



## REVIEW OF RESEARCH



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### USING TECHNOLOGY TO CONDUCT RESEARCH IN EDUCATION

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#### ABSTRACT

*Technology has changed the way research is conducted by academicians in all disciplines. Unfortunately, however, the availability of research on this topic in the field of education, where one is more likely to find instructional technology as the focus of related research studies, is a problem. The author recommends solutions to this problem including not only an increased focus on the availability of such technologies, but also the extent to which these technologies are used by educators as well as their perspectives regarding concomitant advantages and disadvantages. The fact that such technologies are coming into existence as fast as they can be documented, while but one limitation noted, is more reason for comparative analyses that can be used to inform next generation technologies.*



**KEY WORDS:** Internet, World Wide Web, research, educational policy analysis.

#### INTRODUCTION:

The Internet or World Wide Web (www) emerged in the 1990s as an important new source of mediated messaging. Subsequently, research and scholarship in higher education has changed. Interestingly, however, very little has been written on this topic by academics in Education. In fact, no related research studies can be found in the literature. The latter is particularly significant in comparison to the volumes that have been written related to this topic in other disciplines and the amount of research that is reported in Education in the area of instructional technology. Traditional research methods involve extensive photocopying of paper-based journals and books and note-taking. Today's twenty-first century research methods demand the use and knowledge of the Internet to access indices and abstracts (e.g., [formerly] ERIC, Psychological abstracts, etc.). Further, the World Wide Web has the capacity to combine characteristics of existing media (e.g., print, audio, and video) with a number of new critical attributes including hypertextuality and interactivity. In addition, electronic or online survey system software packages are now available – offering sophisticated questionnaire logic features.

It is now increasingly common for a faculty member to use remote data bases, exchange e-mail globally, collaborate on research, and get copies of the latest journals all online. The “new scholar” on the internet uses distant libraries, meets new colleagues online, and exchanges ideas and knowledge in real time with academics around the world. No longer are they bound to traditional hard copy journals and books.

The extent to which scholars in Education are using the full array of available technology resources to conduct academic research, however, begs for empirical perspectives, not to mention perceived

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advantages and disadvantages or effectiveness of these transforming technologies. The purpose of this article is to begin to address this gap.

### TECHNOLOGY UTILIZATION

Utilization of the Internet and related technologies to conduct academic research can be organized into three broad categories: (1) information and data collection, (2) data, statistical, and text analysis, and (3) results communication.

#### Information and Data Collection

Electronic mail (e-mail) is the most wide spread internet/technology service used by all academics. In addition to its obvious use for sending and receiving messages, e-mail has become the basis for what are many other academic research related activities. There are, for example, discipline specific discussion groups that use automated systems to transmit and receive e-mail messages from one person and then automatically to everyone else on a designated list. E-mail can also be used to get files from file transfer protocol (FTP) sites, find resources through various search engines, and get information from databases.

In addition, several electronic (online) journals have come into existence over the last decade. Academics serve as editors and referee for these online journals, and receive and critique articles using e-mail. Also, opportunities for collaboration in developing thematic journals and writing articles at a distance has become increasing common and many paper-based journals now allow electronic submission of text using the Internet. On-line surveys can also be conducted using e-mail or web survey software for purposes of information and data collection. E-mail surveys involve sending a survey to a list of individuals who then reply with their answers. Web-based surveys involve posting a questionnaire on a web page that potential respondents visit.

These software systems are interactive. They present and gather information from respondents through standard web browsers and store the data in e.g., an Oracle<sup>®</sup> or Microsoft<sup>®</sup> SSQL Server<sup>™</sup> database. 2Way is a JavaScript<sup>™</sup> application embedded in an HTML document, deployed to the Internet via a web server. 2WAYS intelligently gather feedback through multiple user-defined logic paths. Using this logic, a 2WAY interaction responds to user feedback with new questions and elements based on their responses, helping to tailor content to individual recipients (<http://www.2way.com/products/is/what.htm>).

Peruses, represents yet another web-based survey software system available to academic researchers. The survey processor can run on any server operating system (OS), enabling each organizational unit to use the server OS that best fits its needs (e.g., Perl, Java, and Python.net). Survey results can be managed in Oracle, SQL, server, Sybase, or DB2, enabling institutions and faculty to use their current database standard (<http://www.perseus.com>).

#### Data, Statistical, and Text Analysis

Most web-based survey systems can also be used to analyze research data. Respondent data can be formatted to contain bar charts, pie charts, and itemized lists of text responses representing both aggregate and individually collected data (<http://www.2way.com/products/is/what.html>, [http://www.perseus.com/survey/news/release\\_efm\\_trade.html](http://www.perseus.com/survey/news/release_efm_trade.html); <http://www.surveysystem.com/websurveys.html>).

Most academic researchers are very familiar with electronic versions of SPSS and SAS, particularly in Education. In addition to the typical SPSS and SAS software programs, SIMSTAT for Windows: Simulation and Statistics, v2.5 might also be considered. SIMSTAT is a statistics program that provides for the conducting of a wide range of statistical analyses of a descriptive nature including cross-tabs, t-tests, ANOVA/ANCOVA correlations, linear, nonlinear and multiple regression analyses, time-series, and reliability, etc. SIMSTAT, however, goes beyond mere statistical analysis. It offers output management features as well as its own scripting language to augment statistical analysis and write small applications, interactive tutorials with multimedia capabilities, and computer assisted interviewing systems. (<http://www.exetersoftware.com/cat/simstat.html>; <http://www.simstat.com/simw.htm>) The 2Way Survey Interactive System as well as Peruses,

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mentioned earlier, also provide for automated statistical analysis. In addition to web-based questionnaires, Peruses allows for telephone-based interviews with sound and graphic images, and has a report “indexer” (an add-on function) that can be used for purposes of benchmarking. Nowhere in the literature, however, did the researcher find any studies of the extent to which these various technology resources are actually being used by faculty researchers in education.

In addition, quantitative computer text analysis software is available. As early as 1997, Skalski provided a listing of quantitative text analysis programs and highlighted key features of each. Most of these software programs as identified by Skalski (1997) were able to perform quantitative and or qualitative text analysis functions such as the development of alphabetical lists, frequency lists, multi-unit data file output in (case-by-case) variable form, key word in context (KWIC) or concordance, coding with a built in (standard) dictionary, and coding with a user-created (custom) dictionary as well as other special analyses.

After WWII, the development of the digital computer sparked widespread interest particularly in formal, quantitative computerized models to convert “soft” problems into “hard” ones. Subsequently, a new breed of technical practitioners came into being, including policy researchers who began to use formal computerized modeling techniques to address economic, business, and social policy in addition to e.g., differential and inferential statistics.

As noted by Gill and Sanders (1992), statistical methodologies such as multiple correlation, log-linear modeling, and analysis of variance can provide valuable insights into relationships among variables in the policy environment. Such work has come to be more specifically referred to by educational policy researchers as “policy analysis.” A listing of related differential technologies available to and/or used by the education policy analyst also remain, however, conspicuously absent in the education literature. Empirical evidence of how these differential technologies have impacted the work the education policy analyst, also remains unknown.

### **COMMUNICATING RESEARCH RESULTS**

E-mail and Web-based surveys such as 2Way and Perseus Interactive systems allow for respondent data to be published as HTML reports, research articles, or be exported to third-party analytic tools for purposes of report writing and preparing for dissemination. Using these technologies, resulting reports and research articles can also be formatted to contain bar charts, pie charts, and itemized lists of text responses representing both aggregate and individual views of collected data. It is also noted that it is becoming more commonplace for such reports and research articles to be published online in electronic journals.

In terms of citing references, End Notes represents one of many software packages available for citing references once research findings are written and prepared for publication. Again, however, no empirical research has been published that describes the extent to which education researchers use or do not use this or similar software. Empirical evidence in terms of advantages and disadvantages, along with recommendations identifying more contemporary product software could prove invaluable to the educational researcher.

### **Limits to Using Technology to Conduct Academic Research in Education**

There are limits, however, in terms of using technology to conduct academic research in Education. One limitation is costs. Technology infrastructure continues to need more funds. Colleges of Education are being required to spend huge amounts of their budgets on computer-related support. A second limitation is time for training and education. In addition to Education faculty typically carrying greater teaching loads than faculty in the so called “hard” disciplines, they are also held to traditional research and service requirements. And, third though not final in terms of limitations - one drawback noted by Lindblom (1992) is that it is still impossible to take all factors into consideration in data collection and analyses. No matter how sophisticated the technology, all possible outcomes cannot be projected. As such, resulting policy changes in Education tends to be incremental. As new analyses are conducted or new, more sophisticated technologies emerge, the policy will continue to change, infinitum. This latter would also be the case with

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traditional paper and pencil approaches as well. The advantage of technology would lie in a quicker turnaround time of analyses that can be used for purposes of research reporting.

### SUMMARY/CONCLUSION

Empirical research is needed to determine the extent to which academicians in education researchers are using technology to conduct their research. The results of such research would provide useful insights not only into the various technologies that have emerged more recently and are being used to conduct research, but also the applications, strengths, and weaknesses of each. Short of this much needed empirical data, a well organized web site listing such applications as they emerge, inclusive of links and tutorials, would be a good starting point. Future research could include topics such as how technology is continuing to change the way academic research is conducted, perceived advantages and disadvantages of emerging research techniques and related effectiveness and efficiency studies.

Today, education needs professionals more capable than ever in terms of analyses and management of complex problems, and knowledge production. Technology can help, but these professionals - many who are education researchers - must have or create empirically-based insights in terms of what technologies are available, including empirically proven strengths, weaknesses, and potentialities.

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