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The Utilisation Of Statistical Packages For Data Analysis Among Post-Graduate Students In Universities In Rivers State.

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Abstract

This study investigated the utilisation of statistical packages for data analysis among post-graduate students in Universities in Rivers State. The design for the study is descriptive research design.The study was guided by four research questions and their corresponding null hypotheses. The population of the study is 397 post graduate students in Universities in Rivers State with sample size of 91. One instrument was used for the study titled "Utilisation of Statistical Packages for Data Analysis Questionnaire (USPDAQ). Items in the instrument were validated by the two experts in the field of Measurement and Evaluation, from Department of Psychology, Guidance and Counseling University of Port Harcourt. Both face and content validity of the instrument was done. The construct validity was also done using factor analysis. The significant value obtained (0.000<0.005) shows that the instrument

is valid. To ensure the reliability of the instrument Cronbach alpha (α) technique was used for all the items in the instrument. Copies of the instrument were administered to 20 post graduate students who were not part of the sample for the study and then the scores obtained were subjected to Cronbach alpha technique. The alpha coefficients of 0.78 and 0.86 were obtained for SPSS and R Package respectively. Research questions were answered using mean and standard deviation. Hypotheses were tested using Z-Test at 0.05 level of significance with the use of Statistical Packages for Social Sciences (SPSS) version 20. Results revealed that statistical package is useful to post graduate students and is utilized among male and female post graduate students in Universities in Rivers State and is mostly used by male students. The use of statistical package essentially reduces errors in data analysis, presentation and interpretation of result in research among students. Most schools, companies, business owners governmental agencies use statistical packages for data analysis and presentation of results in either tabular or graphical form. It was recommended that students as well as teaching and non-teaching staff should learn to improve their efficiency on the usage of statistical packages especially the one that is suitable for all analysis in their areas.

Key Words: Statistical Packages, SPSS and R Package

Introduction

As the world continues to progress technologically, traditional and analogue methods of service provision have been replaced with more efficient and effective digital solutions. One area that has benefited greatly from technological advancements is research and data analysis. In the past, data analysis was a rigorous and time-consuming process that often involved manual calculations and analysis using paper and pen (Abatan & Olayemi, 2014). However, with the advent of computers and statistical packages, data analysis has become much simpler, faster, and more accurate.

Statistical packages are software programmes designed to simplify the calculation and presentation of statistics, and reduce errors in data analysis (Kwashabawa, 2021). These packages have greatly contributed to the development of research in universities around the world, including Nigeria in the 21st century (Eshasrenan, 2006). The high demand for information and communication technology (ICT) has made it a major priority for researchers and organizations.

With the use of statistical packages, researchers can easily analyze and validate data, and produce accurate figures for their analysis. Multidimensional statistical packages are particularly useful in educational data analysis, and offer a wide range of tools for statistical data analysis. While prior programming knowledge is not required, basic computer skills and an understanding of statistics are necessary to utilize these packages

Statistical Packages for Social Sciences (SPSS)

Statistical Package for Social Sciences (SPSS) has been developed by three students at the University of Stanford (Norman & Hadlai, 2008), after graduation, Nie moved to the University of Chicago, joined by Hull (National Opinion Research Center), initially not meant for distribution outside their home university, the publication of the first manual made SPSS widely known and used which was developed for International Business Machine (IBM) mainframe computers, versions for most other important mainframe brands and later for the so-called minicomputers (like DEC, PR1ME,) were available. SPSS Inc. was the founded in 1975. In 2009, International Business Machine (IBM) acquired SPSS; it is now fully integrated into the IBM Corporation Business Analytics Software portfolio (Norman & Hadlai,

2008). SPSS- (Statistical Package for the Social Sciences now Statistical products and Solution services) is most widely used in social science disciplines and courses. SPSS is the oldest software programmes developed and made available in 1960s and has been redeveloped over the years, the latest version is SPSS 28.0.1 which was produced in April 2022 (Astro.com, 2022). Many sociologists, psychologists and social workers use this programme to enter their research data and formulate results. Although social science uses SPSS more widely than other fields, many find it easy to navigate with SPSS because it is a package that many beginners enjoy due to its very easy to use nature. SPSS has a "point and click" interface that allows you to use pull down menus to select commands that you wish to perform. Odusina (2011) disclosed that working with SPSS demand some background knowledge of statistics. There are slight variations in the difference version of SPSS e.g. version 10, 11, 12, 13, 14, 15, 16, etc.

SPSS assists the user in describing data, testing hypotheses and looking for a correlation or relationship between one or more variables. SPSS is very suitable for most regression analysis and different kinds of ANOVA (regression, logistic regression, survival analysis, analysis of variance, factor analysis, multivariate analysis but not suitable for time series analysis and multilevel regression analysis) (Wikipedia, 2014). Many students, both undergraduate and graduate, are taught SPSS during research analysis classes in demography, psychology, sociology and other social sciences. The IBM SPSS Statistics is landmark advancement in Information and Communication Technology (ICT) that is radically changing the world swiftly. IBM SPSS statistic is indeed the most comprehensive statistical software system for accurate analysis of all sorts of data, from the least to the most complex in various fields (Kpolovie, 2018).

R Package

R Package is an alternate implementation of the statistical programming language called S. S-PLUS was developed post S as its commercial version (Nikita, 2020). R was introduced later by Ross Ihaka and Robert Gentleman in 1991. Though R is independent of S-PLUS, much of its code works without any alteration for R too. The first official version of R was released in 1995 as an open-source software package under the GNU General Public License (Nikita, 2020).

According to Nikita (2020), R primarily is an open-source programming language, provides an environment for performing statistical computing and graphics. The R software is open source, i.e. freely available for use, development, and distribution (Joachim, 2021). R is free, open-source statistical software. Colleagues at the University of Auckland in New Zealand, Robert Gentleman and Ross Ihaka, created the software in 1991 because they mutually saw a need for a better software environment for their classes. R has more than two million users according to an R Community website (Revolution Analytics, n.d.a). The basic installation of the R programming language provides many powerful functions, its main strength comes from the many add-on packages that have been developed by the R programming community. As of June 2021, more than 17,000 packages are available on the Comprehensive R Archive Network (CRAN). The popularity of R is constantly increasing, and especially in the fields of statistics and social sciences R is becoming the major software tool (Joachim, 2021).

Importance of R in Research & Data Analysis

R performs most general statistical analyses (regression, logistic regression, survival analysis, analysis of variance, factor analysis, multivariate analysis). The greatest strengths of both are probably in its ANOVA, mixed model analysis and user's creative freedom in the analysis (Matthew & Sunday, 2014).

R is a comprehensive statistical analysis toolkit. It can perform any statistical analysis desired, but users must either write the code or access the code from someone who has already written it. As stated on its website, people have already designed many standard data analysis tools "from accessing data in various formats, to data manipulation (transforms, merges, aggregations, etc.), to traditional and modern statistical models (regression, ANOVA, GLM, tree models, etc.)" (Revolution Analytics, n.d.b). Programmers have designed many more packages than just these, including packages for Bayesian statistics, time series analysis, simulation based analysis, spatial statistics, survival analysis, and many, many more.

Importance of statistical packages for data analysis

Advantages of using statistical software include being free from manual tasks, saving time, dealing with large amounts of data, having more flexibility, and obtaining valid and reliable results. The importance of software in data analysis can hardly be overstated. For a business, the software will either help it to make more money or will allow it to save money. This is because using these tools, we can analyse the business as a whole. We can integrate all the data sets from different parts of the business and then get insights that can help us to make decisions that are most appropriate for the specific situation. Without this software, a business would be forced to do everything manually, using a lot of guesswork.

With the help of this software, data sets from across the business can be analysed using different approaches. This will help the company take preventive measures against unforeseen events in future. Software in analytics is usually used for a variety of tasks, including the following: data cleansing, data mining, data modeling, data visualisation and forecasting. The software also integrates the data sets with external databases, allowing the business to gain access to additional information. Data cleansing is done when the analytics software automatically cleans the data sets of invalid records and out-of-date information. Meta analysis software allows one to get insights into the business process and identify the problems related to the business. Data mining is a term that is used to describe the process of extracting insights from large sets of unstructured data. It is achieved by the use of software tools that allow the business to mine data from diverse sources. The tools are designed to identify relationships among the data, allowing business managers to build up a framework to understand the various business elements. Businesses that require a lot of data are naturally attracted towards the idea of using software in data mining. The data mined can include customer and employee records, financial statements, and other similar kinds of information. It is essential that the business employ the right software for the purpose. The best software generates reliable results and should be very easy to use. It should also be capable of generating reports in suitable formats that are easy to read, analyse and manipulate.

To sum up, software for data analysis makes it possible for businesses to acquire the necessary data without having to spend a lot of money hiring an outside

company. The software allows for the easy handling of large amounts of data without losing important data or spending valuable time. It also allows for accurate business judgments. Furthermore, the software reduces business costs by allowing businesses to use data in a profitable manner. Finally, the software improves business productivity and profitability by allowing businesses to make more informed decisions.

Features of Statistical Software

Statistical software has some common characteristics that make it reliable and suitable for data analysis:

1. Data editor is in rows and columns which make it very easy to enter numeric data.

2. There is availability of menu bar comprises drop-down menu, quick analysis as well as brief user manual.

3. Statistical level of measurement is put into consideration in data entry

4. They follow the initial steps in research project

(a) Getting your data ready to enter into the software.

(b) Defining and labeling variable

(c) Entering data appropriately with each row containing each case and each column as variable.

(d) Data checking and cleaning is possible.

This study is supported by exploratory data analysis theory by Kukey, John Wilder, (1970). The philosophy behind this approach is to examine the data before applying a specific probability model. According to Tukey, (1970), exploratory data analysis is similar to detective work. In exploratory data analysis, these clues can be numerical and (very often) graphical. Indeed, Tukey introduced several new semi-graphical data representation tools to help with exploratory data analysis, including the "box and whisker plot" (also known as the box plot).

Exploratory data analysis (EDA) is an approach to data analysis where the features and characteristics of the data are reviewed with an "open mind"; in other words, without attempting to apply any particular model to the data. It is often used upon first contact with the data, before any models have been chosen for the structural or stochastic components, and it is also used to look for deviations from common models. It also refers to the critical process of performing initial investigations on data so as to discover patterns, to spot anomalies, to test hypothesis and to check assumptions with the help of summary statistics and graphical representations. (Patil, 2018).

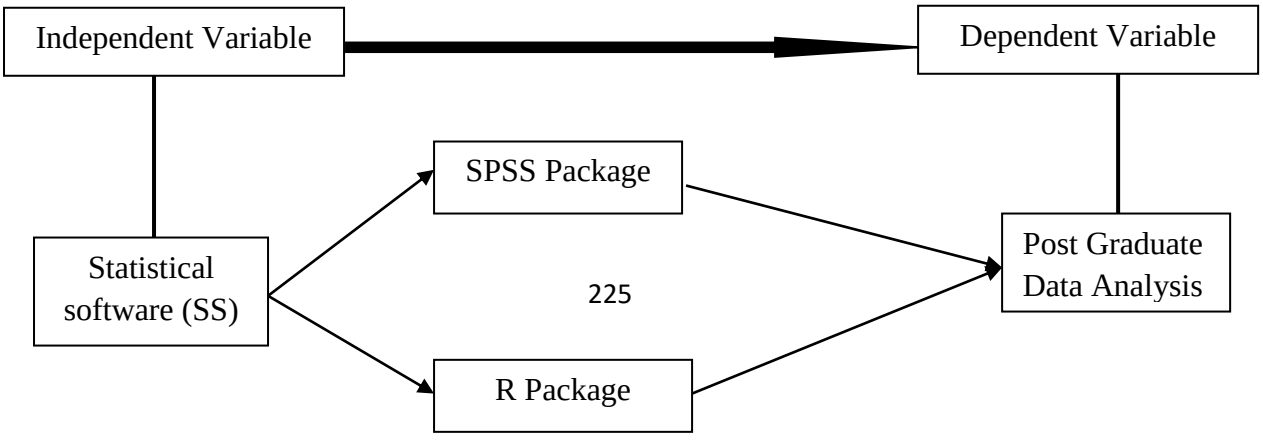

Fig 1: Conceptual Framework of statistical Packages on Post Graduate Data Analysis

Statement of the Problems

Researchers are faced with series of statistical problems especially for data analysis. This has instilled phobia among researchers; some are caused due to inadequate knowledge of mathematical calculation as well as statistical calculation. Hence must researcher prefer to take their data analysis to experts in data analysis because of the calculation phobia. It has also been shown that data not properly analysed will yield wrong generalisation of findings which will totally misinterpret the empirical computation of that data. Consequently, data analysed whether by the researcher or data analyst is prone to clumsy and inaccurate result if analysed manually which can lead to error in presentation of result. This error can be as a result of computation of required formula for a particular statistical tool or in the process of calculation or table reading for a particular distribution or approximation of the calculated figure etc. Furthermore, time consumption and delay involved in rigorous step-by-step calculation of these statistical tools for a particular research analysis is also a major problem for researchers, particularly when there is a time bound for a particular research to be completed. This will obviously post a treat in the delay of the research thereby elongating the stipulated period for a particular research to be completed. This is particularly pre-dominant among post-graduate students in various tertiary institutions especially institutions that lack the adequate knowledge of statistical packages for data analysis and the application of a particular statistical package suitable for a particular research design.

Again, it has also shown that most of the researchers' supervisors have no knowledge of the usage of statistical package for data analysis thereby bending to the traditional method of data analysis. This is because some of these supervisors are not properly trained and has refused to enroll for the professional training of these statistical packages for data analysis. They prefer the manual way of analysis thereby instructing most of the researchers to get their data analysed manually in order for them to adequately interpret them due to lack of adequate knowledge of the statistical packages for data analysis. This research will provide some of the posting issues militating against data analysis among post-graduate students in Universities in Rivers State.

With the adequate knowledge and application of statistical packages for data analysis, data can be properly analysed without any clumsiness, error free, short period of time and accuracy by the researchers especially the post-graduate students in Rivers state Universities. The effectiveness of research is embedded in adequate use of statistical packages; hence, it is highly advisable that researchers master any of the packages for analysis especially empirical research. To find solution to the above stated problems and more, the researcher deemed it fit to investigate the utilisation of statistical packages for data analysis among post-graduate students in Universities in Rivers State.

Aim and Objectives of the Study

Research Questions

The following research question will be answered in this study

1. To what extent does gender differ in the utilisation of Statistical Package for Social Science (SPSS) for data analysis among post-graduate students in universities in Rivers State?
2. To what extent does the utilisation of Statistical Package for Social Science (SPSS) for data analysis differs among post-graduate students based on university school ownership in Rivers State?
3. To what extent does gender differ in the utilization of R package for data analysis among post-graduate students in universities in Rivers State?
4. To what extent does the utilization of R package for research differs among post-graduate students based on university school ownership in Rivers State?

Hypotheses

The following hypothesis was tested at 0.05 level of significance

1. Gender does not differ in the utilisation of Statistical Package for Social Science (SPSS) for data analysis among post graduate students in universities in Rivers State.
2. The utilisation of Statistical Package for Social Science (SPSS) for data analysis does not differ among post graduate students based on university ownership.
3. Gender does not differ in the utilization of R Packages for data analysis among post graduate students in universities in Rivers State.
4. The utilization of R Packages for data analysis does not differ among post graduate students based on university ownership.

Methodology

This study investigated the utilisation of statistical packages for data analysis among post-graduate students in Universities in Rivers State. The population of this study consists of three hundred and ninety seven (397) post-graduate students in Federal, State and private Universities in Rivers State for 2022/2023 academic session. Descriptive research design was adopted for the study. Stratified random sampling technique was adopted for this study. Proportionate stratified random sampling formula was used to get a sample size of 91 post graduate students from federal, state and private universities in Rivers State. Two self structured questionnaires were used for collection of data. A Four (4) points modified Likert scale was adopted for the questionnaire, such as Strongly Agreed; (SA) = 4, Agree (A) = 3, Disagree (D) = 2, and Strongly Disagreed (SD) = 1. The instruments were validated by experts from measurement and evaluation, department of educational psychology. The reliability of the instrument was determined using Cron-bash Alpha which was found to be 0.78 and 0.66 for SPSS and R. Package. This shows that the instruments were reliable for the study. In this study, descriptive statistics such as mean and standard deviation was adopted and used in answering the research questions. The hypotheses were tested with Z-Test at 0.05 level of significance using Special Packages for Social Sciences (SPSS) version 20.

Result

Research question (1 and 2)

1. To what extent does gender differ in the utilisation of Statistical Package for Social Science (SPSS) for data analysis among post-graduate students in universities in Rivers State?
2. To what extent does the utilisation of Statistical Package for Social Science (SPSS) for data analysis differs among post-graduate students based on university school ownership in Rivers State?

Hypothesis (1 and 2)

1. Gender does not differ in the utilisation of Statistical Package for Social Science (SPSS) for data analysis among post graduate students in universities in Rivers State.
2. The utilisation of Statistical Package for Social Science (SPSS) for data analysis does not differ among post graduate students based on university ownership.

Descriptive statistics and Z-test for the utilisation of SPSS for data analysis among Post Graduate students in Universities in Rivers State based on Gender or school ownership.

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	SPSS	7.3902	82	1.78993	.19766
	GENDER	1.5000	82	.50308	.05556
Pair 2	SCH_OWNER	2.2683	82	.62950	.06952

Paired Samples Test

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
SPSS - GENDER	5.89024	1.91167	.21111	5.47020	6.31028	27.902	81	.000
SPSS - SCH_OWNER	5.12195	2.01470	.22249	4.67927	5.56463	23.021	81	.561

The above analysis shows descriptive statistics and Z-test for the utilisation of SPSS for data analysis among post graduate students in Universities in Rivers State based on Gender or school ownership. It shows the descriptive statistics of SPSS (N =82, mean = 7.3902, standard deviation = 1.78993 and standard error = .19766), gender (N= 82, Mean =1.5000, standard deviation = .50308 and standard error = .05556)

while school ownership (N= 82 mean = 2.2683 standard deviation = .62950 and standard error = .06952).

From the testing of the corresponding null hypothesis 1, it was indicated that the Z-test of 27.902 was gotten at 81 degree of freedom, with a corresponding p-value of 0.000. Since the p-value was less than 0.05, this result therefore indicates that gender differs in the utilisation of statistical package for Social Science (SPSS) among post graduate students in Universities in Rivers State. Also, for null hypothesis 2, Z-test of 23.021 was gotten from 81 degree of freedom with a corresponding p-value of 0.651, since the P-value was greater than 0.05, this result therefore indicates that the utilisation of Statistical Package for Social Science (SPSS) for data analysis does not differ among post graduate students based on university ownership.

Research question (3 and 4)

3. To what extent does gender differ in the utilization of R package for data analysis among post-graduate students in universities in Rivers State?
4. To what extent does the utilization of R package for research differs among post-graduate students based on university school ownership in Rivers State?

Hypothesis (3 and 4)

3. Gender does not differ in the utilization of R Packages for data analysis among post graduate students in universities in Rivers State.
4. The utilization of R Packages for data analysis does not differ among post graduate students based on university ownership.

Descriptive statistics and Z-test for the utilisation of R Package for data analysis among Post Graduate students in Universities in Rivers State based on Gender or school ownership.

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	R Package	7.5000	82	1.73739	.19186
	GENDER	1.5000	82	.50308	.05556
Pair 2	SCH_OWNER	2.2683	82	.62950	.06952

Paired Samples Test

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Rpack - GENDER	6.00000	1.89215	.20895	5.58425	6.41575	28.715	81	.000
Rpack - SCH_OWNER	5.23171	1.82099	.20110	4.83159	5.63182	26.016	81	.082

The above analysis shows descriptive statistics and Z-test for the utilisation of R Package for data analysis among post graduate students in Universities in Rivers State based on Gender or school ownership. It shows the descriptive statistics of R package (N =82, mean = 7.5 standard deviation = 1.73739 and standard error = .18119), gender (N= 82, Mean =1.5000, standard deviation = .50308 and standard error = .19186) while school ownership (N= 82 mean = 2.2683 standard deviation = .62950 and standard error = .06952).

The testing of the corresponding null hypothesis 3, it was indicated that the Z-test of 28.715 was gotten at 81 degree of freedom, with a corresponding p-value of 0.000. Since the p-value was less than 0.05, this result therefore indicates that gender differs in the utilisation of R Packages for data analysis among post graduate students in universities in Rivers State. Consequently, for null hypothesis 4, Z-test of 26.016 gotten from degree of freedom 81 with a corresponding p-value of 0.082, since the (p-value >0.05), this result therefore indicates that the utilisation of R Package for data analysis does not differ among post graduate students based on university ownership.

Discussion of findings

The utilisation of Statistical Package for Social Science (SPSS) for data analysis based on gender and school ownership

The result from research question one and two and the corresponding hypotheses, the result showed that gender differs significantly in the utilisation of SPSS for data analysis among post graduate students. Statistical Package for Social Sciences is used for data analysis among post graduate students by either male or female post graduate students; SPSS is used frequently by different field of studies. This finding is supported by finding of (Astro.com, 2022) which asserts that many sociologists, psychologists and social workers use this SPSS programme to enter their research data and formulate results. This means that the use of SPSS makes data entry interpretation and presentation easier for the researchers, company or industries. Also the finding was supported by the study of Odusina (2011), that the use of SPSS enhances the background of statistics. SPSS as a statistical package is rooted in statistical operations, it is very vital that all the post graduate students using SPSS to be conversant with statistical calculation as its output depicts statistical results and information. In line with the findings of Noel, (2018), SPSS can perform analysis on ANOVA, REGRESSION, CORRELATION, ANCOVA etc.

Also, the result from hypothesis two showed that the utilisation of Statistical Package for Social Science (SPSS) for data analysis does not differ among post graduate students based on university ownership. This means that SPSS is being used by both public and private Universities in Rivers State. The application of SPSS cut across all filed of studies in Universities in Nigeria. This finding is supported by findings of Cabrini, Grácio and Garrutti, (2006) which state that the wide application of the SPSS method in studying education and social phenomena and processes is not accidental; it is applied both in natural and social sciences. The finding is also supported by Idris (2018), which postulates that the goal of applying the SPSS in higher education was that students learn the basics of statistics to understand and evaluate information in

the world better. This explains that the use of SPSS in Universities in Nigeria is vital among post graduate students' in Rivers State Universities for data analysis.

The utilization of R package for data analysis based on gender and school ownership

The result in hypothesis five showed that gender differs in the utilization of R Packages for data analysis among post graduate students in Universities in Rivers State. This mean that the use of R package for data analysis differs significantly in gender among post graduate students in Universities in Rivers State. The extended to which R package is used by male differs with that of the female among post graduate students in Rivers State Universities. R package is used for qualitative data analysis. This finding is in line with the findings of Tyagi, (2022) which opines that R package uses various statistical tools on qualitative data like frequency distribution, relative frequency distribution, bar graph, pie chart and category statistics. As a statistical package, it can be used for regression, logistic regression, survival analysis, analysis of variance, factor analysis, multivariate analysis etc. the application of R package cut across non-parametric statistics. This is in line with the findings of Tyagi, (2022) which opines that various non-parametric tests like Sign Test, Wilcoxon Signed-Rank Test, Mann-Whitney-Wilcoxon Test, Kruskal-Wallis Test can be performed in using R package.

The result in hypothesis six showed that the utilization of R Packages for data analysis does not differ among post graduate students based on university ownership. This means that the use of R package for data analysis among post graduate students in Rivers state Universities does not differ significantly. Both public and private universities in Nigeria uses R package for data analysis. That obviously makes R package an important tool for analysis among post graduate students in Universities. This finding is supported by findings of Sage Campus, (2019) that the use of R package cut across disciplines from psychology to political science and across levels, from undergraduate to postgraduate students for higher education institutions. Universities across the world uses R package for different purpose. This finding is support by article published by Stack Overflow, (2010) that "R is most visited from universities, where it's a common choice for academic research, especially in the social sciences and biology". Also the cost effect of R package is low as compared to other statistical packages for various Universities.

Conclusion

Based on the findings, statistical package is useful to post graduate students and is utilised among male and female post graduate students in Universities in Rivers state and is most used by male students. The use of statistical package essentially reduces errors in data analysis, presentation and interpretation of result in research among students. Most schools, companies, business owners governmental agencies uses statistical packages for data analysis and presentation of result in either tabular or graphically. This study concludes that in this 21st century, statistical packages are frequently used for data analysis among Post graduate students.

Recommendation

Based on the findings of the study, the following recommendations were made:

1. Post graduate students both male and female should be encouraged to improve their efficiency on the usage of statistical package for social sciences (SPSS) for data analysis.

2. Institutions should endeavour to incorporate the training of SPSS among post graduate students for effective data analysis and error free in data presentation and interpretations
3. Professional experts should be contacted for teaching of R package among male and female post graduate students due its toughness.
4. Nigeria institutions should encourage separate curriculum on the usage and application of statistical packages especially R package in research study just like other compulsory courses where students are trained with practical application of statistical packages in analyzing data.

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