Information and Communication Technology tools for Research in Social Sciences

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Abstract

In the modern education system, Information & Communication Technology (ICT) has a seminal role and increasing its importance every day. The education system of the school, college and university is using ICT at various stages, and the utilisation of it grows with a higher level of education. The intensity of usage of ICT tools varies in university education streams like humanities & social sciences, commerce, management, science, medical, engineering, etc. In this article, we have reviewed the usage & feature of ICT tools in Social Sciences for research and higher study. This article may facilitate researchers & scholars for selection of appropriate ICT tools for their research work.

Keywords: ICT, Social Science, Research. Tools, Higher, Education

I. INTRODUCTION

The Modern education system does not achieve its goals without the use of appropriate and adequate ICT tools. The education system of the school, college and university is using ICT at different levels. Its usage in the higher education system is rapidly increasing. The university education system uses these tools for all the streams humanities & social sciences, commerce, management, science, medical, engineering, etc. but its intensity of usage varies.

It is essential that students, research scholars should choose the appropriate ICT tools and methods for their study and research. The usage of ICT is related to complicated tools to help in educational activities. It includes digital tools, cloud classes, e-books, audio-video lectures, web contents, etc. The execution of methods is done with the help of web broadcasting, extranet, intranet, internet, e-books and presentation-rooms[1].

The scholars from the stream of social sciences, humanities & commerce are less tech-savvy compared to science and engineering. The major problem with ICT tools is that students and researchers have to identify the appropriate tools and learn them. Other issues are that these tools are changing very fast and keep updating them is a key challenge[2]. In all the above cases, the usage and details of ICT tools available for study and research need to be mentioned at a place to help the students and researchers.

It is necessary to for less tech-savvy students and researchers to provide all the information regarding usages of the ICT tools for preparing study material, research proposal, collecting data, analysing the data and present the final reports. In the current scenario, a single mechanism is not enough to fulfil all the requirements of a researcher scholar. The teaching requires different types of tools, and the research requires other types of tools. So, there is a need to discuss the usage of ICT tools for the assistance of students and researchers.

The globalisation of education and research the researchers have to compete with global standards, and it is eased with the active and adequate usage of such tools. The existing scenario provides enough infrastructure and facilities[3] to students and researchers for easy adoption of the ICT tool. The use of the smart devices and internet attracts them to access the tools from anywhere at any time. In this article, we describe the usage & feature of ICT tools for the scream of Social Sciences used for research and higher studies. The tools mentioned in this paper are easy to use, and it may be a great assistance to students and researchers for understanding and selecting the appropriate and adequate means for their study and research work.

The article is divided into various sections. In Sec-II, we describe the process of research in social sciences, commerce and management streams. In Sec-III, we present ICT tools for education, literature resources, documentation, checking

of correctness, analysis and investigation, etc. Finally, we conclude our article in Sec-IV.

II. RESEARCH IN SOCIAL SCIENCES (RSS)

It refers to the analysis of individual behaviour or behaviours of people in different aspects. It deals with how and why of individual behaviour. Broadly, it is of two types, i.e. qualitative and quantitative research. The qualitative research is that in which data are collected by unrestricted and informal communication while in quantitative analysis, some statistical and computational methods are used. Social science research follows different scientific ways for different types of data sets. It contains various steps[4] which have to be followed by the researcher before conducting any research process. Fig 1 describes the actions of the research work in social sciences:

Researchers should first concern with their research idea they want to perform, and then research questions should be formulated. These questions are the base on which the research project is conducted. A research question can be formulated by examining the issues and challenges faced by the economy or a specific community or else;researchers can develop its interest in the particular subject matter. But before making any research question, one should keep in mind that the questions should be answerable and not too large or not too constricted.

Literature review refers to studying the published research or articles from different sources on those matters which a researcher is concerned. It can be in the shape of books or articles or magazines or other published sources. It gives the researcher to understand the facts and findings of others and can help as a base of their research. Theory can be in the form of a hypothesis which a researcher has to prove in his/her research process. Various econometrics tests are used to show the significance of the interpretation. These tests can be of parametric or non-parametric depends on the nature of the hypothesis.
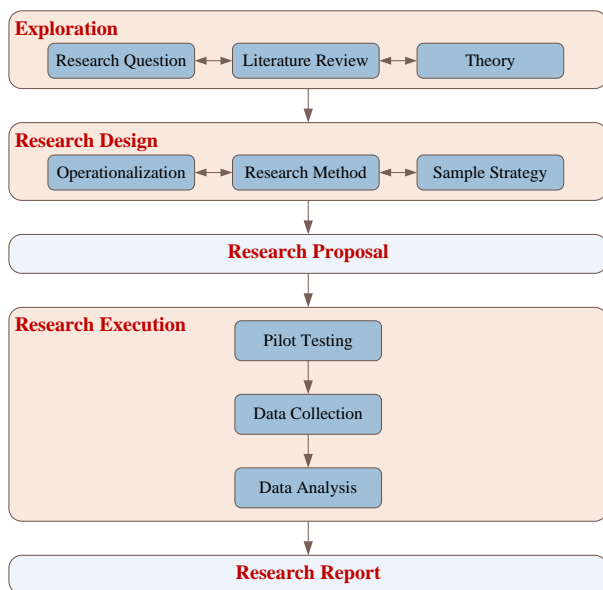

Figure 1: Social Sciences Research Process

Research design[5] is a process of collection and analysis of data required for the research. It shows one's research operation, which is going to be applied in the research process and provides information about the techniques used to the study. Thus while preparing an efficient and effective research design the methods of data collections and analysing them should be taken into account. There are two types of research design, i.e. formal and informal research design. Formal research design enables more control and includes a precise statistical process for analysing the data. In contrast, informal designs use a less complicated form of investigation based on variations in magnitudes.

Research methods are the tools and techniques used for conducting research. The research in social sciences has different types of methods used for different types of research. In table 1, we mention some research methods.

Table 1
Social Sciences Research types and methods.

Type of research	Research methods
- Field research	Participant inspection, Non- participant inspection, Mass inspection, Questionnaires, Interviews, etc.
- Library research	Historical records and documents study.
- Laboratory research	Random behavioursstudy of different groups.

Sample strategy refers to the methods used for the selection of a sample from a population or a large group of items for the research purpose. It includes two types of strategies, probability sampling and non-probability sampling. Probability sampling is that in which every element of the sample has an equal probability of selection. Probability sampling is also called as random sampling or chance sampling while in non-probability sampling has biased selection based on the convenience of the researcher. It is also known as purposeful sampling, purposive sampling and judgement sampling.

A research proposal is the research plan that a researcher is going to conduct. It includes the research questions, objectives of the research, the methodology that will be applied by the researcher, then indicators chosen by the researcher on which data analysis has to be done. In these sources, data will be collected, etc.

The pilot testing/study introduces a small scale examination or review or feasibility testing of research tool/methods selected for a research work such as a questionnaire or interview scheduling etc. it is a crucial component of a well-designed research plan. It helps to reduce the risk of project failure. In advance, it warns the researcher regarding failure and weak points of research project whether the tools/methods are appropriate or not.

Once the research problem and research design are defined, then the next step is data collection. There are principally two types of data, primary data and secondary data. Primary data consists of data which are personally collected by the investigators through questionnaires and interviews and by other methods used for collecting primary data. Secondary data are mainly collected from the published sources such as newspapers, government publications etc.

After the collection of data, it is analysed through various statistical techniques to get the reliability and validity of data for the research. There are dissimilar methods for different types of study such as if a researcher has to prove hypothesis introduced in the research then there are various statistical test those can be applied for testing the significance of the interpretation. Nowadays, the data analysis has become easy and can be done with the various software tools other than MS Excel such as SPSS, Eviews etc. Finally, the researcher prepares a research report and mentions the details of the procedure adopted, tools used, and outcome of the research work.

III. ICT TOOLS FOR RSS

The RSS is a study of individual behaviour or behaviour of people in different aspects. It has two types of studies, such as qualitative and quantitative research. It requires various statistical, computational, scientific methods & tools. The ICT tools are very useful for designing research plans, getting accurate results, analysing data and preparing documents. In the subsequent section, we describe various ICT tools and summarised in table 2 for researchers.

1. Educational:

Videos: YouTube is an extensive network and provides various educational content videos to the students. YouTube EDU is announced in 2009 where the educationists can put their videos [6]lectures and anyone can see them. Vimeo, like YouTube, contains various contents with high definition (HD) videos. Metacafe is easy to use and contains short and original contents with different categories according to the content searched, but its limitation is that some specific videos might be limited. National Geographic site which is full of inspiring, educational videos. Other tools used for learning online from videos are Archive.org, TeacherTube, For a TV, NASA Videos, etc.

Presentations: For a long time, PowerPoint is regarded as the easiest and useful tool for making presentations in every field of education, but now there are many other tools have been developed containing the features that are rarely found in PowerPoint. Emaze is an up-gradation on PowerPoint, and it includes a wide range of templates and visual learning aids and provides one to design 3D presentations. Cloud-based software which can be used on any computer for editing or for doing any change in the previous presentations, but it requires an internet connection. Google Presentation, an alternative to PowerPoint and have all those features that are not present in PowerPoint. If one wants to present its research for that, it has Google research tool. It is also cloud-based, but it does not require the internet and is enable for editing offline. Apply Keynote provides one to create, modify and present its presentation anywhere once the app is downloaded. Other tools which are mostly used for the creation of presentations are Prezi, Nearpod, Tellagami, etc.

Table 2
Summary of ICT Tools for RSS

Category	Require-ment	Tool Usage	ICT tools
Educational	Recorded/ Integrative Lectures	Make & view educational video lectures, online in lectures	Archive.org, Discovery Channel, TeacherTube, For a TV, NASA Videos, Zoom, Webexetc
	Animations, presentations	Presentations	PowerPoint, OpenPresent, LaTex, Prezi, Nearpod, Tellagami, etc.
	eBooks	Online publication and reading	EPUB, iBooks, Calibre, Kindle, PDFs, Digital/Open Library, National Digital Library of India, UGC-InfLibNet
	Classes	Cloud Classes	MOOCs, NPTEL, Coursera, Edx.org, Cloud Academy, etc
	Webinars	Interactive Web Seminars	WebinarJam, Demio, WebinarNinja, GoToWebinar,LiveStorm, WebinarOnAir, AnyMeeting, Zoom, Webex etc.
Literature Resources	Literature for researcher	An online search for related research publications	IEEE Digital Library, Elsevier, Springer, Online Journals, Conference Proceedings, Shodhganga etc.
Data Preparation	Questio-nnaires	Electronic forms for the collection of data	Google, Forms, PDF forms, Web/HTML pages, HTML Emails, etc.
	Document-ation	Documentation of research work for publication/ presentation	MS-Office, PDF-Creator, OpenWord, LaTex, etc
	Correct-ness	Checking of correctness and grammar	ProWritingAid, Grammarly, Reverso, Sapling, SentenceCheckup, PaperRater, Ginger,WhiteSmoke etc.
Data Analysis &Investiga-tion	Qualita-tive data analysis	Analysis of qualities	NVivo, MAXQDA.t, Atlas.ti, Socialsuite, IntraStage, HyperResearch, Advize etc.
	Quantita-tive Data analysis	Analysis of Data Science	MLib, RStudio,Anaconda, Python's R & STATA functions, SPSS, MATLAB, SAS Advanced Analytics etc.
Citation	Biblio-graphic	Reference maintenance	Zotero, MENDELEY, Citavi, PaperPile, RefWorks, EndNote
Similarity Check	Similarity Index	Plagiarism Tools	Turnitin, DupliChecker, Copyleaks, Scribbr, questext, plagtracker etc.
Indexing	Spreading Reach of publica-tion	Indexing in databases	Science Citation Index (SCI), Web of Science, Scopus/Elsevier, ICI (Indian Citation Index), Google Scholar etc.

E-Books: EPUB a highly flexible eBook reader contains interactive features, but it does not support many devices. It has two primary varieties of the reflowable and fixed layout. It can be read on computers using iBooks on MAC OS X and Calibre for MAC, Windows and Linux. Kindle Book a collection of eBooks used within Amazon.com's Kindle Reader podium. It has similar features of EPUBs and can only read with the help of the Kindle reader. Portable Document Format (PDFs) can be accessed at any type of device. Some eBooks that can be found on the web are International Children's Digital Library, Open Library, National Digital Library of India, etc.

Cloud Classes: There are many resources for the cloud professional, which help individuals to learn and join many online courses for both free and paid. Some of these are Amazon Web Services which provide short courses for free with substantial information. Udemy used by professional and educational institutions for delivering high-quality

contents related to education and offers various courses on different topics. It enables both paid and free courses for beginners, middle or professional in multiple languages. Other sources for effective learning through cloud classes are MOOCs[7], NPTEL, Coursera, Edx.org, Cloud Academy, etc.

Webinars: The word means 'web' and 'seminar' an event organised on the internet and is attended by the participants by an online link sent by the organiser to the participants. Other terms used for the webinar are web event, webcast, online seminar, etc. They offer various opportunities such as ask a question, chat, poll, survey, etc. and contain various interactive training activities, categorised as a general workshop for a mixed audience &closed workshops for specific group training. The conference is a formal meeting where people or professionals confer or discuss regarding a matter or subject. There are one or more important speakers who convey speech on the subject matter. It has various types such as Symposium, Seminar, Round table, etc.

2. Literature Resources:

IEEE Digital Library: Is Institute of Electrical and Electronics Engineers[8] where more than 4 million scientific and technical documents, journals and articles were published. It has the world's most cited publications in streams like electrical engineering, computer science and electronics. It contains documents in a robust, dynamic HTML& PDF formats.

Elsevier: It includes journalssuch as the lancet and cell, the science direct collection of electronics journals, the online citation database Scopus etc. It publishes more than 40 thousand articles in a year. It helps the researcher to in discoveries and provides them knowledge which they want to find a grant. It helps administration and institutions to improve their research strategies.

Springer: Publish academic journals and books mainly form fields such as nursing, social work, psychology etc. it also has vast eBook collections and archives. It provides researchers with quality content in academia, scientific institutions and corporate research and development.

Online Journals: A service given by the non-profit international association of online engineering. It aims to contribute to innovations in science in a very efficient and effective method which enables researcher and other easy access. It also offers their support to the researcher concerning copyediting, design of articles in the format LaTex, OpenOffice and Microsoft word.

Conference Proceedings: A record or collection of the published articles presented in conferences, symposium or other meetings sponsored by associations or other institutes.

3. Data Preparation:

Questionnaires: A type of primary investigation in which data are collected through schedules that are to be filled either by the investigators or with the help of enumerators or it can be filled by the individuals themselves those are selected by the investigator or researcher. It contains questions required by the researcher's subject matter. Things that should be remembered while designing a questionnaire are the minimum number of questions; Questions should be

easy& clear to understand; Questions should be answerable as yes or no, or it should contain options which help participants to answer. A questionnaire should have multiple-choice questions; simple, alternate questions; specific information questions; cross-check questions etc. The researchers may use Google forms[9], PDF forms etc. for designing, collecting responses of a questionnaire. The researcher may create online form and HTML emails to record the answers of responders.

Documentation: Such as user guides, white papers, online help etc. it often provided via websites, software products, and online applications. David Berger has given several ethics of document writing, terms used, etc.. The guides which deal with each field and type are a) documentation in health care, b) theory writing, c) papers for scholarly journal publishing. Documentation consists of a procedure that is while writing the thesis it involved SOPs convene steps such as drafting, formatting, submitting, reviewing, approving etc. and in dictatorial diligence.

Correctness checking a process which verifies one's knowledge of English grammar, its style to express. In recent time there are many software tools available for checking the English language, a grammar which helps professional for there writings. Some of these software tools which are commonly used are ProWritingAid[10] tool for checking grammar online;Grammarly easy and affordable tool for checking spellings and grammar. It also grants free online content editor and free browser expansion for chrome, Safari, and Firefox. White smoke is used for editing through grammar and checking punctuations. It also suggests the writer where he should improve his writing. It works mostly on MS Word and Outlook, Ginger online for text editing most commonly used as it combines with MS word. Others tools for checking and testing grammar and other writing mistakes are grade proof, language tool, online correction, paper rater etc.

4. Data Analysis & Investigation:

It is the process of analysing and applying different statistical techniques to evaluate and define the data collected for the research. The reprehensible methods will alter the analysed results and will mislead researchers and can have a negative influence the society. Thus proper and correct techniques should be applied for better results. The best tool for analysis of data is MS-Excelbesides this; there are other software tools developed nowadays which are also commonly used for analysis moreover thestatistical software provides accurate results. These tools are designed for both qualitative and quantitative data sets.

Qualitative data analysis tools:NVivo developed by QSR and designed for qualitative data analysis. It requires rich text-based multimedia information where a small or large amount of data can be analysed. MAXQDA.ti is similar toNVivo[11] and allows association, colour coding and recovery of data. Atlas.ti is a package of outsized bodies of textual, graphical, sound and video data.

Quantitative Data analysis tools: Apache Spark developed on data science and is an engine for processing large data sets. It has MLib a library which contains techniques such as classification, regressions and other statistical methods. Python includes the functions of R and

STATA[12]. Its usage has been growing over the years. R is software which is free to access and is used for analysing data and graphics. It provides various types of statistical and graphical techniques. SPSS (Statistical Package for the Social Sciences)[13]used for editing, analysing and presenting data in academic research. Stata is a general-purpose package. It is generally used in the streams like economics, sociology, political science etc. it has facility such as graphics, data management, custom programming, statistical analysis, regression and simulations.

5. Citation:

A bibliographic section where references from different sources for the related work of others to the subject of discussion form where the references appear are given. The citation can be done into various styles which are common to science and social sciences. Some styles are the Chicago manual of style, MLA and APA styles. Among this APA style is commonly used. Nowadays, various tools for the citation or references have been developed, which helps to arrange and layout citation easily. Zotero is a reference tool which is freely available to collect, refer to, organise and share research sources. It automatically resolves its data or references sources of PDF files and take out the reference in turn and list it to the library. MENDELEY is also available in free which manage and helps in arranging the research, pool resources online and ascertain new research. It is easy to install the Mendeley desktop tool on the computer. One can arrange it reference in Mendeley library by merely copying or dragging files from the drive. It can be used for the MS Word and LibreOffice.EndNote which provides facility to copy references from online sources directly, i.e. PubMed, Library of Congress etc. One can also input its reference manually if the sources are unpublished. But it has to be purchased and is somehow costly.RefWorks[14] is same as EndNote. It is a web-based tool where references are stored online. Other citations tools are Citavi, PaperPile, JabRef etc.

6. Similarity Check:

These are used for checking the similarities of the articles or manuscripts with the previously published works. Many publication organisations use these tools for checking similarities or plagiarism. Several software tools are now available for plagiarism checking some of these are free, and some are used after purchasing their licenses. DupliChecker[15] is a free tool and easy to use and is widely used. It provides researchers to either copy-paste text for the similarity check or can upload text or document. It enables 50 documents to be checked per day.Copyleaks based on cloud certification and provide one to follow eLearning substance on the internet. It allows checking multiple files or articles of all Universal character encoding standard languages. It enables the API tool for plag check and provides a mobile app. Turnitin[16] is a plagiarism checker which is based on internet and is commercialised by America. Other plagiarism checker tools are Scribbr, questext, plagtracker[15] etc.

7 Indexing:

It is the list of articles that are cited, each along with a list of citing articles. It must have an online indexing service for the success of a journal. It is a type of reference database where indexing of citation is done between publications which enable researchers to access and establish the articles easily and cite previous articles. The primary indexing services are SCI whose electronic version is known as 'web of science', Scopus or Elsevier, ICI (Indian Citation Index) and Google Scholar etc.

IV. CONCLUSION

This articlepresents the ICT tools required for the research in social sciences (RSS). In sec-II, we briefly described the research process followed in social sciences. Sec-III presents the various ICT tools available for RSS at different stages of research like educational, literature resources, data preparation, data analysis & investigation, citation, similarity check and indexing. This provides the information regarding the ICT tools required during research planning, literature review, collection data analysis of research data for the less tech-savvy scholars at a single place. It will help the researchers in the quick and right selection of ICT tools for their work.

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