Using Internet surveys to gather research data from teachers: Trials and tribulations

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The paper describes one specific approach to implementing web based survey research and reviews a range of online survey techniques. The advantages and disadvantages of various web based survey approaches are discussed. The paper describes one research project that used an 'off-line contact-online response' in an educational setting. The researchers conclude that it is not possible to describe one process that would work well in all situations, given the variations in the way technology is currently utilised in schools and homes. The paper discusses the problems encountered and makes suggestions for future web based survey research.

Introduction

Internet based technology such as the World Wide Web (web) is fast becoming accessible to large segments of society. Usage is doubling every year with a current estimate of 1 in 6 people using the Internet in North America and Europe [http://www.internetcoast.com/]. In general there is a great deal of support for using Internet based technologies for improving educational research (Fetterman, 1998; Roschelle & Pea, 1999; Owsten, 1997). One particular area that appears to offer a great deal of promise is Internet based survey research. At the AERA (American Educational Research Association) 2000 conference, three papers were presented on this topic to an overflow audience of educators currently engaged in survey based research (Carbonaro & Bainbridge, 2000; Luchs, Zulli, Gullickson, & Barbour, 2000; White, Carey, & Dailey, 2000). So much interest was generated on this topic that AERA 2001 created a special session to deal with various issues surrounding the implementation of Internet based surveys in the context of educational research.

Survey research has traditionally played an important role in many areas of the social sciences and business, such as policy development, marketing and consumer research, health issues, educational practice,

media polling, and political polling (Weisberg, Krosnick & Bowen, 1996). More importantly, as technology evolves in the context of the digital economy, the implementation of web based surveys will become increasingly prevalent. The appeal of using the Internet to collect large amounts of data is obvious. Computer automation can reduce the cost associated with data entry while simultaneously reducing error to zero (Nicholls, Baker & Martin, 1997). On the other hand, the cost of developing web based surveys can be extremely high when questions are complex (eg., when they entail branching logic), and when graphics, video, and audio are included. In addition, if respondents are required to log back into the survey numerous times, the cost of instrument development will also increase (Witmer, Colman & Katzman, 1999; Valentine & Lucas, 2001).

As Dillman (2000) astutely points out, the number of households in the US with members who can access email is in excess of 35% or about the same level of households with telephones in 1936. During that year, *Literary Digest* conducted an infamous telephone survey of over a million people and erroneously predicted that Roosevelt would lose the presidential election. According to Dillman, the impact of this inaccurate prediction was partly responsible for setting back telephone survey research until the 1970s. It is therefore important that care be taken in researching the best approaches to web survey design in order to avoid this type of setback.

The purpose of this paper is to provide an overview of the design, development, and implementation of Internet based educational survey research. The paper draws on the authors' experience of conducting a large scale web based survey of elementary school teachers.

The authors of the article are involved in a larger research project on the use of Canadian children's literature in the elementary school setting. The Canadian Children's Literature Survey project is designed to collect information from schools throughout the Province of Alberta regarding the use of Canadian children's literature in Alberta provincial elementary schools.

It was originally intended that the method of contact and data collection be conducted by postal mail. However, during the early (1997) conceptual phase of this project the Alberta Provincial government announced its intention to have all schools throughout the province linked to the Internet before the year 2000. We viewed the government commitment as

an opportunity to design, develop and deliver our survey over the Internet because our target population would have equal access to the Internet. The following is an overview of two general approaches to web based survey research, and a description of the approach we employed and the issues we encountered.

Possible approaches to web based surveys

According to Smith (1997), "at any moment there are thousands of surveys and polls being conducted on the web, yet surprisingly little scholarly research is reported about this new technique" (p. 1). This very true in the field of education where survey research conducted via the web is largely devoid of study. However, a number of research papers have appeared recently in various other domains (Tse, 1998; Buchanan & Smith, 1997; Schmidt, 1997; Smith & Leigh, 1997; Witmer, Colman & Katzman, 1999; Yun & Trumbo, 2000). Numerous strategies can be used to implement surveys on the Internet, but overall there are two general approaches. One involves using solely Internet technology. In this approach the entire process can be accomplished online, ie., using only electronic communication technologies. The second approach uses a mixed mode strategy with some parts conducted off line and some conducted online. For example, initial contact with the sample is made by postal mail, but data is collected online via email or a web form.

Online only approach to survey data collection

The strict use of Internet technologies alone in gathering data can be further classified into two categories, both of which depend on the use of email. The first approach we will refer to as "Email contact-Email response" and the second as "Email contact-Web response".

Email contact-Email response

In this scenario: a) the sample subjects must obviously have email addresses and the ability to access their email accounts, and b) the survey researchers must have access to the email addresses of the sample subjects and permission to use these addresses. In the context of educational research these two important elements are often the first major impediments in the email contact-email response approach.

In one early study of email users, Parker (1992) administered an electronic questionnaire to a sample of AT&T employees. His results indicate a 68% return rate in contrast to 38% rate for the same survey by postal mail.

Parker claimed the higher response rate was the result of a novelty effect. In an email survey at the Chinese University in Hong Kong, Tse et al. (1995) reported the opposite results - 27% return rate by postal mail as compared to 6% return rate for email. Tse et al. attributed the poor result to a belief that email responses could more easily be traced and fear of the new email technology. In another study Bachmann and Elfrink (1996) indicated very little difference in the return rate (both at 56%) between the email and postal mail when they surveyed employees at the Lotus Corporation. Couper, Blair & Triplett (1997), in a survey of employees at government statistical agencies, reported a 71% response rate by postal mail as compared to 43% response rate by email. People also appear to respond differently to email than regular post in that email can be immediately processed (deleted or answered) - whereas paper requests take more handling time (Kittleson, 1997). Clearly, the reported response rates from these researchers indicate a great deal of variability. One can hardly conclude that an email contact-email response approach will produce higher response rates than a survey conducted by postal mail.

From a technical perspective, email questionnaires raise a number of implementation problems. The first problem that may arise is multiple response copies of the same email questionnaire. It is easy for the respondent to press the send key more than once. Attempting to keep the responses anonymous makes it almost impossible to control for multiple submissions. In contrast, numerous strategies can be employed with postal mail questionnaires to ensure anonymity (Weisberg, Krosnick, & Bowen, 1996).

A second problem with questionnaires returned via email is that they must be converted into individual records with data fields. Typical email software filtering techniques can usually classify email based on the text contained in the subject section of the email. A more difficult problem arises when the body of the message must be parsed to create a respondent's record and data fields (one email response should translate into one respondent record). There are various technical problems associated with this parsing approach and a number of methods have been developed to handle such problems (White, Carey & Dailey, 2000). In almost all cases, automating this process requires solutions that incorporate various levels of programming expertise. The nature of the programming problems often depends on the hardware and software configuration of the respondent (client side) and surveyor (server side).

In the simplest case the respondent simply answers the questionnaire items and emails the response back to the surveyor. At this point the researcher must employ a "simple but labor intensive approach" (White, Carey & Dailey, 2000; p. 3) to organising the data into a respondent's record. For example, each respondent's email message must be moved to an editor so it can be modified into a suitable record format and then appended to a cumulative data file. This cumulative data file will continue to grow, one record at a time, until responses are no longer received.

Given that the researcher can overcome ethical and technical problems, there do appear to be some advantages to using the email contact-email response approach. The two most obvious ones are speed of access and reduced cost. Existing research indicates much faster return rates for email surveys (Schaefer & Dillman, 1998, Yun & Trumbo, 2000). The email contact-email response approach is usually less costly than postal mail and this cost saving will grow larger as the sample size increases (Watt, 1999). Another advantage occurs in cases where the email is returned to the sender as "non-delivered." The researcher knows almost immediately the portion of the sample that did not receive the questionnaire and can then employ alternative methods of contact.

Email contact-web response

This approach is very similar to email contact-email response except that sample subjects complete a web form and submit it as the response instead of using an email response. The sample subjects are initially contacted by email, but instead of the questionnaire being included in the body of the message, the sample subjects are directed to a URL where they will locate the web questionnaire that is to be completed.

A major concern with using web form questionnaires is the type of hardware platform and web browser being used by the sample subject. The two most popular browsers are Netscape Navigator (Netscape Corporation) and Internet Explorer (Microsoft Corporation). In an educational setting, such as a school district, it is often difficult to predict which version of Netscape or Explorer a potential respondent will be using. Browser software packages are revised regularly with newer versions coming out yearly and, depending on software bugs, modifications to these versions can appear at almost anytime. Compounding this problem is the 'between group variability' in the hardware platforms used by sample subjects (Macintosh or Intel PC) and

the 'within group variability' of these hardware platforms (various versions of the hardware, eg., Pentium III vs Celeron, G-series Macintosh vs iMac). Even differences in monitors can affect screen presentations of the web form. If one considers the possible combinations: a) browsers and hardware platforms (between group variability), and b) browsers and hardware versions (within group variability), the number of confounding variables that can interfere with web based data collection is high. This does *not* include the use of client side software technologies such as JavaScript, VBScript, and Cookies, which can further act as intervening variables. Thus the survey researcher must be extremely careful to ensure some type of standardisation.

Technical problems aside, there are clearly a number of advantages to using web form questionnaires in survey research:

1. Security methods can be put in place to help prevent multiple responses and to support anonymity.

2. Questions can include text editing fields that behave as simple word processors and allow sample subjects to copy and paste data from other electronic sources.

3. Color graphics can more easily be included as part of the questionnaire items.

4. The data collected can be more easily dealt with than similar data received by email. In other words, once the web form is operational, data can generally be processed with less technical intervention.

5. Submitted data can route directly into a database where one record represents one respondent's questionnaire data.

6. Processing of data and feedback to the respondent can occur almost immediately.

7. Questions can be filtered to ensure data integrity, such as missing data or failure to complete subsections of the survey instrument. Data integrity is clearly an advantage, especially in regard to avoiding missing data (the researcher can insist that all questions be answered before the questionnaire is submitted). However, there are a number of valid reasons why researchers may want to provide the option for respondents to opt out of answering an item on the survey. These reasons include reducing the frustration respondents may experience when required to respond to a question they cannot or choose not to answer, ie., respecting the privacy of individuals.

Off line contact-Online response

In this approach, initial contact with the sample subjects is made via telephone, fax, or by postal mail. The subjects can respond either by email or through a web form. This combination approach offers greater flexibility for the survey researcher because contact with the sample does not rely on email. Subjects who do not have email accounts but do have Internet access to a web browser can still be part of the Internet survey. The important point here is that data will be collected electronically. The approach can be expanded to include email as a method of contact, making it a mixed mode Internet survey approach similar to the type described by Yun and Trumbo (2000). Depending on the sample size, one would expect the cost of such a mixed mode strategy to be higher than a strategy conducted entirely online. Figure 1 shows the Off line contact-Online response flow between surveyors, sample respondent subset, and back to the surveyors.
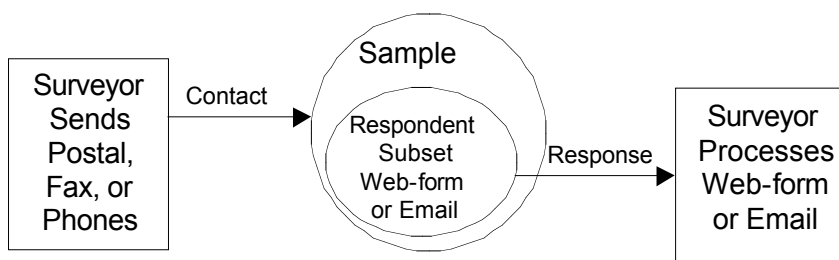
Figure 1: Off line contact-Online response event sequence

In a recent study Yun and Trumbo (2000) compared the responses to a survey executed by post mail, email, and web form. Their target audience was the 900 National Association of Science Writers (NASW) who listed both their email and postal addresses in a 1998 membership directory. They randomly selected 360 of these subjects and contacted them all via both postal mail (survey letter with paper survey) and email. All sample subjects had the ability to respond either by postal mail, email (in the body of the email), or by using a web form (a URL was provided in the email and postal contact letters). The response rate was 72%, but only about one third of these responses were completed electronically. This result indicates that, given the choice, the respondents in this study still preferred the paper form of the questionnaire. Yun and Trumbo do, however, indicate that respondents using the email were much faster to

respond - many responding (either by email or web form) within the same day of receiving the original email.

In summary, there are a number of advantages and disadvantages to employing the Internet based survey strategies described thus far. A researcher's approach to conducting an Internet survey depends entirely on the technical resources available at the research site and the technical capabilities of the target subjects. Educational survey researchers must pay particular attention to such issues given the complex task of dealing with the various technical systems employed by school jurisdictions.

Our approach: Case study

Based on the three possibilities described, we initially decided to use the Email contact-Web response approach.[1] We quickly modified our approach to off line contact-online response but only provided a web form response. After the first contact, 216 school principals responded; 207 provided consent for participation. Schools not responding to the first request (729 of them) were contacted a second time. Sixty-eight additional schools agreed to participate after the second contact. Based on this level of participation we decided to forgo our initial stratified random sampling approach and instead surveyed all 275 participating schools. From these schools, we received 170 completed surveys (a return rate of 62%).

A number of factors guided our approach to the web based survey. First, access to the survey instrument should be as simple as possible for all survey participants. Second, the respondents should be able to fill out the survey instrument with the same relative ease as if they had received the survey on paper. Third, a relatively simple security system (that we call "respondent authentication") should be in place to ensure the integrity of the data. Fourth, all data obtained through the survey must be safe from any external tampering. Finally, the data should be stored in a format that can easily be read by the data analysis software package, in our case SPSS. What follows is a brief discussion of these factors.

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[1] With respect to the software/hardware technology, two different implementations were employed; these are briefly described in Appendix I. The Microsoft tool set appears to be an easier and cheaper way to achieve our goal given our limited resources.

Access issues

Given that all elementary schools in the province were in the process of connecting to the Internet, we contacted all provincial school districts (62 in total) to ask for their permission to conduct our online survey in their schools. This part of the survey process was very straightforward. A letter was mailed to each school district explaining the purpose of the survey and requesting permission to contact all their eligible schools. We asked that all future correspondence with the school board, and subsequently with the participating schools, be conducted by email or fax. As a corollary to this request, all participating school boards were asked to email or fax to us a list of the email addresses for the school principals in their districts. This procedure was followed because a higher response rate can normally be obtained in school based surveys by dealing with someone in authority (ie., principal or superintendent) who can request teachers to fill in the questionnaire (Fraenkel & Wallen, 1997). All subsequent communication occurred directly with the school principals who were asked to select an appropriate subject (elementary school teacher involved in language arts and/or library development) to complete a web form questionnaire. Completion of the form required only "minimal" computer skills, defined here as the ability: a) to use a mouse; b) to type on a word processor; and c) to use an Internet browser (eg., Microsoft Internet Explorer v3.0 or higher, Netscape Communicator v3.0 or higher) to enter a URL, http://www.education.ualberta.ca/survey/ The computer hardware platform was not assumed to be an issue since both PC and Macintosh platforms support both browsers.

Ease of questionnaire completion

The questionnaire was designed as an online form that consisted of radio buttons for use with categorical data and Likert scale items. Rank order items required the respondent to enter a number. Short answer items required the respondents to type an answer into a text box on the form (they could cut and paste from a word processor if they chose to do so). On completion of the questionnaire, the respondent clicked a "SUBMIT" button and received a message on the survey web page indicating the data had been received. All required questionnaire items had to be completed before the questionnaire could be submitted to the web server and stored as an individual record in the database. If the respondent did not complete the questionnaire or left questions blank and pressed the SUBMIT button, the system would inform the respondent about the items that needed to be completed.

In order to ensure that the survey was easy to complete, a pilot study was undertaken in a computer laboratory with 15 participants. During the pilot testing phase, the average time to complete the online survey was twenty minutes. We designed the online forms to ensure respondents did not have to download files (eg., cookies) and thus deal with issues concerning file incompatibility. No user expressed frustration at having to complete all items before submitting the form. On reflection, however, it would have been extremely useful to conduct a "think aloud" process with the pilot respondents (Luchs, Zulli, Gullickson, & Barbour, 2000). A think aloud procedure would have enabled us to follow the respondents' thinking as they navigated the survey. The "think aloud" could have been audiotape recorded and the respondents could have spoken face to face with a research assistant at the time of completing the survey. A protocol could have been developed to identify any problems the respondents encountered, and track and monitor the processes they engaged in as they completed the survey. We could also have provided information to the respondents, on their request, that later could have been incorporated into the general instructions for completing the survey.

Respondent authentication

Each participating school principal was provided (via email or fax) with a user login identification, password and the survey website address. Each principal was asked to select an appropriate subject and provide that subject with the login identification, password and survey website address. The use of a login identification and password prevented unauthenticated users (any web "surfer" who accidentally came upon the site) from gaining access to the web site. During the login, subjects were presented with a brief explanation of the survey and an assurance that their anonymity would be maintained. They were also told that their use of the login identification and password was an acknowledgement of their consent for their data to be used in the study.

Data processing

The data from each questionnaire was automatically stored as a record in a relational database on a web server. There was no record of which individual filled out the questionnaire nor was there any record of which school the subject taught at. The website was secure from outside access through various levels of password protection. Once the data was obtained it could quickly be imported "as is" into SPSS for analysis (with the exception of short answer text fields).

Problems and pitfalls

Ethical considerations

Early in the project we discovered that our efforts to adhere to rigorous research ethics guidelines in protecting the anonymity of the teachers was bumping up against our need for clear communication and direct access to participants. This was particularly true with respect to accessing email addresses of individual schools and more specifically teachers within those schools.

School boards (through the school superintendent) and school principals provided initial consent to the project. The principals invited one teacher in each school to participate. This guaranteed anonymity for the teachers. The teachers were not to be named by the school principal. On filling in the survey, individual teachers first encountered a web page that explained the project, notified them of their rights and informed them that by responding to the questionnaire they were consenting to participate. They were not to provide their name or any other identification.

Sophistication of computer hardware and programs used in schools and home

In order to complete the survey, respondents needed access to at least Netscape 3 or Internet Explorer 3. We made every effort to test our survey instrument on several versions of web browsers running on different computers with different versions of the operating systems. For example, we tested the survey on Macintosh computers using both OS 7 to OS 9 with various versions of Internet Explorer and Netscape. We also tested the same browser versions on Intel PC platforms running Office 95/98. Unfortunately some home computer users of the Internet were using software or hardware we had not tested, ie., software that was relatively outdated. We had not expected such large variability in the browser software and in the hardware the teachers were using in their homes (see the section on "Email contact–Web response" earlier in this paper). We also had not expected that teachers would complete the survey at home. Rather, we expected them to use the computers available in their schools. Since we did not have the resources to carry out a wide range of tests, we were not able to evaluate many of the possible combinations of software and hardware prior to conducting the survey.

Further compounding the problem was that home users could choose from a variety of Internet Service Providers (ISPs), whereas the school districts were all standardised on one ISP. This proved to be problematic because different ISPs use different software, some of which caused problems when the data were being transferred to our server. This was also evident when either schools or private ISPs used firewall technology to filter communications. For example, firewall technology often got in the way of our respondent authentication strategy by preventing potential respondents from accessing our secure web site.

Sophistication of school personnel technology skills and knowledge

Electronic communication is already 'taken for granted' in university settings. Email, fax and other electronic document transfer are common and accepted ways of conducting business. In the schools in Alberta, where every school is currently connected to the Internet, electronic communication is still not a central part of the everyday world. Teachers and school administrators are not necessarily comfortable with email and many are reluctant (or not allowed by their school board) to provide their email addresses to people outside the system. Many teachers use the email systems they have at home rather than using their emails at school. Thus, many school districts either would not allow us to contact schools via email, or they did not have the capacity to send bulk emails to their schools from central office.

Our expectations that the schools would be able to converse easily via email, should they encounter problems, were undermined by errors in the way computer systems were configured and supported at individual schools and throughout school districts. We discovered that when we sent emails to teachers and principals at their schools, they frequently did not receive them. If we faxed the schools and asked teachers or principals to email the researchers then there was a successful communication. Thus, email use may be a matter of time constraint or of ease of access (depending on the number of computers in the school).

Some potential participants were lost because the survey was conducted online. For example, two teachers accessed the questionnaire online, printed it, filled it in by hand and submitted it via postal mail. Three other schools asked if they could receive the survey in printed form. At the same time we probably gained some respondents because of the "novelty effect" of completing a survey instrument on the web, or from what Yun and Trumbo (2000) refer to as the "techie effect" - in this case those teachers drawn to any topic that uses some aspect of technology or the web.

The support system put in place by the researchers to help teachers in accessing the survey could have been stronger. We relied on faxes, email and phone calls from teachers, and it took a few weeks before we realised that teachers needed more specific information than we had provided to them in the initial letter. For example, there were differences in the screens appearing on Macintosh and PC computers that had to be explained to the teachers in the letter. Such specific items had not been anticipated at the outset even thought we had tested our software on both PC and Macintosh computers.

Discussion

Using a web based survey to conduct research is a relatively new process (Fink & Kosecoff, 1998). Weisberg, Krosnick, and Bowen (1996) discuss Internet surveys in the context of non-probability sampling by using either volunteer subjects or haphazard sampling. With respect to recruiting volunteer subjects, Internet survey questionnaires are often placed on a server or web page and information is provided to circulate them to appropriate groups or individuals. Surveys can also be targeted at email listserve groups or specific Internet news groups. In either of the above cases the problem with volunteer subjects is well known - the subjects who volunteer may not be typical. Weisberg et al. (1996) note that the use of technology is often justified by the researcher because it permits instantaneous polling. This is most relevant in cases where the researchers use a haphazard sample (whereby the researcher surveys only those subjects who can easily be contacted). On the other hand, there are often clear biases with those who might have access to such technologies. Weisberg et al. (1996) cite the 1995 poll by Princeton Survey Research Associates for *Newsweek* (1995) where people online were 15% more likely to be Republican than one would expect to find in the general public. As Weisberg, et al (1996) warn,

> Changing technology provides exciting new opportunities for conducting surveys, but the results will clearly be biased toward the views of a technological elite. Indeed, it is not always possible to tell who is answering questions on such systems - whether adults are giving serious answers or whether children are just punching buttons. (p. 42).

Clearly, one must be careful not to see Internet and web based technologies as a panacea for carrying out survey based research.

The project described in this paper had a number of goals, one of which was to design and develop a process for web based survey research. We now realise that it may not be possible to describe one process that would work well in all situations given the large variations in the way

technology is currently utilised in schools and at home. In other words, the approach we describe in this paper is one of many that could be used to carry out a web based survey.

Essentially, a self administered web based questionnaire appears to have a number of advantages. Two important ones are that it provides fast access to the survey instrument, and the data obtained can be automatically analysed or saved in file format which can be directly uploaded into a program such as SPSS. In all cases there is a financial saving because reliance on the traditional postal service is greatly reduced and data input and coding errors are a non-issue (assuming the program works correctly).

Some disadvantages include: the need to have access to the Internet, subjects must be willing to use a computer to complete the survey, and both the respondents' (client) system or network and surveyors' (host) system or network can encounter problems. For example, we are unsure of how many schools simply turned down our request for participation because they feared using technology or how many potential respondents in the schools agreeing to participate failed to complete the survey due to technology phobia. As Fink and Kosecoff (1998) note, "for some time to come, certain respondents (such as some who prefer to take cyberspace slowly) will continue to mistrust computers and computer based surveys." (p. 7).

Furthermore there is still a great deal of variability in hardware and software used in both school and home environments. This means it often becomes difficult to assume that everyone who has a computer hooked to the Internet actually has equal access. For example, we know of some individuals who tried to access our web survey and continuously encountered problems. We are not completely sure how to solve such problems (especially those of a technical nature) given that some individuals are great distances away and without local technical support. We are also unsure of how many "potential respondents" tried to complete our survey but because of technical problems just gave up!

Overall, as well as successfully collecting useful content data, important lessons were learned in conducting web based survey research. Items we shall keep in mind for future projects include the use of a "think aloud" procedure with the pilot group. This would have provided us with invaluable information regarding the thought processes and the difficulties, if any, that pilot respondents encountered in completing the survey. We also need to conduct a more thorough testing of the compatibility of various browsers and hardware platforms. In addition, we need to attend to the recent advent of the firewall technology used in

schools, as this technology can interfere with both the transmission and collection of data. We need a better understanding of the range of technology (hardware/ software) used within school jurisdictions and in the teachers' homes. Finally, we need to explore the possibility of including graphics, audio and video in a web based questionnaire.

Acknowledgments

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Appendix I: Technical issues

The design, development and implementation of our web based survey system were completed twice. The first technical implementation of the system revealed a number of cost and software maintenance problems that we felt uncomfortable supporting. We were hoping to devise an Internet based survey process that would be simple to implement and could be generalised to other educational research situations. Furthermore, as researchers, we wanted to be close to the data collection process and to understand as much of the technical details as possible.

1. *Sun Workstation running UNIX*: A web programmer was required to set up the server side software. Specific programming CGI (Common Gateway Interface) scripts had to be written to support data processing on the web file server. A question database that stores survey questions in an Extensible Markup Language (XML) was created. When the survey subjects logged into the questionnaire web page, the CGI scripts would construct the questionnaire based on the questionnaire's XML description stored in the database. Once this was done, the CGI scripts generated an HTML web page that appeared on the subjects' computer in their browser's window. Once the questionnaire was completed and the submit button pressed, another set of CGI scripts took the data and stored it as a record in the database. The main financial costs were encountered during the development of these CGI scripts and the XML question database. We are currently working on a set of editing tools that will allow researchers to build and edit a questionnaire directly from a "questionnaire creation web page." This part of the project is ongoing but changes in personnel, software and hardware, and financial restrictions have forced us to put some of this work on hold. That being said, the pilot study of the online survey, conducted in the Faculty of Education's computer lab, was carried out using the server software development discussed in this section.

2. *Using a Microsoft set of tools*: As is the case with most web based technology projects, advances in software and hardware rapidly changed the ease with which data could be both presented and

collected. The second design and approach relied much less on the technical expertise of a network and programming specialist skilled in using UNIX, CGI, XML, HTML and Java. Instead, one researcher with assistance from a graduate student was able to set up a Microsoft NT 4.0 web server and install the necessary service pack (extensions) software updates so that MS *Office 2000* could be used: a) to develop the web survey questionnaire using *FrontPage 2000*, b) link the questionnaire to the Microsoft Access database, and c) ensure the appropriate level of Internet security. This second method of web based survey implementation proved to be much easier for the researchers to develop and maintain because it relied less on highly paid computer personnel with specialised web based programming skills. Both MS *Office 2000* and *FrontPage 2000* are simple tools that can easily be learned. The only difficult hurdle proved to be the configuration of the NT server. For this reason we used this second design and implementation strategy to collect the data.

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