STATISTICAL QUALITY CONTROL IN GOVERNMENT OPERATIONS

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I. Introduction

The need for an efficient and economical tool for assessing and controlling the quality of results in man's varied activities stems basically from four interacting factors: (1) the "constant inconsistency" of human behavior, (2) stringency of time, (3) financial restraints, and (4) the dearth of manpower resources for the performance of specialized tasks and functions. Furthermore, the restraining effects of these factors on efforts to attain certain quality standards have been continuously magnified by the growing complexity of man's social, political, and economic wants.

Happily, just as knotty problems have cropped up in an increasingly sophisticated society in a great number of situations so has man also come up with refined, precise tools and techniques to bear on such problems for their solutions. Indeed, in not a few fields of study, the developmental pace for new tools, techniques and models has far out-stripped their "global" application. The field of statistics, particularly statistical quality control as a branch, has not been an exception to this proliferation of cases where exists an unnecessarily great lag between the birth of an experimentally tested technique and its application towards the solution of time-consuming and expensive problems.

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In this paper an attempt is made to assess the progress made in the application of quality control measures in the Philippines, particularly in the government service, with the view to indicating possibilities and directions for the improvement of the quality of various processes employed in government operations.

II. Points of Reference

There are two broad areas of activity where quality control techniques have been and may be applied. One is in the production of physical goods in plants while the other is in the processing of documents, administrative files and records, and papers containing collected information and data in offices. Although the objectives are similar in both areas, techniques slightly differ. In the plant, the work on quality control almost always centers on the measurement of certain characteristics of a product with a margin of error for variations due to materials, processes, and equipment involved. These variations are then charted to serve as a guide as to whether the process or quality is within specified standards. In the office, the work concentrates primarily on the existence or non-existence of an error or errors in the processing of papers. It is in this latter area of application that this paper is concerned.

Specifically, quality control on paper work or clerical quality control relates to the maintenance of some prescribed routines, the departure from which forms the basis for the institution of quality control measures. Such departure may be an error in typing, posting, coding or calculation; or it may be some form of disturbance which inhibits the smooth, fast, and efficient flow of paper work.

Whatever type of error or departure is involved, the situation becomes more severe with the increase in the sizes of business and office organizations. With the introduction of the division of labor and its concomitant effect, individual workers oftentimes fail to comprehend the interrelationship

of information, data, and figures in the whole office or business setup, precluding the early detection of errors and the like.

Hence, there is a need for a system by which the results of clerical work may be assessed quickly and continuously and before the quality of work is seriously affected. Experiences have shown that the application of quality control techniques has resulted in the following:

1. the early discovery of inaccuracies and tracing of their causes,
2. economy in inspection cost,
3. more precision in the control of quality in general, and
4. the injection into the worker's psychological make-up of a sense that the importance of his work in the maintenance of standards is continuously being appreciated.

Some aspects of office activity on which quality control techniques may be applied are consistency checks, error detection at latter stages, stratification, verification of each item of output, verification of a sample of items of output, and others.

To gain maximum advantages such as cited above, quality control, as a specialized technique, has to be based on some probability sampling schemes. In this regard, provided that the aggregate of items called population under study is homogeneous and the sampling is random, the effectiveness of the sample depends on its size and not on that of the population. However, the size of the sample has to be of considerably lower magnitude than the population itself so as to offer advantages over a 100 per cent inspection or verification, particularly on cost. The types of sampling usually used in clerical quality control are sequential sampling and acceptance sampling where the sample is accepted or rejected on the basis of set levels of errors.

Either type of sampling requires two impositions. One is the formulation of rules to follow in the unitary identifica-

tion of errors; the other is the setting of levels of errors on which the action to accept or reject the sample is based.

The application of quality control measures in government offices will now be appraised using as basis the above points of reference.

III. Basis of the Study

With a view of obtaining some ideas on the quality control measures employed in government offices, a mailed questionaire survey was undertaken by the Office of Statistical Coordination and Standards (OSCAS) of the National Economic Council. The survey started on February 24, 1965. The deadline for submission was set on March 8, 1965. However, a few survey forms arrived as late as April 28, 1965. Questionnaire contents were grouped into three headings, namely: (1) quality control measures currently employed, (2) quality control measures planned to be instituted, and (3) remarks on the need for instituting quality control measures in current operations and an assessment of problems faced in instituting the required quality control measures.

The first and second parts, quality control measures currently employed and those planned to be instituted elicited the following information: name of quality control measures, objectives, techniques and devices employed, and remarks on the organizational set-up and results.

Questionnaires were sent out to 24 government agencies in Manila and environs and 21 responded. The highlights of the results of the aforementioned survey are discussed below.

IV. Quality Control Measures Currently Employed.

It is significant to note that although not all offices from which data and information were obtained were applying statistically designed quality control measures, the survey results indicated a general awareness of the need for scientifically de-

signed quality control measures for effectively attaining and maintaining certain standards of quality. Such an awareness provides the necessary pre-condition for the development of a sound statistical quality control system.

The form of quality control measures employed in the various Philippine government agencies ranges from the simple ocular inspection to the formal application of sampling techniques, specifically, **acceptance** and **sequential sampling**. These quality control measures may be classified by the purposes for which they were instituted. Broadly, they were applied to assess and/or control (1) quality of supplies and materials, (2) quality of completed work, (3) quality of record keeping, and (4) quality and completeness of processing work done.

1. Quality of Supplies and Materials

Under this category may be mentioned control measures being employed by the Bureau of Supply Coordination, the Bureau of Public Works, the Bureau of Public Highways, and the Bureau of Coast and Geodetic Survey.

One of the basic functions of the Bureau of Supply Coordination is to ensure that the quality standards of supplies and equipment procured for the use of national government offices are properly maintained. Samples submitted by bidders are either accepted or rejected on the basis of the test results. However, because of the lack of experts and facilities in the Bureau, the testing is done by the National Institute of Science and Technology. Against prescribed specifications, both the Bureau of Public Works and the Bureau of Public Higways check and test samples of materials to be used in construction work. The tests are performed in their own laboratories by their own personnel. The Bureau of Coast and Geodetic Survey finds it necessary to employ quality control measures as the final results in map making and photolithographing of other geodetic surveys are extremely dependent on the quality of

materials such as chart and map paper, ink, chemicals and graining compounds. It is generally observed that such measures have resulted in the high accuracy and quality, time and money economy as well as a reduction of wastage in the form of misprints, dirtied copies, and curled and torn paper.

2. Quality of Work Completed

Again to be mentioned under this purpose for which quality control measures are instituted are the Bureau of Public Works, the Bureau of Public Highways and the Bureau of Coast and Geodetic Survey. Besides controlling the quality of materials to be used, as a final check these bureaus also undertake positive measures to insure the quality of results.

For the first two bureaus, on-site inspections of completed work to verify compliance to prescribed specifications are undertaken. The Bureau of Coast and Geodetic Survey employs more detailed methods in controlling the quality of results. For press and negative proofs, actual printing is done and the results carefully reviewed. In mass printing of maps, copies are individually inspected to eliminate misprints, dirtied copies and other defective items. In the case of geographical and topographic surveying anl leveling are employed to provide final check on established reference points.

3. Quality of Record Keeping

An excellent example of quality control measures on record keeping is that being employed by the Headquarters of the Philippine Army under the responsibility of the Army Internal Auditor. The specific objective is "to insure that the basic property records as required are accurately maintained by the property accountable officers and items of PA property are picked up into accountability." Under such a responsibility the Army Internal Auditor has to conduct inspections of property records and of physical stock and maintain a complete record of such audit inspections. The unit

commanders are made answerable for whatever deficiencies and errors in record keeping discovered in the course of audit inspection.

The audit inspection is done through a two-pronged **sampling inspection procedure.** One sampling inspection is done on property records and the other on physical stock. For each audit inspection to be complete both sampling inspections have to be undertaken, and independently of each other.

The plan for property records is double sampling with an acceptance quality level of 1% defective. It involves an integrated sampling inspection of debit or credit vouchers, recording of items of property, and accuracy of stock cards. Such a plan was designed on an assumed lot size of 1000. The sampling design is as follows:

	1st Sampling	2nd Sampling
Sample Size	75	150
Acceptance Number	1	5
Rejection Number	6	6

For the first sampling a random sample of 75 is taken consisting of 25 debit or credit vouchers, 25 items of property taken from the 25 vouchers and 25 stock cards corresponding to the 25 items. The 25 vouchers are then checked whether each has been registered in the Master Voucher register. Each voucher not registered thus is counted as one defect. Subsequently, the 25 items from the vouchers are checked against corresponding entries in the stock cards, each item not registered constituting a defect. Finally, arithmetic processes on entries in the stock cards are verified for possible error or errors. Each stock card with error or errors makes up one defect.

With one or no defect, the sample is accepted. With 6 or more defects, the sample is rejected. With 2 to 5 defects, a second sampling of 150 is taken. This second random sample

consists of 50 debit or credit vouchers, 50 items of property from the 50 vouchers, and 50 stock cards corresponding to the 50 items of property. The procedure is the same as that for the first sampling. The bases for action would, however, be 5 or less defects including the defects in the first sample for accepting the sample and 6 or more defects for rejecting it.

The sampling plan for the physical stock is also double sampling with an acceptance quality level of 1.5% defective. In practice this part of the audit inspection is conducted regardless of the result of the sampling inspection of records to record and report the extent of deficiency in the accounting of physical stock.

	1st Sampling	2nd Sampling
Sample Size	75	150
Acceptance Number	2	7
Rejection Number	8	8

The random sample of 75 consists of 45 stock cards and 30 items from the physical stock. The recorded balance in each stock card is then checked against the physical count. Each stock card with a discrepancy with the physical count constitutes one defect. Similarly each physical item not properly taken up in the stock card is considered one defect.

In the case of the first sample of physical stock not being accepted, a second random sample of 150 consisting of 75 stock cards and 75 items from the physical stock is taken. The sample is accepted if the total number of defects including those in the first sample is 7 or less and rejected if total defects number 8 or more.

Acceptance or rejection of the first sample in both sampling plans complete the audit inspection.

Another area where quality control measures are used by the Philippine Army and where accuracy of records against

physical stocks is of primary importance is the appraisal of material readiness. Such measures are applied to determin> the mobilization capability of the service. Sampling inspection procedures similar to those described above are followed in this regard.

Along this line of work, mention may also be made of the quality control program used in the Government Service Insurance System. The work is undertaken for the purpose of determining the quality status of recording of due dividends for distribution and for instituting corrective measures. For the purpose, a random sampling of dividend distribution list and verification of such dividend listing against updated policy and premium records are undertaken.

4. Quality and Completeness of Processing Work Done

This is another area where quality control measures have been used to maximize the effectiveness of limited manpower resources, enhance the quality of information and economize in time in routine checking processes of entries. At present the only office employing such measures is the Bureau of Census and Statistics, particularly its Foreign Trade Division, by the use of **sequential sampling**.

Prior to the adoption of this technique, the processing of customs entries forwarded to the Bureau was verified 100 per cent regardless of their type, volume and value. There was then a great backlog as the routine work consumed a lot of time. To solve this problem the Foreign Trade Division started doing the verification work on a sample basis.

The First step employed was to sort the bundles of customs entries by type. It was observed that there were about 10,500 **formal import entries**, 43,500 **informal import entries**, and 26,500 **export entries** received annually. Since the average value of each export entry was high (about ₱100,000 each), verification of processing work was done on a hundred percent basis for this type.

The formal import entry type was grouped into three, the multi-commodity formal entries as group I, single-commodity formal entries with values of ₱10,000 or more each as group II, and single-commodity formal entries with value of less than ₱10,000 each as group III. The informal import entries composed group IV. Groups I, III and IV constituted 73.6% of all entries but accounted for only 39.8% of the value of all imports while group II made up only 26.4% of all import entries but accounted for 60.2% of the total import value. Thus it was obvious that for accuracy of magnitude and economy in time and manpower, group II had to be verified on a hundred percent basis and sampling verification done on groups I, III and IV.

A table of sample sizes and corresponding acceptance and rejection numbers was prepared. The minimum and maximum sample sizes for acceptance and rejection are 32 and 90 respectively. The sequential sampling plan is as follows:

Sample Size	Acceptance Number	Rejection Number
32	0	6
44	1	7
57	2	8
69	3	8
82	4	9
90	9	10

For the foregoing sample sizes, the quality acceptance level ranges from 1.8% to 6.1% defective.

All other divisions of the Bureau employ quality control measures through verification and inspection on a hundred per cent basis.

5. Organizational Set-up and Results

Almost all government offices currently employing some form of quality control measures do not have organizational

set-ups established definitely for statistical and quality control work. Such personnel having something to do with quality control measures perform their tasks in addition to other duties and functions. Exceptions from this situation obtaining are the Wing Base Commands of the Philippine Airforce and the Supply Center of the Armed Forces of the Philippines which have their Quality Control Unit Statistics Branch, respectively. Nevertheless, as stated earlier, all these offices recognize the need for and the importance of a sound quality control system.

Two fundamental problems involved towards the organization of a compact and specialized unit for the purpose are those of manpower and budgetary limitation. Several offices included in the survey cited the lack of qualified personnel for the institution of statistically designed quality control program as a major drawback in their efforts towards this end. Of late, however, some progress in partially filling this vacuum has been made with the training and formal courses offered by the University of the Philippines Statistical Center. In addition, if plans go through the effort will be accelerated with the opening of an undergraduate course in statistics and the expansion of in-service training to fill in the gap between field operations and theory.

As to the latter problem, it would seem that it has been due to two factors—the real lack of funds for the purpose and the inability of those who have something to do with budget allocation to appreciate the importance of the work for which the amount is to be spent. This problem coupled with that on manpower in a large measure explains the slow progress that has been made so far.

Although there is no definite numerical measure of the gains made in terms of volume and quality of work output, it is felt that all indications point to at least satisfactory results. The problem of checking on the quality of record keeping in a large organization as the Armed Forces of the Phil-

ippines would be impossible without the aid of statistical quality control as has been used by that agency. Similarly, the Foreign Trade Division of the Bureau of the Census and Statistics would have probably accumulated further its backlog had it not been for the application of a sound quality control program.

V. Quality Control Measures Planned to be Instituted

Among the various offices currently employing some form of quality control measures, only a few of them reported plans for the institution of quality control measures. In this regard the advantages and benefits accruing from the use of statistically designed quality control programs seem to have registered with the agencies which have been using sampling techniques in the form of a keener appreciation of their usefulness. As a consequence, the same offices have plans to implement statistically designed quality control programs.

Agencies with such plans are the Philippine Army Headquarters, the Philippine Air Force, the Philippine Navy, the Philippine Constabulary, the Government Service Insurance System and the Department of Public Works. The Philippine Army Headquarters plans to undertake acceptance sampling for checking the "integrity" of inventory records of supplies and materials, serviceability of equipment and ammunitions and the transfer of the accountability between one accountable officer to another. Almost along the same line of objective, the Philippine Air Force is planning to embark on a more extensive quality control work particularly on petroleum, oil and lubricant, metal structure, maintenance and paper work. The Philippine Constabulary, on the other hand, though at present without a quality control program, intends to apply acceptance sampling in its attempt to be up-to-date, and to keep accurate records of "frozen" firearms. The quality control plan of the GSIS will center primarily on the service and policy records which are used for retirement and life insurance valuation. That of the Department of Public Works will

cover property inventory to determine the extent of property and the workability, strength and economy of concrete mixtures.

Summarized, these quality control measures being planned to be instituted fall under the following objectives: to check on (1) the quality of record keeping, (2) the quality of materials, (3) accountability of personnel and (4) status of property.

VI. Summary and Conclusions

Briefly stated, the study brought forth the following points:

1. All offices covered employed some way or another some form of quality control measures.

2. There exists among these offices a keen awareness of the importance of quality control measures in office work.

3. However, only a few of these offices are taking advantage of the economy in time, cost and manpower offered by quality control techniques based on statistical sampling.

4. With the exception of some agencies there are no units organized specifically for statistical work in general and statistical quality control in particular.

5. These two conditions (3 and 4 above) seem to have been due to problems on manpower and funds and the pre-conception in some offices that the application of quality control techniques as a specialized method based on mathematical probability is a greatly involved and complicated affair.

These existing conditions point to a greater scope for the application of statistical quality control in offices. As defined

at the earlier part of this paper, clerical quality control is the maintenance of a prescribed routine, the technique of which is based on statistical sampling. Departure from this routine may either be in the form of errors or delays ni the flow of paper work. In this context such a technique could be made to bear upon the problems of checking the quality of processing work in offices without incurring so great an amount of time and money and a big number of personnel. Among these may be cited the check on the accuracy of import valuation and appraisal against developed standards done in the Bureau of Customs, the verification and inspection of processing work in the Bureau of Agricultural Economics and those in the different divisions of the Bureau of Census and Statistics other than the work on foreign trade statistics, to mention only a few.

It is evident that in whatever type of activity a government office is engaged in as long as chances for the occurrence of errors exist and there is a prescribed quality standard to maintain, there is always a scope for the application of statistical quality control techniques.

Finally, I would like to express my sincerest appreciation to the heads of various government agencies without whose cooperation the difficult task of collecting the basic information and data on the subject would not have been possible and to Mr. Teofilo A. Masulit of the OSCAS for his invaluable assistance in the organization of materials used in the preparation of this paper.

REFERENCES

1. Quality Control In the Office — P. N. Wallis Current Affairs Ltd. — 319 High Holborn, London, W. C. I. — 1st Edition, 1961.
2. Florencia: A Case Study In Data Processing of Population and Housing Censuses, U. S. Department of Commerce, Bureau of the Census, International Statistical Program Office.
3. Feigenbaum, A. V. — Quality Control.
4. Allan, D. H. W. — Statistical Quality Control.