Data Analysis/ Visualization in Social Sciences: Current Challenges and Trends in Religious Studies

By

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Abstract

This paper examines the concept of data analysis and visualization as veritable features of research. The methodology adopted will usually determine the nature of data analysis. The research applied descriptive phenomenological methodology to conclude that the universe of methodologies in the social sciences does not imply lack of methodology or trivialising of methodology in social research. It highlights fundamental research methodologies popular in the social sciences. The study observed that phenomenological methods are profusely applied with very minimal visualization. The research encouraged the use of visualization as a veritable tool to elucidate data analysis.

Introduction

This paper examines the challenges of data analysis in the disciplines of social sciences, with particular reference to Religious Studies. Since the concern of social sciences is that of order in the society as it relates to human beings in their social interaction it becomes necessary that human activities and responses to social problems be given primary attention. Incidentally human behaviour is sometimes determined by goals that are hidden in the mind characterised by idiosyncratic impulse. As a scientific research data analysis must follow a systematic and observable order. Interestingly scholars have noted that in the natural sciences understanding the natural world can be termed singularly hermeneutic since the natural world cannot interpret back. However, in the social sciences the case is not the same; there is a dialogical relationship between researchers and their human subject matter which is doubly hermeneutic, because human beings can and do interpret back, which creates an interpretive

loop.[1] As a result, social research requires methodologies that address the complexities of the subject matter.

Data Analysis

This is a process of inspecting, cleaning, transforming, and modelling data with the goal of highlighting useful information, suggesting conclusions, and supporting decision-making.[2] It is a scientific process that enables one to make better decisions in a system, industry, business organisation or to verify or disprove existing models or theories. Every scientific enquiry must collect, inspect and interpret data. Different approaches and techniques are adopted depending on the nature of the research and discipline a researcher belongs to. It is generally divided into Exploratory Data Analysis which emphasises discovery, Confirmatory Data Analysis which sustains or disproves existing hypothesis or theory, and Qualitative Data Analysis, used to examine non-numerical data like words, photographs, maps, videos etc. Qualitative Data Analysis is an approach which is very popular in the Social Sciences and humanities. It is an approach that has received more elaborate attention than the rest because this paper is limited to Religious Studies, as a discipline. The first two analytical approaches could be summarized in Quantitative Data Analysis.

Data Analysis and Social Sciences Methodologies

Data analysis is a concept of methodology. It is the methodology that determines methods of data collection and analysis. To examine data in the Religious studies, taking bearing from the social sciences discipline, must be notes the complexities of Religious studies. It has earlier been noted that the major concern in the Social Sciences is the problem of order in the society. Human beings, in a series of integrated relationships, make up the society. One way that social order has been theorized is according to the degree of integration of cultural and social factors. It deals with habitual and behavioural responses to social order. It is has been noted that "social research reflects society, and society itself is diverse, multifaceted, and composed of many antagonistic groups. It follows that the goals of social research are multiple and sometimes contradictory. Today, no single goal dominates social research."[3] In Social Sciences, as a result, one identifies five methodological models in qualitative research which includes ethnography, grounded theory, hermeneutics, empirical phenomenological

research and heuristic research. Ethnography is a social scientific methodology very popular in anthropology and related disciplines. It studies "people, ethnic groups and other ethnic formations, their ethnogenesis, composition, resettlement, social welfare characteristics, as well as their material and spiritual culture"[4] Grounded theory is another social scientific methodology that "was originally developed by Glaser and Strauss in the 1960s. The self-defined purpose of grounded theory is to develop theory about phenomena of interest. But this is not just abstract theorizing they're talking about. Instead the *theory* needs to be *grounded* or rooted in observation -- hence the term."[5] Empirical phenomenology engages in a "structural analysis of the participants' accounts of a phenomenon in order to determine the essential components of that experience … in the sense that the end result of the analytical process is a description of the structure of the experience provided by the participants."[6] Hermeneutics is the study of interpretation theory, and can be either the art of interpretation, or the theory and practice of interpretation.[7] This method is found in traditional hermeneutics, profusely used in biblical studies and modern hermeneutics, used in philosophy. Heuristic research is a method of self-search and self discovery used mostly in psychology. It is a "way of inquiring into what Wilber has identified as the Upper Left quadrant, or individual internal experience, and what Polanyi referred to as tacit knowledge, which is deeply embedded knowledge not normally available to conscious awareness."[8] In other words it is "a process of internal search through which one discovers the nature and meaning of experience and develops methods and procedures for further investigation and analysis."[9] One should note the overlapping tendency in the methods. This is the string that ties them within the social sciences domain. It is also worthy of note that the way Social Science disciplines approach phenomenological research is not always the way it could be approached in Physical Sciences. Yet the connecting string is that of observable phenomena. The essence of these presentations is to bracket off oneself from the erroneous conclusion that in the Social Sciences there is a consensus of methodology that must be highlighted in dominance against all other ones. Though in the above methodologies there are computer-mediated softwares that have been developed to make data analysis easy and fast, it is however in the quantitative research that one finds so much of computer-mediated softwares for this purpose. There is no doubt that electronic processing and presentation of information captures the interest of the end users of research findings more than the old traditional ways.

The challenge is that people like to have well analysed data with effective visualization but only a very small group, and sometimes insignificant few, will represent research findings with such interest-capturing visualization techniques.

Note on differences

Though this research tries as much as possible to examine these different ways of data analysis it is necessary to note that one form of analysis is always loosely present in the other form. This research does not also pretend that there are not different types of qualitative research, the traditional and the critical modes, and their different special emphasis of methods of data collection, analysis and interpretation.

Qualitative Data Analysis

"Qualitative methods are ways of collecting data which are concerned with describing meaning, rather than with drawing statistical inferences. What qualitative methods (e.g. case studies and interviews) lose on reliability they gain in terms of validity. They provide a more in depth and rich description."[10] In Social Sciences the aim of Qualitative analysis is "to gather an in-depth understanding of human behaviour and the reasons that govern such behaviour. The qualitative method investigates the *why* and *how* of decision making, not just *what*, *where*, *when*."[11] It is a research that allows the data to speak for itself, in line with some theoretical framework. The reason for this is because in qualitative data analysis it is very difficult for the neutrality and unbiased personality of the researcher to be established. Yet, neutrality and unbiased position is highly required in qualitative analysis. In this form of data analysis diversity in responses as well as the ability to adapt to new developments feature very prominently. Theoretical Framework is a theoretical approach that guides data analysis. In theoretical framework theories are adopted, depending on the intention and nature of the topic or problem being solved. Research problems are viewed and variables interpreted from the vantage point of theoretical framework.

Quantitative Data Analysis

Kendra Cherry has noted that "The term quantitative data is used to describe a type of information that can be counted or expressed numerically. This type of data is often collected

in experiments, manipulated and statistically analyzed."[12] Quantitative Data Analysis is used in the Social Sciences mainly in the following disciplines, Economics, Psychology and Geography, Sociology, etc. It is also very interesting to note that in recent times these fields now combine both the quantitative and qualitative analysis in their methodology. The software that is popularly used in data analysis is the Statistical Package for Social Sciences, SPSS. It is very convenient for large amount of numerical data.

Statistical Package for Social Sciences, SPSS, is a computer programme used for numerical data analyse, data management and data documentation. It was acquired from the Predictive Analytics SoftWare (PASW) by IBM in 2009.

Statistics included in the base software:

- Descriptive statistics: Cross tabulation, Frequencies, Descriptives, Explore, Descriptive Ratio Statistics
- Bivariate statistics: Means, t-test, ANOVA, Correlation (bivariate, partial, distances), Nonparametric tests
- Prediction for numerical outcomes: Linear regression
  Prediction for identifying groups: Factor analysis, cluster analysis (two-step, K-means, hierarchical), Discriminant.[13]

When cases are studied in SPSS the first thing to identify are the variables. Values are assigned to the variables. The strenuous aspect of the package, however, is the keying of the data into the software. Another challenging aspect is identifying the right kind of variables.

Not only does SPSS require that you select a sufficient number of variables to produce output, it also requires that you choose the right kinds of variables. If a categorical variable is required for a certain slot, SPSS will not allow you to choose any other kind. Whether the output makes sense is up to you and your data, but SPSS makes certain that the choices you make can be used to produce some kind of result.[14]

Qualitative Research Methodology in Religious Studies

Religious studies is an enquiry in the study of religious beliefs, behaviours and institutions from a standpoint of academic scholarship. It is different from theology in the sense that it requires neutrality and unbiased position of the enquirer. Theology engages dogma and logic to explain supernatural manifestations and beliefs from the standpoint of a believer. Religious studies "describes, compares, interprets, and explains religion, emphasizing systematic, historically based, and cross-cultural perspective"[15] from the standpoint of neutrality. The enquirer engages in this scholarship from a third party perspective rather than from first person experiential approach. It studies the people's beliefs, behaviours, and institutions rather than assessing the validity of these beliefs and behaviours. In Africa, religion is an inseparable part of the society. It could therefore be studied in the economics, politics, psychology, sociology or geography of the African people. Being part of these disciplines religious studies can, therefore, take quantitative or qualitative methodologies. However, qualitative methodology is more popularly applied. In the qualitative approach the phenomenological and hermeneutical methodologies are most commonly applied.

Phenomenological Methodology in Religious Studies

The word, phenomenology, is derived from "phenomenon" and "ology". Phenomenon is an observable experience or occurrence. "Ology" means study. Simply defined, phenomenology is the study of observable experience or occurrence. The phenomenology of religion, therefore, "concerns the <u>experiential</u> aspect of <u>religion</u>, describing religious phenomena in terms consistent with the orientation of the worshippers. It views religion as being made up of different components, and studies these components across religious traditions so that an understanding of them can be gained."[16] The strength of phenomenological methodology lies in the fact that it engages the enquirer in the mindset of the worshipper. The enquirer assumes the position of the worshipper in order to understand what the experience means to the worshipper, as against the biased position of an enquirer. The end product is finding the essence of the religious experience. Phenomenological methodology of religious studies does not express a judgmental validity of experiences but the essence of the experiences to the religious. It is, however, in the field of theology that validity and evaluation of the truth, examined from the standpoint of a believer, becomes glaring. Phenomenology examines

religious experience as ritual, mythological, doctrinal, ethical, social, and experiential. According to Howkins, it means "looking at the phenomena of religions without any expression of personal commitment."[17] The two major goals of phenomenology of religion are:

    i.   to group historical religious communities having certain elements in common and

    ii.   to group similar phenomena so as to reveal structure of religious experience

The basic steps of phenomenological research

This research has outlined five basic features of phenomenological methodology in religious studies. In doing this, Gerardus van der Leeuw, in his *Religion in Essence and Manifestation*, outlined seven features were useful, though not completely adopted. The following five subheadings must therefore serve as a basic guide in methodological research in religious studies:

Categorization of sacred actions: Firstly, it will be necessary to classify the religious phenomena into distinct categories: e.g. sacrifice, sacrament, sacred space, sacred time, sacred word, festivals, and myth. Examining concepts from the generic standpoint enables the enquirer to be better focused in the search for materials and literature. It relates experience to a definable group or genre.

Empathetic understanding: Secondly, rather than extricating oneself from the experience the researcher puts himself into the phenomena into his own life, empathetically understanding the religion from within. Gerardus der Leeuw insists that the scholar needs to "acquire its place in the life of the student himself who should understand it out of his inner self." This actually means bracketing off the scholar's personal prejudices and putting oneself in the position of the religious adherent.

Suspension of value-judgements: There is the need for the suspension of value-judgements and the adoption of a neutral stance. The researcher does not approach phenomenon as one validating claims but as one who gives a reliable position of what a concept claims to be. It does not express how true the phenomenon is but understanding what it claims to be from its own standpoint.

Structural relationships of information: In order to understand the series of integrated relationships of the various parts of religious phenomena as a functional unit the scholar needs to clarify any apparent structural relationships. Religious phenomena exist in a series of connected string that function together to answer a religious question.

Up-to-date research tie with alike disciplines: Facts must be compared with up-to-date research in the fields of archaeology, history, philology, sociology, etc. This is necessary so as to avoid degeneration into fantasy. To understand the claims of a religious concept, up-to-date related research in the fields of archaeology, philosophy, history and other related disciplines has far reaching positive implications that will bring about its socio-religious unity. Religious concepts express the worldview of a people in their attempt to explain their experiences in concrete terms of supernatural reality.

Descriptive Phenomenology

The descriptive phenomenology shares its position with natural sciences, especially in the fields of physics where the scientist usually emphasises description of phenomena as against explorative. Descriptive Phenomenology of Religion describes but does not explain. It seeks to describe accurately the eventful manifestations or religious actions in human experience. "A descriptive phenomenology, attempting to avoid reductionism and often insisting on the phenomenological epoche, describes the diversity, complexity, and richness of experience."[18]

Comparative Phenomenology

In comparative phenomenology groups of religious phenomena are brought together in order to examine their major aspects. It came initially as comparative methodology which stood as Science of Religion. This method compares a large number of documents and ideas expressing a great diversity of religious phenomena. It seeks to analyse the human and natural conditions which have determined the content of the several faiths. Comparative phenomenology is a non-evaluative method in the people's religious beliefs system, myths, and institutions. It searches for "observable, documentable similarities and differences without making normative judgments concerning which similarities and differences were good or bad, right or wrong, original or derivative, primitive or modern."[19] In this method the researcher goes on to theorize on the reasons why the similarities and differences. Normative judgment on the reasons is left with the theologian.

Historical Phenomenology

The phenomenologist insists that no religious phenomena can be understood outside their history. As such, historical phenomenology examines the historical, cultural and socioeconomic contexts of the event. This is also called sitz em leben (situation in life).

Every religious phenomenon has a historical setting. It is better understood from the context of its historical setting. It describes, step by step, how that understanding was built up over time, leading through the various wrong theories and dead ends before arriving at current understanding. That way the phenomenological experience of learning about a religious event would mimic the historical process. It expresses the historical evolution of the thought.

Hermeneutical Methodology in Religious Studies

Hermeneutics is derived from the Greek work hermenuo which means to interpret. It is the process of correct interpretation of a text. Biblical Hermeneutics studies the principles of interpretation of the biblical texts. It is often expressed in the phrase with exegesis since it has to examine the historical context of the text so as to apply it in modern understanding. Exegesis itself is the effort to understand the original meaning of the text as it was applied to the original audience. This is an effort to appreciate the socio-cultural dynamics that influenced the writing of the text. Biblical Exegesis addresses questions of context and content.

1. Contextual questions include:

   Historical Context: historical setting of the document, including its geography of the places, people, religions, economy, the purpose of the writing, etc

   Literary Context: the reason for the statements in the context of the occasion, stating why some of the points were made in the narrative

2. Questions of content address four key issues as raised by Gordon Fee:

   a. textual criticism (the determination of the actual wording of the author)

   b. lexical data (the meaning of words)

   c. grammatical data (the relationship of words to one another)

   d. historical-cultural background (the relationship of words and ideas to the background and culture of the author and his readers)[20]

The nature of the text will determine the various exegetical methods that would be applied. The following are quite popular exegetical methods in biblical writings: textual, literary, form, redaction critical methodologies, etc. Examining the historical context of the text and the psychology of the author will require historical critical methodology. If a text has variant readings, it will be necessary to apply textual critical methodology. In textual criticism the principles of intrinsic probabilities and transcriptional probabilities are applied. These are complex ways of examining the both the internal evidence and external evidence so as to determine the best reading. It is only when the best reading is technically determined that a scholar can establish a good understanding of the text. The textual apparatus is a veritable tool that assists in this methodology.

Visualization

Data visualization is the visual representation of data in charts, maps and graphics so as to achieve the effective communication goal. In this effort it is "used to describe any technology that lets corporate executives and other end users "see" data in order to help them better understand the information and put it in a business context."[21] The focus is to provide "a graphical interpretation of a company's data so that it can be analyzed from different perspectives."[22] The researcher should always bear the end users in mind while representing the data analysis. A research that is not packaged in a way that lets the users understand what is required is a research that is still in the mind of the researcher. The society wants solution to problems. Clarity of thought is a very important feature of research because the mind must be read by those who are outside. It is possible for the owner of a house to locate his belongings even when the room dark. If some other persons are required to locate positions of items then the room needs illumination. If a research provides possible solutions to social problems, yet those who are supposed to implement the findings so as to create favourable societal atmosphere hardly understand the findings, the researcher has failed to communicate. This problem is serious even in the University, among academics. Sometimes we supply data without having a good understanding what the data represents. Demonstrate the power of positive visualization we may use the Senate paper on examination results.

Departments supplied the data and the analysis was made by the Exams Unit of the Registrar Department. However, when we visualized the data analysis, almost all the Departments protested that we indicted them wrongly.

Distribution of 2010/2011 Graduating Students' Results
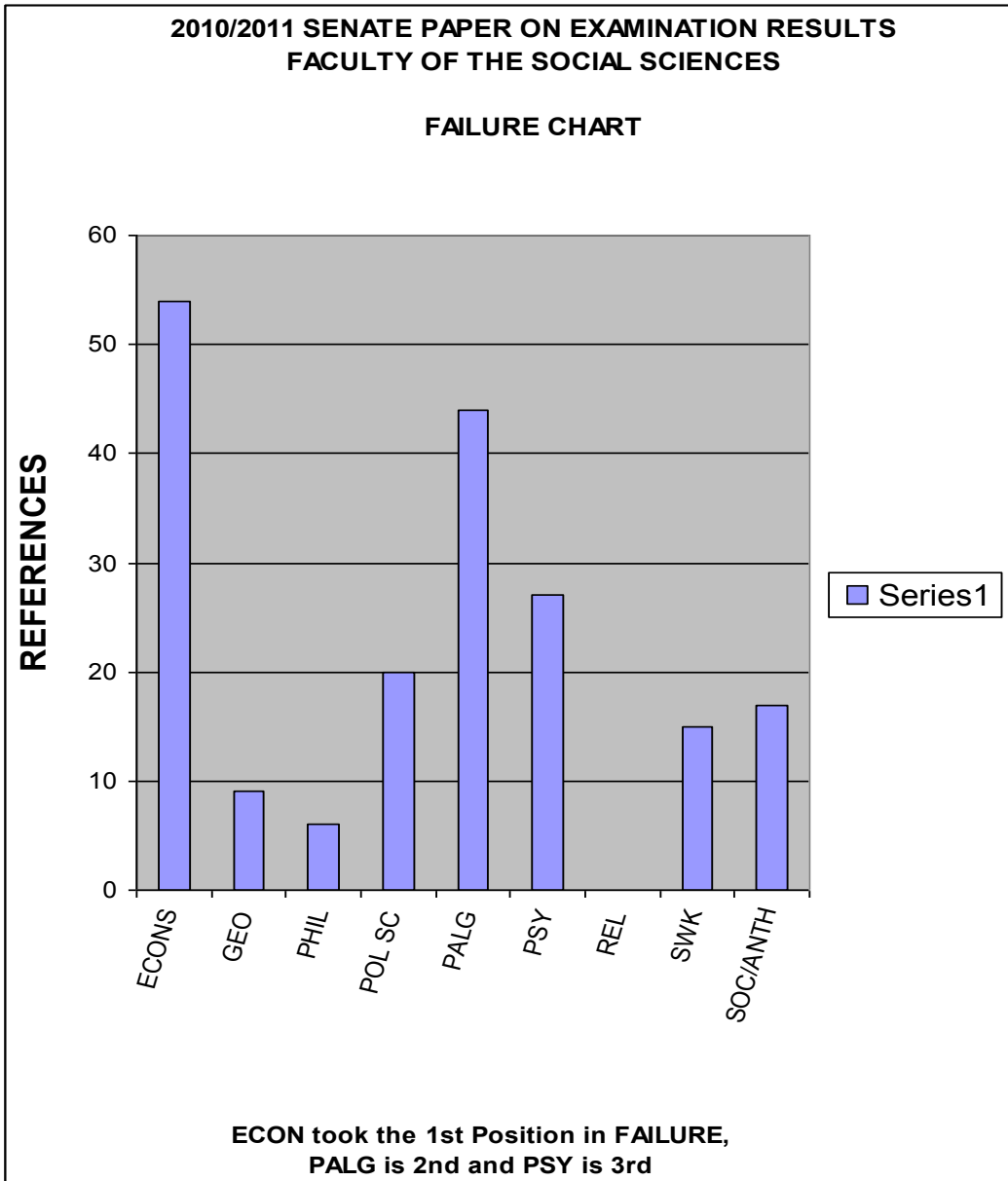Faculty of Agriculture

Departments	Grad	Total	% Processed	Failure	Total Unprocessed	% Unprocessed
Agric Economics	41	21	51.22	9	20	48.78
Agric Extension	19	17	89.47	2	2	10.53
Animal Science	28	8	28.57	2	20	71.43
Crop Science	10	5	50	5	5	50
Food Sc. & Technology	58	23	39.66	4	35	60.34
Home Sc Nutrition & Diet	45	16	35.56	15	29	64.44
Soil Science	4	4	100	-	-	0
Total	205	94	45.85	37	111	54.15

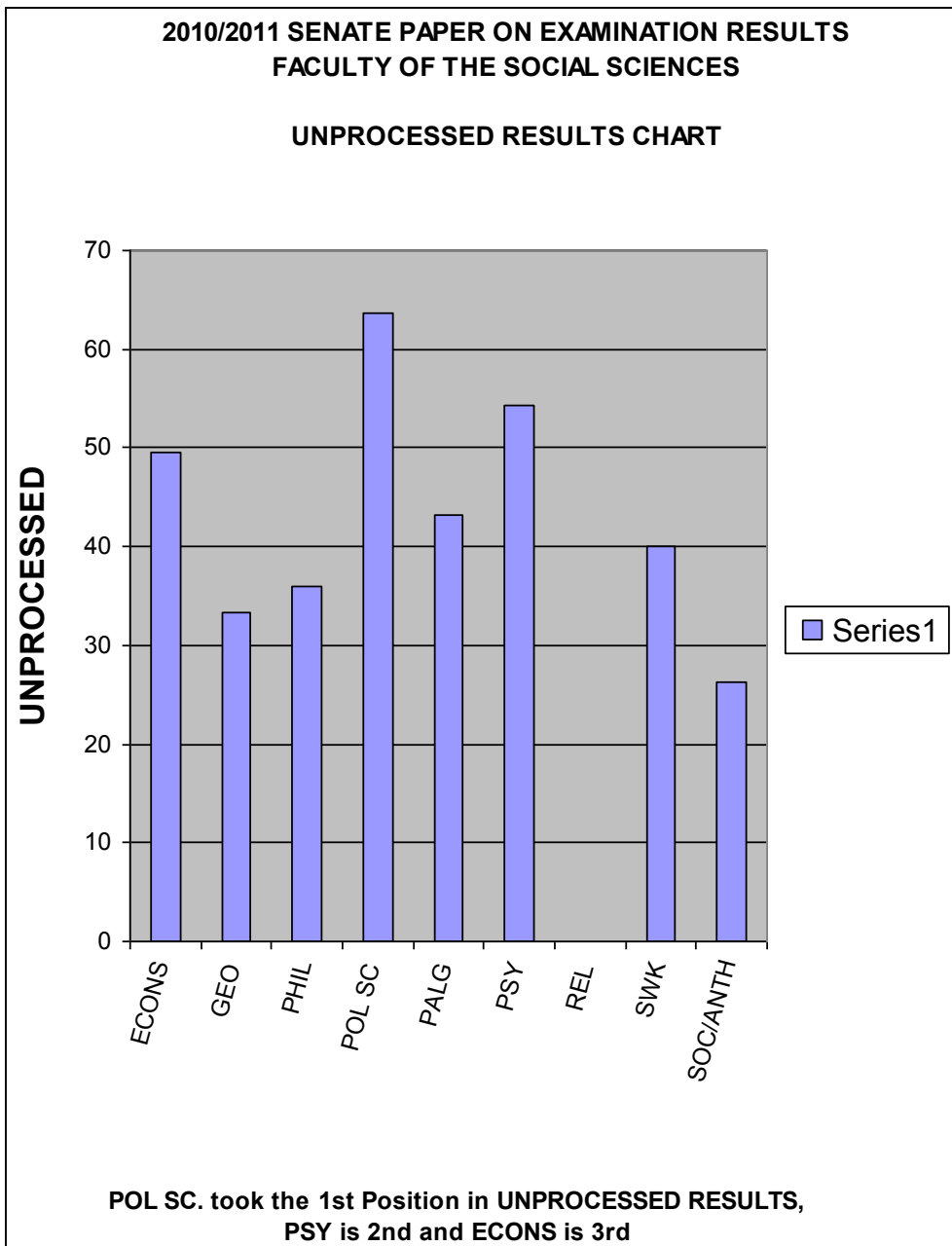Distribution of 2010/2011 Graduating Students' Results
Faculty of the Social Sciences

Departments	Grad	Total	% Processed	Failure	Total Unprocessed	% Unprocessed
Economics	230	116	50.43	54	114	49.57
Geography	42	28	66.67	9	14	33.33
Philosophy	39	25	64.10	6	14	35.90
Political Science	190	69	36.32	20	55	63.68
PALG	229	130	56.77	44	99	43.23
Psychology	160	73	45.63	27	87	54.37
Religion	16	16	100	-	-	0
Social Work	70	42	60	15	28	40
Soc & Anth	80	59	73.75	17	21	26.25
Total	1056	558	52.84	192	498	47.16

Data Analysis/Visualization of Senate Paper on approval of Examination results 2010/2011 Graduating year

Faculty of Social Sciences

2010/2011 SENATE PAPER ON EXAMINATION RESULTS FACULTY OF THE SOCIAL SCIENCES

FAILURE CHART

ECON took the 1st Position in FAILURE,
PALG is 2nd and PSY is 3rd

Faculty of Social Sciences Unprocessed Results Chart

2010/2011 SENATE PAPER ON EXAMINATION RESULTS FACULTY OF THE SOCIAL SCIENCES

UNPROCESSED RESULTS CHART

POL SC. took the 1st Position in UNPROCESSED RESULTS, PSY is 2nd and ECONS is 3rd

Faculty of Agriculture Failure Chart
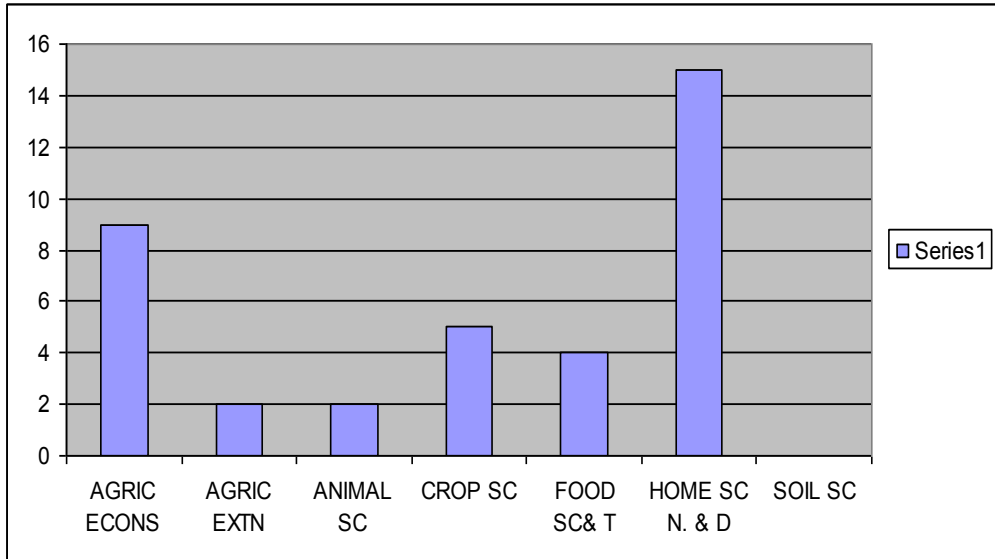
Faculty of Agriculture Unprocessed Results Chart
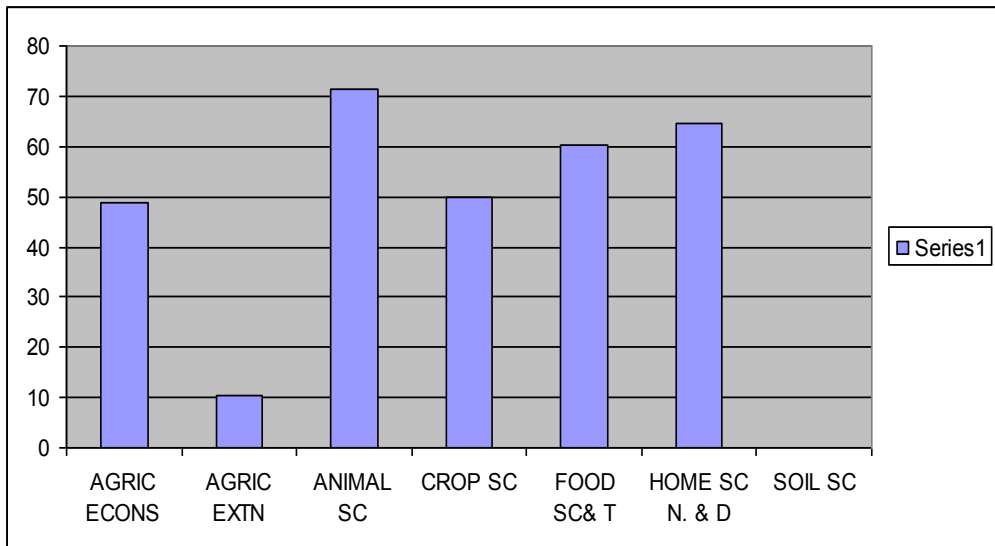
The different Departments may not fully understand the meaning of the data they had generated for the Senate meeting until it is represented in this form. Some Departments and Faculties may even argue that they did not supply the data.

Reality of the meaning of the data base on visualization

Failure grades in the results
1. Some lecturers released results so late that the students had no opportunity to register them again, eg, 200 level result released when the students are in final year.
2. The students did not understand the lecture, etc
3. The lecturer either did not teach or does not know how to teach or many students could not be made even after the four years class lectures, assignments, industrial training, etc.

Other Reasons for unprocessed results
1. Results were released in piecemeal such that single results outnumbered the group results. As a result of this, such single result sheets were either lost on transit or buried inside some mega sheets. Even the dispatch staff may have considered this single result of less importance such that he forgot to dispatch.
2. Exams Unit of the Registrar had very poor filing habit such that results sheets got "missing",

3. Processing of files were not properly monitored. So, many files are either left in Records or in Admissions Office
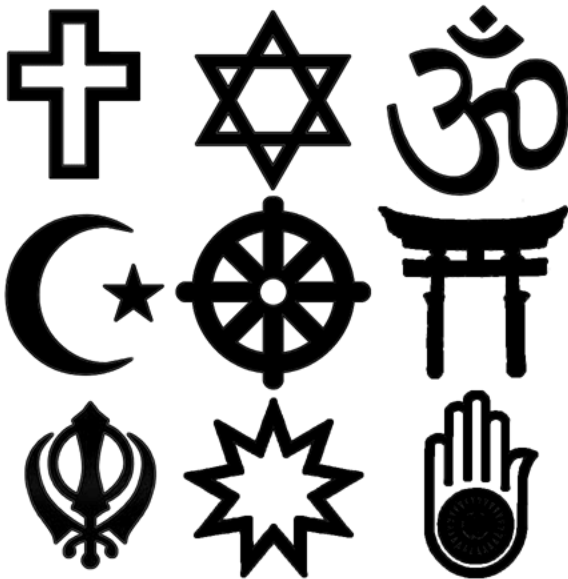
Symbols, taken fro wikimedia commons[23]

From left to right:
1st Row: Christian Cross, Jewish Star of David, Hindu Aumkar
2nd Row: Islamic Star and Crescent, Buddhist Wheel of Dharma, Shinto Torii
3rd Row: Sikh Khanda, Bahai star, Jain Ahimsa Symbol

These symbols visualize core values and myths of the faith. They are not abstract philosophical objects. They foster unity among the adherents and bring them closer to the object of worship.

Challenges
It is not arguable that teaching and learning become interesting, interactive and less boring when effective visualization techniques are adopted. Visualization is very necessary if one must teach and express research findings with good intentions to impact on the audience. There are many challenges and problems militating against effective data analysis and visualization among the staff and students of social sciences in quantitative research and qualitative research.
1. Lack of patience: Both staff and students are in a hurry to conclude research works. As a result of this, coding and keying data into the systems become a nightmare.
2. Unavailability of software: With the high level of software piracy in Nigeria, it is sometimes impossible to find original softwares. Many pirated softwares are hardly properly installed. As a result of this such softwares cannot function properly. It can be very disgusting that large amounts of data were patiently keyed into the system only for the

software to fail. Not only that the original softwares are very costly, they are not even available, most times in the market.

3. Lack of interest: It is a shock sometimes that in a graduating class of three hundred students only five of the students carried out quantitative research, effectively analysing data with computer softwasre. Among staff and students the interest is hardly present. If one is in doubt I will suggest a look at the journals in the Faculty to establish the fact that members of the academia are no longer interested in this. A look at the research projects in the Departments will also establish the lack of interest among the students.

4. High level of "Grade syndrome" among students is a big problem. Students attend classes where they are taught how to do research but they want to pass exams without learning the methods. They want to have good grades at little stress.

5. Automated Systems are not available for students to put into practice what they learn. The only option will be to look for vendors who display billboard: "Come and run your analysis without stress," "Come and have readymade Term Papers and Projects at very little cost." The moment a student realizes that he could pay a very little token to run analysis or getting a research Project by merely paying a little token of money he will not be bothered about learning the techniques of data analysis or rudiments of research.

Suggestions

1. The University system is a research institution and should therefore provide enough computer systems in the departments for the students.

2. Both staff and students should be encouraged to use computer-mediated softwares in their research, perhaps by appointing facilitators in every department.

3. Visual display equipment should be installed in every Department and experts trained to man the equipment, retrain staff and monitor the use of such equipment.

4. ICT compliance should be given priority consideration in staff appraisal for promotion. It is interesting to note that in ranking of Universities in the world visibility in the internet is the first port of call.

Trends

Many students spend so much time in the internet but most times it is in facebook and other chatting devises. They watch and download films and hardly aware that they could have unlimited access to research materials in the internet. When this is the case we end up producing graduates who go into the labour market unable to solve challenging problems which would be easily solved if the computer-mediated softwares were handy. Modern approach to problems is no more the old traditional approach. Precision is the keyword now and it is automated. Yes, virtually everything is automated to produce results. Without producing graduates who automate their industrial input in the labour market we fail in our duty.

Conclusion

It is completely out of place to conclude that research and learning are getting on effectively without effective data analysis and visualization. There is no field of research that does not require data analysis and visualization. Systematic inspecting, cleaning, transforming, and modelling of data with the goal of highlighting useful information must consider modern

techniques and recent software developments. The tertiary institution distinguishes itself in research. Modern trend in research makes so much use of computer-mediated softwares and one fail if one wants to go back to the outdated techniques. A good researcher is a researcher who understands the times and makes use of the available tools to produce good results.

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