

ISSBN: 2006-0378

Journal of Geography & Development



Volume 7, No. 1,
February, 2017

Table of Contents

Authors	Articles	Page No.
Bibi, Umar Muhammed And Hundu Williams Terseer	A Geospatial Assessment of Accessibility to Road Infrastructure of Rural Dwellers in Katsina-Ala Local Government Area of Benue State, Nigeria	732
E. A. Inuk, A. E. Ubogu and R. O. Yusuf	Determinants of Airline Demand at Nnamdi Azikiwe International Airport, Abuja, Nigeria.	742
Kehinde T. Oyatayo, Kushi D. Zumunta, Godwill G. Jidauna, Christopher Ndabula,	Gumbel's Flood Frequency Probability Analysis Of River Donga, Taraba State, Nigeria	766
Iorkua, S.A., Kerenku, T.A. and I.S. Adaji	Effect of Municipal Refuse Dump on Soil Chemical Properties in, Makurdi, Benue State	783
Ifabiyi, I.P. (Ph.D)	Association Of Drainage Basin Characteristics and Runoff in The Upper Kaduna Catchment, Nigeria.	795
Yahaya, Olanrewaju Yusuf and Issa, Sheu Oladimeji	Farmers Perception of Climate Change Impacts and Adaptation Challenges In Northern Katsina State, Nigeria	809
Abaje, B. I., Olatunde F. A., and Ati, F. O.	Human Health Effects of Ozone Layer Depletion and Interactions with Climate Change: A Review	822
Iroye, K.A. (Ph.D)	Quantitative Revolution in Geography: How Revolutionary was the Revolution?	836
Mage, J.O. Ogwuche, J. and Emaikwu	The Contribution of the Environment to the Burden of Disease in Makurdi Urban Area, Nigeria	845

QUANTITATIVE REVOLUTION IN GEOGRAPHY: HOW REVOLUTIONARY WAS THE REVOLUTION?

Iroye, K.A. (Ph.D)

Department of Geography and
Environmental Management,
University of Ilorin.

Email: iroyekayode@yahoo.com

Abstract

The study traces the origin and development of quantitative revolution in Geography. It observed that the method which originated from United State of America was first introduced into the discipline in the 1950's. However, during the early period of its introduction into Geography, its application did not have the same impact, both in the different aspects of the discipline (Physical/Human) and in the global world at large. Five reasons were adduced for the initial rejection of the technique in the early stage of its introduction. The study however observed that though the approach was first rejected, it is now widely accepted, not only in different aspects of the discipline but also in the global community at large, hence the acceptance in this study, the introduction of quantitative techniques as a revolution in Geography.

Keywords: Quantitative, Revolution, Techniques, Theories, Models Origin and Development of Quantitative Techniques in Geography

INTRODUCTION

In the past decades, the discipline of Geography has undergone a radical transformation in both intent and purpose best described as quantitative revolution. The movement which leads to the revolution was started by physicists and mathematician and is now strongly recognized in Geography as the application of statistical and mathematical methods.

There have been divergent views as to when this approach really started in Geography. According to a school of thought; the approach existed before the 1950's especially during the 19th century; but much of the approach then was mechanistic, where people like Ratzel, Taylor and others were preoccupied with the notion of cause and effects and were constantly seeking laws for the explanation of these causes and effects. A typical example of this is the work of Christaller (1933) on urban settlement distribution.

However, another school of thought believed that the application of

quantitative technique into geographical research started only after the World War II. According to this school of thought, the inter-war generation of Geographers had been skeptical of the formulation of general and theoretical laws. Therefore it was only after the World War II that such theoretical issues as the study of diffusion models and location theory, and also the search for geometrical models to explain geographical patterns, came to occupy a dominating position in Geography (Arid, 1988). Gregory (1983) in his own study however, observed that quantification in Europe did not start earlier than 1960; according to him, it was in the 1960's that the innovation, adoption and growth of quantification began in the region.

The origin of quantification lies in the field of Physics and Mathematics like the case of economic behavior put forward by Zipf (1949). This work cumulates in what is called the spatial interaction model using Newton's law of gravitational attraction. Arid (1988) also noted the fact that quantification took its origin from the field of natural sciences. According to him the acceleration of the theoretical work in Geography was especially marked in institutions led by Geographers who had studied the natural sciences, especially physics and statistics, and/or where there were good contact with the developments in theoretical economic literature.

The major reason for the application of quantification method is basically to explain some geographical features that were formally discussed in verbal form in more concise statistical and mathematical form. For example, in comparing the association between two spatial phenomena, these phenomena could be previously discussed as being closely related or highly correlated; but the modern Geographer will want to know the degree of the relationship and its direction. The approach therefore gives the discipline a scientific orientation and the technique is relevant to all aspects of geographical researches although more relevant in the physical aspect such as in the fields of Climatology, Hydrology, Geomorphology etc. than in the human aspect.

The application of quantitative techniques to the area of physical Geography has never caused any controversy especially in Climatology which essentially deals with figures, since such figures need to be classified and analyzed. A good example of its early application in Geomorphology is the work of Davies (1912) on land forms cycle which according to Strahler (1950) has made a very useful contribution to the descriptive explanation of land forms.

However, its introduction in the field of human Geography has been met with mixed feelings. According to some researchers, quantification has no relevance in human Geography because certain aspects in human behavior cannot be easily quantified. This development therefore led to a serious argument in international

journals as to the relevance of statistical technique in the explanation of human phenomena. The argument just as those in physical aspect was however short lived, and quantification technique is now being used today in virtually all branches of Geographical studies.

Quaini (1982) observed that quantitative revolution came into existence as a response to pressures from the material or economic base of society which indicated the desirability of discovering ways of manipulation and control, particularly within the planning sector. This view was supported by Guelke (1978) who pointed out that after the Second World War, the North American universities were expected to produce problem-solvers or social technologists in order to run the increasingly complex economics. This according to him is what brought the discipline into adopting quantification methods in their researches; to him, "Geographers were not slow in adopting these theory building and modeling methods" which has in no small way contributed to the promotion of the discipline to its present stage.

Modal (2015) recognized seven main objectives of quantification in Geography. These according to him were to:

- (i) change the descriptive character of the subject and make it a scientific discipline,
- (ii) explain and interpret the spatial patterns of geographical phenomena in a rational, objective and cogent manner;
- (iii) use mathematical language instead of the language of literature;
- (iv) make precise statements (generalization) about locational order;
- (v) test hypotheses and formulate models, theories and laws for estimations and predictions;
- (vi) identify the ideal locations for the various economic activities so that the profit may be maximized by the resource users; and
- (vii) provide Geography a sound philosophical and theoretical base, and to make its methodology objective and scientific.

The place of quantitative techniques in Geography according to Britannical (2003) quoted in Uluocha (2015) can be summarized thus:

"Although the use of mathematics in Geography is ancient, the extensive and fundamental utilization of quantitative and statistical methods in modern Geography arose mainly in the second half of the 20th century. The methodologies are similar to or identical with those used in the physical, biological, and social sciences, except that special attention is given to the problems of place-specific or area-specific data, in which the recognition and description of spatial patterns

require special techniques. Model building, probability theory, and simulation techniques have proved to be of special value..."

In the same vein, Microsoft Encarta Premium Suite (2004) also quoted in Uluoccha (2015) observed that:

"...Since the 1950's Geographers have increasingly resorted to statistical and other quantitative techniques to analyze data, a process that has been enormously facilitated by improvements in computer technology. The use of quantitative methods enables Geographers to treat large amounts of data and a large number of variables in an objective manner, often based on the development of predictive models. This is particularly true in physical Geography, where the emphasis today tends to be on the study of the relationship between form and process".

In the early stage of its development, Livingstone (1990) revealed that various researchers took it upon themselves to introduce the method to their students. Among such researchers according to him is Ackerman (1958) who encourage his students to concentrate their attention on systematic Geography, cultural processes and quantification. A range of different statistical methods were subsequently brought into use in several systematic branches of Geography which enabled the development of more refined theories and models in the discipline.

The history of quantification will however not be complete without making references to United State of America where the technique originates. According to Johnston (1987), three schools were developed in the Department of Geography in the Universities of Washington, Wisconsin and Iowa, with Washington serving as the most prominent centre of innovation. The forth school according to him is "Social Physics" school, which developed independently, drawing its inspiration from Physics rather than Economics.

How revolutionary was Quantitative Revolution in Geography?

Though, quantification after a while was able to find its way into physical Geography, researchers in the human aspect totally refused to support its introduction into the discipline initially. According to these researchers, there are certain aspects of human behavior that cannot be easily quantified. For example the attitude of people. All these attacks had a serious effect on the introduction of the method into the discipline.

Generally speaking; five groups of opposers to quantification in Geography

can be recognized, and these are:

- i. those who felt that quantification could lead geography into a wrong and fruitless direction;
- ii. those people who felt that enough time has been spent on perfecting geographical tools such as maps, cartography and diagrammatic representation of geographic features; and that geographers should look for other means of describing geographic phenomena;
- iii. those who felt that statistics is applicable in some areas of geography and not in other branches such as historical and cultural geography;
- iv. those people who felt that quantification is suitable and the application desirable, but felt that they should be left out completely because they are sometimes incorrectly applied and that ends are often confused with means and,
- v. those who feels that statistical methods should be completely left out simply because they felt that though quantification is good but quantifiers are bad.

Critics of quantification do not however stop at this point. For example Stamp (1966) in his observation noted that there are many fields of inquiry within the subject in which the application of quantitative method may be retarding rather than aiding progress. According to him, this is because there will be a temptation to discard information that cannot be punched on a card or fed into a magnetic tape thereby ignoring both the ethical and aesthetic values of researches. Hoyt (1962) diagnosed quantification dilemma faced by 'old-school' social scientist in general as a case of schizophrenia. He described their position thus:

The older social scientists are torn between conflicting alternatives. Should they abandon their concepts, revise their previous thinking, and begin a course in mathematics that will enable them to understand the articles appearing in economics, statistical, econometric, and sociological journals? Should they hold their ground and maintain the validity of the assumptions they have clung to for so long? Or should they try to live with one foot in the world of their old concepts and the other in a universe of higher mathematics?

Based on criticisms levied against the introduction of quantification into Geography, Arild (1988) concluded that, its introduction did not have the same impact everywhere. According to him, quantitative Geography spread over the

world from innovative centres; but it did not have the same impact in all countries. This, Arld (1988) viewed could be supported with the fact that Christaller's (1933) work on quantification aroused only little interest in his own country, Germany. His theories according to Broek (1965) had to take a detour into the English speaking world, from whence it returned stepped in into the "new Geography" for it to be fully appreciated.

In looking at how revolutionary the quantitative "revolution" has being in Geography, observations thus far seems to agree with James (1972) assertion that quantitative "revolution" did not, in any way, represents a major change in direction of the discipline as many people think". This is because in its introductory years, the implementation of the method was faced with a lot of problems from researchers, not only from those in the human aspect of the course but also from those in the physical aspect as earlier observed. For example, Woodridge (1958), commenting on the introduction of the method into Geomorphological investigation explained that anything that cannot be investigated in verbal form should be discarded. To him; application of quantification into the discipline can give a false impression of precision, objectivity and accuracy.

To Chisholm (1975) the phrase 'quantitative revolution' is something of a misnomer. This according to him is due to the fact that Geography has in reality been quantitative since the nineteenth century. For example, The Royal Geographic Society has for long been a 'centre of calculation' (Latour, 1987) involving the assimilation of maps, tables, figures and statistics. Chisholm (1975) thus argued that the widespread use of formal statistical techniques from the 1950's to the present day therefore represents more of an evolution than a revolution. Similarly, the significance of the 1950's according to him was not the introduction of numbers per se, but the introduction of theory: it was thus much more of a theoretical revolution.

Despite the arguments against quantification methods as pointed out by its critics, its application in geographical researches has really been revolutionary. Infact, Stamp (1966) described quantitative revolution in Geography as a "civil war". According to him, the approach had many points in common with a political ideology. To him, it was more or less a religion to its followers; having the computer as its "golden calf". The revolution has strongly influenced Geography, involving the widespread adoption of abstract modeling techniques and scientific methodology which has gone a long way in reaffirming Geography's status as a respected scientific discipline. This development had a huge impact upon the discipline, leading to Harvey (1986) coining the famous slogan "by our models you

shall know us"

The revolutionary element of quantification in Geography according to Morill (1984) can also be shown by the way in which the young generation of Geographers at that time advocates the method through the establishment of a theoretically oriented journal christened Geographical Analysis. This attempt was to see to the opposition among established Geographers at that time to learning and teaching of quantitative methods.

The application of quantification in geographical researches can also be said to be revolutionary when one considers the rate at which many schools of Geography in North America added courses in quantitative methods to their requirements for graduate studies at that time. Burton (1963) observed that "quantitative revolution did really take place in Geography although it is now over".

Quantitative revolution can thus be concluded as being really revolutionary when one considers its wide acceptance among the generality of Geographers, both in physical and human aspects. Hardly now can any research work be conducted in Geography without the use of statistical method. The introduction of the technique has therefore changed the research direction of the discipline from its earlier descriptive form to a more analytical method and this has in no small way helped in the upliftment of the discipline to a higher grade as clearly shown by Haggett (1972) in one of his speeches which read thus:

"Today, the general acceptance of quantitative technique, the more complete mathematical training of a new generation and the widespread availability of standard computers on campus make the conflicts of a decade ago unreal" (Haggett 1972 p. 460).

However, Haggett (1972) did not fail to recognize the fact that "the first year of over-enthusiastic pressing of quantitative methods on a reluctant profession have given way to another phase in which mathematical methods are just one of many tools for approaching geographic problem (Arild, 1988)".

Conclusion

In conclusion, the quantitative revolution did take place truly as can be seen from this write up; but as good as this revolution is to the discipline; there is no doubt that the technique today has giving way for other approaches as earlier rightly noted by Harvey (1973) who declared that "the quantitative revolution has run its course, and diminishing marginal returns are apparently setting in... our paradigm is not coping well... it is ripe for overthrow".

REFERENCES

- Ackerman, E.A (1958) Geography as a Fundamental Research Discipline. University of Chicago, Department of Geography Research Paper No 53.
- Arild, H. (1988) Geography, History and Concepts 2nd Edition Paul Chapman Publishing Limited, London.
- Broek, J.O.M (1965) Geography, Its Scope and Spirit Merrill, Columbus, Ohio.
- Burton, I. (1963) The Quantitative Revolution and Theoretical Geography. *Canadian Geographer* 7;151-162.
- Chisholm, M. (1975) Human Geography: Evolution or Revolution? Pelican Harmondsworth.
- Christaller, W. (1933) Die Zentralen Orte in Suddeutschland, Jena Translated in English by Baskin, C. W (1966) Central Places in Southern Germany, Prentice-Hall, Englewood Cliffs, N.J.
- Davies, W. M. (1912) Die erklärende Beschreibung der Landformen. Leipzig, Teubner.
- Gregory, S. (1983) Quantitative Geography: The British Experience and the Role of the Institute. *Institute of British Geographers, Transactions New Series* 8 (1): 80-89.
- Guelke, L. (1978) Geography and Logical Position In: Herbert, D.T. and Johnson, R.J. (eds) Geography and the Human Environment. Progress in Research and Application. John Wiley Publication Chichester.
- Haggett, P. (1972) Geography: A Modern Synthesis. Harper and Row Publication, New York.
- Harvey, D. (1973) Social Justice and the City. Arnold, London.
- Harvey, D.W (1986) Justice Nature and Geography of Difference Oxford Blackwell Publishers.
- Hoyt, H. (1962) 'Schizophrenia in the Social Sciences', Business Horizons (Reprinted in According to Hoyt (Chicago).
- James, P.E (1972) All Possible Worlds: A History of Geographical Ideas. Odyssey Press, Indianapolis.
- Johnston, R.J. (1987) Geography and Geographers: Anglo-American Human Geography since 1954 3rd Edition, Arnold, London.
- Làtour, B. (1987) Science in Action: How to Follow Scientists and Engineers through Society Open University Press, Milton Keynes.
- Livingstone, D.N (1990) Geography, Tradition and the Scientific Revolution: An Interpretative Essay. *Institute of British Geographers. Transaction New Series* 15 (3): 359-373.
- Mondal, P (2015) Historical Perspective of Quantitative Revolution in Geography. www.yourarticlelibrary.com

- Morrill R.L (1984) Recollection of the "Quantitative Revolutions" Early Years: The University of Washington 1955-1965. In: Billinge, M, Gregory, D. and Martin, R. (eds.) Recollection of a Revolution, Macmillan, London pp. 57-72.
- Quaini, M. (1982) Geography and Marxism. Blackwell, Oxford
- Stamp, D. (1966) Ten Years On. Trans. Institute of British Geographers 40: 11-20.
- Strahler, A.N. (1950) Davies Concept of Slope Development Viewed in the Light of Recent Quantitative Investigation. Ann. Assoc. Amer. Geogrs. 40, 209-213.
- Uluocha N.O. (2015) Research Methods in Geography and Environmental Sciences. Sam Iroanusi Publication, Lagos.
- Wooldridge, S.W (1958) The Spirit and Purpose of Geography Revised Edition London, Hutchinson.
- Zipf, G.K (1949) Human Behaviour and the Principle of Least Effort: An Introduction of Human Ecology. Martine Fine Books.