

Augmenting Research using Software and New Technologies in contemporary times

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Abstract:

What is constant is the “Change”. Key to development, innovations and improvisations is “Change”. As the name itself signifies “re-search”, if we search again using new tools and techniques, we may come across the unexpected results which may be desired in contemporary times. The process of research needs to be upgraded and upscale. The reason is pretty simple, technology is evolving very quickly. Emerging are those technical innovations which represent progressive innovations within a field of research. The researchers of the time have adopted many technological devices for their research work like computer assisted data analysis packages (CADAP), tablet computers, cloud based computing etc. The spread of video and photographic technology means that images can be used both as sources of data and as tools for data collection. The digital form much audio and video data now takes makes possible new ways of creating, processing and analyzing such data. The parallel growth of the Internet also makes available new ways of collecting qualitative data and new settings in which to collect it. This paper attempts to describe various types of tools which can be practiced by researchers to enhance and improve the experience of conducting qualitative research.

Key words: CADAP, computer assisted qualitative data analysis, Computer technology, telecommunication technology, instructional technology.

Introduction:

New technologies offer new opportunities. Nearly five decades ago, when the first programmable computer switched on, that was a research of science and then science became a tool to research. Technology is one of the researches of science. The same is now being used as a tool to facilitate research in various domains of knowledge. Be it computer technology, telecommunication technology, instructional technology or blend of all to create new entity. The blends of these have done much to remove from the researcher the constraints of speed, cost and distance. Through these technologies researchers can collaborate more widely and efficiently. The scale of use of technology in the research process depends upon the nature of discipline. The everyday work of the researcher involves writing proposals, developing and investigating theoretical models, designing experiments, collecting data, analyzing data, reviewing and interpreting the results. The blend of technologies and the tools developed, when employed by the researcher for these purposes proves to be effective and efficient. Collecting and analyzing data using technology, makes it possible for the researchers to process and manipulate observations in the database consisting of n number of variables for each individual and developing set of relationships and then subject the data to complex statistical analysis, at a reasonable cost which was not possible two decades ago. Increasing availabilities of software packages for standard research activities allows researchers to do statistical analysis of their data, compute complex mathematical functions, maintain larger database and develop graphic displays if required. Researchers can work more efficiently through the blend of computer technology and communication technology. Researchers cannot work without the access to collaborators for which communication is needed. The technologies that can be employed for the same are e-mail, word processing and networks which would support the researchers to share information, organize and schedule the events/experiments and further handle the logistics. Increased communication among researchers as a result of proliferated technological usage allows data collection and analysis to be done remotely, and data to be shared among concerns with same interest but in different domains leading to knowledge explosion. Researchers are

making new collaborative arrangements. The technology of network provides increased convenience and faster turnaround times. A technology in the process of development reflects the potential of networks. Multimedia mail allows researcher to send combination of still images, videos, sounds and text. Teleconferencing provides simultaneous electronic links among several groups. Electronic chalkboards allows researcher to draw and have the drawing appear on their computer and on the computers of collaborators across their country. The advent of digital information technology continues the revolution, suggesting a futuristic vision of research.

Technological tools for data Collection:

Technological advancements have paved a different path through which researchers can collect data for their work. Widespread usage of mobile technology and smart devices has presented researchers with the tools to collect data in a more innovative and creative way. Some of the technological advancements are:

Computer-Aided Personal Interviewing (CAPI) has been around for decades and its benefits well documented, it is still not a mainstream data collection technology among financial inclusion researchers. The main advantage of CAPI is that it allows the interviewer to focus on the interview and leave the sophisticated routing and filtering to the laptop, tablet or mobile phone.

Online/web surveys are perhaps the data collection method that has developed most rapidly over the past 10 years; and in many developed countries, online surveys are the primary tool for data collection. They lend themselves to all forms of gamification, which make them more engaging than other survey methods. Online surveys can be used on a variety of devices, including PCs, tablets and mobile phones. These include the low costs of, automation of and real-time access to data, the fact that they take less time to execute, are convenient for respondents and offer design flexibility and creativity, and that interviewer bias is eliminated.

Mobile phone surveys are becoming increasingly popular, despite concerns around self-selection bias, because they are cost-effective, quick to deploy and generally provide “good enough” reading for decision-making. These surveys are cost-effective, work on all phones, are considered an unobtrusive contact method, deploy well-used and well-understood technology, have quick turnaround times and can have large samples.

The use of **Interactive Voice Recording (IVR)** surveys is increasing. They can be quite impersonal and need to be short to be effective. Self-selection is usually a major concern, and the technique requires that the respondent uses the keypad to respond to questions asked by the IVR system.

Web tracking technologies (like cookies or meters) allow researchers to monitor websites in terms of how long users spend on them, when they visit, which links are clicked through and so forth. Through this, researchers can gain a deep understanding of how consumers behave online, which content interests them and which products and services they research and purchase. This type of data is also used to improve advertising effectiveness.

A **chatbot** is an artificially intelligent software program that uses natural language processing to hold a conversation with its users. They are programmed to interpret and understand natural language to complete common tasks but were originally developed with the intent to use them in surveys to ask and direct open-ended questions. Some more sophisticated bots can assess sentiment and direct follow-up questions based on the direction of the sentiment. Survey bots make for a more conversational style, which should lead to better-quality responses and can be deployed in online surveys or through messaging apps.

Functional Magnetic Resonance Imaging (fMRI) is a technique used by research to monitor in which regions and to what extent the brain responds to various stimuli. It does this by monitoring blood flow in the brain. Marketers have been using fMRI extensively to see how consumers respond to advertising and which product mix factors influence decision-making.

Galvanic skin response. Galvanic skin measurement is done to detect a change in the electrical resistance of the skin caused by emotional stress, and this is measured with a sensitive galvanometer. For example, we can measure the reaction of a consumer to a brand, advertisement, web page, in-store experience, fragrance and so forth. The advantage of this method is that it strips out the perception bias and measures the actual emotional response to a stimulus.

Eye-tracking technology allows researchers to track eye movements in real time. Knowing what people are seeing and what they pay attention to assists with advertising, web and product design. This data is quantified and an aggregated visual analysis is presented depicted the pattern and strength of gazes.

Social media monitoring. There is a plethora of tools that allow researchers to extract and analyse social media data (Twitter, Facebook, etc.). These kinds of techniques can be useful to gauge sentiment towards a company, brand, product or political issue.

Poll Everywhere make use of wireless technology to gather “live” data through internet-enabled devices. Poll Everywhere allows the researcher to ask questions, either multiple choice or open-ended, and get live responses from the participants via text or website interaction. The results can be viewed in real-time online or as an embedded image in a PowerPoint or Keynote presentation. This kind of technology can be useful in gauging a group's experiences or opinions. It could be especially useful in focus groups when there may be a sensitive topic where anonymity of responses would be beneficial to the participants. It could also be helpful in getting conversations started in focus groups by polling participants about the topic and using the results to prompt discussion.

Skype-Another online tool for gathering textual data is Voice over Internet Protocol applications such as Skype. Most people are aware of Skype for video and phone calls, virtual meetings or instant messaging, but it can also be used for data collection. For example, you can conduct interviews or focus groups in real time via the instant messaging feature, which allows multiple users to participate simultaneously by typing their comments in a common “room.” All conversations are saved in Skype and can then be searched for keywords or concepts. The conversation can also be exported in plain text format into programs such as Microsoft products (Word or Excel) or a specialized qualitative data analysis program.

Programs such as **Kudos Chat Search** also allow the user to do more powerful and complex searches, backup data, and manage multiple Skype accounts and chats across multiple computers. Skype can also be useful for collecting audio and visual data. The researcher can conduct interviews or focus groups via the audio-only phone feature or the video chat feature that includes a live video stream of each participant. Programs such as Evaer video recorder for Skype allow you to record both audio and video content and convert it to MP4/AVI files that can be used in data analysis.

In addition, applications such as **Circus Ponies** or AudioNote allow you to record audio and take notes within the same interface, with the audio and notes synced. Users can either navigate through the audio file via automatically generated time stamps or by clicking on a note that then links directly to the audio that was recorded when the note was written. Notes can also be added after the initial recording is made, so researchers can sync added notes to the audio file while working on data analysis or during the writing process. Syncing notes and audio data enhances the utility of field notes and creates a seamless integration of normally unlinked sources of data.

Picasa and Flickr allow users to create closed groups of invited users to upload and share photographs from participatory visual methods projects. These photo-sharing sites can house data and also function as an online forum for reacting to and discussing the images.

Ning- support more of a community-building process by allowing the researcher to create an interactive online community that includes customized forums, photos, videos, and blogs, all of which can be contributed to by invited users.

Geo-tagging refers to the process of attaching geographical coordinates to other types of data. These programs create a digital history of place by using smartphones to track location as standalone data or to attach spatial information by “tagging” photos, videos, or written material. This function could be especially useful for ethnographies or other projects in which place are conceptually important.

Longitudinal research has begun to embrace new technologies to supplement traditional data collection methods. New technologies are increasingly being used to improve the quality and quantity of different data, as well as collecting entirely new kinds of data. Smartphones, fitness trackers, or the ‘internet of things’ provide new data on study respondents, while linking to social media, smart meters and loyalty cards can generate additional information not available via traditional survey methods.

These new technologies offer potential advantages over questionnaire-based data collection in terms of the content and quality of data collected, the burden placed on respondents, and the cost of data collection. However, which of these benefits can be realised depends on the features of the technology, how it is used and, most importantly, the purpose of collecting the data in this way

Technological Tools for Data Analysis:-

We carry out research to test hypotheses, and we do that by getting hold of data. Hopefully, if our experiments are planned and executed correctly, we can get hold of good data that can tell us something unique about the world.

While the first part of any experiment – the planning and execution – is critically important, it is only half the battle. How the data is treated is just as important, and analyzing good data in the right way can lead to groundbreaking findings and insights.

Data analysis is often seen as the scariest aspect of completing research, but it doesn't have to be that way. While you'll need to understand what to do with the data, and how to interpret the results, software that is designed for statistical analysis can make this process as smooth and as easy as possible. A great number of tools are available to carry out statistical analysis of data, and below is the list of few suitable for human behavior research.

Statistical Package for Social Science (SPSS)-SPSS is the most popular quantitative analysis software program used by social scientists. It can be used to generate tabulated reports, charts, and plots of distributions and trends, as well as generate descriptive statistics such as means, medians, modes and frequencies in addition to more complex statistical analyses like regression models. SPSS provides a user interface that makes it easy and intuitive for all levels of users. With menus and dialogue boxes, you can perform analyses without having to write command syntax, like in other programs.

STATA-STATA is an interactive data analysis program that runs on a variety of platforms. It can be used for both simple and complex statistical analyses. STATA uses a point-and-click interface as well as command syntax, which makes it easy to use. STATA also makes it simple to generate graphs and plots of data and results.

SAS- SAS, short for Statistical Analysis System, is also used by many businesses. In addition to statistical analysis, it also allows programmers to perform report writing, graphics, business planning, forecasting, quality improvement, project management and more. SAS is a great program for the intermediate and advanced user because it is very powerful; it can be used with extremely large datasets and can perform complex and advanced analyses. SAS is good for analyses that require you to take into account weights, strata, or groups.

R: . Is a free statistical software package that is widely used across both human behavior research and in other fields. Toolboxes (essentially plugins) are available for a great range of applications, which can simplify various aspects of data processing. While R is a very powerful software, it also has a steep learning curve, requiring a certain degree of coding. It does however come with an active community engaged in building and improving R and the associated plugins, which ensures that help is never too far away.

NVio: "It helps researchers organize and analyze complex non-numerical or unstructured data, both text and multimedia," according to [UCLA Library](#).

MATLAB: Provides "Simulations, Multidimensional Data, Image and Signal Processing," according to NYU Libraries. MatLab is an analytical platform and programming language that is widely used by engineers and scientists. As with R, the learning path is steep, and you will be required to create your own code at some point. A plentiful amount of toolboxes are also available to help answer your research questions .While MatLab can be difficult to use for novices, it offers a massive amount of flexibility in terms of what you want to do – as long as you can code it (or at least operate the toolbox you require).

Microsoft Excel: While not a cutting-edge solution for statistical analysis, MS Excel does offer a wide variety of tools for data visualization and simple statistics. It's simple to generate summary metrics and customizable graphics and figures, making it a usable tool for many who want to see the basics of their data. As many individuals and companies both own and know how to use Excel, it also makes it an accessible option for those looking to get started with statistics.

Graph Pad Prism is premium software primarily used within statistics related to biology, but offers a range of capabilities that can be used across various fields. Similar to SPSS, scripting options are available to automate analyses, or carry out more complex statistical calculations, but the majority of the work can be completed through the GUI.

The **Minitab** software offers a range of both basic and fairly advanced statistical tools for data analysis. Similar to GraphPad Prism, commands can be executed through both the GUI and scripted commands, making it accessible to novices as well as users looking to carry out more complex analyses.

Newer Web 2.0 (i.e. cloud-based) software, such as **Dedoose**, allows users to access their data and analysis from any computer with internet access. Dedoose also allows for multiple users to work on an analysis project simultaneously from distant locations, facilitating the increasingly common practice of team-based coding and analysis in qualitative research. Because the analysis software is housed on a remote server, it is updated continuously and without effort on the part of users allowing the developers to add new features without interrupting the user experience.

Atlas.ti has a well-developed “network” interface that allows the researcher to drag and drop codes, quotations, or other concepts in order to organize their connections and relationships. Similarly, mind mapping software is accessible and easy to use, allowing researchers to organize patterns and themes that emerge from data analysis into a conceptual framework.

Many technological advances in recent decades were quickly adopted by qualitative researchers. Early software programs were associated with a grounded theory approach and some worried that using the software would lead to a troubling homogenization of qualitative research methods ([Coffey et al., 1996](#)). As researchers became more familiar with computer-assisted data analysis packages, these concerns largely dissipated and the use of computers in qualitative analysis has grown considerably ([Gilbert et al., 2013](#)). New applications available on the internet, and more recently through smartphones, tablet computers, and cloud-based computing, are again changing the way we carry out our work as scholars ([Van Doorn, 2013](#)).

Technological Tools for Dissemination:

Researchers also disseminate results through presentations, such as at academic conferences or as training for practitioners. Presentation software has become the standard means of providing visual aids at conference and other presentations. Most academics are familiar with at least one presentation software package, such as Microsoft's Powerpoint or Apple's Keynote. Several new software applications have developed that improve the user experience or final product. For example, Prezi eschews the standard linear format of presentation software and instead has users place all their presentation content on a single canvas so that a “camera” can then move around and zoom in and out to view the content. Done well, this feature of Prezi gives presenters an added way of telling the story through the use of visual metaphors (e.g. the phrase “if we dig down deeper into the interview data, we can see something interesting emerge” can be paired with the camera zooming in to show the interesting findings). However, the movement of the camera around the canvas can make audience feel motion sickness. One of the more useful features of new presentation applications is that they are web-based, rather than housed on a local computer. Having cloud-based presentations allows for easy collaborating with coauthors. More importantly, the presentation is housed on a server and can be shared as widely as the user wants. Presentations can also be paired with pre-recorded audio tracks in order to share a verbally annotated version of a presentation. Twitter can be used to publicize and share brief updates about research findings with networks of colleagues and practitioners. Blogs offer a venue for engaging in discussion and dialog about issues related to research ([Vannini, 2013](#)). Many free blogging sites are available (e.g. WordPress, EduBlog, and Blogger). Infographics or visual

and graphic depictions of research findings offer engaging and accessible ways for practitioners to quickly understand the gist of the results. Visual.ly has a large gallery of infographics and templates for creating your own graphic. Others have experimented with using cartoons and digital animation to disseminate research results to communities and stakeholders ([Bartlett, 2013](#); [Vaughn et al., 2013](#)).

Conclusion:

New software offers a means of increasing the ease by which qualitative researchers communicate their ideas. Much of the research done by social workers has direct relevance to practitioners and finding ways to distribute results to those most likely to make use of them is a particular priority for community-engaged scholars. Technological advances open up new possibilities for qualitative researchers to share their findings with nonacademic audiences. In this paper we have made an attempt to discuss various technological tools used by researchers for data collection, data analysis and result dissemination. But the advancements and emergence of technologies is a continuous process, so a researcher should keep himself/herself upgraded with the emerging trends.

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