral and multilateral cooperation in statistics contributes to the improvement of systems of official statistics in all countries.

Against the backdrop, we present below some guidelines as to how to maintain quality in official statistics of our system.

### ***Conclusion***

1. Statistics should be produced to a level of quality that meets users' needs. The strengths and limitations of the statistics and data should be considered in relation to different uses, and clearly explained alongside the statistics.

2. Quality assurance arrangements should be proportionate to the nature of the quality issues and the importance of the statistics in serving the public good. Statistics producers should be transparent about the quality assurance approach taken throughout the preparation of the statistics. The risk and impact of quality issues on statistics and data should be minimised to an acceptable level for the intended uses.
3. The quality of the statistics and data, including their accuracy and reliability, coherence and comparability, and timeliness and punctuality, should be monitored and reported regularly. Statistics should be validated through comparison with other relevant statistics and data sources. The extent and nature of any uncertainty in the estimates should be clearly explained.
4. Scheduled revisions, or unscheduled corrections that result from errors, should be explained alongside the statistics, being clear on the scale, nature, cause and impact.
5. Systematic and periodic reviews on the strengths and limitations in the data and methods should be undertaken. Statistics producers should be open in addressing the issues identified and be transparent about their decisions on whether to act.

### **References**

*Desrosières, A. (2009). How to be Real and Conventional: A Discussion of the Quality Criteria of Official Statistics, Minerva, 47, pp.307-322.*

*Porter, T. (1994). Making things quantitative. In Accounting and science, ed. M. Power, 36-56. Cambridge (UK): Cambridge University Press.*

*Rao, T.J. (2013). National Statistical Commission and Indian Official Statistics, Resonance, December 2013, pp. 1062-1072.*

*Maiti, P., Rao, T.J., Ghosh, J.K. (2016). The Indian Official Statistical System Revisited, Sankhya: The Indian Journal of Statistics, 78-B, Part 2, pp. 215-237.*

*UN Fundamental Principles of Official Statistics – Implementation guidelines, 2015. downloaded from [https://unstats.un.org/unsd/dnss/gp/Implementation\\_Guidelines\\_FINAL\\_without\\_edit.pdf](https://unstats.un.org/unsd/dnss/gp/Implementation_Guidelines_FINAL_without_edit.pdf)*



***"If your experiment needs statistics, you ought to have done a better experiment."***

***Ernest Rutherford***

# ***Use of Balance Sheet and P/L Account : For Collection of Industrial Statistics***

***Banshidhar Mahapatra, ISS (Retd)***

## ***Abstract***

*The paper is specifically highlights on collection of secondary data from books of account and its use in Industrial Statistics. As proper skilled knowledge in data collection, supervision and scrutiny has an important role in quality assurance the paper elaborately describes the concepts and process for use of balance sheet and profit loss account for collection of Industrial Statistics.*

***Keywords :*** *Balance Sheet, Profit Loss Account, Industrial Statistics, Annual Survey of Industries*

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## ***Introduction***

Industrial Statistics is collected in the name of Annual Survey of Industries (ASI) by Central Statistical Organisation (CSO). The data collection is statutory and under collection of Statistics act 2008 and rules framed there under in 2011. The field work is done by National Sample Survey Office (NSSO) and some State Governments. This is a secondary data and collected from the books of accounts of an Industrial Unit. The main books of accounts used are Balance Sheet, Profit Loss Account and their groupings or schedules and subgroupings. Besides these, other registers like Ledger, Journal, Salary cum Bonus and Attendance register are required to collect the requisite information.

Most important is reading of Balance Sheet and Profit Loss (P/L) Account and its groups and sub-groups and putting the required data in the various blocks of the schedule meant for collecting industrial data. The prescribed schedule is having various blocks or tables for fixed assets, working capital, labour attendance, salary, consumption and other expenditure and income. In the Balance Sheet there will be share capital/partner/proprietor's capital, liability both long term and short term and assets. Total liability and total assets are balanced or in other words equal in the Balance Sheet. Schedule for collection of Industrial Statistics is synchronised with the Balance Sheet and Profit Loss Account, so that it will be easier to put the data in the requisite tables or blocks.

**Balance Sheet:** Information on both Asset and Liability constitutes the Balance Sheet.

### ***Assets***

**Fixed Assets:** In the Balance Sheet there will be a group called fixed asset like land, building, machinery, transport, computer, office equipment etc. These are all tangible assets. There are also intangible assets like good will, trade mark etc whose data should not be collected as it is not considered for tabulation. In the fixed asset table, gross or original value of the asset, addition and sale during the year, depreciation up to, during and net value of all assets are presented and those data is to be collected in the fixed assets block of the ASI schedule. In some limited companies software is shown as intangible assets. But in the ASI return it will be collected as tangible asset and taken with computer head.

**Current Assets including inventories and Sundry debtors:** These are nothing but inventories like stock of raw material, store, semi finished and finished goods along with sundry debtors, and amount receivable on various accounts. Also considered here cash in hand and in bank including fixed deposits. Certain amounts like investment in equity and deposit in Govt. account will not find place in ASI return although it is shown under current assets.

### ***Liability***

**Loan:** Loans may be long term or short term. Short term loans like over draft, cash credit etc will be treated differently to that of long term secured loans and debentures.

**Sundry Creditor and Current Liability:** These are the amount to be paid by the factory for various activities. Liability for payment to the suppliers is known as sundry creditors and other liability like payment of electricity bill, telephone bill, auditor's payment etc will come under current liability.

**Profit and Loss Account:** Both expenditure and income constitutes profit and loss account.

### ***Expenditure***

Expenditures like salary, wages, bonus, and other payments for the employees will come separately along with their attendance or man-days. Consumption of raw materials,

stores, packing material and fuel will come separately. Other expenses like transport, job work paid, interest, insurance, stationery, rent etc will also come separately.

### ***Income / Sale***

Sale value of products manufactured along with quantity of production and sale will find place in a separate block. Also along with sale value distributive expenses like out ward transport, sale's commission, GST etc will be taken along with the sale value for calculation of net sale value.

Besides this where income is other than sale of manufactured product like Job work income, service charges received, gain in fluctuation of exchange rate, interest income etc will find place in a separate block.

### ***Some Factors on Data Quality***

Quality of data mainly depends on some factors like:

- i. Factory owner's cooperation in giving all the required books or registers to the investigators / data collectors.
- ii. Data collector's understanding of the concepts and definitions as per the manual is highly essential.
- iii. Proper collection of various data from the Balance Sheet and profit and loss account as well as ledger etc.
- iv. Correct transcription from primary data available from the registers kept with the factory.
- v. Tallying of ASI return profit / loss with that of factory profit and loss account.



***“Lack of statistics is to hide inconvenient facts.”***

***Albert Bertilsson***

# *Quality assurance in Indian Statistics : Some issues and problems*

*Dr. Kailash Chandra Pani,*

## ***Abstract***

*This paper climaxes on many aspects some important and basic problems and issues on the quality assurance in Statistics elaborately. The quality assurance in collection of both primary and secondary data due to different reasons, wrong results for improper and unscientific use of statistical methods, tools at different levels has been presented in the paper elaborately.*

***Keywords :*** *Statistical infrastructure, robust, boosting , social consciousness*

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## ***Introduction***

India has one of the robust statistical system in the world and the quality of Indian Statistics is fairly good. Statistical infrastructure as well as quality of performance of statistical personnel of this country are of fair degree of acceptance at world level. While telling this we do not have any hesitation in accepting the fact that still we have many gray areas so far as quality aspects are concerned which need to be looked into. With the passage of time, the Indian Statistical system is adding colours to its feathers and marching ahead to reach close proximity of truth in its every endeavour with the use of more scientific methods of data acquisition and advanced methods of data processing and analysis. In spite of our poverty and unemployment, the rapid strides in the various sectors of development has taken India to the brink of becoming a super power in the world. It is admittedly an acceptable fact that India is now a very influential member in all the game plans taken up at International level. In consideration of the success of the country, without any doubt, with emphasis we can speak that Indian Statistical System has a big role in boosting the progress of the country because the plans and policies programmed by a nation is based on the statistics available to it. Hence statistical data and the statistical methods adopted for analysis and interpretation to surface the cause of problems encountered by the country is fairly accurate which speaks of the quality of our data and methods. On the other hand, there is no denying the fact that our statistical system still suffers from many deficiencies and not at par with many developed Countries.

Though the quality assurance in statistics is dependent on lot many aspects, we can divide it into two broad spheres, i.e the loss in quality of statistical data and wrong results for improper and unscientific use of statistical methods, tools at different levels either due to ignorance or due to motivated reasons. In the present paper, attempts has been made to discuss some important and basic problems on both the aforesaid issues.

### ***Quality assurance in collection of data***

**A) Primary Data:** Statistical organizations collect some primary data by conducting regular / adhoc sample surveys and census surveys. In this method the enumerators or the primary investigators go to the respondents / unit of data collection to collect the data. Following are some illuminating areas which embarks upon quality of the data collected in Indian context which need to be looked into if we want to improve upon.

**Need of Social Consciousness:** With the change of time, people are becoming very reluctant and non-co-operative to afford any time for data collection as a result of which the poor investigator hardly finds scope to probe the issues of the survey focusses. He tries to fill up the schedules someway or other in view of his job. Further the people have developed an attitude of grabbing the Govt. assistance given inform of individual benefits some way or other. If the objective of the survey is directly related to their interest, instantaneously they upgrade or downgrade the information to suit their purpose. In such situations since they are reluctant for co-operation even if well trained investigator fails to surface the fact. For illustration it may be cited that in BPL survey everybody tries to supplement misleading information such that they find place in the BPL register to grab the probable Govt. benefits. It is not said that these problems were not their earlier, but the impatience and non-cooperation which is brewing up with the respondents in sparing a little time ensures failure on part of a trained investigator who is forced to collect the basic information as far as possible and fill up other portions applying his own intellects and circumstantial evidences. One interesting point which may be noted here that once the village people / informants know that this is a statistical survey and is not related to getting any Govt. benefit, they exhibit 100percent indifferent attitude. Further, the mute point is that this non-cooperation attitude of informants to divulge personal information is increasing very fast with the educated people and basically in urban areas which is detrimental to national interest. Mass awareness / sensitization is highly essential to deaccelerate the process. On this backdrop it will not be illogical, as a first hand measure, to make it obligatory on part of employees of Govt. / Public sector undertakings to provide such information proactively which will have an inducing effect on other neighboring informants.

**Recognition of statistics and Statisticians:** Qualitative data or qualitative statistics is the prerequisite for success of all policies and plans. It is the foundation on which super structure of every plan rests. Hence this necessitates development of social conciseness so that the respondent or the common man feels that furnishing of the correct information and affording a little time to Statistical enumerators / investigators is his duty in nation building exercise. In spite of several Statistical legislations for acquisition of data we have not come above the problems. Hence socially, we have to recognize weightage of Statistics and the importance of job performed by Statisticians since all these are indirectly related to all public interest. Though state income is a single figure, chain of pains shouldered by Statisticians/Economists should be well appreciated which will boost his morale. However, constructive criticisms are always welcome. This appreciation should start with the people who are in ministerial berths and key occupants in bureaucracy. If they become responsive for the cause of statistics, this will percolate to the field and will create an enabling environment for collection of qualitative data. In addition, the electronic and mass media and other social Medias should be triggered of in developing the desired social conciseness for this great job.

**Token money for respondents:** In household surveys there should be provision of token money which should be paid to the informant at his door step for the time he is sparing for providing the data. It is a fact that the people in the middle and lower strata of our society find it difficult to afford 2 – 3 hours for such works in view of the rising labour prices.

**Strengthening inspection and supervision:** The inspection and supervision is a very important task in improving the quality of data. Sufficient facility should be provided to the officials responsible for inspection and supervision. They should be motivated to do it carefully and consciously. We have to build up a confidence in themselves that they are doing a great job for the country and their services is no way less significant compared to persons providing direct benefit to the people. Adequate trained manpower should also be provided at each level for inspection and supervision. It is a presumably a fact that in Indian context there is much dearth of manpower for supervision and inspection.

**Training and Skill upgradation:** Proper training and skill upgradation is directly related to productivity in quantum and quality. We do not say that training is not conducted. But it is inadequate. Proper training of persons involved in process in regular intervals is highly essential for improving the quality in data acquisition. State level training institutes equipped

with proper infrastructure and skill is essential supported with a team of qualified well trained and dedicated trainers.

**Use of Media:** It is heartening that since some years, the National Sample Office(NSDSO) is appealing through electronic mass media about its sample surveys with request to people to share their information / viewpoints in this nation building exercise. Since NSSO is the premier data collection agency in the country, it should make an uniform advertisement through electronic mass media and other social medias highlighting the importance of statistics with request to people to share the information for the different type of surveys taken up by State Govt. and other National Statistical Bodies in addition to NSSO etc. Alternatively state Bodies / other National Bodies should make some vibrant preaching for their work like NSSO

**Timely payment of remuneration:** Timely payment of Remuneration is a very important aspect. In many big censuses like Economic Census etc., very often, we take manpower from other tracks who do not have any statistical background or any inclination for Statistics. In such situations the willingness and attitude of those adhoc enumerators / investigators is extremely important to ensure quality of data. Apart from convincing them and conducting training programme in congenial and conducive atmosphere, payment of remuneration to them in time will certainly go a long way in improving the quality of the data collected.

**Govt. Commitment in writing:** In connection with household data, Govt. should provide a commitment in writing that the information collected from the household or individual will be kept secret and will not be divulged and It is for estimation of group level, community level, village level average. An agreement of the District level / Block official as the case may be with seal and signature should be provided to the informant to this effect.

**Curbing political pressure:** It is a matter of great concern that with the advance of society and civilization, political pressure is mounting up for grabbing of Govt. benefits by ineligible people. The Statistical field man working in the grass root level is sometimes man handled and threatened to report misleading data to suit the objective of those unscrupulous people. Protection from police though is inevitable but not a panacea to the problem cropping up. The adoption of scientific method in data acquisition and its online transfer from the household door step to the state / national headquarter is essential which should be supported with mandatory measurable video clippings. This problem accentuated in case of PMFBY and adoption of mobile App has solved field problems to a great extent.

**Manpower pool at block level:** To meet the purpose of adhoc needs of Statistical manpower we can think of upgrading the skill of 100 unemployed willing youths in each block who have crossed age 40 i.e. who do not have any further scope of direct employment so that we can utilize their services with proper remuneration package as and when adhoc surveys and censuses are conducted.

**B) Secondary Data:** After sharing something about quality assurance in primary data, now we want to speak a couple of points about the quality aspects of secondary data

**Check and balance system:** It is a fact that very often secondary data is the byproduct of administration which are generated half hazardly without any attention to quality aspects. In such cases a system of accountability should be built up so that the data generated in the process of activities of Department / Organization is transparent and consistent. A check and balance system should be put in place to ensure consistency and accuracy of the generation system.

**Need of professionals and Nodal approval:** There are many resource Departments and other organizations who are doing quite a lot of Statistical work with less or without support of professional statisticians. Even if some statistical people work in such places, their knowledge and skill are not updated since they do not belong to main statistical stream either at the Centre or at the State. Such organizations should post professional statisticians / statistical people and they should be linked to the premier Statistical Organization of the State / Centre after whose approval work should be taken up at their level.

**Use of advanced IT:** Very often the sudden jumps in Statistical data are owing to manmade reasons than natural. The bureaucrats or people at the helm of affairs force the Statisticians to provide an overestimate or an under estimate of the phenomenon to suit a specific purpose to please their political bosses without realizing the future consequences for such lapses. Such rise or fall in essential sectors seriously tells upon the economic backbone of the country. Transparency, use of IT technology and online data acquisition will probably go a long way in making statistical data and its estimates reliable in such situations.

### ***About methodology***

Now it is the time to speak a few words about the adoption of proper Statistical methods in deriving desired output or estimates. There is no dearth of professional statisticians or softwares in India. But there should be a chain up relationship among the

Statistical bodies working at lowest level up to the body working at apex level. The latest knowledge and technique should continuously and consistently be disseminated. Untrained non-professionals should not be allowed to utilize Statistical methods from their quack knowledge in deriving misleading results. In every state there should be an apex body who should approve the methodology to be adopted for a specific statistical purpose.

### ***Conclusion***

Statistics is just like clay of which one can make a god or a devil as one pleases. Requirement of experience and skills for judicious use of statistical method restrict their use to experts only. Hence science of Statistics is the most useful servant but only of great value those who understand its proper use. In drawing a conclusion, we can safely say that in consideration of dimension of usage of Statistics in India, we can do a great job in assuring quality in statistical data if we can put up coordinated, concerted and scientific efforts for acquisition of statistical data apart from paving the bottle necks for other important issues standing on the way. At last, if we can ensure generation of qualitative data we can do a great job for our country



***“Words count; let the numbers speak!”***

***René Gélina***

# ***Managing the Quality of Official Statistics: Facts and Factors***

***Smt. Indira Garnaik***

## ***Abstract***

*Developing nations like India are data intensive: they need socio-economic information about their population to design redistributive policies and, given their obsession with global rankings, they also need information to compare themselves with other countries. But India's official statistics are not error free. It is required to identify the gaps in official data and analysis obtained from different sources and determine to bridge the gaps. This article describes a general framework for improving the quality of statistical programs in organizations that provide a continual flow of statistical products to users and stakeholders.*

***Keywords :*** Data gap, quality, accuracy, NAS, NSS

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## ***Introduction***

Official statistics is the activity in the field of production of official data, including administrative data. official data are obtained as a result of processing and aggregation of administrative and primary data on social, economic, demographic, environment and quantities of other public processes by corresponding executive authorities producing official statistics and other state authorities .Administrative statistics is the official statistics produced in relation to the fulfilment of duties by corresponding executive authorities and other state bodies .They provide both quantitative and qualitative information on economic and social development, national productivity, living conditions, health, education, transportation, the environment, and many other areas of national interest. Credibility and confidence in the statistics depend to a large extent on the quality of official statistics. If the quality is suspect, the reputation of the organization providing the statistics could be undermined.

## ***Controversy Relating to NAS vs. NSS Estimates of Household Consumption Expenditure***

Poverty alleviation has become an important plan objective in India. Ever since the issues of poverty gained the policy attention in the development planning, there exists diversity of opinion among experts on the methodology of measuring poverty. There are multiple dimensions of poverty. However, the base for the income poverty estimations in India has been the consumption expenditure but the estimates of consumption expenditure

are generated from the two sources. The first source is the Central Statistical Office (CSO) publishes National Accounts Statistics (NAS) for the country and releases estimates of expenditure on Gross Domestic Product (GDP) by item break-up of which Private Final Consumption Expenditure (PFCE) is an important component. CSO's estimate of PFCE is derived following the 'commodity flow approach'. This consists of obtaining quantum and value of different commodities flowing finally into the consumption process of the households and the private Non-Profit Institutions Serving Households (NPISH) from the quantum and value of the commodities produced and available. In other words, the inputs for PFCE of NAS consist of expenditure by households (including Non-Profit Institutions Serving Households (NPISH)) on non-durable consumer goods and services and all durable goods except land and buildings. Thus, household consumption expenditure plays an important role in the calculation of GDP.

The second source is the National Sample Survey (NSS), initiated by **Prof. P. C. Mahalanobis**, is a nation-wide, large-scale continuous survey operation organized in the form of successive rounds employing sampling techniques. Among other things, surveys of this organization include household consumption expenditure ascertained directly by canvassing a well structured schedule of enquiry covering broadly every item of consumption. Besides the PFCE of NAS mentioned above, these Consumer Expenditure surveys by the NSS Office also provide estimates of household consumption expenditure, with the exception of NPISH. Some of the inputs for obtaining these estimates are food and non-food items, fuel and light, clothing, footwear, durable goods for domestic use.

**Table 1: Divergence between NAS and NSS estimates (₹. crores) of household consumption expenditure in India**

Year	Source	Total Expenditure
1972-73	NAS	35160
	NSS	33210
	% difference	5.5
1977-78	NAS	63084
	NSS	56530
	% difference	10.4
1983-84	NAS	146084
	NSS	108668
	% difference	25.6
1993-94	NAS	574772
	NSS	355770
	% difference	38.1
2004-05	NAS	1873729
	NSS	931415
	% difference	50.29

Source : NSSO\_CS0 (2005), 1Crore= 10 million.

Even though one expects that the NAS estimates and the NSS estimates should be close, it is seen from Table 1 that there is a widening divergence between these two estimates over a period of time. It is noted that the gap between the two sets of estimates has been widening progressively. For example, 5.5 percent difference in 1972-73 increased to 10.4 in 1977-78 which further went up to 25.6 percent and 38.1 percent in 1983-84 and 1993-94 respectively. Thus within a period of two decades, the percentage difference increased almost seven times. It is also observed that the NAS estimates were found to be moving at a faster rate than NSS estimates. However, the Expert Group on Estimation of Proportion and Number of Poor, constituted by the Planning Commission in 1993 regarded that the NSS remains the best available source of assessing poverty incidence.

The controversy relating to the NAS and NSS estimates had an important role in the Indian Official Statistical System and received much attention. This chapter suggests improved methods of deriving NAS estimates and data collection in the consumer expenditure surveys and examined the extent of deficiency and ascertained reasons. Having observed discrepancies an attempt has been made to find out and analyse the reasons behind it and to reduce the difference between the two.

### ***Various Aspects of Quality Assurance***

The quality of official statistics is defined in terms of five dimensions like *Accuracy, Relevance/Contents, Timeliness and Punctuality, Comparability and Coherence, and Accessibility and Clarity*. that reflect their fitness for use by data users and other constituents.: This article considers all five dimensions but primarily focuses on Accuracy or data quality which is considered fundamental to product quality.

### ***Total Quality***

#### ***Product, Process and Organizational Quality***

Product quality refers to the acceptability of a product data quality. Improvements in product quality are made by improving the processes generating the product. Thus, process quality refers to the ability of survey processes to generate data and other statistical products of high quality. It is important that statistical organizations possess the knowledge, skills, and appropriate control systems to sustain and improve process quality. Organizational quality refers to the ability of the organization to consistently develop and maintain high quality processes. These three quality levels do not exist independently. Rather,

organizational quality is required to achieve quality at the process level which is required for consistent product quality.

Product accuracy can be described in terms of error components that comprise the total mean squared error (MSE) of the estimate – an indicator of product data quality. Reductions in the MSE can only be achieved through process improvements such as more effective follow up of non-respondents, improved interviewing, better estimation approaches, and so on (i.e., improved process quality). These improvements are possible because the organization possesses the knowledge, skills, and management structure to design and implement improved processes that result in real quality improvements. The early literature on survey quality focused on product data quality (Accuracy) and the MSE as the primary indicator. The focus obviously was on minimizing and controlling sampling errors. But it was also recognized early on that other error sources could affect the survey results – for example, the interviewers and the non-respondents. Importance should be given to minimize all type of error sources.

### ***Dimensions of Product Quality***

A good product quality is synonymous with estimates having MSEs. The smaller the MSE, the more accurate are the estimates which give better statistical inferences. Quality should go beyond accurate estimates and should also encompass relevance. Over the years, the definition of quality has expanded to encompass other dimensions that are important to data users such as timeliness, comparability and accessibility. The development of quality frameworks for official statistics has expanded by new developments in survey methodology, technology and system architectures. As an example, accessing data sets through the Internet is now common place and, for users, ease of access (i.e., accessibility) is an important component of quality. Decision-making in society has become more complex and global resulting in demands for harmonized and comparable statistics across countries and surveys (i.e., comparability and coherence). Several quality frameworks have been developed – each consisting of a number of quality dimensions. As an example, the quality framework developed by Eurostat (2009) consists of six dimensions: Relevance, Accuracy, Timeliness and Punctuality, Accessibility and clarity, comparability, and coherence. This is essentially the framework adopted for the current report after combining the latter two dimensions into one dimension.

This article also emphasizes the accuracy component of product quality. One can view accuracy as the dimension to be optimized in a survey while the other dimensions can

be treated as constraints during the design and implementation phases of production. They argued that sufficient accuracy is essential for the other quality dimensions to be relevant. However, there are examples where accurate data may lose much of their utility if, for example, they are released too late to affect important decision-making or if they are presented in ways that are difficult for the user to access or interpret. As an example, surveys designed for the surveillance of disease outbreaks must be very timely if diseases are to be effectively contained. Accuracy may be secondary to timeliness in that case or there may be trade-offs involved where accuracy must be compromised to some extent for the sake of timeliness.

### ***Accuracy***

For survey products, data accuracy is achieved by minimizing total survey error (TSE) which is the totality of error that can arise in the design, collection, processing, and analysis of survey data. (the term, TSE, could be generalized as “total product error”). A few error sources (such as measurement and data processing errors) are common to almost all surveys; however, other sources of error are dependent upon the survey design, type of data collected, and processing system used to develop the survey products.

*To identify the relevant error components, we let  $\hat{Y}$  denote a survey estimate (or product) that is subject to errors from a number of sources. One can conceive of an “error free” version of  $\hat{Y}$  denoted by  $Y$  which would result if the processes producing  $\hat{Y}$  were error free including non-sampling error (i.e., a complete census). Thus, the difference, i.e.,  $\hat{Y} - Y$ , i.e., the total survey error, is due to all the errors in the processes that produce  $\hat{Y}$ , both sampling and non-sampling errors.*

The total survey error can be divided into sampling error and seven non-sampling error components, viz., frame error, nonresponse, measurement error, data processing error, modelling/estimation error, revision error, and specification error. **Frame error** arises in the process of constructing, maintaining, and using the sampling frame(s) for selecting the survey sample. It includes the inclusion of non-population members (coverage over), exclusions of population members (coverage under), and duplication of population members, which is another type of coverage over error. Frame error also includes errors in the auxiliary variables associated with the frame units (sometimes referred to as content error) as well as missing values for these variables. As examples, information on company size, industry, location, contact name, and address may be missing or erroneous for some

enterprises on a business frame or register, thus potentially increasing costs and other errors (for example, sampling and modelling errors)

**Nonresponse error** encompasses both unit and item nonresponse. Unit nonresponse occurs when a sampled unit does not respond to any part of a questionnaire. Item nonresponse occurs when the questionnaire is only partially completed because an interview was prematurely terminated or some items that should have been answered were skipped or left blank. **Measurement error** includes errors arising from respondents, interviewers, imperfect survey questions and other factors which affect survey responses. **Data processing error** includes errors in editing, data entry, coding, computation of weights, and tabulation of the survey data. **Modelling/estimation error** combines the error arising from fitting models for various purposes such as imputation, derivation of new variables, adjusting data values or estimates to conform to benchmarks, and so on.

Preliminary estimates are published for some key statistics in order to address user needs for timely data. For example, quarterly GDP estimates based on preliminary data are published in order to provide Government and other important users with timely, though approximate, information on national economic performance. Preliminary estimates may be available one month after the end of a quarter; final estimates may be delayed until the end of the following year or later. Obviously, the utility of the preliminary estimates depends substantially on how close they are to the final, official estimates that are ultimately released. **Revision error** is the difference between a preliminary, published estimate and the final revised estimate and is an important component of the total error for some products.

However, revision error is somewhat unusual because it reflects the combination of all other error sources on the preliminary estimate. For example, the preliminary estimate may differ from the final estimate as a result of late respondents (i.e., non-respondents at the preliminary deadline) whose characteristics may be estimated or imputed in the preliminary estimate while their reported values are used in the final estimate. Likewise, revisions may correct for other non-sampling errors such as measurement, data processing, etc. that are identified after the preliminary deadline. In this way, revision error may account for error sources that have already been considered in the assessment of data quality for the revised estimate.

**Specification error** arises when the observed variable, differs from the desired construct, that is, the construct that data analysts and other users prefer.

## ***Conclusion***

Statistics is a tool in the hands of a researchers/policy makers by which they can analyse their study findings to make policy decisions. If statistical methods used in the study are inappropriate, the conclusions drawn from the study become questionable. So it is very essential to reduce the level of error. The primary important steps to reduce the level of error are to: (a) identify the current, most important threats or risks to the quality of a product, (b) apply a structured, comprehensive approach for rating the efforts aimed at reducing these risks, and (c) identify areas where future efforts are needed to continually improve process and product quality focussing on those high risk error sources where ratings are relatively low. These steps can be applied by and large in Government as well as in private sector or university statistical products. Reviews could provide useful insights regarding a product's current quality-level. Also, there are some other serious administrative problems in our statistical bureaucracy like paucity of staff and dependence on ad hoc part-time workers, inadequacy of staff in NSS and CSO for which sample sizes for many surveys are shrinking, reduction in the number of sanctioned posts of field investigators and their supervisors at sub-state level. Not enough resources spent—as the economy becomes more complex, we need more not less resources for the data collection machinery. The general situation seems so dire that the whole statistical community needs to get involved in focusing attention on this job, and in helping restore the former prestige of Indian data quality.

## ***References:***

*Paul Biemer, Dennis Trewin, Heather Bergdahl, and Lilli Japac: Journal of Official Statistics, Vol. 30*

*P. Maiti, T. J. Rao, J. K. Ghosh : The Indian Official Statistical System Revisited*

*Ankush Agrawal, IEG, and Vikas Kumar : How reliable are India's official statistics?*

*Ravi Chaganti and Venkatanarayana Motkuri: Estimating NAS Consistent Poverty and Inequality from NSS Data*

*Pranab Bardhan: The State of Indian Economic Statistics: Data Quantity and Quality Issues*



***“It is the mark of a truly intelligent person to be moved by statistics.”***

***George Bernard Shaw***

# *Role of Metadata in Quality Assurance of Official Statistics*

*Rashmi Ranjan Kanungo*

## *Abstract*

*Metadata have a vital role in both the development and use of statistical information. The production of information requires that data and metadata be viewed as a totality rather than individually. Since metadata provides the basis for human understanding of data, it is seen as an integral part of statistics production. The first part of the paper will be devoted to metadata. Also the metadata have a key role in linking survey measurement and process quality improvement. On the one hand, metadata describe the quality of statistics. On the other hand, metadata are themselves a quality component, which improves the availability and accessibility of statistical data. The second part of the paper will describe the quality assurance and how metadata relates to it.*

*Key words: Information, usability, users, dissemination, management.*

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## *Introduction*

A very short definition of metadata is “data about data”, or “information about information”, i.e. Some kind of second-order data. Now the descriptions go beyond the pure form and contents of data. Metadata are also used to describe administrative facts about data, like who created them, and when. Such metadata may facilitate efficient searching and locating of data. Other types of metadata describe the processes behind the data, how data were collected and processed, operational description of the data collection process behind the data (e.g. questions asked to respondents) before they were communicated or stored in a database. It is important for statistical agencies to publish good metadata because by doing so they show openness and transparency, thereby increasing the confidence of users in the information they produce.

Now the question is what does “metadata” mean with respect of official statistics? Official statistics probably the first area to recognise the importance of metadata, but the real progress could be seen during 1980’s and 1990’s when the Statistical Division of UN/ECE (*United Nation/ Economic Commission for Europe*)organises several meetings and

workshop on statistical metadata organised by Eurostat in 1993 draw attention and a large number of participation. Though the dictionary definition of metadata is concise and accurate, it lacks the specifics and context needed to communicate meaning. So, a few years ago, members of the Open Forum on Metadata developed the following definition:

*“Statistical metadata describes or documents statistical data, i.e. microdata, macro data, or other metadata. Statistical metadata facilitate sharing, querying, and understanding of statistical data over the lifetime of the data.”*

The main objective of this paper is to indicate the meaning associated with the term metadata in the context of official statistics and the agencies that produce them. The topic has been classified into four questions i.e. What is statistical metadata? Why statistical metadata are needed? Who uses? How metadata are used?

### ***What is statistical metadata?***

A simple, basic definition is that metadata are data that describe other data. Thus, statistical metadata are data that describe statistical data. Statistical metadata may also describe processes that collect, process, or produce statistical data; such metadata are also called process data. Finally, the term ”statistical metadata” may also be used for descriptions of resources and tools that are instrumental in statistics production, i.e., statistical classifications and standards, registers, and statistical methods, procedures and software.

### ***Why statistical metadata are needed?***

Statistical metadata has several purposes. The first and most fundamental purpose is to help a human user of statistical data to interpret, understand, and analyse statistical data, even if they have not themselves participated in the production processes behind the statistical data. Statistical metadata should help a human user to transform statistical data into information. Information can only be communicated and shared between people by means of data representations. Information can be represented by data in many different ways: spoken and written languages, pictures, electronic representations, gestures and body language, etc. Thus, the primary role of statistical metadata is one of facilitation and sharing. Metadata is necessary for the interpretation of statistics.

### ***Who uses statistical metadata?***

There are two types of users of statistical metadata. One is the producer includes the designers of the data collection processes, the data collectors, the data processors, and the

data evaluators. The second type is the user group includes civil servants, politicians, policy analysts, social scientists, financial analysts, students and teachers at all levels, journalists, and interested citizens. During designing the metadata, have to take into account user's different requirements, different user profiles, and their resources and abilities.

### ***How metadata are used?***

Metadata is a tool for interpretation, using data to make inferences and facilitating the acquisition of new knowledge Metadata is a tool for comprehension and understanding. It provides meaning for numbers. At the most basic level, metadata makes it possible to interpret a number. That is, the number 5.1 has no meaning without metadata. Metadata helps the information seeker find data and determine if it is appropriate for the problem at hand. Metadata is also a tool for modifying work processes to improve data quality or reduce costs.

### ***Metadata and quality***

Metadata plays a key role in linking survey measurement and process quality improvement. There is a bidirectional relationship between metadata and quality. On the one hand, metadata describe the quality of statistics. On the other hand, metadata are themselves a quality components, which improve the availability and accessibility of statistical data. Then it comes in mind regarding quality statistics.

***First is the relevance*** of statistical information reflects the degree to which it meets the real needs of users. It is concerned with whether the available information sheds light on the issues of most importance to users. The problem of relevance is a difficult one in official statistics, since such statistics are produced for many users and usages over a long time period, so-called multi-purpose statistics. In order to enable many users, now and in the future, to judge the relevance of certain statistics in many different usage situations, a lot of metadata have to be provided about the meaning of the originally collected data (possibly from different sources) and about how these data were treated in the original production process.

***The accuracy*** of statistical information is the degree to which the information correctly describes the phenomena it was designed to measure. It should be reasonably correct (accurate, precise), that is, they should be free from serious errors. As a minimum, the sources of errors should be known and the error sizes should be estimated. Enhancing metadata on accuracy and precision should be an integral part of the statistics producers work program.

**The timeliness** of statistical information refers to the delay between the reference point (or the end of the reference period) to which the information pertains, and the date on which the information becomes available. The timeliness of information will influence its relevance. By managing metadata as part of the production process, the timeliness and quality of dissemination products can be improved.

**The accessibility** of statistical information refers to the ease with which it can be obtained by users. This includes the ease with which the existence of information can be ascertained, as well as the suitability of the form or medium through which the information can be accessed. The cost of the information may also be an aspect of accessibility for some users. Good metadata facilitates resource discovery, especially via the internet.

**Lastly the coherence** of statistical information reflects the degree to which it can be successfully brought together with other statistical information within a broad analytic framework and over time. The use of standard concepts, classifications and target populations promotes coherence, as does the use of common methodology across surveys.

## **Conclusion**

The role of metadata is a ubiquitous one, the first and foremost purpose of metadata is to help a human user of statistical data. For a statistics' producer to determine if it is providing usable, useful, and sufficient metadata, it must engage in user studies. The quality have been identified within the concept of relevance, accuracy, timeliness, accessibility and coherence. Metadata are at the heart of the management of the interpretability indicator.

## **References:**

*"The Swedish Statistical Metadata System", Eurostat and Statistics Sweden.*  
*Metadata as a Tool for Enhancing Data Quality in Statistical Agency, European Conference on Quality and Methodology in Official Statistics*  
*Statistics Canada, Standards Division, Qualitative Analysis*  
*United Nations Statistics Division, Statistics of International Trade in Services Section*



***"Errors using inadequate data are much less than those using no data at all."***

***Charles Babbage***

# *Quality Assurance and Quality Control in Official Statistics: A Conceptual Framework*

*Kiran Prava Panigrahi,*

## *Abstract*

*Quality is an important element at all levels of processing of official statistics. Reputation of a statistical agency depends upon the quality of its data. Data quality is ensured when it can be demonstrated that the datasets are relevant, complete, consistent, reliable, current, accurate and objective. In addition, processing data to derive standardized baselines should be conservative, secure, transparent and traceable. This paper discusses the quality assurance (QA) and quality control (QC) procedures to ensure the quality of data in official Statistics.*

**Key words:** *Data, quality, assurance, management, control.*

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## *Introduction*

Official statistics include the data and estimates that are published by National Statistical Offices (NSOs) and other public organizations on the major areas of society and the economy. They provide both quantitative and qualitative information on economic and social development, national productivity, living conditions, health, education, transportation, the environment, and many other areas of national interest. Credibility and confidence in the statistics depends to a large extent on the quality of official statistics. If the quality is suspect, the NSO's reputation as an independent, objective source of trustworthy information could be undermined. Therefore, managing the quality of statistical products is a key objective for all NSOs.

Quality is an important element at all levels of processing of official statistics. Reputation of a statistical agency depends upon the quality of its data. Data quality is a multi-dimensional concept and is commonly described as the degree to which data are fit for use. Data quality is ensured when it can be demonstrated that the datasets are relevant, complete, consistent, reliable, current, accurate and objective. In addition, processing data to derive standardized baselines should be conservative, secure, transparent and traceable. It is good

practice to employ quality assurance (QA) and quality control (QC) procedures to ensure the quality of a product or service of an official statistical agency.

### ***Key Elements of Data Quality***

**Relevance:** The relevance of statistical data and estimates mirrors the extent to which they meet the requirements of users. It is concerned with whether the available information sheds light on the issues that are important to users. As various users of official statistics have different needs, assessment of relevance is subjective.

**Completeness:** Complete information conveys true and fair representative standardized baselines. It requires well-established procedures to avoid, identify and handle missing data (For example, samples that have been left out or incomplete data entry).

**Consistency:** The consistency of statistical information reflects the degree to which it is compatible and comparable with other statistical information within a broad analytic framework as well as over time. The use of standard concepts, classifications and target populations promotes consistency. Use of common methodology across surveys also helps consistency.

**Credibility:** Credible information is the one which is obtained from authoritative data sources. Collected data / information should always reference their sources.

**Currentness:** Current statistical information conveys most recent baseline status. Currentness is affected by the delay between the reference point to which the information relates, and the date on which the information is published. The timeliness of information influences its relevance.

**Accuracy:** It is usually reflected in terms of error in statistical estimates and is categorized into bias (systematic error) and variance (random error). It may also be denoted in terms of the major sources of error that potentially cause inaccuracy (e.g., coverage, sampling, non-response, response).

**Objectivity:** Assumptions or differing interpretations in compiling the required data need to be avoided to ensure objectivity.

**Security:** Data security has been becoming increasingly important in present times and must be mentioned as a key element of data quality. There should be restricted access to datasets.

There should be procedure to identify, process, present and manage confidential data. The data should be made available to the public in an anonymous aggregate form.

**Transparency:** Processes and methodology used in compiling statistical information should be sufficiently disclosed to allow monitoring of the quality of the compiled datasets and the generated outcomes.

### ***Quality Management in Official Statistics***

It is essential for a statistical agency to be committed to quality, and to ensure that organisational factors, such as professional independence and adequate resource allocation, establish a firm institutional foundation for a culture of quality to exist within the organisation. At operational level, quality assurance and quality control are important mechanisms to produce quality statistical information. The terms 'quality control' and 'quality assurance' are often incorrectly used interchangeably. There are profound differences between the two processes, even though they are complementary.

### ***Quality Assurance***

Quality assurance refers to all planned activities necessary in providing confidence that a product or service will satisfy its purpose and the users' needs. It is basically a way of avoiding errors and shortcomings in products or services. It consists of administrative and procedural activities implemented in a quality system so that requirements and goals for a product or service will be fulfilled. Quality assurance draws from two principles: 'Fit for purpose' and 'Right first time'. 'Fit for purpose' means that the product or service should be suitable for the intended use. 'Right first time' refers to removal of mistakes. In the context of survey conducting activities, quality assurance can take place at any of the major stages of survey development: planning, design, implementation, processing, evaluation and dissemination. Examples of planned activities include: improving a survey frame, changing the sample design, modifying the data collection process, improving follow-up routines, changing the processing procedures, revising the design of the questionnaire etc. Quality assurance attempts to move quality upstream by anticipating problems before they occur and aims at ensuring quality via the use of prevention and control techniques.

### ***Quality Control***

Quality control is a procedure or set of procedures intended to ensure that a manufactured product or performed service adheres to a defined set of quality criteria or meets the requirements of the user. Therefore, quality control is a regulatory procedure

through which we measure quality, compare quality with pre-set standards, and act on the differences. One hand quality assurance assures that the right production process or service protocol is performed in the right manner, on the other quality control ensures that the product or service will match the requisite standard. While the former stresses on preventing defects, the later focuses on identifying defects. Some examples of this include controlling the quality of the coding operation, the quality of the survey interviewing, and the quality of the data capture. The objective of quality control is to achieve a given quality level with minimum cost. Some assurance and control functions are often performed within the survey unit itself, especially in connection with the tasks of data coding, capture and editing. Several of these procedures are automated, some partially automated and others employ purely manual methods.

### Quality Assurance vrs Quality Control:

	Quality Assurance	Quality Control
<b>Definition</b>	QA is a set of activities for ensuring quality in the processes by which products are developed.	QC is a set of activities for ensuring quality in products. The activities focus on identifying defects in the actual products produced.
<b>Focus on</b>	QA aims to prevent defects with a focus on the process used to make the product. It is a proactive quality process.	QC aims to identify (and correct) defects in the finished product. Quality control, therefore, is a reactive process.
<b>Goal</b>	The goal of QA is to improve development and test processes so that defects do not arise when the product is being developed.	The goal of QC is to identify defects after a product is developed and before it's released.
<b>How</b>	Establish a good quality management system and the assessment of its adequacy. Periodic conformance audits of the operations of the system.	Finding and eliminating sources of quality problems through tools and equipment so that customer's requirements are continually met.
<b>What</b>	Prevention of quality problems through planned and systematic activities including documentation.	The activities or techniques used to achieve and maintain the product quality, process and service.
<b>Responsibility</b>	Everyone on the team involved in developing the product is responsible for quality assurance.	Quality control is usually the responsibility of a specific team that tests the product for defects.
<b>Example</b>	Verification is an example of QA	Validation/Software Testing is an example of QC
<b>Statistical Techniques</b>	Statistical Tools and Techniques can be applied in both QA and QC. When they are applied to processes (process inputs and operational parameters), they are called Statistical Process Control (SPC); and it becomes the part of QA.	When statistical tools and techniques are applied to finished products (process outputs), they are called as Statistical Quality Control (SQC) and comes under QC.
<b>As a tool</b>	QA is a managerial tool	QC is a corrective tool
<b>Orientation</b>	QA is process oriented	QC is product oriented

## ***Conclusion***

Quality management, as a specific area of risk management, is fundamentally about striking a balance between the level of quality required and the resources available to meet a specified level of quality. The elements of quality in official statistics tend to overlap, often in a confounding manner. Just as there is no single measure of accuracy, there is no effective statistical model for bringing together all these characteristics of quality into a single indicator. However, a well formulated quality assurance and quality control guidelines go a long way in making the statistical information more relevant and useful for the users. Quality assurance and quality control are not activities that can be side lined as ‘optional extras’. Rather, sufficient resource needs to be made available, and time allowed, in planning the statistical production process to ensure that quality issues are appropriately addressed.

## ***References:***

*Learn about Quality Assurance and Quality Control, ASQ Audit Division and J.P. Russel, Editor, 2015*

*International Organisation for Standardisation (ISO) 1994, Quality Determination Performance Characteristics of Measurement Methods, (ISO, 9196)1994 Geneva, Switzerland*



***“Statistical thinking will one day be as necessary a qualification for efficient citizenship as the ability to read and write.”***

***Herbert George Wells***

# *Role of Demonetization in Quality Assurance to Global Economy*

*Smt. Sudipta Dash*

## *Abstract*

*This paper has described the quality assurance of demonetization in India through the descriptive analysis of positive and negative impacts on global Economy.*

**Key words:** *economy, import, export, liquidity*

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## *Introduction*

The Government of India tossed out a plan to ban high denomination currency includes 500 and 1000 notes on 8<sup>th</sup> November 2016. The motto of Government of India was to stop terrorism and flow of black money in the country. The terrorist and other related outfits had hoarded hundreds of crores of high denomination notes. They were operating their networks against India by that black money. So the flow of black money came to a point of grinding halt by that decision. This decision impacted in high factor on global Economy.

## *Demonetization Effects on Global Trade*

Though Demonetization brought a short term shocks to the economy across globe however it was well for many sectors. One of them is the EXIM trade (Export and Import Trade) of India. The skeptical economists have argued that such a shock therapy to reinvent unaccounted wealth has given a shot in the arm for India's exports. Similarly the imports suffer reduction too, bringing joy for India's balance



of trade. Let us look at the short term effects of the demonetization scheme on Indian exports and imports. We are discussing only the short term effects because the long term effects on the economy are very dynamic and depend on multiple factors which cannot be predicted at this nascent stage.

## ***Impact on Export***

In the short run, the overall exports may suffer due to lower liquidity in the market. Lower liquidity means lower purchasing capacity of the exporters. An exporter found it difficult to arrange the factors of production due to liquidity crunch, leading to lower productivity and hence lower volume of exports. All this is happened in the midst of a situation when Indian exports became competitive in the global market due to “Chinese slowdown” and lower crude oil prices. Exports from the primary sectors of the economy such as agriculture, animal husbandry among others found it difficult to market and service their production for exports in the global market despite “ample steps” taken by the Government.

Due to demonetization liquidity crunch forced to the traders to sell at below market price in the domestic markets focusing them into a mystery rural distress. The informal middlemen such as traders at the borders who procure the finished goods for export in the global market became difficult to procure such goods due to unavailability of liquid cash (an economy that works mostly on black money) and it became difficult for them to honour their previous commitments, which further “lowered” the trust on



Indian markets. Unavailability of liquid cash in the market brought the price of rupee into a “stable frame” due to lower demand of foreign currency in the global market. This became a “boon for Indian exports” in the long run, contain inflation in the short run and improve India’s balance of trade in value terms. Lower exports in the short run enabled the competitive economies like Bangladesh, Vietnam to penetrate deep into the global markets and replace Indian exports as a sustainable and committed mode of supply. This lowered down trust in Indian exports.

Micro and small industries that thrive on export business were hit because many of them are isolated from formal banking channels and the liquidity crunch is bound to hit them the most. Exporters who thrive on procuring finished goods from a least developed country (LDC) and exporting the same at a higher price after value addition to a developing or developed country found it difficult to sustain their business due to unavailability of cash in the system and thereby lowering down their ability of procurement.

## ***Impact on Import***

In case of imports also, they fell down because of usual cash crunch. The domestic economy started hoarding cash again (i.e. in savings mode) and the people are not willing to spend money freely which would reduce demand of domestic as well as international

products. Lowering down of imports saved India of its precious foreign exchange, hence accelerating India's foreign exchange currency basket. This brought a situation for "stability of rupee" and possible appreciation of the currency. In case there is an appreciation of the domestic currency, it made our exports costlier and seize off the tag of price competitiveness of our exports in the international markets, hence affecting the overall exports from India. Decrease in essential imports like plant and machinery seriously affected business expansion plans of Indian companies due to unavailability of technology required to start and expand a business. Note Plant and machinery is one of the major components of various factors of production.

Businesses in India that thrive on procurement of raw materials from outside and production of finished goods inside India suffered a major blow in the short run due to unavailability of cash. Hence, this cash crunch forced the importer business persons for a "temporary shutdown" and lower productivity in the near term. Again, those exporters who import finished goods from a least developed country (LDC) to be further exported to a developing or developed country found it difficult to import the goods due to unavailability of cash in the market therefore, hurting the entire chain of value addition business. The losing shine of the Indian market and declining imports by India pushed few major business conglomerations outside India because of business losses to explore other attractive markets.

### ***Conclusion***

Economists are discussing the use of Statistics and its long term effects due to the demonetization move. While some are in favour, some are against this scheme in context of the Indian economy and quality assurance on global economy. Commentators are making future predictions without taking all the factors into consideration. Acceleration requires the catapult to be slowed in the beginning to realize its maximum potential later when it is fired at the right time. This whole exercise has pulled money out of the economy from both formal and informal sectors. It depends how the Government plans to push this hard earned economic resources back into the economy and at what speed.

### ***Reference :***

- a. *Demonetization effects on International Trade*, Raj Malhotra, IAS, December, 28, 2016  
*Impact of the Demonetization on International Business ...* <https://www.quora.com>, Nov, 2016  
*Author A.Granan, Chairman, NAAC,- EC, Bangalore, India, 2016*



***“Statistics are no substitute for judgment.”***

***Henry Clay***

# *Quality Enhancement of Official Statistics by adopting Statistical Cognition and Fuzzy logic*

*Dr. Ramakrushna Swain*

*Smt. Sanghamitra Mohanty,*

## *Abstract*

*A strong database enumerating the levels and trends of a nation's material and social resources has always been a requisite for the formulation of Government policies. Sound statistics lead to informed decision-making and effective formulation and monitoring of public policies. As instruments, questionnaires are complex instruments that yield misleading results when not well-designed. While there are a variety of issues related to the quality of survey evidence, the validity of response processes—how respondents process thoughts, ideas, views, perceptions, and experiences when answering survey questionnaires is critical. This paper describes the use of statistical cognition and fuzzification method for improving the quality of categorical data in official statistics.*

**Keywords:** *Categorical data, cognition, fuzzy logic, linguistic labels*

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## *Introduction*

Quality and trust are fundamental to official statistics. High quality statistics is a central part of the infrastructure of a modern society and a basis for decisions both by private and Government agencies. In an accelerating information society, official statistics are faced with challenges in terms of responding to the increased demand for statistics, analysis and indicators, and at the same time taking necessary actions to secure quality in products and methodology. The economies and societies we are attempting to measure are changing at an unprecedented pace. We need to close the “relevance gap” between the information we produce and the priority needs of our users. In this context quality assurance is a system of activities whose purpose is to provide an assurance that the overall quality control is in fact being done effectively. Quality assurance is traditionally defined as a systematic process of checking to see whether a product or service being developed meets specified requirements. Today's it emphasises catching defects before they get into the final analysis.

## ***Analyzing qualitative data***

Data are the actual pieces of information that we collect through our study. Data Types are an important concept of statistics, which needs to be understood, to correctly apply statistical measurements to our data and therefore to correctly conclude certain assumptions about it. Most data fall into one of two groups: numerical or categorical. Other names for categorical data are qualitative data which are grouped into categories based on some qualitative trait. These are expressed not in terms of numbers, but rather by means of a natural language description such as a person's gender, marital status, hometown, or the types of movies they like. Qualitative analysis is less tangible. It concerns subjective characteristics and opinions – things that cannot be expressed as a number. This paper describes the use of cognitive interview/testing using statistical cognition and fuzzification method for improving the quality of categorical data.

Quality can be qualitative, quantitative, or both. It is an ongoing, iterative process to assess the data's fitness to serve their purpose. It covers the entire statistical production process and involves monitoring data quality over time and reporting on variations in that quality. Post-collection quality assurance methods, such as data validation, are an important part of the quality assurance process, but can be of limited value if the underlying data are of poor quality.

As with survey data, producers need to: investigate the administrative data to identify errors, uncertainty and potential bias in the data; make efforts to understand why these errors occur and to manage or, if possible, eliminate them; and communicate to users how these could affect the statistics and their use.

### ***Patterns of crisis behaviour: a qualitative inquiry***

Over the years, the Administrative Statistical System has been deteriorating. The deterioration has taken place at its very roots namely, at the very first stage of collection and recording of data. Though India has a long tradition of comprehensive official statistics, the current status with regard to their adequacy, timeliness and reliability is far from satisfactory.

While the scientific basis for the generation of data and the methodologies adopted may not be in question, in many cases, what has brought about a decline in the quality and reliability of the statistics generated by the system is the inability of the present system or procedure of collecting data to meet the quality standards. Questionnaires constitute the basis

of every survey-based statistical measurement. They are by far the most important measurement instruments statisticians use to grasp the phenomena to be measured. Errors due to an insufficient questionnaire can hardly be compensated at later stages of the data collection process. Therefore, having systematic questionnaire design and testing procedures in place is vital for data quality, particularly for a minimisation of the measurement error.

### ***Statistical Cognition***

Statistical Cognition or cognitive testing can be done primarily to collect narratives from respondents to analyse their understanding and interpretations of the questions asked. Hence substantial amount of statistical cognition has the potential to guide development of effective strategies for improving the statistical understanding of researchers and respondents for data collection and processing. It is known that the process of responding to a survey question is complex (despite it happening almost instantaneously) and involves a series of cognitive processes. An accurate response only arises if respondents understand the question, retrieve the necessary information from their memories, review this information and then map their response onto the responses provided for that question. This is the process that informs the reasons for the cognitive testing of survey questions. Thus cognitive testing tries to determine what stages of cognitive processing yield the major problems, (if any) in comprehension, retrieval, judgement or response. The analysis is primarily thematic in nature and aims to identify common errors in interpretation which will highlight weaknesses in the formulation of the survey questions. The benefits of cognitive testing are that inherent problems and biases in questions are identified before collecting data from a large sample. Analysts can reach more conclusive decisions as to what the survey data tells them if they have the knowledge of how people understand and interpret the survey questions. In other words, cognitive testing provides a better understanding of possible respondent measurement error.

### ***Cognitive storage***

It makes the system of official statistics more efficient by storing the most relevant data with high redundancy and the less relevant data with less redundancy. Generally the metadata of the data contains the information about its relevance, popularity, storage tier and redundancy. After initial classification, the selector sorts the dataset according to relevance class to determine the level of protection and the tier for each dataset in the multitier storage units.

## ***Fuzzy Statistical Analysis: Methods and Applications***

Now we shall illustrate some ideas, stemming from the investigations concerning the fuzzy approach to statistical methodology about qualitative or categorical data in socio-economic sector.

Very often, the concepts in the human brain for perceiving, recognising, and categorising natural phenomena are vague and imprecise. The boundaries of these concepts are not clearly defined. Therefore, the judging and reasoning that emerge from them also become vague. For data collection a questionnaire normally comes with statements or questions, but in all cases the subject is responding to some specific purposes. There are many ways in which a question or statement can be worded, and several ways in which the response can be made. One of the most popularly used response is a combination of statements and gradation of the statement in the form of scales. Every item is usually stated in the form of a statement in which the respondents have to choose a response from a scale of 1 to 5. For instance, the statement ‘I am not very interested in joining the armed forces’ is followed by a 5 point rating scale of strongly agree (1), agree (2), neither agree nor disagree (3), disagree (4), and strongly disagree (5). Respondents will make their choice from this 5 point rating scale. So the statement in the questionnaire could be fuzzy (not clear) and vague. Furthermore, the degree of ‘strongly agree’ and ‘agree’ are bounded with nominal integers of 1 and 2. Is there any other value between these two numbers? Despite the fuzziness and ambiguity of questionnaires, researchers conclude with convincing and comprehensive findings. Hence, it is important to look into an alternative approach using highly reliable fuzzy questionnaires. This is where fuzzy theory can be applied successfully. Since the questionnaires are considered as fuzzy, then the answers to the questionnaire (from the respondents) can also be considered as fuzzy data.

A useful tool for the treatment of such “inexact knowledge” and approximate reasoning is represented by the fuzzy set theory. First introduced by Lotfi A. Zadeh and extensively applied in many areas of research, this theory has also recently gained considerable attention in poverty measurement. Fuzzy set theory recognises the properties like agree, disagree, slow, fast, adequate, competent etc. by giving variations for each category with its membership value. It provides an effective means for conflict resolution of multiple criteria and better assessment of options paving way to an unambiguous representation of qualitative data.

In a nutshell, fuzzy set theory substitutes the characteristic function of a crisp set that traditionally assigns a value of either 1 or 0 to each element in the universal set (discriminating between members and non-members of the crisp set), with a generalized characteristic function (called membership function) which varies between 0 and 1. Larger values denote higher degrees of membership. In formal terms, if  $X$  denotes a universal set, then the membership function  $\mu_A$  by which a fuzzy set  $A$  is usually defined, has the form

$$\mu_A: X \rightarrow [0, 1]$$

Where  $[0, 1]$  is the interval of real numbers from 0 to 1. Hence,  $\mu_A(x) = 0$  if the element  $x \in X$  does not belong to  $A$ ,  $\mu_A(x) = 1$  if  $x$  completely belongs to  $A$  and  $0 < \mu_A(x) < 1$  if  $x$  partially belongs to  $A$ .

Let us assume that the subset  $A$  defines the position of each individual according to the degree of achievement of one of the indicators considered for the assessment. When we consider qualitative variables measured on an ordinal scale or expressed with linguistic attributes (as in the case of health and physical condition or subjective opinions or perception on one's own conditions), intermediate values between 0 and 1 describe gradual positions within the arrangement. In this case, it will be necessary:

- i) To define an appropriate arrangement of values on the basis of the different degrees of the indicators;
- ii) To identify the two extreme conditions such that  $\mu_A(x) = 1$  (full membership) and  $\mu_A(x) = 0$  (non-membership);
- iii) To specify the membership functions for all the other intermediate positions.

New computing methods based on fuzzy logic can be used in the development of intelligent systems for decision making, optimization, and control. It's applicability in creating high quality official statistics can be realised as discussed below.

### ***Applications in Decision Making***

Now we discuss the decision making application of fuzzy logic in households surveys with two examples.

The structure of some of the variables used in the decision-making process can be represented using linguistic expressions, since they are difficult to express numerically. The linguistic variable is a function that has a linguistic expressions such as 'very good', 'good', 'medium', 'bad' and 'very bad'. Table 1 presents the linguistic variable that can represent the housing condition in which a families live.

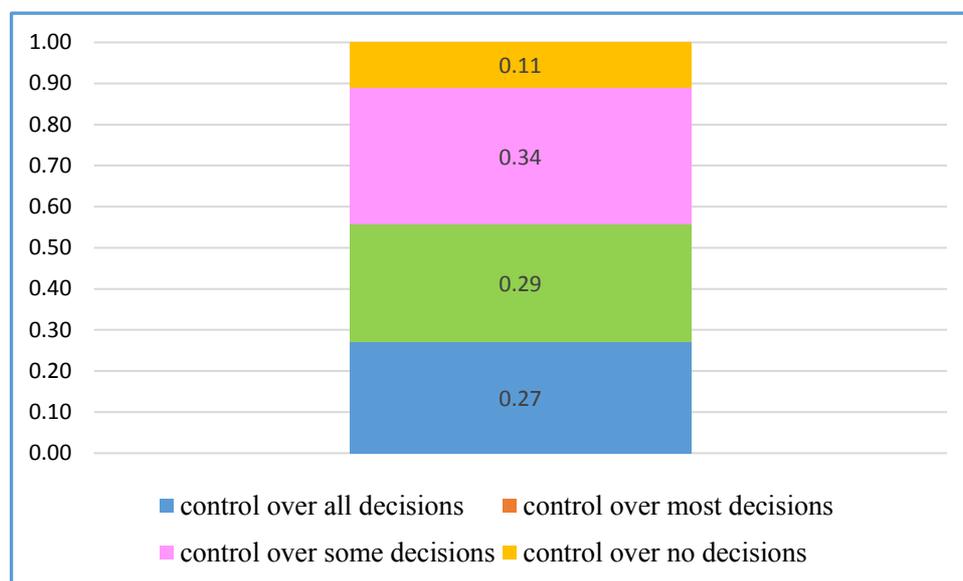
**Table 1: Linguistic expression and fuzzy representation of non-poorness (richness)**

Housing condition	Fuzzy membership value of Non-poorness (0: low, 1: high)
Very bad	(0,0, 0.2)
Bad	(0.2,0.3,0.4)
Medium	(0.4,0.5,0.6)
Good	(0.6,0.7,0.8)
Very good	(0.8,1,1)

The value calculated is the degree of poorness with an interval [0,1] and indicating that poverty decreases as the value approaches “1”. Here only a single indicator (living condition) of poverty measurement is addressed only as an example. But poverty being a multidimensional index, fuzzy logic can efficiently be used as a measurement method over multiple indicators because of the ambiguity of poverty concept.

For another example, let us consider the situation where the observed statistical data are imprecise, vaguely defined or they refer to linguistic labels attached to vague concepts like estimating “perceived control over personal decisions of women at household level”. They were asked how much control they felt they had over personal decisions affecting their daily life which had an implication of wider barriers (including freedom of movement) to accessing health care. A reasonable way of dealing with such data consists in “fuzzifying” the responses by defining appropriate “fuzzy-valued variables” capable to express the imprecision/vagueness associated with each observation.

**Figure 1 : Perceived control over personal decision affecting daily life in women 15-49 yrs in Odisha**



Source-nrhmorissa.gov.in

The membership study show that if women’s role in decision making within household will be higher, it will increase their autonomy at household level. Autonomy of women is a great link of the family especially in rural areas. Women’s decision with education, age, access to resources and making power at household level plays an important role in their empowerment.

### **Conclusion**

Quality assurance of administrative data is more than simply checking that the figures matched. It is an ongoing, iterative process to assess the data’s fitness to serve their purpose. It covers the entire statistical production process and involves monitoring data quality over time and reporting on variations in that quality adopting sophisticated techniques like cognitive interviews and fuzzy logic. Suitable statistical analysis methods have to be adapted for the analysis of data fuzzy data which are very often encountered in social phenomena to strength the quality of consequent official statistics as binary principle is not fully adequate to analyse them. So installation of fuzzy logic in social science research could open auspicious avenues for social scientists mainly to demonstrate and uncover the realm of different development issues.

## **References:**

*Improving Survey Methods with Cognitive Interviews in Small- and Medium-Scale Evaluations* Katherine Ryan<sup>1</sup>, Nora Gannon-Slater<sup>1</sup>, and Michael J. Culbertson.

*Application of Yager's Fuzzy Logic in Sociological Research*

*Fuzzy Sets in the Social Sciences An Overview of R*, *Journal Teknologi*, 41(E) Dis. 2004: 43–54 © University Teknologi Malaysia

[springer.com/article/10.1007/s40300-013-0029-5](http://springer.com/article/10.1007/s40300-013-0029-5)

<https://www.stat.nus.edu.sg/~stazjt/teaching/ST3241/lecture/Notes%20PDF/Notes%201>

NFHS-3 (2005/6) *Women's empowerment and demographic health outcomes. Chapter 14: 449-451* **Citation:** Odisha Technical and Management Support Team. (2015). *Concurrent Monitoring II:*

*Advances in Economics and Business* 5(9): 510-517, 2017 <http://www.hrpub.org> DOI: 10.13189/aeb.2017.050904 *Measuring Poverty Level of Households by Using Fuzzy Logic* Hakan Pabuçcu.

*Fuzzy set theory approach to socio-economic status of migrated students studying in chennai, using amartya sen's functioning multidimensional paradigm* volume: 02, october 2013, Pages: 167-176 *International Journal of Computing Algorithm*



***“By the time your perfect information has been gathered, the world has moved on.”***

***Phil Dourado,***

# ***Need and Importance of Quality Assurance in Official Statistics: In case of processing/managing***

***Smt. Anita Dash***

## ***Abstract***

*The article describes the need and importance of quality assurance in different fields of implementation in respect of official statistics. It elaborately describes the phases of quality assurance in official Statistics before, after and during process of data through discussion and diagrams.*

***Keywords:*** model, processing, IT, sustainability.

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## ***Introduction***

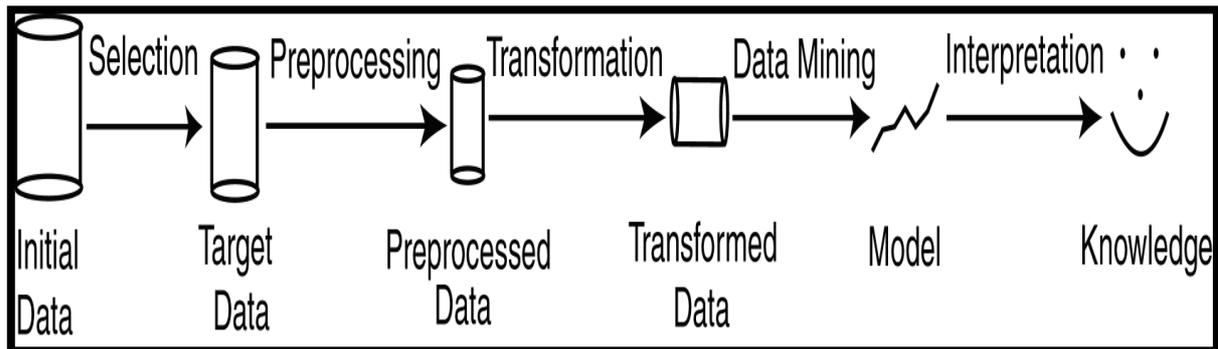
The success of E-governance, E-Commerce and E-business largely depend on its official statistics and it is the prime objective of all stack-holders to assure its quality and timely up gradation. The success of a project depends on many factors and they are taking places in different phases starting from the Inception of the Problem - Requirement Specification -Selecting the Appropriate Model - Feasibility Study - Collection of Appropriate Data - Designing – Testing – Implementation – Debugging - Documentation and Finally Maintenance. Quality and sustainability are the two major parameters to decide the success. Quality is a relative term that can be defined by taking many factors into consideration such as time, place, and availability of resources, person's requirement and situations. Whereas sustainability refers the robustness of the process. Whatever precise and advance methods we are using; it is quite a difficult task to maintain the absolute quality. Variation is bound to be there. These variations are basically of two reasons: Assignable causes and Chance causes. Assignable causes are detectable by nature whereas chance causes are beyond the control of humane hand. Hence when we are talking about 'Quality Assurance' it refers to assure the assignment causes only. Quality assurance in official statistics becomes more important because the information is provided by the Government

to facilitate the users nationally and internationally by uploading them in public domain. Authenticity and security of the official statistics is the prime concern of all the stack holders without compromising its quality. Increasing demand of mankind results rapid growth in the size of the data. Data being the most vital aspect of an organisation must be kept updated and safe without compromising its quality. A person/ Institution having updated data in the concerned field is treated as rich in that field. In official statistics, original data and subsequently created transactional data are so vast that cannot be dealt with the traditional methods. To meet the requirements in changing scenario, database can not only be treated as repository of data but at the same time online transaction processing (OLTP) and online analytical transaction processing (OLAP) facility must be there to generate the rules with support and confidence that will be fruitful in future. This brings the concept of Data Warehouse (DW), Data Mining (DM), (ARM) Association of rule mining, Knowledge Discovery in Database (KDD) and Big data. Now days these modern techniques are playing a vital role in every sphere of our day to day activities such as fraud detection, crime detection and their preventions, policy making by collecting public opinion, early detection of disease, artificial intelligence, image processing, pattern recognitions and in machine learning techniques. This can be better explained by citing the recent example of stone pelting that has taken place in various parts of Jammu and Kashmir. To identify the criminals and their god fathers, phones which were active in and around the place of happenings was traced and when analysed, provided a surprise result. It was observed that some of the phones were active in all most all the places of stone pelting. Subsequently, persons holding those phones were interrogated and finally culprits were detected.

### ***Computer and Networking***

The introduction of Computer and Networking has revolutionised the field of computing and data processing especially in Official Statistics. Success of the project depends on its qualitative data, technically trend staffs, preparing the appropriate questionnaire, tools used for collecting, methods of processing and its presentation, online updating facilities in regular intervals, review and timely maintenance. To meet the upcoming challenges and to assure the quality in official statistics, we have to take the help of three major subjects namely: Mathematics, Statistics and Computer Science. Here Mathematics is used to develop the appropriate logic to capture the relevant data and there

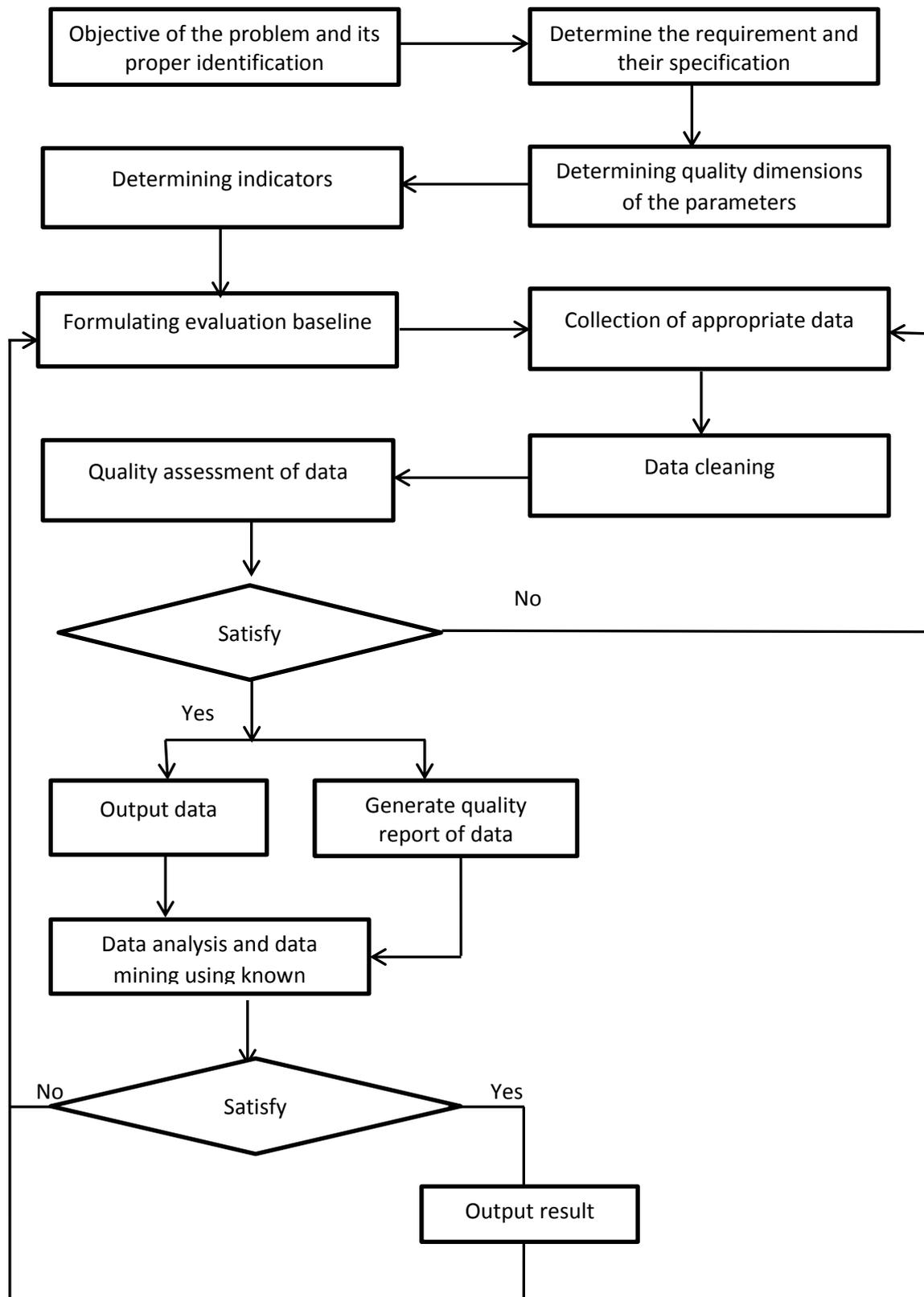
must be provision of its validation, Statistics is used to analyse the collected data, minimise the biased data (outliers, outfitted, over fitted, missing vales etc.) and also to draw conclusions in favour of the organisation by using different methods, whereas Computer Science is used to process, retrieve and storage (for future applications) of a vast amount of data with less time, less labour, less money, accuracy, reliability and to ensure their worldwide accessibility. The above mentioned processes are taking place in chronological order as depicted in the following diagram:



### ***Phases of quality assurance***

The term Quality and its assurance have more concern when it deals with official statistics. A data/information is treating well/good, if it possesses the characteristics such as timeliness, availability, accessibility, interpretability, completeness, relevant, accurate and coherent. All these characteristics are interrelated and overlapping in nature. There is no model to bring them together and to optimise the prescribed level of quality. Achieving an acceptable level of quality is the result of addressing, managing and balancing these characteristics of quality over time with careful attention to their objective. Quality of official statistics can be assured in three different phases pre-processing, processing and post-processing.

*Flow chart*



## ***Phases of quality assurance***

**Pre-processing:** It starts with the inception of problem with its proper identification, selecting the target groups, collection of appropriate data, requirement analysis and their specification, planning and designing, selecting the best mode and their feasibility study. At this stage, testing can be done by using prototypes (working model) and simulations to ensure the success of implementation.

To maintain the quality at this level following measures are suggested:

- Different rounds of field survey.
- Choosing and finalising the target group with different sampling techniques.
- Make a comparative study.
- Preparing the questionnaire as per the requirement.
- Consultation with the experts and use heuristics.
- Prepare and analyse the metadata.
- Select the best model and design by using the test data that must be robust in nature.
- Check the feasibility based on cost benefit analysis.
- Provide the proper training to the data collectors (primary) with field exposure.
- Provide the required tools and their proper use to the data collectors.
- Sensitize the data collectors by emphasising the gravity of the data.
- There must be provision for fault tolerant mechanism and stand by facilities.
- Proper documentation of the process before its implementation.

**Processing :** This phase is crucial as because the quality can be assured when the processes are operational in its real time. Planning and its execution have their own dimensions and very difficult to achieve them in totality without compromising with quality. In many cases it appears to be impossible to deal with all the data (population) and have to depend on sample. Sampling and their types depends on many factors such as population size, distribution of data, types of data (numerical or categorical), features and behaviours of data, temporal (time relevant) or spatial (location based) etc. Whatever sample is selected, it must represent the entire lot without compromising its objective and quality. At this stage intelligence of the data collectors and coordination among subsequent players are very important. Potential sources of error that can occur at this stage are:

- ❖ Sampling error : selecting the wrong sampling technique
- ❖ Non-Sampling error :
  - Measurement error or questionnaire
  - Behavioural effect

Any of the suggested technique can be used only if the size of the data is countable, having limited features and are not changing frequently. But in many cases these parameter are practically not possible to achieve. In such a situation soft computing such as Artificial Neural Network, Fuzzy logic, Particle Swarm Optimization, Genetic algorithm etc. has to be used. Quality can be assured at this stage by adopting the following points:

- There must be provision for cross validation of the data collected.
- Data collector must be well aware about the sampling technique adopted.
- Error detection mechanism must be there in real time processing by using programmes that can prevent wrong entry of data and having pull-down menus.
- Data collector must be well versed and smart enough to establish the genuineness of the data.
- Tools provided to the data collector must be upgraded and have proper exposure.
- Online/Offline support to the data collector.
- Statistical Process Control (SPC) must be followed.

**Post- process:** Once the data is collected from prime sources, it is our first duty to ensure its safety from the unwanted/unauthorised users. This can be achieved by using many techniques (take the multiple backups and keep them in different places in the form of softcopy and if possible hardcopy, store them in encrypted form, use the password that is known only to the authorised users, use digital signature and other forms of biometrics.) At this phase following measures can be taken to assure the official statistics before its final uploading:

- Thorough checking by self and experts.

- Use the validation techniques to remove the meaningless data.
- Draw the control chart and scatter diagram to remove outliers.
- Calculate the central tendency (mean, median and mode) and dispersion (range, standard deviation, variance, mean deviation about mean, median and mode) and other statistical parameters to analyse and justify the authenticity.
- Use Hypothesis (NULL or ALTERNATIVE) either to accept or to reject the claim on the basis of data collected.
- Try to ensure the Type-I error (rejecting the correct data) and minimise the Type-II error (accepting the wrong data).

### ***Conclusion***

Quality control (all the activities and operational techniques that are under taken within the quality assurance framework) and quality assurance (enforce all policies and activities to be implemented systematically within a quality system) together constitutes the quality indicator. Modernisation in terms of globalisation and liberalisation is the call of the day. The use of IOT (Internet Of Things) also has a greater impact on official statistics. The success of an organisation (Government or Private) solely depends on its official statistics, hence its proper documentation and timely up gradation must be ensured before uploading them in public domain. After analysing all the facts I want to conclude my views by citing the line

**IT + IT = IT**

That, India Today with proper use of Information Technology leads to the India Tomorrow.

### ***Reference***

*A Data Mining – A. K. Pujari*



***“One is born an individual; one becomes a statistic.”***

***Marty Rubin***

# *Quality Assurance in Official Statistics: An overview*

*Ramesh Chandra Panda*

## *Abstract*

*This descriptive paper overviews the concept and definition of quality assurance and its utility in the field of Statistics to get qualitative estimation. Qualitative data always lead to proper planning process. Also it highlights on the modern quality management considering the present situation.*

**Keywords:** *Quality, efficiency, management and improvement*

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## *Purpose*

"The quality of official statistics" is a concept built on the compatibility of users' needs, the timeliness of dissemination, and the interpretability of the statistical data as well as accuracy. We establish this guideline as a standard guidance to promote the practices of "Quality Assurance," which aim at improving the usefulness and reliability of official statistics through compilation and dissemination as well as through indication, evaluation and improvement of statistics quality in administrative organs ("administrative organs" means those prescribed in Article 2 (1) of the Statistics Act - No. 53 of 2007; hereafter referred to as "The line ministries") in order to satisfying user's needs to official statistics.

## *Background*

In the first place, the "Quality Assurance" movement has been promoted in industries and related academic societies since the 1970's. It includes activities which:

- (1) Establish the process of grasping needs and providing goods and services corresponding to needs efficiently,
- (2) Evaluate and grasp the compatibility with needs continuously, and make necessary improvements to goods and services,
- (3) Provide a sense of reliability and confidence for goods and services through above activities. The same point of view of statistics quality based on this "Quality Assurance" is shown in the first "Master Plan Concerning the Development of

Official Statistics” (Cabinet Decision on March 13, 2009; hereafter "the first Master Plan"). Our standard – what we will look for when we decide whether statistics merit National Statistics – is clear and simple.

### ***What is quality?***

Quality has been defined as fitness for use, conformance to requirements, and the pursuit of excellence. Even though the concept of quality has existed from early times, the study and definition of quality have been given prominence only in the last century. Quality control is a regulatory procedure through which we measure quality, compare quality with pre-set standards and act on the differences.

Some examples of this include controlling the quality of the coding operation, the quality of the survey interviewing, and the quality of the data capture. The quality of a statistical product can be defined as the “fitness for purpose” of that product. More specifically, it is the fitness for purpose.

Reports covering the relevance, accuracy, timeliness, accessibility and coherence of our statistics

***Relevance:*** Statistics are relevant when they meet users' needs. Relevance requires the identification of users and their expectations;

***Accuracy:*** is defined as the closeness between the estimated value and the (unknown) true value;

***Timeliness and punctuality:*** Statistics are only useful when the figures are up-to-date and published on time at pre-established dates; ·

***Accessibility and clarity:*** Data have most value when they are easily accessible by users, are available in the form users desire, and are adequately documented ("metadata" according to the type of user). Assistance in using and interpreting figures should be part of the providers' tasks;

***Comparability:*** Data are most useful when they enable reliable comparisons across space like countries or regions and over time.

**Coherence:** When originating from a single source, statistics are coherent in as much as elementary concepts can be combined reliably in more complex ways. When originating from different sources, e.g. from different surveys with differing frequencies, statistics are coherent insofar as they are based on common definitions, classifications and methodological standards.

**Completeness:** Areas for which statistics are available should reflect the needs and priorities expressed by the users. Completeness is an extension to relevance, for completeness does not only mean that statistics should serve user needs but also they should serve them as completely as possible, taking restricted resources into account.

**Quality assurance (QA) consists** of that “part of *quality management* focused on providing confidence that *quality requirements* will be fulfilled.” The confidence provided by quality assurance is twofold—internally to management and externally to customers, Government agencies, regulators, certifiers and third parties. Quality assurance refers to all planned activities necessary in providing confidence that a product or service will satisfy its purpose and the users' needs. In the context of survey conducting activities, this can take place at any of the major stages of survey development: planning, design, implementation, processing, evaluation and dissemination.

### ***Improvement of Quality assurance***

- To bring more powerful information equipments, user friendly statistical packages and online statistical surveys.
- To enable you better coordinate each steps from questionnaire designing, data collection, data processing/analyzing to data dissemination as well as better control of the whole process;
- To vastly reduce the human errors and operational risks, enhance the Government statistical capability ;
- To improve statistical data quality and quicker turn around; to broaden information channel for the Government statistics; to bring interface within statistical end-user and statistical bureau.
- To empower possibilities for establishment of international statistical standard to facilitate the cooperation of statistical theory and practical experience internationally.

- Government should apply the same statistical methodology and tools during the census survey and data analyzing.
- Standardize the Government statistical frameworks, concepts, classifications and systems.
- Develop and implement an evaluation system that conform to international standard and strengthen quality management awareness.
- Establish special quality management organization for statistical data, check the quality periodically.
- Establish multilayer quality evaluation system.
- Divisional statistics should focus on the segregated statistical information.
- Firstly, statistical data derived from business activities could be collected by Government departments by compiling data through vertical business lines.
- Secondly, industrial data or detailed segregated data required by various research entities could also supplied by Government department and the statistical bureau could conduct survey as supplement.
- Thirdly, any overlapping information with regarding to non-macro level should still be accomplished by Government department and the statistical bureau could focus on key macro level statistics.
- Establish statistical data exchange and sharing mechanism, promote communication and collaboration platform. To crystallize the statistical data exchange and sharing, it should establish an electronic platform through partnership between statistical bureau and department statistical division.

***Planned activities include***

- Improvement of a survey frame
- changing the sample design
- modification of the data collection process
- improvement of follow-up routines
- change of processing procedures
- revision of the design of the questionnaire

Quality assurance attempts to move quality upstream by anticipating problems before they occur and aims at ensuring quality via the use of prevention and control techniques. It is any systematic process of determining whether a product or service meets specified requirements.

### ***Quality management today***

There have been many interpretations of what quality is, beyond the dictionary definition of “general goodness.” Other terms describing quality include *reduction of variation*, *value-added*, and *conformance to specifications*. *ISO 9000:2015: Quality management systems—Fundamentals and vocabulary* defines quality as the “degree to which a set of inherent *characteristics of an object full fills requirements*.” Simply stated, quality is meeting customer requirements.

### ***Difference between quality assurance and quality control***

Quality assurance and quality control are two aspects of quality management. While some quality assurance and quality control activities are interrelated, the two are defined differently. **Quality control** is that “*part of quality management focused on fulfilling quality requirements*.” While **quality assurance** relates to how a process is performed or how a product is made. Quality control is more the inspection aspect of quality management. **Inspection** is the process of measuring, examining, and testing to gauge one or more characteristics of a service and the comparison of these with specified requirements to determine conformity. A statistical service may include products that are documents such as a report, contract. It may be necessary to control product quality in a service organization to ensure that the service meets customer requirements.

Outlined below are some of the key differences between quality assurance and quality control:

Quality Assurance	Quality Control
Anticipates problems before they occur	responds to observed problems
Uses all available information to generate improvements	uses ongoing measurements to make decisions on the processes or products
is not tied to a specific quality standard	requires a pre-specified quality standard for comparability
is applicable mostly at the planning stage	is applicable mostly at the processing stage
is all-encompassing in its activities	is a set procedure that is a subset of quality assurance

The following are the Steps to attain Quality Assurance

### ***Increasing Office Efficiency***

Increasing efficiency in the office is more than just making people work faster. It means employing the latest technology, establishing incentive programs, and finding ways to empower employees. Learn the creative management strategies that lead to more work and happier employees.

### ***Staffing the Office***

The staff determine if the office will function efficiently. Learn how to find the best people for the job, as well as the planning and communications you need to ensure that the work is being done efficiently

### ***IT and Security***

The information needs of companies have greatly expanded over the last two decades. These resources will help you manage and select the right computer and networking technologies to insure your company's survival in the digital age.

### ***Standard Operating Procedures (SOP)***

Standardization is defined as an activity that gives rise to solutions for repetitive application to problems in various disciplines including science and it is aimed at achieving the optimum degree of order in a given context. Therefore, standards are the ultimate result of a standardization activity and within the context of quality systems consist of quality documents or documents related to the quality systems. Standard format, guideline, execution to be maintained to attain QA.

### ***Merits of Quality Systems***

The importance of properly established and managed quality assurance systems with their integral well-written SOPs and other quality documents for the achievement of Official Statistics objectives cannot be ignored.

- Customer satisfaction and therefore, customer loyalty.

- Alignment of processes with achievement of better results.
- Understanding and motivation of employees towards quality policy, as well as participation in continual quality improvement initiatives.

### ***Quality and methodology information***

“Statistical methods should be consistent with scientific principles and internationally recognised best practices. Quality should be monitored and assured taking into account internationally agreed practices”.

### ***Regular Quality Reviews (RQRs)***

An RQR consists of a facilitated meeting between the manager of a statistical output, a senior methodologist and a representative from the Apex Quality Centre. National Statistics and other official statistics are fit for purpose and that we seek to improve the quality of these outputs: Quality and reliability which are highlighted as key factors for the reputation of official statistics.

### ***Reference***

*Quality Assurance – Wikipedia*

*[https:// search software quality.techtarget.com](https://searchsoftwarequality.techtarget.com)*

*[https:// www ons.gov.uk](https://www.ons.gov.uk)*

*[https : // content lospress.com](https://content.lospress.com)*

*[https:// unstats.un.org.](https://unstats.un.org)*

*[https:// www.statcan.gc.ca](https://www.statcan.gc.ca)*

*<https://www.nisra.gov.uk>*

*quality and methodology information-office for national statistics*



***“Numbers never lie, after all: they simply tell different stories depending on the math of the tellers.”***

***Luis Alberto Urrea,***

# *Better Coordination, Better Quality*

*Sri Rama Chandra Mishra,*

## *Abstract*

*This paper elaborately describes the quality managements in official Statistics through the quality assurance framework. It highlights on the essential relationship of assessment quality with multi-level coordination and communication along with mutual cooperation. It also highlights on the efforts made by the state income division of DE&S Odisha through a case-study, to assess the contribution of various Local Bodies in Odisha to the Gross state Domestic product. Finally it concludes to get better quality through better co-ordination.*

**Keyword:** *quality management, co-ordination*

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Quality and trust are fundamental to official statistics. Increased complexity of the society and processes such as globalisation, modernisation have increased the need for more evidence-based policies, and thus the demand for official statistics has increased manifold. To deliver high quality statistics, in a situation where resources tend to be scarce, is a major challenge to statistical producers, analysts. Thus, during the last decade, both international organisations and National Statistical organisations worldwide have focused on the importance of quality work.

A systematic approach to quality has been adopted in many organisations. This has been based on some basic and common principles of quality management, even if the use of formal quality systems varies. Both on the national and international level quality work in statistics has gradually developed from assessing and reporting on output quality to a process-oriented approach following the whole statistical value chain. To this end various methods and tools have been employed, ranging from quality reports and self-assessments to formalised statistical audits. Several statistical organisations have embarked on standardisation programmes. Risk management has been given increased focus. Important initiatives have been taken up on the various national and state level by setting-up of the Working Group on Quality in Statistics, the formation of an Expert Group on Quality and the adoption of good statistical Practice for the production and dissemination of statistics and its reports.

As official statistics are officially produced by the various Organisations, there is little scope for modifications and change by the users. The users can use the statistics for his own purpose without modifying the data figured in the official reports. The data/statistics produced by the various organisations are used by the statisticians for further analysis. The users face problems while relying on the data whose quality assurance is in doubt.

Similarly somewhere the data/statistics fails to qualify in the tests like relevance, validity, completeness, timeliness, accuracy, normalisation, standardisation etc. The statistics produced may not be complete and suffers from regularity. The validity and consistency of the statistics is questionable. The lack of the coordination between user and producer of the statistics, difference in definition and classification of various statistical products often creates problems for application of statistics. Statistics without standardisation definitely lowers the quality and efficiency, increases the risks which contributes to dissonance both in statistics production and output which lowers the common understanding process among the user and producer.

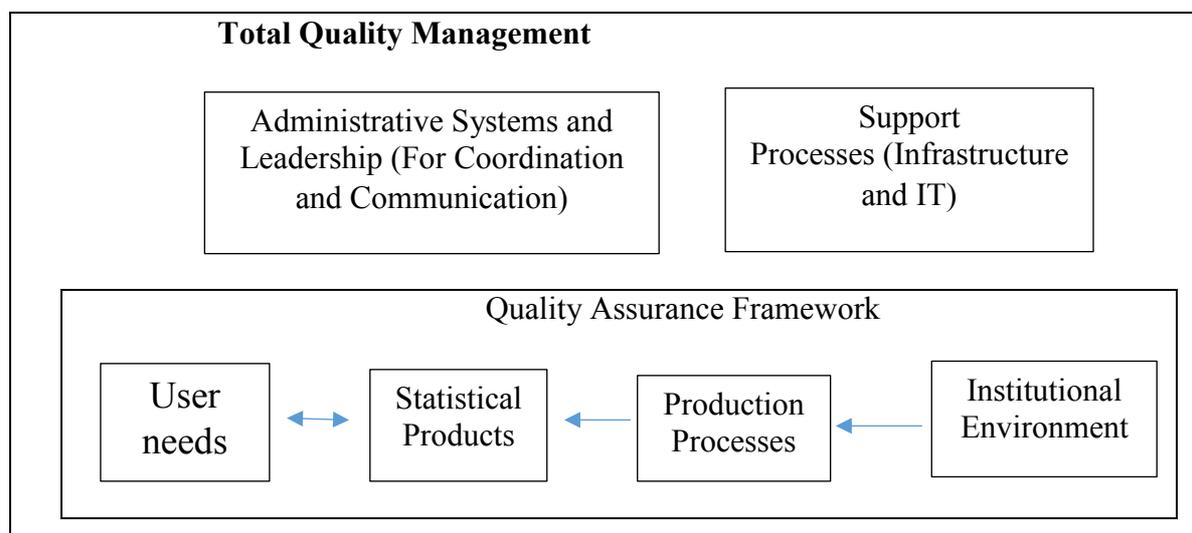
### ***Quality Framework for official Statistics***

In order to minimise such hindrances there is a need for development of quality framework by users and the stake holder organisations. The quality framework for gathering of statistics and its application needs some strategic changes in place of common and traditional practices. Incorporation of new practices like Total Quality Management (TQM) that was developed in the last century is the mother of all quality management systems. It advocates for development of a system for continuous enhancement of quality at all levels of passage of statistics. It is like continual addition of new features and development of existing features in production of goods and services in industrial production. This comprises Six Sigma, Foundation for Quality Management (FQM), Common Assessment Framework (CAF), ISO etc.

These systems are based on a common set of principles (such as user and process orientation), but they differ with respect to their main focus and degree of formalisation. In FQM and ISO emphasis is for example on rating and certification, whereas Six Sigma focuses on quality control. Some Statistical Institutes apply several or parts of these systems for different purposes. Others have established their own systems adapted to their values and activities, but based on elements from the general quality systems.

A quality management system basically consists of:

- Definition of quality – in general and in the field of statistics
- Quality framework, containing principles and procedures for quality work
- Tools and more detailed guidelines
- Organisation and Administrative processes for coordination and cooperation



### ***Implementation***

Quality assurance is traditionally defined as a systematic process of checking to see whether a product or service being developed meets specified requirements. Today's quality assurance emphasises catching defects before they get into the final product. Tools for quality assurance comprise a variety of simple tools such as mapping processes to more comprehensive tools including labelling and certification. Standardisation programs are important both for assuring quality and efficiency.

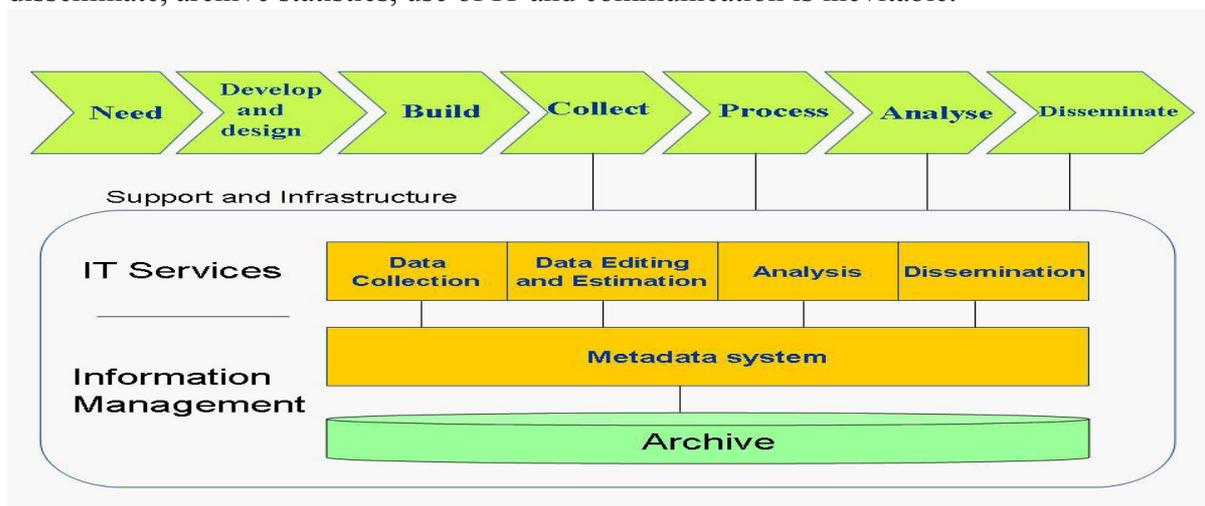
The basis for quality assurance is combined with tools and procedures, guidelines and organisational aspects. This means coordinated assessments or audits across organisations and producers of statistics, including benchmarking. Although some indicators of product and process quality could be compared across organisations as well, this will primarily be the task of each organisation producing statistics. It will therefore seek to develop and define minimum standards for assuring product and process quality on a various level. A meaningful assessment of product and process quality has to be done on domain or subject matter / statistics level. Multi-level coordination and communication along with mutual cooperation is key to the quality assurance.

## ***Quality and Standardisation***

Coordination across statistical organisations is a main feature of official statistics. International standardisation has traditionally been very much about common definitions and classification of statistical products, but standardisation of processes has also been in focus recent years, in particular within the international Statistical System. Such standardisation facilitates benchmarking between various statistics producing organisations. But also within each organisation, standardisation is one of the most powerful ways to facilitate quality assurance. Traditionally, many institutions have developed their own system suitable to their interest, with many parallel production lines and solutions resulting in vulnerability for changes in systems and staff. It also makes systematic quality control difficult. But Standardisation will improve quality and efficiency, reduce risks and contribute to better coherence both in statistics production and output.

## ***Support & Infrastructure***

A coherent and modular statistics production system requires equal flexibility and capability of the supporting IT system. Statistical institutes, processing vast amounts of data, must implement principles with particular attention to the specific needs of the business. IT-solutions must be built upon with standard methods. A standard infrastructure must be set up in accordance with norms based upon common agreed principles. To collect, process, disseminate, archive statistics, use of IT and communication is inevitable.



## ***Local Body Accounts Analysis – A Case study***

Efforts were made in state income division of DE&S, Odisha to assess the contribution of various Local Bodies in Odisha to the Gross state Domestic product. The efforts suffer from initial setback in collecting statistics from various local bodies as there is

no uniform pattern of production of statistics by various stake holder departments. Latter by coordination and communication at various levels, statistics from various institutions reached to the users. The Short of standardisation, incomplete, irregularity and inaccuracy were the features of the data received. Common understanding between producer and user is lacked in both data and Meta- data. Understanding the Data, Meta data and its analysis, became a herculean task on the part of users.

To overcome such difficulties the division gave emphasis on coordination and communication at various level involving high officials at helm of affaires. A process is developed in order to maintain a free and undeterred movement of data from producers to the users. The statistics received were subjected to further classification to some new heads and subjected to quality checks like its completeness, accuracies, validity, standards and also its periodicity etc. A training programme was imparted to the personnel to understand the statistics, Meta data for its classification, codification, and computerisation and also weed out the outliers in the data.

The division is now considering to develop a new process for unrestricted data passage on focusing on coordination and communication, mutual interaction between producers of statistics and intermediate users. Imparting training to the personnel involved in production of official statistics for this purpose and a standard format for presentation of statistics is under pipe line. Adoption of TQM and six sigma may be not possible for the present time but effort is on for development of a framework of continual development of the process. Support from administration and introduction of supporting IT –infrastructure would give a boost the process.

### ***Suggestions***

High quality statistics is a central part of the infrastructure of a modern society, and a basis for decision making both by private agencies and Governments. In an accelerating information based society, official statistics are faced with challenges in terms of responding to the increased demand for statistics, analyses, indicators, and at the same time taking necessary actions to secure quality in products and processes. Quality work on a local level can benefit to the higher level, through sharing of experiences and knowledge of best practices, but also by support from common frameworks, recommendations and measures taken by nodal statistical organisation. Training of personnel gathering statistics at various level to maintain quality in data is central to the system. There is no doubt that the implementation of the best Practices followed by self-assessments and reviews, will be an

important milestone in the work on quality in statistical institutions. Over time such efforts will strengthen the trust and support for improvement in statistical system of the state with cooperation among various stake holders there by helping in sustainable development of the state. So can be said better coordination can generate better statistics.

## ***Reference***

*United Nation's draft report for 41<sup>st</sup> session of the statistical Commission.*

*U.N. work on national quality Assurance framework.*

*European statistical system and its code of Practice.*

*Standardisation for improvement in statistics in Norway—A paper presented at modernisation statistics production-2009, Stockholm.*

*Quality Assurance in European Statistical System by Oystein Olsen and Han Viggo Saebo, Statistics Norway.*

*Report on Analysis of Local Body Accounts by DE&S (GP Accounts).*



***“There are two kinds of statistics, the kind you look up and the kind you make up.”***

***Rex Stout,***

# ***Domestic Investment as a Key Determinant of Economic Growth in India***

***Dr. Kalpana Sahoo***

## ***Abstract***

By using Cobb-Douglas model, this study *empirically investigates the impact of domestic investment and foreign capital on economic growth in India from 1980-81 to 2016-17. It employs Ordinary Least Squares (OLS) test to examine the impact of both domestic and foreign capital on economic growth of India. The OLS test reveals that domestic investment and foreign aid have shown significant positive impact on economic growth whereas population growth has shown significant negative impact on it. The impact of Foreign Direct Investment (FDI) became insignificant on Per capita Gross Domestic Product (GDP) of India. The study concludes that domestic investment is the major driving factor of economic growth in India during the study period followed by foreign aid. It suggests that the national developmental policy in India should focus on the efficient utilization of both domestic capital and foreign capital along with the continuation of population control measures.*

***Keywords:*** Domestic investment, ODA, FDI, growth, India

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## ***Introduction***

Investment considers as an important financial tool to accelerate the growth process of an economy as there is a stable and positive relationship persist between financial development and economic growth (Wadud, 2010). With the development of growth economics particularly in the Post World War, the contribution of capital via investment towards economic growth has been increasingly emphasized. Harrod- Domar growthmodel<sup>2</sup> has considered capital as the crucial factor in economic development. There is no singly country in the world which is self-sufficient. They have to depend upon in each other due to unequal distribution of global natural resources. Adding to this some of the researchers i.e.

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<sup>2</sup>Harrod-Domar model of economic growth was developed by Roy F. Harrod in 1939 and Evsey Domar in 1946 as a pioneer to the exogenous growth model. It explains that growth depends on the quantity of labour and capital; more investment leads to higher capital accumulation, which further generates economic growth.

Frankel (1997), Mallick (2002) have found that domestic investment has been considered as a major determinant of higher economic growth. There is no second opinion that India is one of the fastest growing developing economies in the current world. It is also true that its financial needs are so high that it can only be partially fulfilled by its domestic capital. It has to depend upon foreign capital to finance its growth process as aid accelerates economic growth of a developing economy via supplementing its scarce domestic resources (Morrisey, 2001).

The importance of foreign capital on economic growth is not a new line of investigation. The two-gap model supports the role of foreign capital in filling the two major gaps i.e. saving-investment gap and export-import gap present in many developing countries (Chenery and Burno, 1962). Supporting the importance of foreign capital some other researchers like Papanek (1972), Dowling and Hiemenz (1982), Gupta and Islam (1983), Burnside and Dollar (1997), Hansen and Tarp (2000), Dalgaard et al. (2004), Gomanee, et al. (2005) and Karras (2006), states that foreign capital in the form of aid has significant positive impact on economic growth. The opponents of foreign capital inflows i.e. Knack (2000), Easterly et al. (2003), Mallik (2008) and Ekanayake and Chatrna (2010) have found that the impact of foreign aid on economic growth is negative which caused due to fungibility of foreign aid, bad economic management, corruption, underutilization of aid, poor economic policies, lack of coordination and cooperation among aid agencies.

In the era of globalization and economic integration, the importance of foreign capital in accelerating the growth process of a developing country like India is essential and unique. Currently, India becomes consider as the major investment hub in the world due its massive skilled manpower, abundant natural resources and large market. As the third largest economy in the world, India is the preferred destination of foreign investors. In July 1991, Government of India lunched the new economic policy which included a series of liberalization policies relating to the foreign investment in the major sectors of the economy. The current wave of financial globalization and its aftermath has been marked by the huge transfer in international capital flows to the industrial and developing economies. This allocation of external capital is based on the assumption that huge amount of capital inflows leads to high economic growth in the developing countries (Edwin, 1950). At the same time, some developing countries have experienced periodic collapse in growth rates and faced financial crisis after participating in the globalization process. Some economists argued that foreign capital has significant negative impact on economic growth of these developing countries. Griffin (1970) has argued that foreign capital reduce domestic saving and has negative impact on economic growth.

The role of foreign capital in the growth process has been a burning topic of debate in several developing countries including India. The two major incidences such as recent global financial crisis of mid-2007 and the ongoing depreciation of Indian currency puts a question mark on the effectiveness of foreign capital in India. Some researcher's blames free inflows of foreign capital are one of the major causes of currency depreciation. So it is better for Indian economy to generate more amount of domestic capital rather to depend upon foreign capital inflows to finance its growth process. But at the same time some other group of persons argues that foreign capital is necessary to accelerate the growth process of Indian economy as it helps in filling the two major gaps i.e. saving-investment gap and export-import gap (Chenery and Burno, 1962).

Both theoretical and empirical research on the role of foreign capital in the growth process has generally produced contradictory results (Waheed, 2004). Katerina et al.(2004) examined the relationship of FDI and economic growth and failed to find strong evidence of positive correlation between FDI inflows and economic growth. Knack (2000) has explained that the higher aid inflows reduce the quality of governance indexes i.e. bureaucracy, corruption and the rule of law which ultimately hinders the growth process of the economy. The present study empirically examines the impact of both domestic capital and foreign capital on economic growth of India during 1980-81 to 2010-11. The remaining part of this paper is organized into four sections including introduction. Section 2 deals with theoretical framework and methodology. Section 3 presents empirical results and discussion. Section 4 presents the concluding observations.

### ***Theoretical Framework and Methodology of the Study***

Most of the growth theories in economics such as Harrod-Domar model, Solow model, Neo-classical growth theory and Endogenous growth models consider investment as a major determinant of economic growth. This study is based on the classical theory of economic growth propounded by Cobb-Douglas for its analysis. This study uses some selected macroeconomic variables like Per-Capita Gross Domestic Product (PcGDP as an indicator of economic growth), Official Development Assistance (ODA, as an indicator of foreign aid), Foreign Direct Investment (FDI as the indicator of foreign private inflows), population growth rate (as an indicator of labour productivity) and Gross Capital Formation (GCF, as an indicator of domestic investment) for its empirical analysis. Here GCF, ODA and FDI are expressed as a percentage of GDP in order to minimize the variation in their original values. By introducing domestic investment instead of capital stock, it attempts to

investigate the impact of domestic investment on economic growth in India and compare it with the impact of another two important determinants of economic growth i.e. foreign capital (both ODA and FDI) and population growth rate. Cobb-Douglas model shows the functional relationship between the output and the combination of factors inputs i.e. labour, capital. Classical theory of economic growth can be identified through the following Cobb-Douglas production function:

$$Y = A I^\alpha L^\beta$$

Where, Y is the total production, L is total labour force/input, I is the total investment  
A is the total factor productivity

$\alpha$  and  $\beta$  are the output elasticities of investment and labour force respectively ( $0 \leq \alpha$  and  $\beta \geq 1$ )

This equation can be written in the following manner by adding another factor i.e. foreign aid (F) :

$$Y = A I^\alpha L^\beta F^\theta$$

By taking the differentiation in both sides, the equation can be written as:

$$\Delta Y/Y = \Delta A/A + \alpha \cdot \Delta I/I + \beta \cdot \Delta L/L + \theta \cdot \Delta F/F$$

In short, the rate of growth in Y (per-capita GDP) can be estimated by the rate of growth in A, I, L and F. Assuming  $\Delta A/A$  as the residual/error part of the basic equation, the regression equation can be written as:

$$\text{PcGDP growth} = \alpha + \beta_1 \text{GCF} + \beta_2 \text{Popu} + \beta_3 \text{ODA} + \beta_4 \text{FDI} + e \text{ ----- (1)}$$

Here,  $\beta_1$ ,  $\beta_2$ ,  $\beta_3$  and  $\beta_4$  are the share of investment, population, foreign aid and FDI in per-capita GDP respectively,  $\alpha$  is the slope coefficient,  $e$  = error term.

### ***Model Specification***

In order to examine the impact of both domestic and foreign capital on economic growth, Ordinary Least Squares (OLS) technique is used. Before OLS technique first we have employed unit root test to check the stationary properties of the variables. In the light of the above discussion, the following equation is framed as the basic model to examine the impact of both foreign capital and domestic investment on economic growth. Here PcGDP is considered as the dependent variable and other variables are considered as independent variables.

$$\text{PcGDP} = f \{ \text{GCF, POPU, ODA, FDI} \} \text{----- (2)}$$

We estimate the effects of independent variables on economic growth by using the ordinary least squares (OLS) techniques which can be written as:

$$(g_t) = \alpha + \beta_1 GCF_t + \beta_2 Popu_t + \beta_3 ODA_t + \beta_4 FDI_t + e \quad \text{----- (3)}$$

Here,

$g_t$  = Real per-capita GDP during the time period t

$GCF_t$  = Gross Capital Formation during the time period t

$Popu_t$  = Population growth during the time period t

$ODA_t$  = Foreign Official Development Assistance during the time period t

$FDI_t$  = Foreign private inflows during the time period t

e = Error term

### ***Analysis of Empirical Results***

This section deals with the analysis of the empirical results and its discussion.

#### ***Unit Root Test:***

This study has used annual time series data of 37 years which contains some trend. Stationarity of the variables are very much desired as non-stationary series will produce spurious regression estimates and the resulting outcome will be of no practical use. Unit root test is a pre-requisite of testing long run relationship between two or more time series data (Granger, 1981). Augmented Dickey-Fuller (ADF) test is used to test the stationarity of the variables (table-1). The test result suggests that all the variables are stationary in ADF test (1<sup>st</sup> Differences).

***Table-1: ADF Unit Root Test for India***

Variables	ADF Level		ADF 1 <sup>st</sup> Differences	
	Without Trend	With Trend	Without Trend	With Trend
lnPcGDP	3.58**	-0.73	-4.27**	-5.8*
GCF	-0.93	-2.05	-6.63*	-6.53*
Popu	0.02	-1.55	-2.8**	-6.53*
ODA	-4.46*	-5.01*	-5.61*	-3.83*
FDI	-1.41	-2.99***	-6.86*	-7.61*

Notes: - \* and \*\* indicate significance at 1%, 5% and 10% level respectively.

Source: E-views 5.0 Software,

## Regression Results

Next, we examined equation-1 with applying the Ordinary Least Square (OLS) method. Here we calculate the simple regression to find out the impact of both foreign capital and domestic investment on economic growth of India where real Per-capita GDP is considered as the indicator of economic growth. The result which is drawn from the simple OLS technique can't be considered as good one. Though the values of both  $R^2$  and adjusted  $R^2$  is nearer to 1 which show a good fit but at the same time the Durbin-Watson (DW) statistic is very low i.e. 1.13. But it is very far from its ideal value i.e. 2 which indicate the presence of auto-correlations, which violates OLS normal assumptions. To solve the problem of auto-correlation of error term, we have allowed an AR (1) term of residuals. The result of the OLS technique with AR (1) is presented in the following Table-2.

**Table-2: OLS test results**  
**Impact of both Foreign Capital and Domestic Capital on Economic Growth of India**

Dependent Variable: PcGDP Sample Period: 1980-81 to 2016-17			
Variable	Coefficient	t-Statistic	Prob.
GCF	0.08	5.09*	0.0004
Popu	-0.56	-26.79*	0.0000
ODA	0.047	3.78*	0.007
FDI	0.0018	0.436	0.66

R-squared-0.78, Adjusted R-squared-0.76, Akaike Info Criterion (AIC): -6.12, Schwarz Info Criterion (SIC):- 5.85, DW Statistics: 1.81

Notes: -\* indicate significance at 1% level.  
Source: E-views 5.0 Software

From the above table 2 it is clear that the result which is drawn from the simple OLS technique is considered for analysis as it satisfies all the criteria of a good model. The values of Durbin Watson-t-statistics and both  $R^2$  and adjusted  $R^2$  are nearer to their ideal values which shows a good fit (Gujarati, 2004) of the model.  $R^2$  and adjusted  $R^2$  values are nearer to 1 which shows that the economic growth of India is mostly explained by the independent variables included in the model. Both Akaike Info Criterion (AIC) and Schwarz Info Criterion (SIC) are used for the selections of better model which have values -6.12 and -5.85 respectively. Therefore, we consider the regression results of Table 2 for the analysis of equation 1, as the estimated regression results satisfy all the criteria for a good model.

$$(g_t) = \alpha + \beta_1 \text{GCF}_t + \beta_2 \text{Popu}_t + \beta_3 \text{ODA}_t + \beta_4 \text{FDI}_t + e \text{ ----- (3)}$$

After putting the values of both coefficients and t-statistics in the equation-2, we will get,

$$(g_t) = 3.81 + 0.81 \text{GCF}_t - 0.56 \text{Popu}_t + 0.004 \text{ODA}_t + 0.0001 \text{FDI}_t + e \text{ ----- (4)}$$

t-statistics (14.2\*) (5.09\*) (-6.29\*) (3.01\*) (0.436)

From the above regression results it is found that, the estimated coefficients of GCF, Popu and ODA have shown significant impact on economic growth of India during the study period. Among the three variables, the estimated coefficient of domestic capital (GCF) and foreign official inflows (ODA) have shown statistically significant positive impact on real per-capita economic growth of India during the study period. Among these two variables, domestic capital has shown higher significant positive impact on economic growth of India than ODA that is quite obvious as domestic investment plays a major role in growth of the host economy (Alabdeli, 2005 and Tawiri, 2010). ODA has also shown positive but very less impact on economic growth of India which may cause as its share to GDP has fallen i.e. 1.04 percent drastically over the years (WDI, 2018). Population growth rate has shown significant negative impact on economic growth of India. The estimated coefficient of FDI has shown insignificant positive impact on economic growth of India during the study period. The coefficient of determination ( $R^2 = 0.78$ ) is quite high and reveals the goodness of fit of the model.

### ***Conclusions and Policy Implications***

This paper empirically investigates the impact of both foreign capital and domestic investment on economic growth of India over the period 1980-81 to 2016-17. The empirical findings reveal that domestic investment is the major determinants of economic growth whereas population growth hinders the process. It also states that productive utilization of both foreign aid and FDI at present have a possibility to accelerate the growth process of India in future. The study concludes that domestic investment is the major driving factor of higher economic growth in India. It suggests that productive utilization of both domestic investment and foreign capital along with human resource development (i.e. higher education, health care facilities) should be the main agenda of the Indian developmental policy. The study is constrained due to the unavailability of time series data of certain variables like HDI, sectorial distribution of foreign capital. The present study can hopefully provoke further empirical research in find out the appropriate policy strategy by which foreign capital can be used as an engine of economic growth in India.

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## **References**

*Alabdeli, A. (2005). Expectation of the Impact of Exports on Economic Growth in Developing Countries: An Econometric and Analytical study. Journal for Islamic Economy, 27, 215-259.*

*Burnside, C. and Dollar, D. (1997). Aid, Policies and Growth. American Economic Review, 90(4), 847-868.*

*Chenery and Bruno (1962). Development Alternatives in an Open Economy: The Case of Israel. Economic Journal, 72(285), 79-103.*

*Dalgaard, C. J., Hansen, H. and Tarp F., (2004). On the Empirics of Foreign Aid and Growth. Economic Journal, 114, 191–216.*

*Easterly, William, Levine, Ross. and Roodman, David, 2003, New Data, New Doubts: A Comment on Burnside and Dollar's "Aid, Policies and Growth", NBER, Working Paper No 9846.*

*Edwin, P. R. (1950). Foreign Capital in Economic Development: A Case Study of Japan. The Milbank Memorial Fund Quarterly, 28(2), 173-190.*

*Ekanayake, E.K. and Chatrna, D., 2010, The Effect of Foreign Aid on Economic Growth in Developing Countries, Journal of International Business and Cultural Studies.*

*Frankel, J., 1997, Determinants of Long Term Growth. Canadian Business Economics, Available online at: <http://www.hks.harvard.edu/fs/jfrankel/Apecgrow.PDF>*

*Gomanee, K., Girma, S. and Morrissey, O., (2005). Aid and Growth in Sub-Saharan Africa: Accounting for Transmission Mechanisms. Journal of International Development, 17 (8), 1055–1075.*

*Griffin, K. (1970). Foreign Capital, Domestic Savings and Economic Development. Bulletin of the Oxford university institute of Economics and Statistics, 32(2), 99-112.*

*Granger, C.W.J., (1981). Some Properties of Time Series Data and Their Uses in Econometric Model Specification. Journal of Econometrics, 16.*

*Gupta, K. L. and Islam, M. A., (1983). Foreign Capital, Savings and Growth: An International Cross-Section Study. Reidel Publishing Company: Dordrecht.*

*Gujarati Damodar N. (2004). Basic Econometrics. (4<sup>th</sup> Edition), the McGraw Hill Companies.*

Hansen, H. and Tarp, F., (2000). *Aid Effectiveness Disputed*. *Journal of International Development*, 12, 375–398.

Karras, G., (2006). *Foreign Aid and Long-run Economic Growth: Empirical Evidence for a Panel of Developing Countries*. *Journal of International Development*, 18 (7), 15–28.

Katerina, L., John, P., and Vamvakidis, A. (2004). *Foreign Direct Investment and Economic Growth in Transition Economies*. *South Eastern Europe Journal of Economics*, 1, 97–110.

Knack, Stephen., (2000). *Aid Dependence and the Quality of Governance: A Cross-Country Empirical Analysis*. *World Bank Policy Research Paper*.

Mallick, S., 2002, *Determinants of Long-Term Growth in India: A Keynesian Approach*. *Progress in Development Studies* 2, 4, 306–324.  
Available online at: <http://webspaace.qmul.ac.uk/skmallick/PDS02.pdf>

Mallik, G., 2008, *Foreign Aid and Economic Growth: A Co-integration Analysis of the Six Poorest African Countries*, *Economic Analysis and Policy*, 38, 2.

Morrissey, O., 2001, *Does Aid Increase Growth?*, *Progress in Development Studies*, 1, 1.

Papanek, G. F., (1972). *The Effect of Aid and Other Resource Transfers on Savings and Growth in Less Developed Countries*. *Economic Journal*, 82 (327), 935–950.

Sakyi, Daniel., (2011). *Trade Openness, Foreign Aid and Economic Growth in Post-Liberalisation Ghana: An Application of ARDL Bound Test*. *Journal of Economics and International Finance*, 3 (3), 146-156.

Waheed, A. (2004). *Foreign Capital Inflows and Economic Growth of Developing Countries: A Critical Survey of Selected Empirical Studies*. *Journal of Economic Cooperation*, 25(1), 1-36.

Tawiri, N., 2010, *Domestic Investment as a Drive of Economic Growth in Libya*, *International Conference on Applied Economics- ICOAE*.

Wadud, M. A., 2009, *Financial Development and Economic Growth: A Cointegration and Error-correction Modeling Approach for South Asian Countries*, *Economics Bulletin*, 29, 3, 1670-1677.

*World Development Indicators (2018) published by World Bank.*



**"Statistics are the heart of democracy."**  
**Simeon Strunsky**

# *Official Statistics in India: Before and After Independence*

*Smt. Parbati Barla,  
Sri Bishnu Prasad Rath,*

## *Abstract*

*This paper narrates the history and evolution of Official Statistics in India during pre and post-independence era i.e 321BC to the present century. This page also describes part the present Statistical System and its function of India.*

**Key words:** *Statistical System, Official Statistics*

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## *Official Statistics in India*

### *a) Pre- Independence Era:-*

Early origins of statistical data collection, compilation and need for cross-checks are well documented in Kautilya's Arthashastra (attributed to 321-296 BC).

During the Moghul period (Circa 1590 of Emperor Akbar's rule), we find the details of official statistics in the masterpiece Ain-i-Akbari written by Abul Fazal.

The unstable rule of later Moghuls during the 18th century led to the establishment of the East India Company (1757–1947) which recommended a statistical survey of the Presidency of Fort William.

In 1807, the survey of Eastern India was conducted by the Governor-in-Council, Francis Buchanan, the report of which had a good collection of official statistics of that time.

The foundation of the statistical system in India was laid down by the British administration. The Provincial Governments were required to publish the relevant statistics in their annual administration reports. They, in turn, depended upon the district offices. These statistics covered a wide range of subjects. The forms for this information were later made uniform, and the first Statistical Abstract of British India (1840-1865) was based on such information provided by the Provinces.

The first significant development in the pre-independence era was the constitution of a Statistical Committee (1862) for the preparation of forms to collect statistical information on different subject areas. This led to the publication entitled Statistical Abstract of British India in 1868.

Agriculture Departments were opened in 1881 in various provinces inter alia for collection of Agricultural Statistics.

A Statistical Branch was established in 1862 in the Finance Department of the Government of India. In 1895, the Statistical Branch was converted into full-fledged Statistical Bureau embracing subsequently, within its function the task of dissemination of commercial intelligence in 1905.

In April 1914, a separate Directorate of Statistics came into being. Subsequently, the Directorate of Statistics and the Commercial Intelligence Department were merged into a single organisation, which was renamed as the Directorate of Commercial Intelligence and Statistics in January 1925.

The first complete Population Census was conducted in 1881 on uniform basis throughout the country.

The Indian Economic Enquiry Committee (1925) recommended the establishment of a Central Statistical Bureau, along with similar Provincial Statistical Bureaux whose “aim was to provide a common purpose and a central thinking office on the subject of Statistics”.

The Committee appointed by the Government of India in 1934 under Messrs. Bowley and Robertson, for facilitating a further study of economic problems in India, was required, by one of its terms of reference, to make recommendation about the organisation of a Central Statistical Department.

### ***Official Statistics during the Post-Independence Days***

Immediately after independence, an urgent need was felt for a statistical structure towards a socio-economic development. Important phases of development are given below:

Professor P.C. Mahalanobis, who is regarded as a pioneer in both theoretical and professional statistics, was appointed as the first statistical adviser to the Cabinet, Government of India in January 1949. He was the architect of the statistical system of independent India. Professor P. V. Sukhatme, as Statistical Adviser to the Ministry of Agriculture, was responsible for the development of Agricultural Statistics.

The central statistical unit was created under the charge of the Statistical advisor in 1949 which in 1951 formally became the Central Statistical Organisation (CSO) under the guidance of Professor P.C Mahalanobis. The main responsibility assigned to the CSO was to bring about coordination of statistical activities among various statistical agencies in the Central Government and of Statistical Bureaus of State Governments, which was set up for similar coordination of activities of statistical agencies at the State level.

May 1949, a permanent office for the Census and Vital Statistics was established under a Registrar General and ex-officio Census Commissioner.

A National Income Committee was appointed in 1949 to work out a system for reliable estimation of national income.

National Sample Survey (NSS) came into being in 1950 to collect information through sample surveys on a variety of socio-economic aspects.

In 1951 the Central Statistical Organisation was formally established. The Central Statistical Organisation is now responsible for the coordination of statistical activities in the country, and for evolving and maintaining statistical standards.

In 1954, the National Income Unit was transferred from the Ministry of Finance to the CSO and a new Unit for Planning Statistics was set up.

In 1957, the subject of Industrial Statistics was transferred from the Ministry of Commerce and Industry to the CSO.

In April 1961, the Department of Statistics was set up in the Cabinet Secretariat and the CSO became a part of it.

In 1972, a Computer Centre in the then Department of Statistics was set up.

In 1973, the Department of Statistics became a part of the Ministry of Planning.

In February 1999, the Department of Statistics and the Department of Programme Implementation were merged and named as the Department of Statistics and Programme Implementation under Ministry of Planning and Programme Implementation.

In October 1999, the Department of Statistics and Programme Implementation was declared as the Ministry of Statistics and Programme Implementation (MoS&PI).

### ***Present Statistical System of India***

The Indian Statistical System functions within the overall administrative set up of the country. India has a federal structure of Government. The division of responsibility for administration between the Union Government and the State Governments is on the basis of three-fold classification of all subjects, namely, the Union List, the State List, and the Concurrent List. The last category represents the areas where both the Union and State Governments can operate. The subject Statistics is in 5 responsibility, by subjects or groups of subjects, among the different Ministries/Departments of the Union Government and among the Departments of State Governments, on the basis of their administrative functions.

The Indian Statistical System is largely decentralised with elements of central supervision. All-India large-scale statistical operations, such as Population Census, Economic Census, Agricultural Census and Livestock Census, and nation-wide sample surveys, including the Annual Survey of Industries and the Socio-Economic Surveys, as well as compilation of macro-economic aggregates like national accounts, All-India Price Indices and industrial production, are mainly Central activities, with substantial involvement of State agencies in data collection. The State Governments and statistical organisations of the States also collect and generate data on a number of variables. The Central Government acts as the coordinating agency for presentation of statistics on an all-India basis even in fields where the States have the primary authority and responsibility for collection of statistics. The Ministry of Statistics and Programme Implementation is the nodal agency for all statistical activities at all-India level. The State Directorates of Economics and Statistics (DESS) carry out the responsibility of coordination of all statistical activities at the State level and keeping liaison with the MOSPI for the purpose of coordination at all-India level, and for maintaining norms and standards in the field of official statistics.

The Ministry of Statistics and Programme Implementation is the nodal agency for planning and facilitating the integrated development of the statistical system in the country, and to lay down norms and standards in the field of official statistics, evolving concepts, definitions, classification and methodologies of data collection, processing and release of results. The Ministry has two wings, one relating to Statistics and the other is Programme Implementation. The Statistics Wing called National Statistical Organisation (NSO) consists of the Central Statistics Office (CSO), the National Sample Survey Office (NSSO), the Computer Centre and Coordination and Publication Division. The Indian Statistical Institute (ISI), which is a premier statistical institute, receives budgetary support from the MOSPI.

**CSO:** The CSO, headed by a Director General, consists of five Divisions, namely, the National Accounts Division (NAD), the Economic Statistics Division (ESD), the Social Statistics Division (SSD), the Training Division and the Coordination and Publication Division (CAP). The CSO has an Industrial Statistics Wing, namely, the CSO-IS Wing, which is located at Kolkata.

The Central Statistical Office is responsible for coordination of statistical activities in the country, and for evolving and maintaining statistical standards. Its activities include National Income Accounting; conduct of Annual Survey of Industries, Economic Censuses and its follow up surveys, compilation of Index of Industrial Production, as well as Consumer Price Indices, Gender Statistics, imparting training on Official Statistics,

**NSSO:** The NSSO functions under the overall direction of a Steering Committee with requisite independence and autonomy in the matter of collection, processing and publication of NSS data.

**The National Sample Survey Office (NSSO)** carries out socio-economic surveys, undertakes field work for the Annual Survey of Industries and follow-up surveys of Economic Census, sample checks on area enumeration and crop estimation surveys and prepares the urban frames useful in drawing of urban samples, besides collection of price data from rural and urban sectors. The major activities of the NSSO pertain to Survey Design, Field Operations, Processing of data collected and releasing of the results based on surveys.

**Computer Centre:** The Computer Centre handles the data processing jobs of the MOSPI, provides training to statistical personnel on software, maintain the MOSPI's website and the National Data Warehouse of Official Statistics.

**Coordination and Publication Division (CAP):** This Division is responsible for coordination for the National Statistical Organisation with its two attached offices viz. the Central Statistics Office (CSO) and National Sample Survey Office (NSSO) as also with Central Ministries/Departments of Government of India. It is also responsible for coordination with State Governments/ State statistical agencies.

**National Statistical Commission(NSC):** Through the Government of India Resolution of 1st June 2005, Government has set up a Commission, namely, the National Statistical Commission (NSC) consisting of a part-time Chairperson, and four part-time Members, one each from the fields of economic statistics, social and environment statistics, censuses and surveys, and national accounts and state statistical systems. The Secretary, Planning Commission is also a Member in ex-officio capacity. The Chief Statistician of India serves as the Secretary to the NSC. The mandate of the NSC is to serve as a nodal and empowered body for all core statistical activities of the country, to evolve, monitor and enforce statistical priorities and standards and to ensure statistical coordination.

**Legal Support for Collection of Data:** The Central Government's Allocation of Business Rules, 1961 (as amended from time to time) provides for the roles and responsibilities of the MOSPI. The main Statistics Act under which data is collected by the MOSPI is the 'Collection of Statistics Act, 2008'. The other most important Act for collection of statistics on demographic aspects of population is the 'Population Census Act 1948', which is administered by the Office of the Registrar General of India, functioning under the Ministry of Home Affairs. Besides these two important Acts, there are a number of Acts, Rules and Procedures being administered by 7 various administrative agencies on their subjects, through which statutory returns are collected by these Ministries/Departments.

**Central Ministries / Departments:** Besides the NSO at the Centre, most of the Ministries / Departments of the Government of India have either statistical divisions or statistical cells for all the statistical activities of the Ministry / Department. These Divisions/Cells are mostly manned by officers belonging to two organised Central Services- the Indian Statistical Service (ISS) and the Subordinate Statistical Service (SSS). The Ministry of Statistics and Programme Implementation is the Cadre Controlling Authority for both these Services, which provides another layer of coordination. Furthermore, these Statistical Divisions/Cells are headed by senior level statistical functionaries of the ISS at the JAG / SAG level for effective coordination with NSO.

**Statistical System in the States / UTs:** The Directorates of Economics and Statistics (DESS) in the States / UTs act as the nodal agencies for coordination of all statistical activities in the States/UTs. While most of the States / UTs have been formally declared by the State Governments as the Nodal Agencies on all statistical activities, a few though not yet formally declared, act as coordinating agency on statistical matters in the State/UT. Most of the States / UTs have District Statistical Offices (DSOs) which act as the field offices of the DESS for collection / compilation of statistical data in the districts. The DESS perform almost the same functions in the States / UTs as the NSO at the Centre viz. bringing out some key statistics, coordination with the Central and State statistical agencies, dissemination of statistics, etc.

### ***References***

*T.J. Rao, Official Statistics in India, Past and the Present*



***“The most important thing to know about statistics is  
that you don't have to be a statistic.”***

***Adam Kirk Smith***

# *Agriculture Census in Odisha - A Birds Eye View*

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Sri Nrusingha Charan Jena,*

## *Abstract*

*This paper describes the implementation, function and results of Agriculture Census in Odisha over different censuses . It shows the changing scenario of operational holdings in Odisha from 1970-71 to 2010-11.*

**Key words:** *Operational Holdings, Size-groups, Operated Area*

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## *Introduction*

Agriculture sector forms an important component of the Indian economy. The contribution of agricultural sector towards GDP is to the tune of around 13%. Majority of the population in the State lives in villages. Farmers actually involved in cultivation (known as operational holder) generally have low level of income. Therefore, all programmes of development of agriculture sector are launched with an eye on the operational holder. Thus, reliable data base on the operational holders is a pre-requisite for decision making in the sector. The Ministry of Agriculture and Farmers Welfare, Government. of India collects and maintains various agricultural statistics regularly and makes it accessible to the planners and policy makers for various decisions making. Agricultural Census is one of them. Agriculture Census forms part of a broader system of collection of Agricultural statistics in Odisha. An agricultural operational holding is the ultimate unit for taking decisions for development of agriculture at macro level . In operational holding is taken as the statistical unit of data collection for describing the structure of agriculture. In order to collect information on various characteristics i.e, number and area of operational holdings, tenancy status, land utilization, irrigation, cropping pattern etc, the 1st countrywide agricultural census was organized in India by the Ministry of Agriculture during 1970-71 following broad guidelines of World Census of Agriculture sponsored by FAO of the UN in collaboration with states and UTs. But the first input survey which was a follow up survey of main survey was conducted during 1976-77 in which the information on live-stock, agricultural credit, agricultural machinery and implements, use of fertilizers, manures and quality seeds. etc. were collected. As recommended by the National Commission on Agriculture, the

Agricultural Census is being carried out only once in five years in the Country through the State/ UT Governments. However, the World census of agriculture is recommended to be carried out decennially. The reason for gap of five years between two consecutive census in India is that the structure of holding changes very fast i.e. too much fragmentation in too little time. The present census is the 10<sup>th</sup> in the series with 2015-16 as the reference year, being carried out in the country now. The Ministry of Agriculture and Farmers Welfare, Government. of India is the central agency for execution of the scheme of Agriculture Census. The Agricultural Census Division in the Ministry provides all technical, financial and administrative support to all States/UTs for carrying out the census work by the statistical, revenue and agriculture personnel.

### ***Methodology***

The agriculture census is carried out in three phases. The States/UTs can be broadly divided into two categories i.e Land record and non land record States/UTs for the purpose of conduct of agriculture census. The phase-I is carried out following a complete enumeration approach in those States/UTs where the complete land records are maintained (Land record States/UTs). While in rest of the States/UTs where the system of maintenance of land record is not in vogue, a sample survey approach is used for collection of data. As Odisha is treated as a non-land record State, the sample survey approach is used, where 20% of total villages of the State are taken as sample for collection of data. For selection of sample villages, a two stage sampling design is used. Besides, household approach is followed in non-land record States. The detailed data compiled under phase-I provides the sampling frame for the selection of samples for next phases. The phase-II and phase-III of the census are carried out following the sample survey approach. The data in phase-II Survey covers details about land holdings like tenancy, land utilization, irrigation, cropping pattern and dispersal of holdings according to different size class/social groups in 25% of operational holdings of above 20% sample villages where phase-I work had already been taken up. Phase-III survey is known as Input survey, which is conducted in 7% of the total villages of the State i.e 35% of above 20% sample villages, after completion of above two phases of survey. In this survey the information on inputs like Livestock, Agricultural machinery and implements, use of fertilizer and seeds, agricultural credit are collected.

### ***Data Processing***

The computerization of data is taken up by the National Informatics Centre (NIC) or by the selected outside agencies of the States/UTs using the software provided by NIC/GOI.

## Findings of Agriculture Census

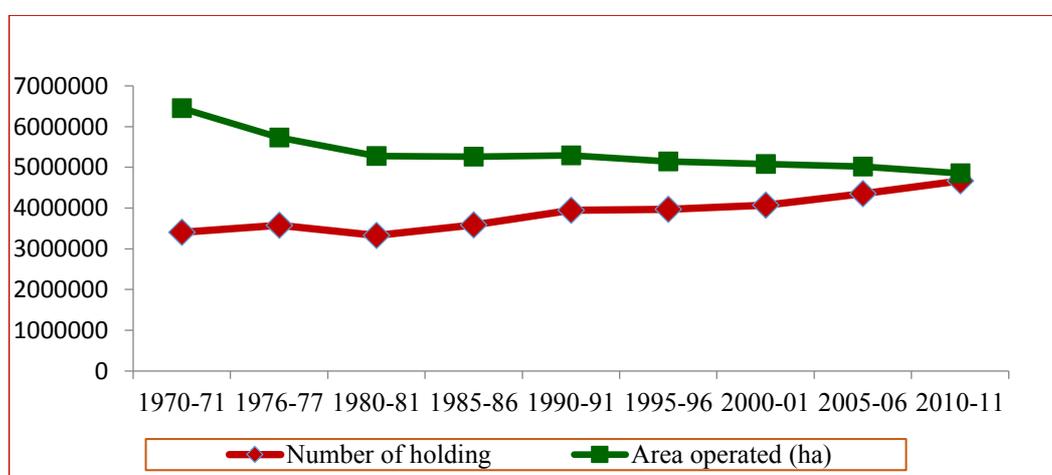
Information on some of the important indicators of different Agriculture Censuses in Odisha (1970-71 to 2010-11) is discussed below.

**Table 1: Number, Area operated and size of holding in Agriculture Census (1970-71 to 2010-11)**

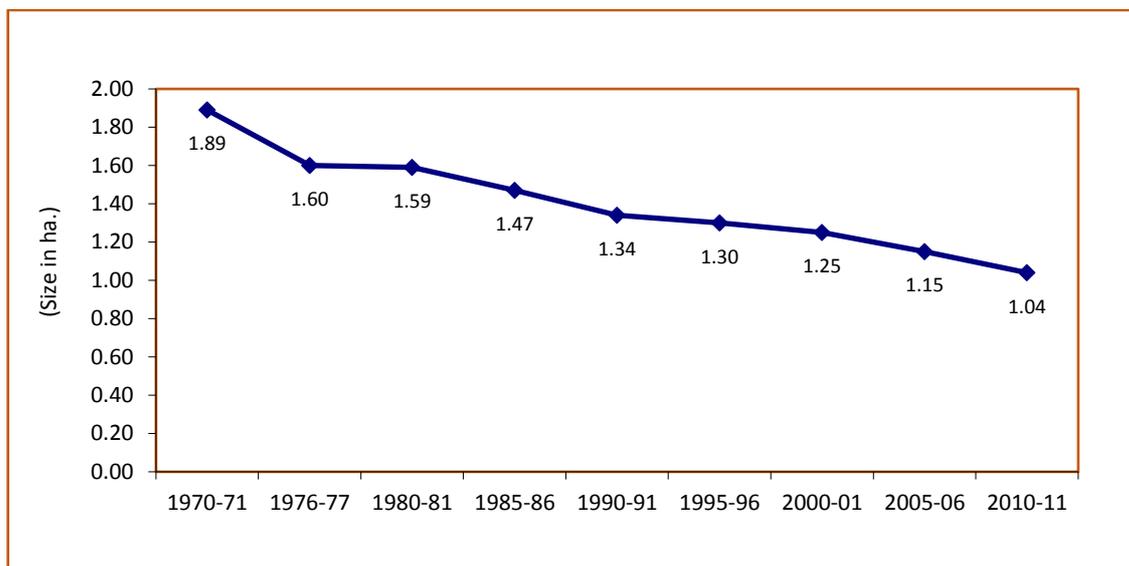
Year	1970-71	1976-77	1980-81	1985-86	1990-91	1995-96	2000-01	2005-06	2010-11
Number of holding	3407418	3576078	3328150	3585528	3947947	3966489	4067135	4356392	4667466
Area operated (ha)	6448715	5731433	5277512	5260818	5295782	5143866	5081033	5019476	4852014
Size of holding (ha)	1.89	1.60	1.59	1.47	1.34	1.30	1.25	1.15	1.04

It is observed that the number of operational holdings in Odisha is increasing in every census, whereas the area operated by the operational holders is decreasing day by day. For which the average size of holding is going down day by day. It happens because of urbanization, unwillingness of cultivators for farming due to low gain, industrialization etc. (Table 1 and Figure 1 and 2).

**Figure 1 : Trend in Number and Area of Operational Holdings (1970-71 to 2010-11)**



**Figure 2 : Trends in Average Size of Holdings (1970-71 to 2010-11)**



### **Operational Holdings by Size Classes**

The operational holdings have been classified into five sizes i.e Marginal ( Below 1.0 ha.), Small ( 1.00 – 2.00 ha.), Semi medium (2.00 – 4.00 ha.), Medium (4.00-10.00 ha.) and Large (10.00 ha. And above)

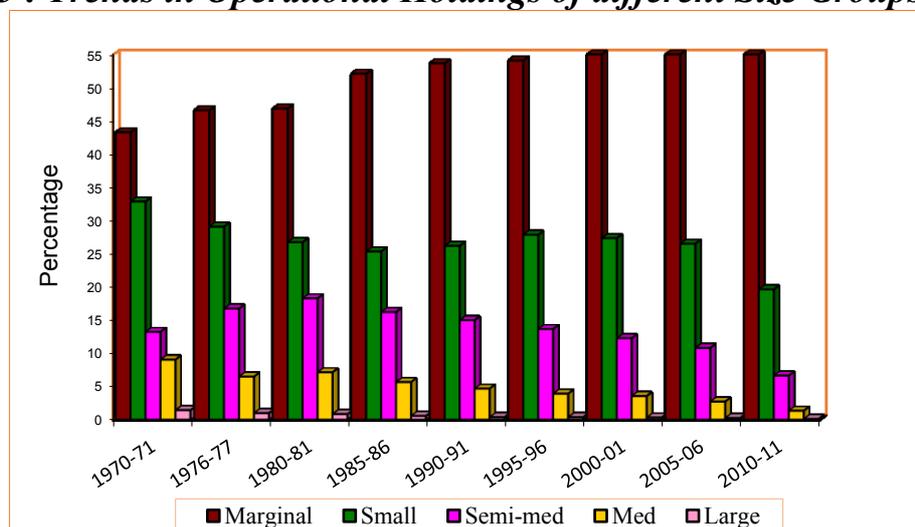
The five broad size classes of holdings have been presented in Table-2. The distribution of holdings reveals that the percentage of large and medium holdings is steadily declining since 1970-71 till 2010-11. The semi-medium holdings have been steadily declining since 1980-81 but it is seen that the marginal holdings have been increasing from 43.30% in 1970-71 to 72.17% in 2010-11, which shows an overall increase of 66.67%. Both marginal and small holdings account for 91.85% of the total holdings in 2010-11, leaving behind only 8.15% holdings covering under semi-medium, medium and large categories . Figure 3 shows the trends in operational holdings in different size groups . It is observed that while the holdings in marginal size gives a increased trends all other remaining four categories shows a declined trend over the census years (Figure-3).

**Table 2 : Percentage distribution of Number of Operational Holdings according to Size Groups**

Size group / year	1970-71	1976-77	1980-81	1985-86	1990-91	1995-96	2000-01	2005-06	2010-11
Marginal	43.30	46.59	46.86	52.09	53.66	54.08	56.42	59.62	72.17
Small	32.89	29.11	26.77	25.38	26.22	27.89	27.38	26.54	19.68
Semi-Med	13.28	16.79	18.34	16.27	15.03	13.71	12.31	10.84	6.67
Medium	9.08	6.51	7.17	5.69	4.70	3.93	3.57	2.74	1.36
Large	1.45	1.00	0.85	0.57	0.38	0.38	0.33	0.26	0.12
All Size groups	100	100	100	100	100	100	100	100	100

From the above table we may observe that the number of marginal operational holding is increasing due to fragmentation of operational holdings, where as the area is decreasing gradually. In case of small holdings, the number and area of holdings was increasing up to 2005-06 census, then decreased. But in other size classes i.e semi-medium, medium and large size class, the number and area of holdings have decreased gradually.

**Figure 3 : Trends in Operational Holdings of different Size Groups**



### **Operational Holding Area by size classes**

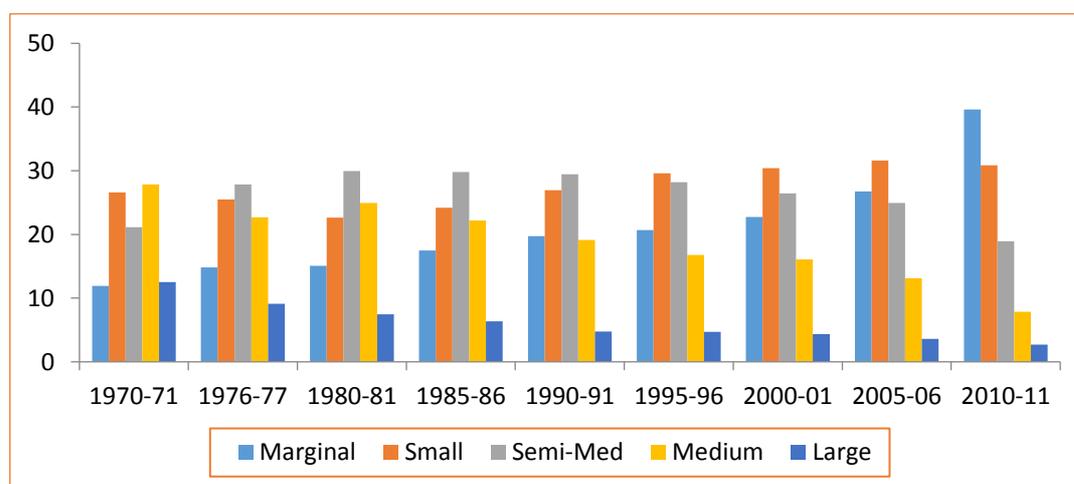
The broad size class wise distribution of operated area over the different census periods is presented below. (Table 3).As regards percentage of operated area, the share of marginal holdings has been increased from 11.94% in 1970-71 to 39.61% during 2010-11. The share of small holdings which was 26.58% in 1970-71 has been increased to 30.87% in 2010-11

with fluctuations during different census years. The share of semi-medium holdings was 21.13% and it increased to 29.94% in 1980-81 and thereafter it shows a declining trend till it reaches at 18.94% in 2010-11. It is observed that the share of both medium and large holdings shows a continuous declining trend since 1970-71 till 2010-11. (Table 3 and Figure 4)

**Table 3 : Percentage Distribution of Operated Area in different Size Groups**

Size group /year	1970-71	1976-77	1980-81	1985-86	1990-91	1995-96	2000-01	2005-06	2010-11
Marginal	11.94	14.84	15.05	17.48	19.73	20.69	22.73	26.73	39.61
Small	26.58	25.51	22.62	24.20	26.93	29.58	30.38	31.63	30.87
Semi-Med	21.13	27.84	29.94	29.79	29.47	28.21	26.46	24.92	18.94
Medium	27.83	22.71	24.94	22.18	19.11	16.80	16.09	13.11	7.86
Large	12.52	9.09	7.44	6.34	4.76	4.71	4.34	3.61	2.72
All Size groups	100	100	100	100	100	100	100	100	100

**Figure 4 : Trends in Operated Area of different Size Groups**



### **Operational Holdings by different type of Holdings**

The number and area operated by different type of holdings ie, individual, joint and institutional holdings over different census periods are detailed below.

It is observed that the number of individual holdings is increasing in every next census, where as the number of joint and institutional holdings decreasing day by day. But,

the number of total holdings is also increasing gradually. On the other hand, the area of the corresponding individual holdings and joint holdings are decreasing day by day.

**Table 4 : No and Area of different type of holdings**

Year	No. of Operational Holdings (No. in Lakh)				Area Operated (in Lakh Ha.)			
	Individual	Joint	Institu- tional	Total	Individual	Joint	Institu- tional	Total
1970-71	34.00	0.07	NA	34.07	64.10	0.39	NA	64.49
1976-77	35.09	0.67	0.14	35.90	55.86	1.45	0.20	57.51
1980-81	32.81	0.44	0.03	33.28	51.76	0.97	0.05	52.78
1985-86	35.47	0.35	0.04	35.86	51.83	0.69	0.09	52.61
1990-91	38.79	0.02	0.03	38.84	51.51	0.02	0.55	52.08
1995-96	39.49	0.13	0.04	39.66	50.85	0.28	0.31	51.44
2000-01	40.46	0.19	0.02	40.67	50.07	0.28	0.46	50.81
2005-06	43.42	0.12	0.02	43.56	49.64	0.20	0.35	50.19
2010-11	46.58	0.07	0.02	46.67	47.86	0.13	0.53	48.52

### **Conclusion**

It is also observed that the major decrease in joint holdings is due to the following reasons.

- i) Equal participation in input sharing causes disputes among joint holdings.
- ii) Dis-integration of Joint Hindu family.
- iii) People prefer to lease out lands to outsiders due to increase in cost of production.
- iv) Deterioration in level of mutual understanding resulting in disturbance in cultivation process in way of sharing of money and labour force.
- v) To obtain Govt. benefits like Kissan Credit card/ Insurance card for getting input subsidy.

It is also a matter of concern that the total area of all operational holdings is decreasing at a diminishing rate due to unwillingness of operational holders for cultivation and urbanization of agricultural lands. In order to improve the farming the cultivations are to be motivated.

### **Reference :**

*Reports on Agricultural Census, D. E. & S, Odisha*



***We are not concerned with the very poor. They are unthinkable, and only to be approached by the statistician or the poet.”***

***E.M. Forster***

# *Fiscal Scenario of Odisha (2012-17): An Analysis*

*Smt Jyoti Prava Swain,*

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## *Abstract*

*This paper examines the paradigm shift of fiscal scenario of Odisha during the period from 2012-13 to 2017-18. The behaviour of receipts of Government, Government expenditure and also the trends in expenditure on economic, social, general and other services sectors have been analysed.*

**Key Words** : *Fiscal scenario, receipts, expenditure, Gross State Domestic Product*

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## *Introduction*

A prudent fiscal scenario is desirable and is crucial for Odisha to achieve the objectives of development and create healthy economic growth. Though there has been a definite improvement in fiscal scenario of Odisha in the recent years i.e. from 2013-14 onwards despite some aggregate indicators creating concern for us. Fiscal Policy is the mechanism by which a Government makes adjustments to its planned spending and the imposed tax rates to monitor and thus in turn influence the performance of a Country's economy. Worsening of fiscal scenario affects the quality of expenditure of the government critically. There is an urgent need for making Odisha Fiscal Policy growth oriented and rationalised.

Guided by the rolling targets of the Medium Term Fiscal Plan, a part of the obligations under the fiscal responsibility legislation of the State, key fiscal parameters were kept within permissible range. The State Government has adopted a rule based fiscal policy with medium term fiscal targets through enactment of the Fiscal Responsibility and Budget Management (FRBM) Legislation.

The State Government has amended the FRBM Act, 2005 on the basis of recommendations of the 14<sup>th</sup> Finance Commission. The FRBM (Amendment) Act, 2016 has made it mandatory for the State to generate revenue surplus, contain the fiscal deficit within

3 percent of Gross State Domestic Product (GSDP). The continuous decline in debt stock to GSDP ratio and debt servicing ratio with higher growth in GSDP has made the state fiscal policy sustainable and solvent. The appointment of the 15<sup>th</sup> Finance Commission has come at a time of momentous Changes in Indian fiscal federalism. Fiscal stabilization very critical to achieve higher inclusive growth rate on sustainable basis for creation of capital assets as well as maintenance of the existing assets so as to increase the productivity of the state economy. The broad fiscal parameters of revenue and expenditure sum up the fiscal position of the State.

The fiscal deficit is required to be kept within the prescribed 3 percent of GSDP in terms of FRBM Act and should be taken care of while working out the revised estimates for 2015-16. Fiscal consolidation in Odisha has been undertaken under a rule based framework through the enactment of Odisha Fiscal Responsibility and Budget Management (FRBM) Act, 2005. The management of State finance in Odisha is guided by FRBM Act, implies revenue surplus and entire borrowing during this time period has financed higher capital outlay to the extent of 3.57 percent of GSDP. It is budgeted at 4.56 percent of GSDP in 2015-16. To examine the impact of FRBM Act on the Odisha fiscal space, the time period for assessment of fiscal performance in terms of major deficit indicators i.e. Revenue Deficit, Fiscal Deficit and Primary Deficit is undertaken by considering two time periods around the implementation of FRBM legislation. i.e from 1995-96 to 2004-05 (Pre FRBM Period) and 2005-06 to 2014-15 (Post FRBM Period). A significant improvement in fiscal scenario of the State has been registered in Post FRBM period over Pre FRBM period.

### ***Revenue Receipt***

The total receipts of the State Government have been categorized into three parts as tax revenue, non-tax revenue and grant-in-aid. Compared to 2012-13, the overall total revenue receipts registered a growth of 11.4 percent in 2013-14 and it further increased at 16.4 percent in 2014-15 over 2013-14 and at 20.95 percent in 2015-16 over 2014-15. The total revenue receipt increased to Rs. 1,06,06,498 lakh in 2017-18 over its level of Rs 45,95,893 lakh in 2012-13. During 2015-16, the actual tax revenue was Rs 46,10,075 lakh, which represents a modest growth of 28.02 percent over 2014-15. The growth pattern observed in case of Grant in Aid, which increased at 22.88 percent in 2013-14 and 53.24 percent in 2014-15 however decreased to 9.38 percent in 2015-16. Receipt of total revenue of Odisha from 2012 to 2017-18 (BE) is shown in Table-1 and Figure-1.

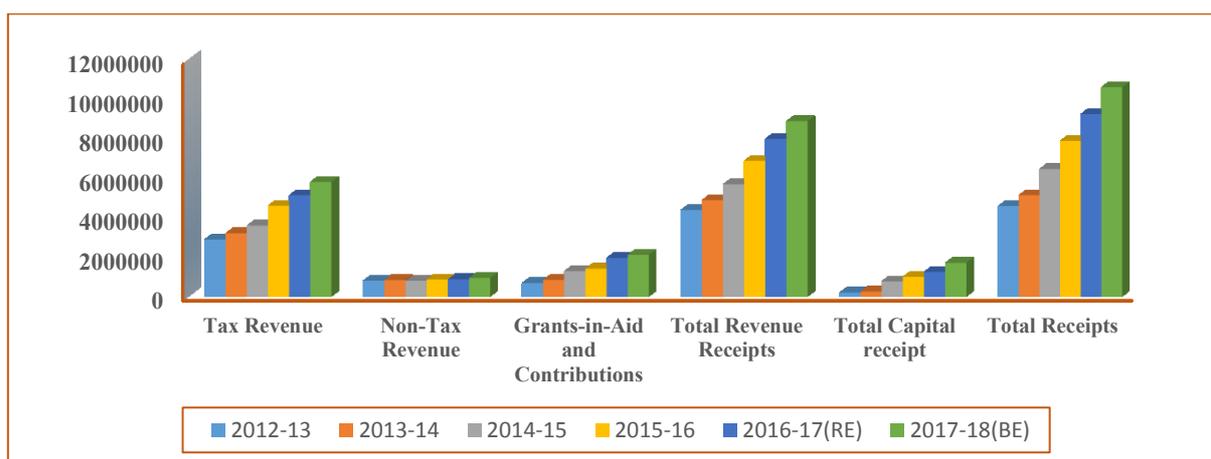
**Table-1: Composition of Revenue Receipts in Odisha  
(2012-13 to 2017-18 BE)**

(Amount in Lakh Rupees)

Year	Tax Revenue	Non-Tax Revenue	Grants-in-Aid and Contributions	Total Revenue Receipts	Total Capital receipt	Total Receipts
2012-13	2899914	807804	685973	4393691	202202	4595893
2013-14	3213882	837861	842942	4894685	254746	5149431
2014-15	3600951	807087	1291750	5699788	773750	6473538
2015-16	4610075	871124	1412946	6894144	1001828	7895972
2016-17(RE)	5152149	882293	1963900	7998342	1253150	9251492
2017-18(BE)	5822167	950000	2120985	8893152	1713346	10606498

Source: Economic and Purpose Classification of Odisha Budget by DES, Odisha

**Figure-1 : Composition of Revenue Receipts in Odisha**



## Expenditure

### Revenue and Capital Expenditure

Government expenditure can be divided into a) Capital expenditure, which affects the liabilities and assets of the State and b) Revenue expenditure which includes the rest of the expenses. Revenue expenditure is the spending of Government for meeting its expenses for running its day to day operation. . It involves salary, pension, interest, subsidy, and maintenance of capital assets. On the other hand Capital expenditure is spending of Government for creation of assets such as roads, bridges, dams, powerhouses, and other capital goods.

**Table-2: Revenue Expenditure and Capital Expenditure**

(Amount in Lakh Rupees)

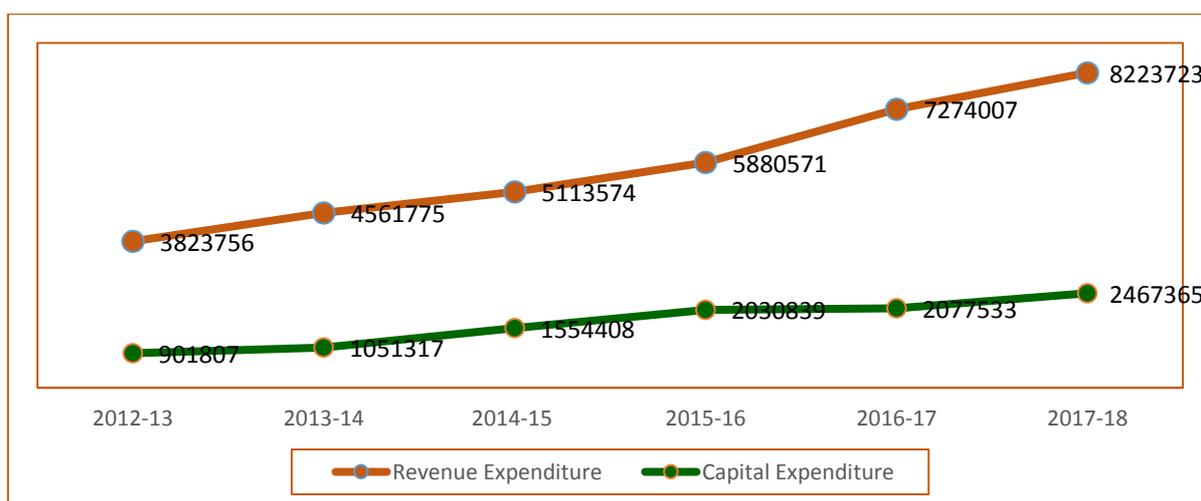
Type of expenditure /Year	2012-13	2013-14	2014-15	2015-16	2016-17 (RE)	2017-18 (BE)
Revenue Expenditure	3823756 (80.92)	4561775 (81.27)	5113574 (76.69)	5880571 (74.33)	7274007 (77.78)	8223723 (76.92)
Capital Expenditure	901807 (19.08)	1051317 (18.73)	1554408 (23.31)	2030839 (25.67)	2077533 (22.22)	2467365 (23.08)
Total	4725563 (100)	5613092 (100)	6667982 (100)	7911410 (100)	9351540 (100)	10691088 (100)

(Figures in brackets are % share of expenditure to total expenditure.)

Source: Economic and Purpose Classification of Odisha Budget by DES, Odisha

Revenue expenditure neither creates assets nor reduces a liability and generally, it is incurred on normal running of the Government Departments, operation and maintenance of existing infrastructural services. Efficiency in revenue expenditure of a sector is measured by the non-tax revenue mobilized from that sector. The capital expenditure has significantly increased from Rs. 9, 01,807 lakh for the year 2012-13 to Rs. 24, 67,365lakh (BE) for the year 2017-18. This emphasizes the policy orientation of creating more income generating capital assets both in social and economic services sector to sustain development oriented growth in the State economy (Table-2 and Figure 2)

**Figure-2: Trends in Revenue and Capital Expenditure**



**Expenditure by Category of Services**

Table3 provides the sector wise contribution to the total revenue expenditure which shows a continuous growth in amount of expenditure of the State over the years from 2012-

13 to 2017-18(BE). In 2012-13 the total expenditure was Rs. 47,25,563lakh, in 2013-14 it increased to Rs. 56,13,092lakh, in 2014-15 the expenditure raised to Rs. 66,67,982lakh and in 2015-16 (AC) the amount was Rs.79,11,409lakh. It is pertinent that more emphasis is given to the social service sector and economic service sector in comparison to other sectors. this is on account of the outcome of policy orientation towards inclusive growth. Government emphasis on general education, health services, safety and security to the citizens in social service sector and development by formation of capital assets in economic service sector are given higher allocations.

**Table 3 : Services wise Expenditure in Odisha (2012-13 to 2017-18 B.E)**

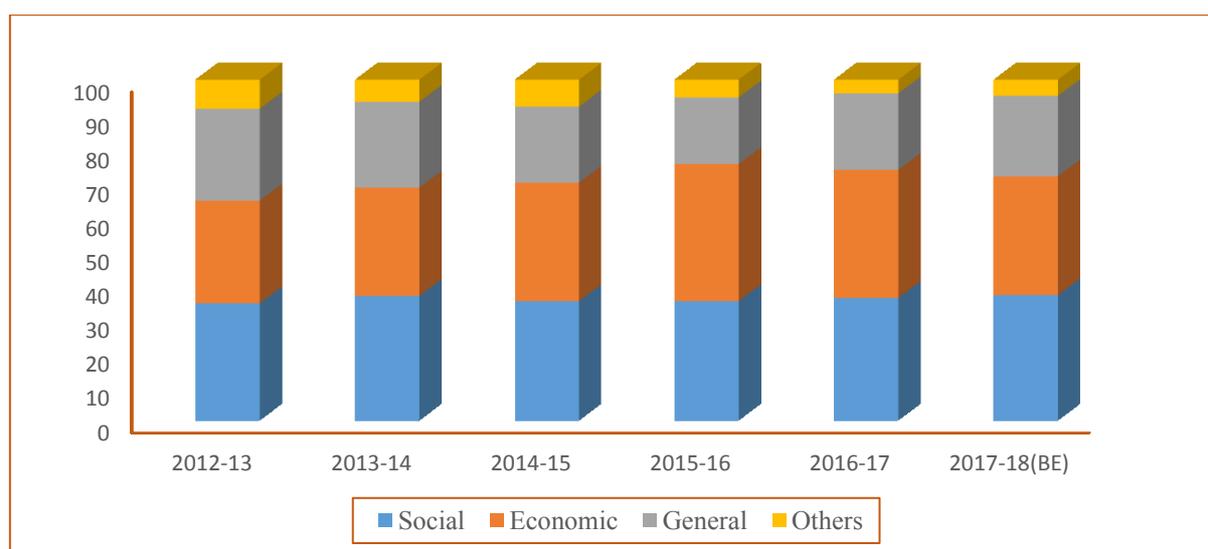
(Amount in Lakh Rupees)

Category	2012-13	2013-14	2014-15	2015-16	2016-17 (RE)	2017-18(BE)
Social	1618147 (34.24)	2044634 (36.43)	2325253 (34.87)	2757171 (34.85)	3348849 (35.81)	3917598 (36.64)
Economic	1426229 (30.18)	1787632 (31.85)	2322182 (34.83)	3192504 (40.35)	3524011 (37.68)	3733204 (34.92)
General	1277448 (27.03)	1415929 (25.23)	1491866 (22.37)	1548368 (19.57)	2101429 (22.47)	2531666 (23.68)
Others	403739 (8.54)	364897 (6.50)	528681 (7.93)	413366 (5.22)	377251 (4.03)	508619 (4.76)
Total Expenditure	4725563 (100)	5613092 (100)	6667982 (100)	7911409 (100)	9351540 (100)	10691087 (100)

(Figures in brackets are share of expenditure to total expenditure.)

Source: Economic and Purpose Classification of Odisha Budget by DES, Odisha

**Figure 3: Service wise percentage share of Expenditure in Odisha**



## ***Conclusion***

Over the last five years there is a shift of Governments objective for all round development in place of meeting only general administration, social security and poverty eradication. There is continuous effort on the part of Government for rapid industrialisation and infrastructure development along with enhancement of standard of life. The Government is interested in more job creation, social security for the people along with economic and infrastructure development.

The task for further improving the quality expenditure, regular expenditure review, expanding the coverage of public service and of investing in social and physical infrastructure are very critical to achieve higher inclusive growth rate on sustainable basis. In order to fulfil this objective the State has to go for higher capital receipts to fund capital outlay in developmental sectors as there is capacity to sustain additional debt burden and State economy has reached a stage where in it can absorb higher capital outlay after the fiscal stabilisation.

## ***Reference***

*Economic-cum-Purpose Classification of Odisha Government Budget, 2013-14*

*Odisha Economic Survey, 2015-16*

*Odisha Budget Document, 2017-18*

*Fiscal Landscape of Odisha – An analysis of deficits and expenditure by Dr. A.R. Mohanty*



***The creator of the universe works in mysterious ways. But he uses a base ten counting system and likes round numbers.***

***Scott Adams***

# ***A Comparative Study on Characteristics of Annual Survey of Industries (ASI) in Odisha over the Years from 2011-12 to 2015-16***

***Sri Parimal Samal***

***Sri Sashibhusan Nayak.***

## ***Abstract***

*The above article throws light on the main findings of ASI Survey in Odisha over the years 2011-12 to 2015-16 covering main sectors of Economic activities namely Manufacturing, Repairing and other services.*

***Key Words : Factories, Capital Investments, Employment, Emoluments, Out put, Input and Net Value Added.***

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## ***Introduction***

The structure and function of the industrial sector is an important perspective of Indian Economy. It is imperative for industries to grow both qualitatively and quantitatively to boost the economy. In the Indian economy Industrial sector not only occupies an important position but also plays a vital role in the balanced and rapid economic development. The well-being of the industries depends truly on the formulation and promotion of industrial policies framed by the policy makers. To frame suitable industrial policies the policy makers need to be aware about the quantified aspect of the existing scenarios of the industries in the country. This is where the Annual Survey of Industries (ASI) is conducted following the guidelines issued by Central Statistics Office (CSO) Industrial Statistics (IS) wing, Government of India. ASI is principal source of industrial statistics in India. ASI, an annual event, not only facilitates suitable data collection based on appropriate sampling techniques but also ensures timely dissemination of statistical information to assess and evaluate the dynamics in composition, growth and structure of organized manufacturing sector. It has been designed to obtain comprehensive and detailed data for the following objectives, viz.,

- i. Estimation of contribution of manufacturing industries as a whole and of each type of industry to the State Income.
- ii. Systematic study of the structure of the industry as a whole and of each type of industry.

- iii. Occasional analysis of various factors influencing industries in the state.
- iv. Construction of comprehensive, factual and systematic bases for formulation of policy.

In this report an attempt has been made on a comparative study on Characteristics of Annual Survey of Industries in Odisha over the years from 2011-12 to 2015-16. The main findings of the survey which inter-alia covers the main sectors of Economic activity namely Manufacturing, Repairing and other services. The estimates of some important economic aggregates of Industrial Sectors in the State for the years 2011-12 to 2015-16 have been prepared which are as follows :

- |                          |                     |
|--------------------------|---------------------|
| 1. No. of Factories      | 9. Total Input      |
| 2. Fixed Capital         | 10. Total Output    |
| 3. Working Capital       | 11. Net Value added |
| 4. Invested Capital      |                     |
| 5. Outstanding Loans     |                     |
| 6. No. of workers        |                     |
| 7. Total persons engaged |                     |
| 8. Total emoluments      |                     |

### ***Concept and Definitions***

**Factory** is one which is registered under sections 2(m) (i) and 2(m) (ii) of the Factory Act, 1948. The sections 2(m) (i) and 2(m) (ii) refer to any premises including the precincts thereof (a) wherein ten or more workers are working, or were working on any day of the preceding twelve months, and in any part of which a manufacturing process is being carried on with the aid of power, or is ordinarily so carried on, or (b) wherein twenty or more workers are working, or were working on any day of the preceding twelve months and in any part of which a manufacturing process is being carried on without the aid of power, or is ordinarily so carried on.

**Fixed Capital** represents the depreciated value of fixed assets owned by the factory as on the closing day of the accounting year. Fixed assets are those which have a normal productive life of more than one year. Fixed capital includes land including lease-hold land, buildings, plant and machinery, furniture and fixtures, transport equipment water system and roadways and other fixed assets such as hospitals, schools etc. used for the benefit of factory personnel.

**Working Capital** is the sum total of the physical working capital and the cash deposits in hand and at bank and the net balance receivable over amounts payable at the end of the accounting year. Working capital, however excludes unused overdraft facility, fixed deposits irrespective of duration, advances for acquisition of fixed assets, loans and advances by proprietors and partners irrespective of their purpose and duration, long-term loans including interest thereon and investments.

**Invested Capital** is the total fixed capital and physical working capital as defined above.

**Outstanding Loans** represent all loans whether short term or long term whether interest bearing or not, outstanding according to the books of the factory as on the closing day of the accounting year.

**Workers** are defined to include all persons employed directly or through any agency whether for wages or not and engaged in any manufacturing process or in cleaning, any part of the machinery or premises used for manufacturing process or in any other kind of work incidental to or connected with the manufacturing process or the subject of the manufacturing process, labour engaged in the repair and maintenance or production of fixed assets for factory's own use or labour employed for generating electricity or producing coal, gas etc are included.

**Total Emoluments** are defined as the sum of wages and salaries, employers' contribution as provident fund and other funds and workmen and staff welfare expenses as defined above.

**Total Input** comprises total value of fuels, materials consumed as well as expenditures such as cost of contract and commission work done by others on materials supplied by the factory, cost of materials consumed for repair and maintenance work done by others to the factory's fixed assets, inward freight and transport charges, rate and taxes (excluding income tax), postage telephone and telex expenses, insurance charges banking charges, cost of printing and stationery and purchase value of goods sold in the same condition as purchased. Rent paid and interest paid is not included.

**Total Output** comprises total ex-factory value of products and by-products manufactured as well as other receipts from non-industrial services rendered to others, work done for others on material supplied by them ,value of electricity produced and sold, sale value of goods sold in the same conditions purchased, addition in stock of semi-finished goods and value of

own construction. Rent received and interest received is not included from ASI 2001-2002 and onwards.

**Gross Value Added (GVA)** is arrived at by deducting total input from total output.

**Net Value Added (NVA)** is arrived at by deducting depreciation from GVA.

## Results

The results of some important economic aggregates of industrial sector in the State for the years 2011-12 to 2015-16 are presented in the Table below.

**Table**

(Rs. In lakh)

Sl. No.	Characteristics	2011-12	% of growth over previous year	2012-13	% of growth over previous year	2013-14	% of growth over previous year
1	No. of Operating Factories	2678	5.60	2854	6.57	2714	-4.91
2	Fixed Capital	16080526	32.17	16377525	1.85	21086599	28.75
3	Working Capital	990623	68.60	624989	-36.91	1101487	76.24
4	Invested Capital	18345421	29.42	19046035	3.82	24112454	26.60
5	Outstanding Loans	8616137	(-) 9.48	11000417	27.67	15200038	38.18
5	No. of Workers	223571	-2.54	213079	-4.69	206788	-2.95
6	Total Persons Engaged	284637	0.63	263651	-7.37	260771	-1.09
7	Total Emoluments	579204	8.83	621601	7.32	707778	13.86
8	Total Inputs	9121209	29.02	8897360	-2.45	9303658	4.57
9	Value of Output	11541915	25.26	11369603	-1.49	12237946	7.64
10	Net Value Added	1820476	7.52	1805725	-0.81	2133980	18.18

(Contd.)

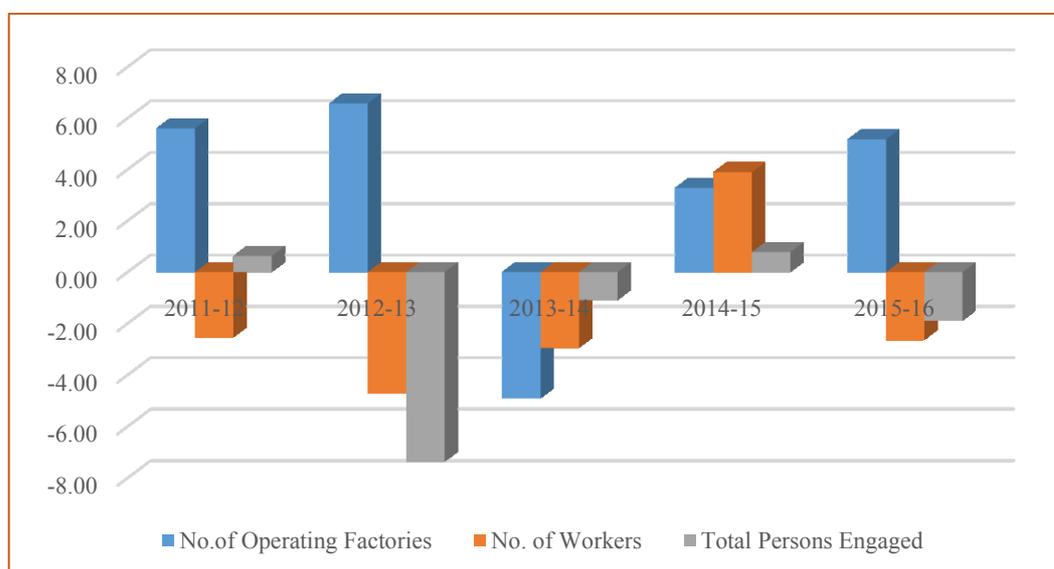
Sl.No.	Charaterstics	2014-15	% of growth over previous year	2015-16	% of growth over previous year
1	No. of Operating Factories	2803	3.28	2948	5.17
2	Fixed Capital	22947886	8.83	26957833	17.47
3	Working Capital	-297870	-127.04	-29137	-90.22
4	Invested Capital	26495184	9.88	30583649	15.43
5	Outstanding Loans	12843522	(-) 15.50	18282172	42.35
5	No. of Workers	214836	3.89	209153	-2.65
6	Total Persons Engaged	262817	0.78	257842	-1.89
7	Total Emoluments	767448	8.43	689489	-10.16
8	Total Inputs	10574792	13.66	11326286	7.11
9	Value of Output	13117979	7.19	13700128	4.44
10	Net Value Added	1668493	-21.81	1433245	-14.10

Source : CSO(IS wing), GOI.

## Analysis

It can be observed from the Table that the number of factories which was 2678 nos. in 2011-12 has increased to 2854 nos. in 2012-13 showing a growth of 6.57 % over 2011-12, while during 2013-14 the no. decreased to 2714 thereby showing a negative growth of 4.91 % over previous year. However during 2014-15 the no of factories increased to 2803 nos. thereby showing a growth of 3.28 % over 2013-14 and it further increased to 2948 during 2015-16 showing a growth of 5.17 % over the year 2014-15.

**Figure 1 : Year wise growth of No.of Operating Factories, Workers and Total persons engaged**



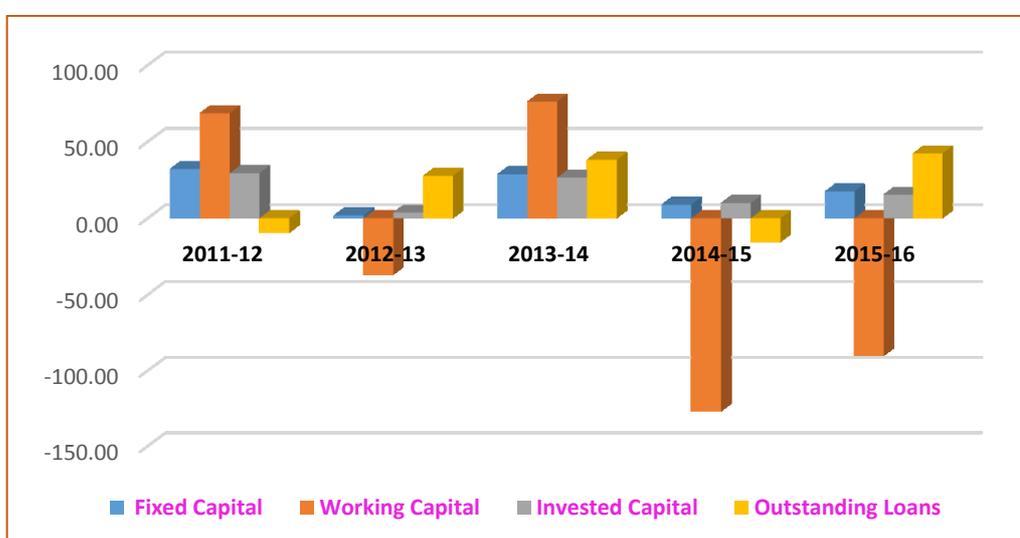
It was found that in the year 2011-12, 2678 no. of factories together had a total stock of fixed capital worth Rs.16080526 lakhs, working capital of Rs. 990623 lakhs and an invested capital of Rs.18345421 lakhs. These factories provided employment to 284637 persons and distributed Rs. 579204 lakhs as emoluments to employees, consumed input worth 9121209 lakhs, their aggregate value of output was 11541915 lakhs and contributed Rs. 1820476 lakh by net value added to the State.

For the year 2012-13 it is seen that 2854 factories together had provided employment to 263651 persons in the state with Rs.621601 lakhs as total emoluments. These factories had a total stock of Fixed capital worth Rs. 16377525 lakhs, working capital of Rs 624989

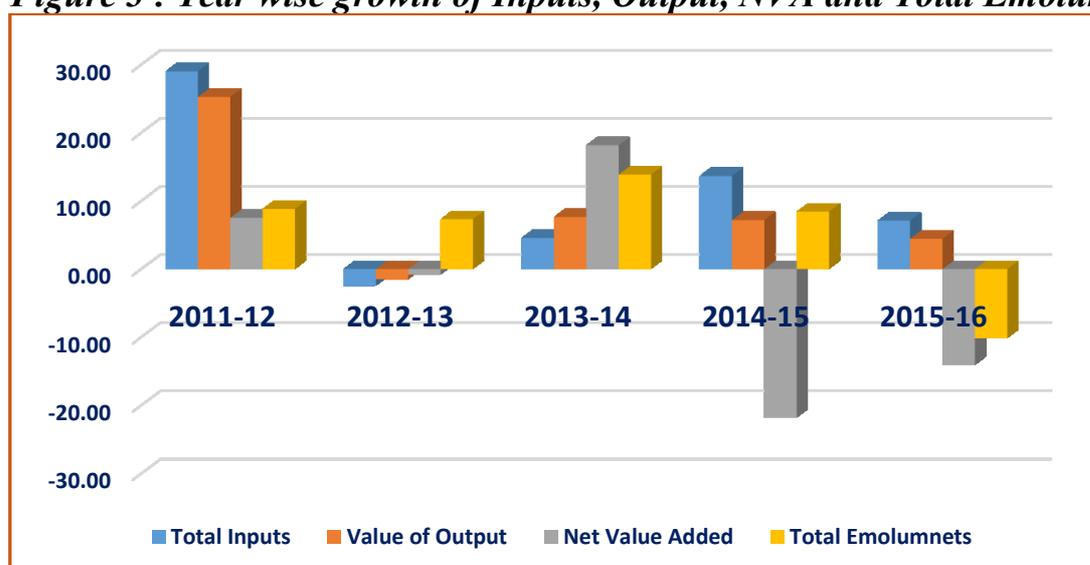
lakhs, Invested capital of Rs. 19046035 lakhs, consumed Input worth Rs.8897360 lakhs and their aggregate value of output Rs 11369603 lakhs and contributed Rs. 1805725 lakhs of net value added to the manufacturing sector.

Similarly, during the reference period of ASI 2013-2014, 2714 no. of factories together provided employment to 260771 persons with Rs. 707778 lakhs as total emoluments and had Rs. 21086599 lakhs as fixed capital, Rs 1101487 lakhs as working capital and an Invested capital of Rs. 24112454 lakhs. Their share in the gross value of output and net value added by manufacture were Rs. 12237946 lakhs and Rs. 2133980 lakhs respectively.

**Figure 2: Year wise growth of Capital Investment and Out standing Loans**



**Figure 3 : Year wise growth of Inputs, Output, NVA and Total Emoluments**



During the reference period of ASI 2014--2015, 2803 no. of factories together provided employment to 262817 persons with Rs. 767448 lakhs as total emoluments and had Rs. 22947886 lakhs as Fixed capital stock, Rs. (-)297870 lakhs as Working capital and an Invested capital of Rs. 26495184 lakhs. Their share in the gross value of output and net value added by manufacture were Rs.13117979 lakhs and Rs.1668493 lakhs respectively.

Similarly, during the reference period of ASI 2015--2016, 2948 no. of factories together provided employment to 257842 persons with Rs.689489 lakhs as total emoluments and had Rs.26957833 lakhs as Fixed capital, Rs (-)29137 lakhs as Working capital and an Invested capital of Rs. 30583649 lakhs. Their share in the gross value of output and net value added by manufacture were Rs. 3700128 lakhs and Rs. 1433245 lakhs respectively.

### ***Conclusion***

One of the main objectives of Annual Survey of Industries is to assess the contribution of the Organised Manufacturing Sector to the State Income on Net Value Added. Taking this aspect into consideration, it is found that the net value added by Manufacturing Sector in Odisha has shown a decrease over the years (except 2011-12 and 2013-14). This may be due to substantial decrease in Working Capital during the last two years i.e. 2014-15 and 2015-16. In spite of constant increase both in Input and Out put of the Manufacturing sector from 2012-13 to 2015-16 and the ratio of output to input remaining more than one, the Net Value Added has a shown a declined trend. This may be due to the effect of factor like depreciation.

### ***Reference :***

*Central Statistics Office, (ISW),Kolkatta*



***“Nature is written in mathematical language”.***

***Galileo Galilei***

# ***Result- based M & E Systems for Development Projects/Schemes***

***Mr Debi Prasad Nayak, MPhil (Economics),***

## ***Abstract***

*The art of Results Based Management is defining outcomes that are measurable in a credible way and are used in decision making. Result-based M&E is a management strategy focusing on performance and achievement of outputs, outcomes and impacts.*

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Monitoring and Evaluation (M&E) are two complementary but distinct processes, plays crucial role for achieving the project's development objectives. *Monitoring* consists of tracking inputs, activities, outputs, outcomes, and other aspects of the project on an ongoing basis during the implementation period, as an integral part of the project management function. *Evaluation*, on the other hand, is a process by which project results, impacts, and implementation performance are assessed. Projects are evaluated at discrete points in time (usually at the project's mid-point and completion) along some key dimensions (i.e., relevance, efficiency, efficacy, impact, and performance). Evaluations often seek an outside perspective from relevant experts. For a clear understanding Monitoring and Evaluation may be demystified as per the following table-1

<b>Monitoring</b>	<b>Evaluation</b>
Clarifies program objective	Analyzes why intended objectives results were achieved or not.
Links activities and their resources to objectives	Assesses specific causal contributions of activities to results.
Translates objectives into performance indicators and sets targets.	Examines implementation process
Routinely collects data on these indicators, compares actual results with targets.	Explores unintended results.
Reports progress to managers and alert them to problems.	Provides lessons, highlights significant accomplishment or program potential, and offers recommendations for improvement

## ***Result-based Monitoring and Evaluation***

Result-based Monitoring and Evaluation (M&E) is a management tool used to systematically track **progress of project implementation, demonstrate results on the ground**, and assess whether changes to the project design are needed to take into account evolving circumstances. On the other way

### ***Traditional M&E Vs Result-based M&E System***

Traditional M&E systems are designed to address compliance—the “**did they do it**” **question**. i.e.

Did they mobilize the needed inputs?

Did they undertake and complete the agreed activities?

The implementation approach focuses on **monitoring and assessing how well** a project, program or policy is **being executed**, and it often links the implementation to a particular unit of responsibility. However, this **approach does not provide** policymakers, managers, and stakeholders with an understanding **of the success or failure of that project**, program, or policy.

On the other hand Results-based M&E systems are designed to address the “**so what**” **question**, i.e.

So what about the fact that outputs have been generated?

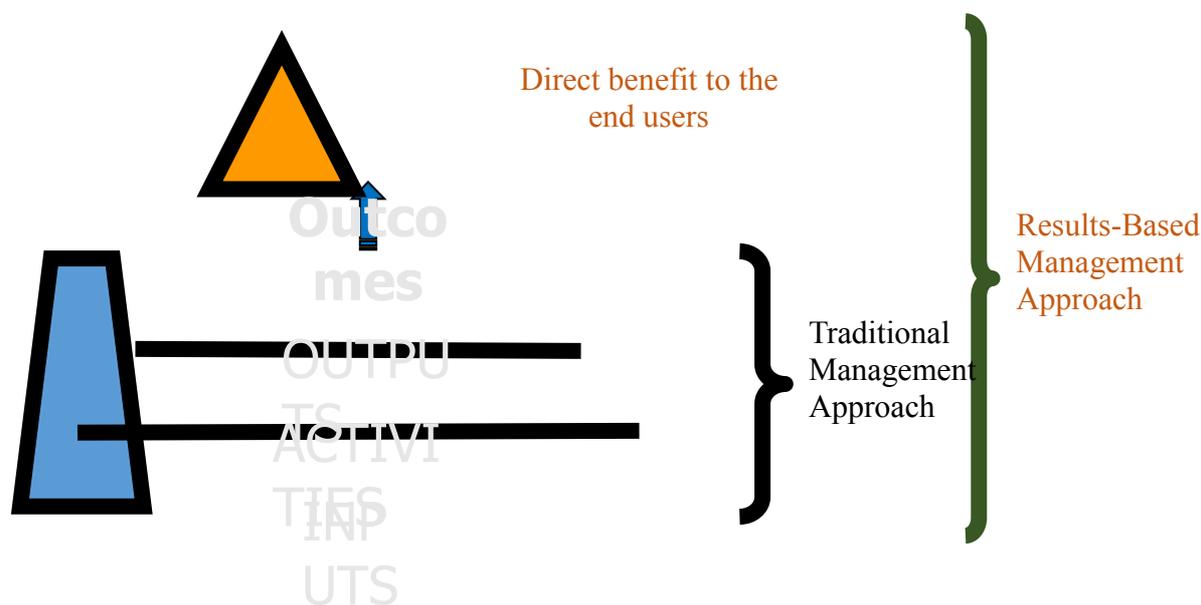
So what that activities have taken place?

So what that the outputs from these activities have been counted?

A results-based system **provides feedback** on the actual outcomes and goals of projects’ actions. We can say results-based monitoring and evaluation focus management on performance and on progress towards these desired development outcomes.

The traditional M&E approach tracks the implementation up to output level where as the result based approach tracks both output and outcome level. It would be clear if we present in pictorial form .

**Figure 1 :**



***Need for Result- based M&E System:***

Result based M&E system is widely followed across the globe by different Government Organisations and popular among international agencies like UNO, World Bank etc.

Important features of result based management are as follows.....

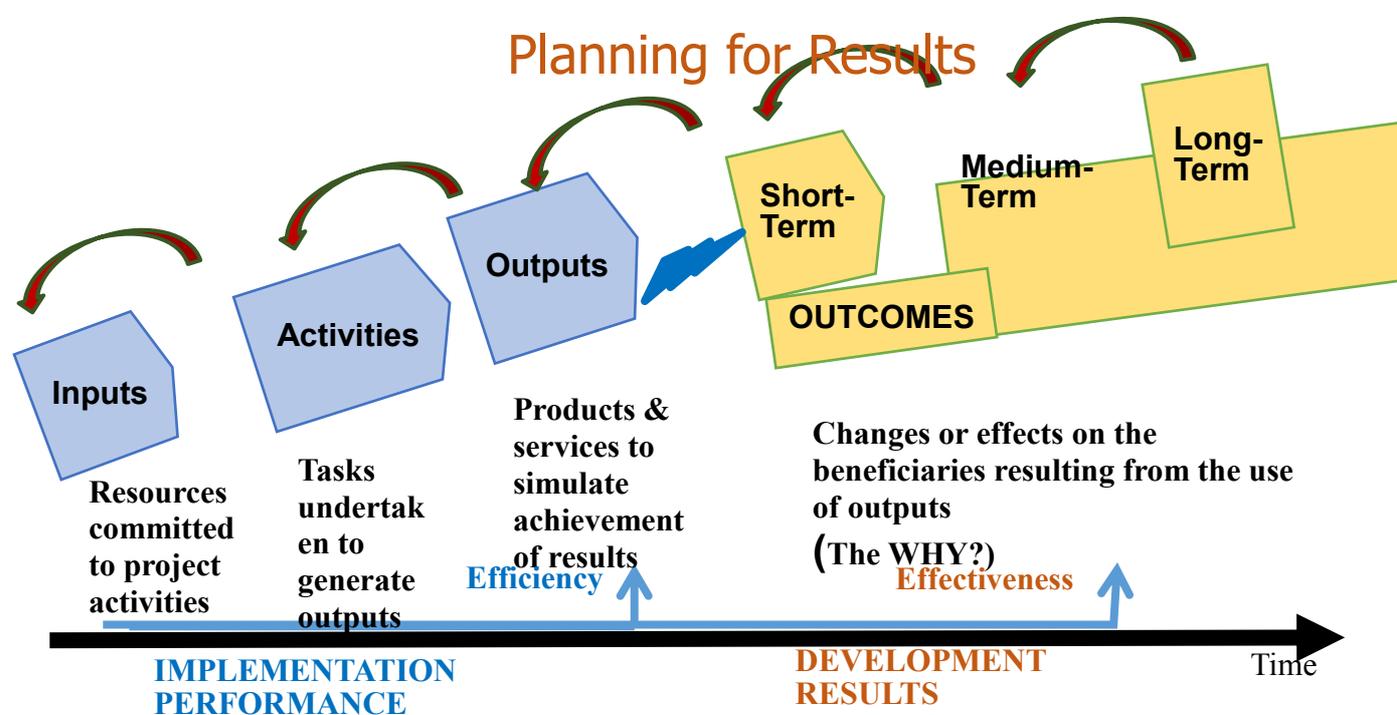
- **Improving project/program management**
  - ✓ Improving planning and budgeting
  - ✓ Focusing implementation and reporting
- **Providing lessons-learned/Assuring stakeholders**
  - ✓ Building “knowledge” and “learning” culture
  - ✓ Marketing success to secure political and public support
- **Ensuring accountability**
  - ✓ Demonstrating results against money spent
  - ✓ Providing evidence that the program is producing desired benefits

In order adopt Result- based M&E System the organisation must have to prepare a “Result Framework”.

A results framework represents the underlying logic that explains how the development objective of a project is to be achieved. This is achieved by translating the **results chain (PI. See figure 2)** of an intervention into indicators that measure the degree to which inputs are being transformed into specific activities and outputs, and the degree to which a relevant target population is using those outputs as the anticipated outcomes of the project

**Result Chain:**

The **causal link** or **theory of change** for an intervention:- How inputs, activities, and outputs link to different levels of outcomes.

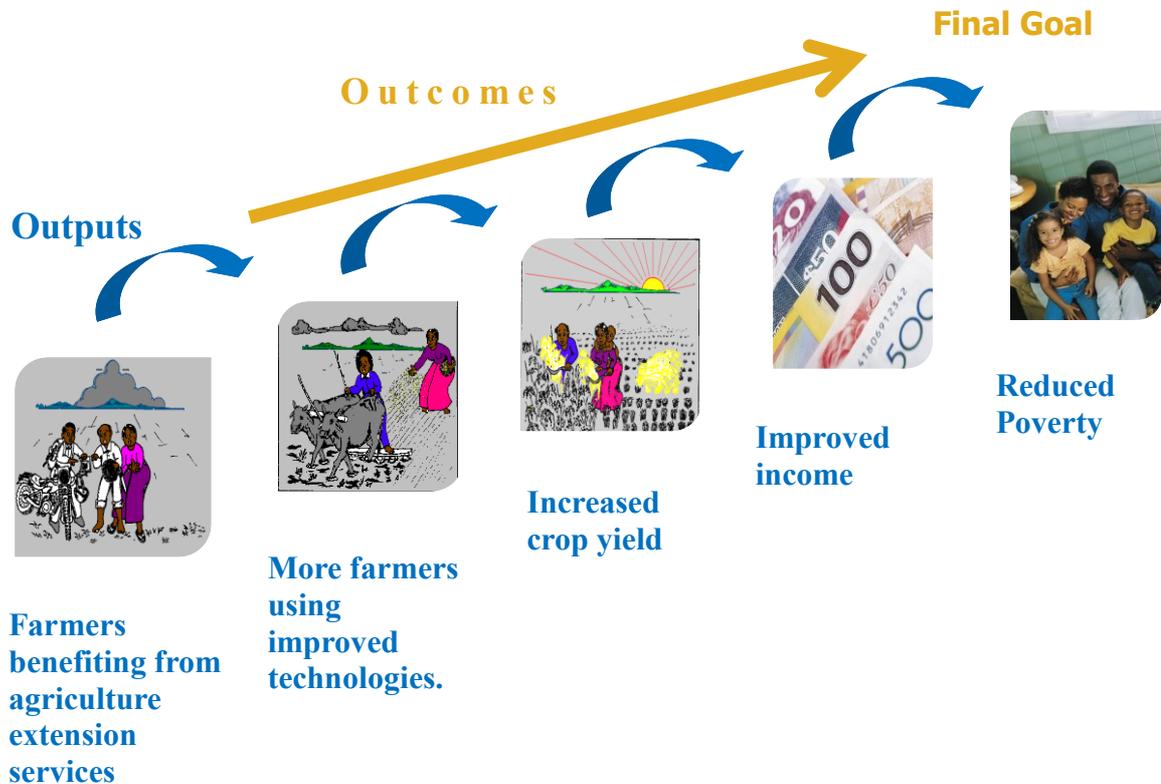


**Figure-2**

While a results chain shows a causal relationship over time, it is not a simple linear process. There are many external factors that may affect the results of the intervention, especially at outcome and impact levels.

**Result Chain in Agriculture:** For clear understanding on result chain we may take an example agriculture sector

# Results Chain: Agriculture



## *Building a Results-based M&E System*

Although experts vary on the specific sequence of steps in building a results-based M&E system, all agree on the overall intent. Regardless of the number of steps, the essential actions involved in building an M&E system are to:

- Formulate outcomes and goals
- Select outcome and intermediate indicators to monitor
- Gather baseline information on the current condition
- Set specific targets to reach and dates for reaching them
- Regularly collect data to assess whether the targets are being met
- Analyze and report the results.

## ***Conclusion***

To sum up it can be concluded that Results-based M&E systems are a powerful public management tool that can be used by governments and other organizations to demonstrate accountability, transparency, and results. It can help to build and foster political and financial support and harmony for common policies, programs, and projects. And can help the government to build a solid knowledge base. Importantly, results-based M&E systems can also bring about major economical and cultural changes in the way governments and organizations operate—leading to improved performance, enhanced accountability and transparency, learning, and knowledge. Results-based M&E systems should be considered a work in progress. Continuous attention, resources, and political commitment are needed to ensure the viability and sustainability of these systems. Building the cultural shift necessary to move an organization toward a results orientation takes time, commitment, and political will. Building and sustaining a results-based M&E system takes time and effort. No system is perfect, and there are many different approaches, but the journey is worth the effort and the returns can be multiple.



***To understand God's thoughts we must study statistics, for these are  
the measure of his purpose.***

***Florence Nightingal***

# ***Quality Assurance of Official Statistics: An Approach to Strengthening Statistical System***

*“Statistics is the science, technology and art of developing human knowledge through the use of empirical data and its use in decision making”:*

***Prof C.R.Rao***

***Sri Rajaballav Kar***

***Md. Feroz Khan***

## ***Abstract***

*Official Statistics helps in informed decisions that affect the lives of the public. It is therefore evident that reliable official statistics is essential for good public management. In 1994, United Nations Statistical Commission unanimously adopted a statement of Fundamental Principles of Official Statistics, which are considered as basic framework which all statistical agencies should follow in recognizing official statistics as public good. These Fundamental Principles were formally adopted through a decision of the Union Cabinet of India on 4th May 2016 and notified in the Official Gazette on 15th June 2016 of Govt of India. Thus steps have been taken by different international bodies and Government of India to enhance integrity of official statistics, and make it trustworthy.*

***Keywords :*** *Official Statistics, Quality Assurance, CSO, Fundamental Principles of Official Statistics*

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## ***Introduction***

The Government Departments are the major producers of official statistics, which are being used in various decision making processes. In addition to survey and census data, they are also essential for understanding economy, our society and performance of the government. It is therefore necessary that good quality official statistics are necessary for proper functioning of the state. Of late the statistical organizations have been moving towards an increased use of official statistics which reduces respondent burden on primary data suppliers and to reduce cost of data collection.

The Central Statistical Office (CSO) at the national level and Directorate of Economics and Statistics (DES) at the State level play a pivotal role in production and

dissemination of official statistics covering for example, the economy, employment, population, infrastructure, education and health etc.

Despite various efforts of statistical agencies to improve the systems, certain systemic deficiencies continue to exist in the statistical system, which raise questions on the credibility of official statistics. According to National Statistical Commission report<sup>3</sup>, these deficiencies are

- Existence of gaps in availability of needed information;
- Delays in publication of results;
- Large and frequent revisions of published results;
- Gross discrepancies between official statistics from different sources; and
- Lack of transparency in statistical operations.

Due to these deficiencies, the user organizations have concerns whether final output is suitable for their purposes. To bring out improvement in statistical system as well as ensure official statistics to follow professional and scientific standards, United Nations Fundamental Principles of Official Statistics has been adopted by the Ministry of Statistics and Programme Implementation, Govt of India during 2016. This paper discusses on the draft national policy on official statistics including quality assurance of official statistics prepared by Govt of India and put in public domain for comments.

### ***Fundamental Principles of Official Statistics: A National Policy***

Official statistics are public goods and therefore they must comply with certain basic principles like professional independence, impartiality, relevance and transparency about methods, data collection and dissemination. These principles have been placed in UN fundamental principles of official statistics. The UN General Assembly adopted a resolution concerning the Fundamental Principles of Official Statistics during 2014 which provide sound guidelines for professional statisticians for impartial practices based on scientific principles and quality standards. The ten principles are :

1. Official statistics to be made available to public on impartial basis.
2. It must be trustworthy
3. Information present by statistical agencies should follow scientific standards on the sources, methods and procedures.

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<sup>3</sup>Report of National Statistical Commission, 2001 by Dr C. Rangarajan

4. The statistical agencies are entitled to comment on erroneous interpretation and misuse of statistics.
5. Use of different sources of statistics following quality, timeliness, costs etc.
6. Data collected should be kept confidential and strictly used for planning purposes.
7. The laws, regulations and measures under which the statistical systems operate are to be made public.
8. Coordination among statistical agencies within countries is essential to achieve consistency and efficiency in the statistical system.
9. Use of concepts, classifications and methods promotes the consistency and efficiency of statistical systems at all official levels.
10. Bilateral and multilateral cooperation in statistics contributes to the improvement of systems of official statistics in all countries.

These Fundamental Principles were formally adopted through a decision of the Union Cabinet of India on 4<sup>th</sup> May 2016 and notified in the Official Gazette on 15<sup>th</sup> June 2016 of Govt of India.

### ***Official statistics as core statistics and other official statistics***

Official statistics with large domain and are of national importance and critical to economy, may be designated as core statistics. These statistics needs much attention and be produced according to used needs in respect of quality and timeliness, and therefore will have the following characteristics.

1. They should be of national importance.
2. It is be mandatory for the Government at all levels to collect and disseminate them.
3. They should conform to prescribed definitions, concepts and standards.
4. They should be updated periodically, with suitable periodicity to be determined.
5. They should be available at both aggregate and disaggregate levels, wherever appropriate.

The core statistics include eight sectors like National Income, Production and services sector,

#### ***Mission of Official Statistics 10 Fundamental Principles of UN:***

1. *Significance, Impartiality and Accessibility,*
2. *Professional Standards and Ethics*
3. *Report and Transparency*
4. *Misuse Prevention*
5. *Sources of Official Statistics*
6. *Confidentiality*
7. *Legislation*
8. *National Co-ordination,*
9. *Use of International Standards*

Budgetary transactions, Money and banking, Capital market, Indices, External sector, Demography, Social and Environmental sector. Each sector consists of different indicators and sources.

The policy initiatives on core statistics at national level are

- Production of core statistics with optimum use of resources and their release, as per a pre-announced calendar, free from Government influence will be ensured.
- The Generic National Quality Assurance Framework (NQAF) endorsed by the United Nations Statistical Commission would be promoted for adoption in respect of core statistics. Further measures to ensure quality, credibility, timeliness and public trust in respect of core statistics will be evolved to enforce national quality standards on core statistics, such as standard statistical concepts, definitions, classifications and methodologies.
- Statistical audit will be exercised over the core statistical activities to ensure quality and integrity of the statistical products;
- Nation-wide strategies for collection, tabulation and dissemination and for ensuring statistical co-ordination among the different agencies involved on core statistics will be evolved and monitored for implementation from time to time.
- The National Statistical Office (NSO) will collect or arrange to collect core statistics. Data collection under the provisions of the Collection of Statistics Act, 2008, to protect the identity of data providers and confidentiality of data, will be promoted.
- The nodal officers designated in Departments will be made professionally responsible to Chief Statistician of India (CSI) on core statistics.
- The NSO will publish, as per pre-announced calendar, core statistics along with critical analysis regarding the quality of data and implication of the use of data in policy making and administration.
- The Code of Statistical Practice will be promoted for enforcement on a mandatory basis by all the concerned producers in respect of core statistics.
- The NSO will maintain a “warehouse” for core statistics, for dissemination amongst all users in the public and private sectors inside and outside the country and serve as the sole provider of information to foreign Governments, international bodies and United Nations agencies.
- Appropriate institutional and legal arrangements would be made as per this Policy to produce and disseminate core statistics and to conduct statistical audit on core statistics on a regular basis.

## ***Code of Statistical Practice***

Multiple agencies produce statistics on similar characteristics. The Govt departments which produce data have no way by which release of a statistical product could be expected by a certain time. Sometimes data are disseminated without disclosing the sources and methodology, which creates confusion among the users. When statistical report is disseminated without availability of unit level data, users may not believe in the product and therefore they are satisfied with the aggregate tables. To address those issues, some principles have been laid down under code of statistical practice in the draft policy.

- **Collection of data:** The informants should be informed about the purpose of collection of data, manner of dissemination and its accessibility.
- **Release of reports and unit level data:** Each statistical agency shall publish a calendar of release of statistical output. In case of deviations, the reasons may be provided. The unit level data relating to the reports may also be uploaded in public domain with detail meta data, methodology, estimation process, sources, multipliers, contact details etc.
  - In case of change in methodology and concepts in the present publications, the same may be put up in separate section.
  - For periodical release of key statistical indicators, whether revisions made in the figures already released, impact of revision in terms of percentage change, date of next release etc may be mentioned.
  - All releases in respect of surveys may be provided with sampling errors
  - The mechanism for receipt of complaints / queries from users / informants need to be evolved and made public.

## ***Quality Assurance***

The quality of survey and census activities is being monitored through field inspections during data collection, scrutiny and validation of data. Statistical products which are regularly produced require statistical audit through an external expertise for improvement in its quality. The generic national quality assurance framework (NQAF) of UNSC is being referenced among the countries to bring enhancement in the quality system. The Ministry of Statistics and Programme Implementation, Government of India also adopted the above guidelines and notified it in the Gazette of India during April, 2018.

According to guidelines, NQAF is to be applied in each statistical product and each organization shall take steps to promote compliance to NQAF through incentives/ awards.

## What is NQAF?

The NQAF has been prepared in response to the decision taken by UNSC in 2010. It aims to improve the quality of all statistical products and provide benchmarks or quality criteria for dissemination of statistical data. It is a guideline for statistical organizations, describing what each needs to do to meet quality criteria. The NQAF framework is arranged in five sections.

**Figure 1 : Five sections of National Quality Assurance Framework**



The Quality Assurance Guidelines have four components and each component is further divided into sub-components of 19 parameters. Each statistical output has to be mapped on the quality assurance guidelines. The details are as follows.

**Table 1 : Quality Assurance Guidelines**

S.No	Components of NQAF	S.No of Parameter	Parameter
1	Managing the Statistical System	1	Coordinating the national statistical system
		2	Managing relationships with data users and data providers
		3	Managing statistical standards
2	Managing the Institutional Environment	1	Assuring professional independence
		2	Assuring impartiality and objectivity
		3	Assuring transparency
		4	Assuring statistical confidentiality and security
		5	Assuring the quality commitment
		6	Assuring adequacy of resources
3	Managing statistical processes	1	Assuring methodological soundness
		2	Assuring cost-effectiveness
		3	Assuring soundness of implementation
		4	Managing the respondent burden
4	Managing statistical outputs	1	Assuring relevance
		2	Assuring accuracy and reliability
		3	Assuring timeliness and punctuality
		4	Assuring accessibility and clarity
		5	Assuring coherence and comparability
		6	Managing metadata

- **Coordinating the national statistical system:** The CSO at the national level and State DES at state level are the nodal organizations to coordinate statistical activities. The national/state statistical organization has to establish communication and continuous coordination within its statistical systems with different departments, data users and suppliers through meetings, agreements, distribution of statistical outputs, review of data sources etc for accurate reporting.
- **Managing relationships with data users and data providers:** The relationship between statistician and data provider is crucial to production of high quality statistics. Regular contact with data providers, face to face meeting will build confidence among the data providers who will report accurate data.
- **Managing statistical standards:** The standards include concepts, methods and design of data collection, processing and editing of data etc , should be clearly defined. The accepted theory and methods must be used to derive model based estimates and projections. Error of the estimates must be calculated and disseminated. This will support appropriateness of the estimates. Due to use of different methods by statistical organizations, the users are often confused on the estimates.

For example, the Census of India had released population projection up to 2026 for different states in 2006 based on 2001 data using Component Cohort method i.e.,

$$P(t+n) = P(t) + B(t) - D(t) - I(t) - E(t)$$

Where  $P(t)$  is the population at time  $t$ ,

$B(t)$  and  $D(t)$  are number of births and deaths occurring between  $t$  and  $t+n$ .

$I(t)$  and  $E(t)$  are the number of immigrants and of emigrants from the country during the period  $t$  to  $t+n$ .

At the same time Central Statistics Office releases projected population based on exponential method, which is  $P(t) = P_0(1+r)^t$ , where  $r$  = rate of growth

Both the results are different and create confusion among the data users. This should be standardized and a single method may be used.

- **Assuring professional independence:** Each statistical organization should be professionally independent to release and disseminate statistical output. It should have the exclusive authority to decide methods and free from political and other interference in compiling statistics. This will not affect quality of statistics.
- **Assuring impartiality and objectivity:** It explains that compilation of statistics should be objectively done following common standards.
- **Assuring transparency:** The statistical information and methods used should be publicly available.
- **Assuring statistical confidentiality and security:** The quality of statistics largely depend on the cooperation of informants. To gain public trust, the information(micro data) should kept confidential.
- **Assuring the quality commitment:** The statistics released should be quality assured and explained to the users. The agency has sufficient insight into any data quality issues and their impact on decision making.
- **Assuring adequacy of resources:** The resources available to the statistical authority are sufficient to meet the statistical needs and would be helpful to carryout activities smoothly.
- **Assuring methodological soundness:** Statistical agency should use sound methodologies based on internationally agreed standards and best practices, otherwise there will be problems for decision makers in acceptability of the product.
- **Example-** Projection of Head count ratio of poverty for the state Odisha in MDG country report was based on linear trend model. The summary of the report is that the Odisha has not achieved the MDG target for 2015. The above procedure was verified by the DES, Odisha and it was suggested to use exponential growth model. The finding was that Odisha has surpassed the target of MDG.
- **Assuring cost-effectiveness:** Good quality administrative data are cost effective from statistical collection. Working with departments to use their records should be the key focus of the statistical agency.
- **Assuring soundness of implementation:** In order to produce timely, reliable and accurate statistics, a statistical agency should carefully plan the implementation process of its statistical activities. Each activity of the project has to be outlined in order of its execution with time line so that one can see tasks are progressing in real time. Graphical tool like gantt chart may be used showing activities performed against time.
- **Managing the respondent burden:** The most crucial part of statistical activity is data collection in survey and census, where respondent plays key role in providing data. The cooperation of the respondents has to be established for collection of

quality data. Efforts may be made for maximum use of administrative data to avoid load on respondents. This will increase analytical value of official statistics.

- **Assuring relevance:** It should be ensured that statistics released not only for the sake of production of data, but also provide service to the society. So each agency has to explain the significance of the results released and make analytical comments where necessary.
- **Assuring accuracy and reliability:** The accuracy and reliability of the results may be assessed by comparing with past data and data from other sources. Even in different stages of production, reliability of data may be evaluated. Expert advice through meetings may be obtained on the statistical products to ensure reliability of data. Each report/product based on surveys may be accompanied with measurement of errors.
- **Assuring timeliness and punctuality:** A time calendar for each activity may be prepared and announced and accordingly it may be ensured to release estimates / reports within time line for use in planning process.
- **Assuring accessibility and clarity:** The statistical procedures adopted should be mentioned clearly. Any deviations from internationally accepted standards and good practices may be reported with reasons.
- **Assuring coherence and comparability:** The concepts, definitions etc based on national / international standards should be strictly followed. The coherence and comparability of data may be promoted throughout statistical agency by adopting national / international standards.
- **Managing metadata:** Metadata plays a vital role in both the development and use of statistical information. The production of information requires that data and metadata be viewed as a totality rather than individually; thus, metadata management must be seen as an integral part of statistics production. It will useful to prove insight on each statistical output and its quality.

## ***Challenges and Conclusion***

Quality assurance of official statistics is an ongoing process to assess the fitness of data to serve their purpose. It covers the entire statistical production process and involves monitoring data quality over time and reporting on variations in that quality. Post-collection quality assurance methods, such as data validation, are an important part of the quality assurance process.

The practices followed by the statistical agency may be mapped with quality assurance framework and deficiencies may be identified. The organization's priority

regarding NQAF and quality assurance work may be indicated. Each organization has to be encouraged to express its needs and expectations and give feedbacks on the methods and standards followed at national and international level. Training and capacity building of statistical personnel need be organized at regular intervals to ensure efficient implementation of guidelines of official statistics.

***Reference :***

*Draft National Policy on Official Statistics, MOSPI, 2018, Government of India*

*Statistics for the people ? the role of official statistics in democratic debate. R. Bumpsted and Richard Alldritt, August, 2011*

*Gazette of India Notification No-124 dated 06.04.2018*

***“It is not difficult to see what is wrong with official statistics in India. There is a gap between theory and practice”. – Mahalanobis***



***“All models are wrong, but some models are useful.”***

***George E.P.***

# *Quality Assurance in Statistical activities at district level of Odisha*

*Bimbadhar Sethy*

## *Abstract*

*This article is brief collection of statistical activities at district level statistical system of Odisha on the process of quality assurance.*

**Key words:** SPC, EARAS, NSS, CPI

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Quality Assurance is a management method that is defined as all those planned and systematic actions needed to provide adequate quality returns. The goal of quality assurance and quality control is to identify & implement sampling & analytical methodologies.

**Statistical Process Control (SPC)** is a method of quality control, which employs statistical method to monitor and a control process. This helps to ensure that the process operates efficiently producing more specification-confirming products with less waste (rework or scrap). Statistical process control can be applied to any process where the “confirming product” (product meeting specifications) output can be measured. Key tools used in SPC include run charts, control charts, a focus on continuous improvement and the design improvement, and the design of experiments.

An advantage of SPC over methods of quality control such as “inspection” is that it emphasizes early detection and prevention of problems rather than the correction of problems after they have occurred. In addition to reducing waste SPC can lead to a reduction in the time required to produce the product. SPC makes it less likely the finished product need to be reworked or scrapped.

## ***EARAS (Establishment of an Agency for Reporting Agricultural Statistics)***

In statistical system, sampling is an important tool of quality assurance. Prior to 2016-17 the Crop cutting experiment (CCE) in EARAS scheme was done in the field and relevant data was collected & filled up in the prescribed format. In this method, there is every

possibility of changes of selected plot and manipulation of data. However, after introducing of PMFBY such type of lapses can be curtailed. All plots of the sample villages are Geo tagged. The CCE experiment cannot be done in a wrong plot. Again, at the time of CCE 4 numbers .of photo is essential. These photos are also Geo tagged. There is also a chance of manipulation on CCE result. After introduction of PMFBY Such type of mistakes could be curtailed. Considering Kalahandi, out of 1723 numbers .of CCE 1523 numbers of CCE are sent in Mobile App from. By adopting this quality, assurance of all statistical schemes have been improved. It is also equally adopted in all the districts of the state.

In the field of conducting national sample survey, consumer price index also quality assurance is also adopted to ensure better result.

### ***National Sample Survey***

The National Sample Survey(NSS) set up by the Government of India in 1950 to collect socio-economic data employing scientific sampling methods will start its 75<sup>th</sup> round from 1<sup>st</sup> July 2017.The survey will continue up to 30<sup>th</sup> June 2018. NSS 75<sup>th</sup> round will cover the subject “Household Consumer Expenditure & Household Social Consumption, Health & Household & Social Consumption, Education. All these three subjects to be covered in this round are the prime source of statistical indicators on social consumption and wellbeing, level of living and inequality thereof. Earlier the primary investigators were collecting the data in the specific schedule and it was sent to the directorate Economics and statistics for data entry and validation. However, in the present method the investigator collecting data by using laptop or schedule and data entry is made in district level. After validation in the district level the data are sent to the directorate for finalization of the result. By this method there is improvement in quality feedback from field level.

### ***Consumer price index***

Market price is a prime indicator of state economy. Market price and consumer price index is another important work done by statistical department. Earlier existing producer price, wholesale price and retail price of different consumer items in urban and rural markets were collected in specific formats in the district level. Basing this data in the state level consumer price index was prepared annually. This was of little help to know the trend. However, at present there is change in the system improving quality. Now in the district, level besides data collection, computerization and validation is done and consumer price

index is prepared every month in the district level. It is going a long way to know the market trend of different areas. This step taken in Odisha is highly appreciated by other states of the country. In Kalahandi district to prepare Consumer price index, market price is compiled from data collected from 2 urban and 6 rural markets.

### ***Statistical Hand Book***

Statistical handbooks are prepared to highlight different information of the district which is helpful in the planning process and for scholars as well. Earlier it was prepared in the state level once in 2 years. But to make it more effective it is now decentralized and is prepared in the district level.



***The coming century is surely the century of data.***

***David Donoho***

# ***Quality assurance linkage with sample size: An illustrative study on Socio-economic Statistics of Odisha***

***Dr. Sujata Priyambada Parida***

***Sri Akshaya Kumar Routray***

## ***Abstract***

*This paper reflects the vibrant role of adequate sample size for reliable estimates in the field of socio-economic Statistics. Using one example socio-economic survey results the quality of data has been analysed with linkage to sample size.*

***Key words:*** *Sample size, RSE, SAS, NSSO and DES.*

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## ***Introduction***

To determine the reliability of a desired parameter or hypothesis for a large population inevitably depends upon the sample size and its representativeness. A sample size that is too small reduces the power of the study and increases the margin of error, which can condense the study meaningless. The agencies and planners may be compelled to limit the sample size for economic and man power constraint. To ensure meaningful results, they usually adjust sample size based on the required confidence level and margin of error, as well as on the expected deviation among individual results.

## ***Background of Socio-economic survey in Odisha***

The father of Indian Statistics Prof P. C. Mahalanobis established the National Sample Survey Organisation (Now it is National Sample Survey Office) in 1950 to coordinate statistical activities in India with objective of providing comprehensive socioeconomic statistics for policy formulation. He introduced innovative applied techniques for conducting large-scale sample surveys for important topics like Household consumer expenditure, employment and unemployment situation, Situation assessment survey on agricultural households etc. by using the method of random sampling. As agency of state government, Directorate of Economics and Statistics, Odisha has been participating

in National Sample Survey on matching sample basis since 1958. The sample surveyed by National Sample Survey Office (NSSO) is called as “central sample”. Another sample surveyed by DES, Odisha is called as “state sample”.

### ***Role of Sample size at sub-state level estimation***

The development policies of Government and other agencies are now giving more emphasis on the Region and District level planning. The demands for sub-state level estimates are increasing day by day. But here the inadequacy of sample size is the main barrier. With limited cost and manpower sample size cannot be increased. NSSO or State DES cannot release sub-state level estimates due to high sampling error.

Keeping in view the growing demand, National Statistical Commission (NSC) constituted a committee on Pooling of Central and State sample data of NSS under the Chairmanship of Prof. R. Radhakrishna on July, 2010. Therefore to increase the sample size with existing man powers pooling of central and state sample data was the only step suggested by NSC. The state DES has taken the responsibility of pooling from 2010 onwards with the prime objectives of is to get more reliable estimates at sub-state level like regions or districts.

### ***Illustrative study***

We may take an illustration of sub state level results on SAS(Situation Assessment Survey) of agriculture households of Odisha surveyed by NSSO and DES during NSS 70<sup>th</sup> round (January 2013 to December 2013) was conducted to have a comprehensive picture of the agricultural households in Odisha . During the survey data were collected on various aspects of farming and level of living measured in terms of household consumer expenditure, income and indebtedness from the agricultural households in rural Odisha. The survey made a detailed assessment of the situation of the agricultural households for the agricultural year July 2012-June 2013.

At present income from agricultural households is one of the burning parameters for state and sub state level planning in the concerned field. Although there are many limitations in the survey concepts and problems of non-sampling error, to get the exact income of

farmer's household in Odisha, this survey result is the only one source to get it at some extents. Recently, DES, Odisha has released the pooling report of 70<sup>th</sup> round on SAS in which sub-state level estimation has been estimated.

### ***Sample size and reliability***

The survey was conducted in rural sector only. The sample villages were drawn from the sampling frame of 2011 census villages. From the large frame of villages only 214 sample villages were drawn for state sample and 214 villages for central sample. Both agencies have estimated the state level results. With this sample size the relative standard error i.e RSE(%) has been estimated for both central and state sample . Again by pooling two samples the sample size increased to double i.e for pooled sample the *total sample size is 428*. With certain criteria 8 agriculture households were surveyed from each sample villages as per availability. Following the guidelines of SDRD (Survey Design Research Division) the samples were drawn and estimation has been made by the agencies. If we choose the indicator as average income of per agricultural households in rural Odisha, we get the following results of reliability in terms of Relative Standard Error ( RSE )(%)

***Table1: RSE (%) for average income of per agriculture household at state level***

State	Central	State	Pooled
ODISHA	5.12	4.88	3.60

From the table it is obvious that the estimation is reliable in both central and state sample for state level estimation but the result is more reliable for pooled sample of more sample size. *According to the pooled sample estimate of average income per agriculture household is Rs. 4837.70. The result is ensured with quality having less than 5% RSE.*

Now for district level reliability the sample size with sample villages distribution is given in the table2. Also table 3 shows the district level reliability in RSE (%)

**Table 2: (District level sample size distribution)**

SL No	Name of the District	Centre	State	Pooled	SL No	Name of the District	Centre	State	Pooled
1	Bargarh	8	8	16	16	Nayagarh	6	6	12
2	Jharsuguda	4	4	8	17	Khurdha	8	8	16
3	Sambalpur	4	4	8	18	Puri	10	10	20
4	Deogarh	4	4	8	19	Ganjam	10	10	20
5	Sundargarh	8	8	16	20	Gajapati	4	4	8
6	Keonjhar	10	10	20	21	Kandhamal	4	4	8
7	Mayurbhanj	10	10	20	22	Boudh	4	4	8
8	Balesore	10	10	20	23	Sonepur	4	4	8
9	Bhadrak	8	8	16	24	Bolangir	10	10	20
10	Kendrapara	8	8	16	25	Nuapada	4	4	8
11	Jagasinghpur	6	6	12	26	Kalahandi	10	10	20
12	Cuttack	11	11	22	27	Rayagada	6	6	12
13	Jajpur	11	11	22	28	Nabarangpur	8	8	16
14	Dhenkanal	6	6	12	29	Koraput	8	8	16
15	Anugul	6	6	12	30	Malkangiri	4	4	8

**Table 3: Reliability of results at district levels in term of RSE (%)**

SL No	Name of the District	Central	State	Pooled	SL No	Name of the District	Central	State	Pooled
1	Baragarh	18.03	22.33	14.02	16	Nayagarh	23.49	33.47	20.58
2	Jharsuguda	47.6	53.86	35.68	17	Khurdha	9.07	21.47	12.48
3	Sambalpur	29.43	46.2	26.34	18	Puri	30.13	22.83	20.82
4	Deogarh	39.93	26.94	25	19	Ganjam	48.54	32.04	31.03
5	Sundargarh	29.67	14.4	20.78	20	Gajapati	41.48	26.99	28.01
6	Keonjhar	10.94	18.89	10.53	21	Kandhamal	19.81	37.28	22.03
7	Mayurbhanj	11.56	5.55	6.37	22	Boudh	45.4	37.22	28.99
8	Balesore	18.3	20.58	14.23	23	Sonepur	51.45	29.36	34.62
9	Bhadrak	27.07	27.4	19.63	24	Bolangir	12.66	20.95	11.55
10	Kendrapara	21.4	33.29	22.22	25	Nuapada	28.27	26.65	19.55
11	Jagasinghpur	19.51	30.74	16.48	26	Kalahandi	24.32	40.71	22.83
12	Cuttack	37.5	12	15.25	27	Rayagada	36.66	22.96	22.55
13	Jajpur	18.19	16.63	12.49	28	Nabrangpur	14.97	16.03	11.24
14	Dhenkanal	25.39	9.26	19.12	29	Koraput	18.21	15.11	12.02
15	Anugul	7.21	30.49	14.41	30	Malkangiri	20.42	54.25	26.67

From table3 it is clear that the RSE (%) is very high in many cases for both central and state sample. But while coming to pooled sample the RSE (%) is comparatively less than others because of more sample size. But still it is more than 30% in some districts for pooled sample also. So the pooled sample size is also not adequate for district level also in some cases.

Now to get better quality estimates at sub-state level, regional estimation has been made by grouping some districts according to geographical contiguity. The regions are called as NSS regions of Odisha. The NSS Regions are *Coastal, Northern and Southern* regions. The coastal region consisting of nine districts, i.e. Khurda, Puri, Nayagarh, Cuttack, Jajpur, Jagatsingh pur, Kendrapada, Balasore & Bhadrak. The southern region consisting of twelve districts i.e. Ganjam, Gajapati, Kandhamal, Boudh, Raygada, Nabarangpur, Koraput, Malkangir, Balangir, Kalahandi, Nuapada, Subarnapur. Similarly Northern region consisting of nine districts, i.e. Sambalpur, Sundargarh, Bargarh, Jharsuguda, Deogarh, Keonjhar , Angul, Mayurbhanj & Dhenkanal. By grouping the districts the sample size will be according to the additive rule using table 2. Now at region level the results of RSE (%) have been obtained as follows (table 4).

**Table 4: RSE (%) for average income of per agriculture household at Region level**

Region	Central	State	Pooled
Coastal	8.4	7.52	5.6
Southern	10.06	9.54	6.95
Northern	7.44	7.34	5.3

From the table it is obvious that the estimation is reliable for pooled sample with error less than 7% in terms of RSE. Statistically one can ensure on the quality of estimates at region level. *According to the pooled sample estimate of average income per agriculture household is Rs. 4382.36, Rs.4703.94.and Rs 5618 for coastal, Southern and Northern regions respectively. The estimates are ensured with quality having less than 7% RSE for pooled sample of double size to other samples.*

### **Conclusion**

With the illustrative study from Socio-economic survey estimates it is very vibrant about the role of adequate sample size in quality assurance of Statistics. The power of a study

depends on the size of the effect because large effects are easier to notice and increase the power of the study. The power of the study is also a gauge of its ability to avoid sampling and non-sampling errors. A sample size that is too small increases the likelihood of errors skewing the results, which decreases the power of the study.

### ***Reference***

*Sub-State Level Estimation on Income & Indebtedness of Agricultural Households of Rural Odisha, DES, Odisha (2018)*



***“Statistics is the budget of things; and without a budget  
there is no public safety”***

***Napoléon Bonaparte***



**" Statistics must have a clearly defined purpose, one aspect of which is scientific advance and the other human welfare and national development."**

**- By Prof. P. C. Mahalanobis**

Professor Mahalanobis (1893-1972) is one of the pioneers who laid the foundation of statistics as separate discipline. He considered statistics as new technology which can be applied to any field of human endeavour. His birth anniversary is being commemorated as Statistics day throughout India.