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Tools and Applications used in the Scientific Research

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Statistical methods involved in carrying out a study include planning, designing, collecting data, analysing, drawing meaningful interpretations and reporting the research findings. The statistical analysis gives meaning to the meaningless numbers, thereby breathing life into lifeless data. The results and inferences are precise only if proper statistical tests or tools are used.

Introduction

The research process consists of a series of actions or steps required to conduct research effectively and the desired sequencing of these steps. The following order relating to the various stages provides a helpful procedural guideline regarding the research process:

- Formulating the research problem;
- Comprehensive literature survey
- Develop the hypothesis
- Formulation of research design
- Determination of sample design
- Planning and Collecting data
- Classification and Tabulation of data
- Project execution
- Analysis of data
- hypothesis testing
- Generalization and interpretation
- Report preparation or presentation of results, *i.e.*, formal writing of conclusions.

There are Six major phases of the research process. They are

1. Conceptual phase
2. Design and planning phase
3. Data collection phase
4. Data Tabulation phase
5. Data Analysis phase
6. Research Publication phase

Statistical Tools & Applications used in the Research Process

1.1. Statistical Analysis Tool: SPSS: SPSS is the most popular tool for statisticians. SPSS stands for Statistical Package for Social Sciences. The latest version of SPSS is **IBM SPSS** 20, 21, 22, 23, 24, and 25. The following indices are present in SPSS software tool:

- Data view and variable view

- Measures of central tendency and dispersion
- Statistical inference
- Correlation & Regression analysis
- Analysis of variance
- Non parametric test
- Hypothesis tests: T-test, chi-square, z-test, ANOVA, Bipartite variable….
- Multivariate data analysis
- Frequency distribution
- Data exposition by using various graphs like line, scatter, bar, ogive, histogram, pie chart….

1.2. Statistical software for data science: STATA: STATA is a general-purpose statistical software package developed by StataCorp in 1985. STATA is "a complete, integrated statistical software package that provides everything you need for data analysis, data management, and graphics". Basically, Stata is software that allows you to store and manage data (large and small data sets), undertake statistical analysis on your data, and create some really nice graphs. This software is commonly used among health researchers, particularly those working with very large data sets, because it is a powerful software that allows you to do almost anything you like with your data.

1.3. R (R Foundation for Statistical Computing): R is a statistical software package that is widely used across both human behavior research and in other field. Toolboxes are available for a great range of applications, which can simplify various aspects of data processing.

1.4. MATLAB (The Matheworks): MatLab is an analytical platform and programming language that is widely used by engineer's scientists. A plentiful amount of toolboxes are also available to help answer you research questions (such as EEGLAB for analyzing EEG data).

1.5. Data Analysis Tool: SPREADSHEET PACKAGES: A spreadsheet is a computer application that simulates a paper worksheet. It displays multiple cells that together make up a grid consisting of rows and columns, each cell containing either alphanumeric text or numeric values. Microsoft Excel is popular spreadsheet software. Others spreadsheet packages are Lotus 1-2-3 Quattro Pro, Javeline Plus, Multiplan, VisiCalc, Supercalc, Plan Perfect etc.

1.6. Other Statistical Tools: SAS (Statistical Analysis Software), SYSTAT, S-Plus, LISREL, Minitab, Eviews etc.

1.7. Word Processor Packages: A word processor (more formally known as document preparation system) is a computer application used for the production (including composition, editing, formatting, and possibly printing) of any sort of printable material. The word processing packages are Microsoft Word, WordStar, Word perfect, Softward, AmiPro etc.

1.8. Presentation Software: A presentation program is a computer software package used to display information, normally in the form of a slide show. It typically includes three major functions: an editor that allows text to be inserted and formatted, a method for inserting and manipulating graphic images and a slide- show system to display the content. The presentation packages are Microsoft PowerPoint, Lotus Freelance Graphics, Corel Presentations, Apple keynote etc.

1.9. Database Management Packages (DBMS): Database is an organized collection of information. A DBMS is software designed to manage a database. Various Desktop Databases are Microsoft Access, Paradox, Dbase or DbaseIII+, FoxBASE, FoxPro/ Visual FoxPro, FileMaker Pro Commercial Database Servers that support multiuser are

Oracle, Ms-SQL Server, Sybase, Ingres, Informix, DB2 UDB (IBM), Unify, Integral, etc. Open sources Database packages are MySQL, PostgreSQL, and Firebird etc.

1.10. Browsers: A web browser is a software application which enables a user to display and interact with text, images, videos, music, games and other information typically located on a Web page at a website on the World Wide Web or a local area network. Examples are - Microsoft Edge, Internet explorer, Mozilla Firefox, Opera, Netscape navigator, Chrome (Google browser), Safari.

2.0.Tools through Internet:

2.1. Search Engines (to search the information)

- Google (popular search engine)
- Yahoo!
- Bing
- WebCrawler
- Excite
- AltaVista

2.2. Online Data/Documentation Management (to manage your documents online)

- Dropbox
- Google Drive
- Google Docs
- MS Sky Drive (free)
- Microsoft 365 (paid version)

2.3. Online Data Collection (To collect data online from different users)

- Online forms
- Online questionnaires
- Online surveys
- Google form
- Jotform
- Paperform
- Forms on Fire
- Zonka Feedback

2.4. Collaboration and Meeting tools:

- Skype: Voice and video conferencing
- Google Hangouts: Voice and video conferencing
- Teams: Voice and video conferencing
- Google Duo
- ZOOM
- Google Meet

2.5.Writing, proofreading and editing Assistant tools:

- Grammarly (free & paid version): writing Assistant to make their online writing clear and effective.
- ProWriting Aid (paid version)
- SEMrush (paid version)
- Hemingway Editor (paid version)

2.6. Bibliographic databases tools:

- J-gate
- CAB Direct
- Science direct
- SCOPUS (On line access to abstracts and full text articles, fee & paid access)

- Google Scholar (provides a simple way to broadly search for scholarly literature like articles, theses, etc.)
- Crossref (makes research objects easy to find, cite, link, assess, and reuse)
- Research Gate (social networking site for people doing research that includes scientists, academics, Ph.D. students, and researchers)
- Academia.edu (social networking site for people doing research that includes scientists, academics, Ph.D. students, and researchers)
- Shodh Ganga (This is an Indian theses repository all Indian theses can be stored and downloaded)

2.7. Reference management tool (help to formatting citations)

- Scribbr: APA Citation Checker and Citation Generator tools (free & paid version)
- Mendeley: This is an exceptional platform that comprises of social networks, article visualization tools, and reference managers. (paid version)
- EndNote

2.8. Ethics Research tools:

- Plagiarism (paid version)

2.9. Modern Research tools:

- Zotero
- Evernote

Modern electronic research tools, like **Zotero** and **Evernote**, make the collection of research data, and collaboration between colleagues possible, which that in the past would have been difficult, expensive, or even impossible. They also save large amounts of time citing and creating bibliographies. **Evernote** allows the user to capture digital content, including web pages, PDF files or snippets of web pages, organize them, annotate them, share them, publish them and search them.

Conclusion

Various programs and applications have eased our way of computing our research process. There are many software applications and tools available in connection with research activities like data collection, analysis, etc.

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