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ABSTRACT

Information fluency is generally defined as an ability to express oneself creatively, reformulate knowledge, and synthesize information regarding new information technology. The term has recently gained popularity over experience, expertise, competence, knowledge, and literacy. As with other related concepts, there is a great need to accurately assess "information fluency" for research and pragmatic purposes. This study seeks to remedy this need by developing a self report instrument to tap this theoretical concept. The paper explores existing computer competence scales (very few of which even include email or Internet components), review the emerging literature on information fluency, and report about the development of a new Computer-Email-Web Fluency instrument. Evidence of the reliability and validity of the instrument is presented, based on data from students enrolled in Basic Public Speaking courses. (Contains 85 references and 6 tables of data. The survey instrument is attached.) (Author/RS)

The Computer-Email-Web (CEW) Fluency Scale - Development and Validation

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ABSTRACT

Information fluency is generally defined as an ability to express oneself creatively, reformulate knowledge, and synthesize information regarding new information technology. The term has recently gained popularity over experience, expertise, competence, knowledge, and literacy. As with other related concepts, there is a great need to accurately assess "information fluency" for research and pragmatic purposes. This study seeks to remedy this need by developing a self report instrument to tap this theoretical concept. In the paper the researchers explore existing computer competence scales (very few of which even include email or Internet components), review the emerging literature on information fluency, and report about the development of a new Computer-Email-Web Fluency instrument. Evidence of the reliability and validity of the instrument is presented.

TABLE OF CONTENTS

RATIONALE

It's clear that the conceptualization and measurement of any set of skills is extremely difficult. It should not be surprising therefore that scholars, researchers and practitioners interested in assessing computing/technological understanding and skills have been challenged to develop measurement tools that adequately capture and assess components of these skill sets. Recently a national level board of scientists and practitioners in the United States was formed to make some sense of this developing area. In their response to this challenge, the Committee on Information Technology Literacy (CITL) of the National Research Board issued a report, Being fluent with information technology. In this monograph, the Committee focused on "fluency" and distinguished it from other commonly used terms including literacy and competency. According to the report, fluency is "a term connoting a higher level of competency" (Committee on Information Technology 1999, p. 2). Some of the differences between fluency and competency are first, that fluency entails a lifelong learning process; second, that fluency implies personalization of skills on levels of sophistication; and third, that fluency is composed of three kinds of knowledge, contemporary skills, foundational concepts, and intellectual capabilities.

Previous research developed measuring instruments for computer literacy, computer experience, computer expertise, computer knowledge etc. However, our social and technological environment is constantly changing as information technology (IT) becomes ubiquitous, and apart from specific computer skills required by some experts (programming, operating system knowledge, hardware expertise, etc.), most people's daily environment (in developed countries) now demands a rather broad, far ranging IT skill set that has not been necessary in the past. Foremost among these fluencies are "information seeking" and "information dissemination" skills including email use and the ability to effectively utilize the World Wide Web. It is critical that we develop measures that adequately tap this increasingly important set of competencies.

Thus, the purpose of this study was to develop an instrument to assess people's ability to use these information seeking and dissemination skills, including skills that involve computer use, email and effective use of the web. This instrument was not designed to be another "computer literacy," experience, expertise or knowledge scale. Instead we took our cues from the recent CITL monograph, and attempted to assess more general "fluency" skills. In addition, though computer fluency, email fluency and web fluency can be expected to be related, this study presumed that email and web fluency were not necessarily subsumed by "computer fluency." Specifically then, the purpose of this study was to develop what we hope is a more general and useful measure, the Computer-Email-Web Fluency (CEW Fluency) scale.

LITERATURE

Over the last few years a considerable body of literature has developed to describe computer usage and attitudes toward computers, computer anxiety, computer stress, perceptions of computers (i.e., Bear, Richards & Lancaster 1987; Coovert & Goldstein 1980; Crable , Brodzinski & Scherer 1991; Durndell, Macleod & Siann 1987; Edwards 1957; Gardner, Discenza & Dukes 1993; Harrison & Rainer 1992; Heinssen, Glass & Knight 1987; Hudiburg, Brown & Jones 1993; Igbaria & Chakrabarti 1990; Kay 1993b; Loyd & Gressard 1984; Maurer 1994; Nickell & Pinto 1986; Pope-Davis & Twing 1991; Woodrow 1991; etc.). This broad array of research is multi-disciplinary and incorporates a wide variety of perspectives and topics. However, at its foundation this research is directed at influencing a person's ability to use a computer efficiently.

This study was less interested in people's reservations towards technology, and more in their own perceptions of their ability of fluency in using the computer for email communication, and information access. Hence, this review focuses more on scales that measure computer expertise, experience, or literacy.

Educators have been aware of the need to develop a concept of computer literacy for a long time (Molnar 1978; Watt 1980). In the computer and technology context, literacy has been defined and described repeatedly. According to Rhodes (1986), an individual is computer literate when he or she is able to use the computer to satisfy personal needs. After reviewing the literature (i.e. ISACS 1985; Johnson et al. 1980; Levin 1983; Longstreet & Sorant 1985), LaLomia and Sidowski (1990) conclude that the definition of computer literacy varies depending on the study, but usually includes one or more of the following factors: programming and operating skills, knowledge and awareness of computers, and positive attitude toward computers. Watt (1980, p. 3), as quoted in Levine and Donitsa-Schmidt (1997), defines computer literacy as the "collection of skills, knowledge, understanding, values, and relationships that allow a person to function comfortably as a productive citizen in a computer-oriented society." With this definition, Watt comes close to the definition of information fluency (Committee on Information Technology Literacy 1999) discussed earlier.

Along with numerous definitions, conceptual and theoretical discussions (i.e., Baxter 1984; Cheng, Plake & Stevens 1985; Ganske & Hamamoto 1984; Kay 1990; Levinson 1986), there is a growing body of literature to assess computer experience, expertise or literacy statistically (i.e., Anderson et al 1979; Bitter & Davis 1985; Born & Cummings 1994; Gabriel 1985a & b; Montag 1984).

Good overview-reviews can be found in LaLomia and Sidowski (1990), Miller, Stanney, and Wooten (1997), Moroz and Nash (1997), and most of the articles mentioned below, especially Panero, Lane and Napier (1997), Potosky and Bobko (1998), or Smith et al. (1999).

Specifically, this paper focuses on twelve computer literacy and competency measures. Interestingly, only two of the scales reviewed here include questions regarding email and/or the Internet.

One of the most detailed measurement instruments is the Cassel Computer Literacy Test CMLRTC) (Cassel & Cassel 1984). This test consists of 120 multiple choice items that are designed to measure a user's understanding of computer functionality. The items are divided into six subtopics, including computer development, technical understanding, computer structure, information processing, information retrieval, and communication systems. Miller et al. (1997) criticize that there is no reliability or validity data known about the Cassel Test.

The Standardized Test of Computer Literacy (STCL) (Montag et al. 1984, Torardi 1985) is an equally lengthy instrument, consisting of 80 multiple choice items determining a user's level of computer literacy. This test is divided into three subsections, including computer applications, computer systems, and computer programming. The overall reported reliability for this scale is a coefficient alpha of 0.86, with a subscale reliability for the computer applications measure of a coefficient alpha of 0.75. Interestingly, both this and the Cassel scale use the term "literacy," but survey rather technical components of computer usage. The use of this term may be connected to the date of publication of these scales, as computer use in the 1980s was much more dependent on understanding the underlying programming structure of both hardware and software than it is now.

A third scale, the Computer Literacy Test, was developed by Simonson et al. (1987) together with the Computer Anxiety Index (CAIN). The literacy instrument consists of 80

multiple choice items in three subsections, including computer systems, computer applications, and computer programming. The reported reliability for this scale is .86. The CAIN scale consists of 26 items and reports an alpha of .90. The authors successfully applied the Computer Literacy Test to establish validity.

The Computer Aptitude, Literacy, and Interest Profile (CALIP) (Poplin et al. 1984) purports to measure a person's level of computer literacy, aptitude and interest in computer technology, using one subtest each for interest and literacy, and four for aptitude. The reliabilities range from a coefficient alpha of 0.75 to an alpha of 0.95 depending on the age group tested.

The Computer Literacy Examination: Cognitive Aspects (CLECA) scale (Cheng, Plake, & Stevens 1985) focuses specifically on high school students' cognitive knowledge about computers. This scale consists of 39 multiple choice questions and reports an overall coefficient alpha reliability of 0.87.

The Windows Computer Experience Questionnaire (WCEQ) (Miller et al. 1997) is a comparatively short measurement instrument, consisting of only 13 items. The authors rotated these items into four factors, accounting for 67.2% of variance and reporting a coefficient alpha reliability of 0.74.

The Computer Understanding and Experience Scale (CUE) (Potosky & Bobko 1998) is a self-report measure of computer experience. The scale consists of twelve items that were rotated into two factors, technical competence and general competence. A number of the items used actually refer to tasks more commonly performed by network administrators or computer specialists than the average computer users, such as "recovering deleted or lost data," "writing computer programs," or "using a mainframe computer systems." This scale also includes one question about email, "I know what e-mail is," without going into more specific details of actual usage of this technology.

The Subjective Computer Experience Scale (Rawstorne, Caputi & Smith 1998) listed in Smith et al. (2000) consists of a total of 62 Likert-type questions. Thirty-one of these questions assess the way people interpret their experiences with computers. The remaining 31 Likert-type items, based on Fishbein and Ajzen (1975), were used to assess behavioral beliefs, outcome evaluation and global attitude toward email in three subscales. The scales don't assess various technical email functions. Instead, questions cover issues such as whether email is a convenient method of communication, or provides access to relevant information. The authors report a coefficient alpha of 0.68 for the behavioral beliefs subscale, and a coefficient alpha of 0.81 for the outcome evaluation subscale.

The Computer Self-efficacy Scale (CSE) (Murphy, Coover & Owen 1989) measures perceptions of respondents' capabilities regarding specific computer-related skills and knowledge. This scale consists of 32 items that were rotated into three factors, including beginning-level computer skills, advanced-level computer skills, and mainframe computer skills. The reported reliabilities respectively were alphas of 0.97, 0.96, and 0.93. The authors concluded among other things that women hold lower self efficacy beliefs than men. This scale was later changed by Torkzadeh and Koufteros (1994). These authors added a fourth factor, the computer file and software management. Reliabilities for all four factors were still above 0.90.

The Computer Use Scale (Panero et al. 1997) measures four dimensions of the different ways in which people use computers. The scale combines 26 items to measure computer use with 36 items of the BELCAT scale for measuring computer attitudes. The authors reduced the items to 18, which they divided into four subfields, including computer enthusiasm, efficiency in

work, entertainment, and communication (which consisted only of two questions). The reported reliabilities for these four fields are between coefficient alphas of 0.71 and 0.87.

The Computer Ability Survey (Kay 1993a) assesses and predicts an adult learner's ability to use computers. The scale consists of 22 items. Total scale internal reliability is 0.96. The coefficient alphas for the subscales are 0.94 for software/awareness, 0.93 for programming, and 0.89 for perceived control.

The last scale to be reviewed here has not been named by the authors (Levine & Donitsa-Schmidt 1997). It consists of several subscales, including a subscale concerning attitudes. The subscale of interest is called Perceived Computer Knowledge. Here, 11 items measured students' perceived knowledge of computers and related issues. The subscale coefficient alpha was reported at 0.90. The authors state that they have included email and Internet related questions in this scale. However, the items were not reported in the article. The authors were contacted and a copy of the subscale could be obtained. The scale includes a question on Internet databases and email, asking students to identify their level of knowledge about these items, and their intensity of desire to know more about these items.

From the review of these existing scales, a need can be perceived. Literacy, the ability to read and write, used to make an important positive difference to a person's social and economical stauts within society. As times have changed, the need for literacy has turned into a need for fluency with information technology. Computers, email and the web are here to stay, and fluency with these technologies will affect not just people's chances of getting good jobs, but also their standing within the entire social environment, as Fortner's (1995) notion of excommunication, and Schmitz et al.'s (1995) article on PEN and the homeless in Santa Monica show. The CEW fluency scale described below can fill the existing void.

SCALE DEVELOPMENT

The computer-email-web (CEW) Fluency scale was developed in three major steps. To facilitate understanding, methods, results and discussion will be presented for each step, followed by a general conclusion section.

Pilot Study 1

Method

The purpose of pilot 1 was to evaluate item question wording, generate new items, and rank all items according to their difficulty level. A total of thirty-two subjects in seven groups of three to six people were asked to sort possible questions for the measure. All subjects were enrolled in the Basic Public Speaking Course of a large mid-western university as described in more detail under the section "Method Pilot 2." Following the main tenets of Q-methodology (McKeown & Thomas 1988), each group independently was asked to first sort 46 questions into three categories of ascending difficulty, "basic," "intermediate," and "advanced." They were instructed that not all categories had to contain items, and that the number of items per category did not have to be equal. Afterward, each group was asked to identify possibly "confusing" questions and to generate "missing" items. Suggestions were evaluated to generate the three subscales used in pilot 2.

Results

Basic frequencies including means, modes, and standard deviations were assessed for all items. As only five items of the total 46 received more than one "advanced" difficulty level

rating, for further analysis the difficulty levels were restricted to "basic" and "intermediate." "Advanced" ranking were combined with "intermediate" rankings. 29 items were ranked "basic," 15 items were ranked "intermediate," and two items were an even split between both, probably due to the low sample size. Interestingly, a forced 2-factor rotation of the pilot 2 data resulted in two factors almost exactly matching the difficulty level assessment of pilot 1. The 46 original items were turned into 49 partially reworded items. Three new items were added. Of the 52 items used in pilot 2, two showed double loading in the factor analysis. Thus, after excluding the two split items, the two double loading items and the three new items, 45 items remained for comparison. Out of these 45 items, only seven differed between their factor loading difficulty level loading and their difficulty level assigned during pilot 1. In all cases, the items were deemed "basic" during pilot 1, but loaded under "intermediate" in the factor analysis. The items were: using the hard drive, renaming files, deleting files, identifying the host server, using hypertext links, adding bookmarks, and editing bookmarks.

Items identified as "confusing" during the pilot 1 group sessions were reviewed. In one case, the term "hard disk" was changed to "hard drive." In three cases, confusion arose because of double-barreled items. In each case, the second component was removed from the question and either deleted or turned into its own item. In a number of cases, subjects identified an item to be "confusing." However, a review of the video-taped session shows that the confusion admittedly rose out of not knowing what a certain computer function was, rather than not understanding the item. Subjects generally confessed, "I have never heard of this." This was particularly the case with items relating to templates and distribution lists. Though these items were included in the scales for pilot 2, they were subsequently deleted through factor analysis.

Discussion

Overall, subjects identified 29 "basic" items, 15 "intermediate" items, and two items that were split between the two difficulty levels. In a factor analysis performed later, seven items showed "intermediate" difficulty levels while deemed "basic" during pilot 1. Possibly, subjects' self-perceived assessment of difficulty levels was skewed due to a normal tendency to overestimate competency. Subjects may say or think an item "basic," while in actuality finding it rather more difficult to perform the described task. Research is needed to correlate subjects' perception of their skills with their actual abilities to perform the same tasks in an applied laboratory situation. This line of research is supported by Geissler and Horridge (1993) in their research on university students' computer knowledge, and by Smith et al.'s (1999; see also Smith, Caputi & Rawstorne 2000) distinction between subjective and objective computer experience. Until then, the purpose of Pilot 1 was to generate items for inclusion in the subscales of pilot 2.

Pilot Study 2

Method

The total sample for pilot 2 consisted of 284 students enrolled in the Basic Public Speaking Course at a large mid-western university. No specific demographics were assessed for this sample. The overall course demographics report an approximate 50:50 gender split, with slightly more females than males. The average age for the Basic Course is 21. Students of all majors are able to enroll, but the majority are majors within the College of Liberal Arts and Sciences. All students have access to computer, email and Internet technology through the numerous university computer labs and public terminals.

Description of the CEW Fluency Scale

The term "fluency" was used to avoid negative connotations that could arise out of the implied opposites of terms such as "expertise," "experience," "competency," or "literacy." Instructions on the questionnaire stated, "There is no correct answer. We are not interested in how well you do, but only in what you can do." The questionnaire consisted of seven introductory questions asking about self-perceived skill level in using computers, email, and Internet, importance of performing well using computers, email, and Internet, and completed number of courses or seminars related to computers. The remaining 52 items were divided into three subscales: 19 items for computer skills; 18 items for email skills; 15 items for Internet skills. All items began with the words "I can ..." followed by the task, followed by the answer options, a 4-point Likert scale (Very well, well, not so well, not at all).

Research Design and Method of Analysis

Basic frequencies, including means, standard errors, modes, and standard deviations were assessed for all items. Coefficient alphas were determined for the items of each subscale and for the overall scale, consisting of 52 items. A principal-component factor analysis followed by a varimax rotation was used to determine the factor validity. Finally, a correlation matrix was used for all remaining 21 items, and between the four resulting factors to demonstrate internal validity of the CEW Fluency scale.

Results

Basic Frequencies and Internal Reliability

On a 7-point Likert scale ranging from "very high" to "very low," participants' self-rating of their computer skills fell into an average to high ranking (85.2%). Their rating of their email skills fell into a high to very high ranking (62.0%). Their rating of their Internet skills also fell into an above average to high ranking (61.9%). These results are not surprising considering that college students overall and students at this university in specific have easy access to computer and Internet technology. Many instructors even require the use of email as part of the course curriculum.

A large majority (75.7%) had completed at least one (43.3%) or at least three (32.4%) computer related courses. Participants consistently reported that knowing how to use a computer well was important or very important (92.6%); that knowing how to use email well was important or very important (89.4%); that knowing how to use the Internet well was important or very important (92.9%). The overall internal reliability for all 52 items of the CEW Fluency scale was very high ($\alpha = .96$).

Computer Skills. The overall mean for the items measuring computer skills was fairly high at 3.88 (SD = .27; possible mean range 1 to 4). This means that overall, subjects believed they could perform the given computer skills very well. Not surprisingly, subjects rated their skills highest on the question "I can switch a computer on" (mean = 3.94 on a four-point scale). Subjects rated their skills lowest on the question "I can format a floppy disk" (mean = 3.15 on a four-point scale). The internal reliability of the subscale was very high ($\alpha = .93$). After the factor analysis, the remaining computer items still showed high internal reliability ($\alpha = .85$).

Email Skills. The overall mean for the items measuring email skills was also high at 3.83 (SD = .38; possible mean range 1 to 4). This means that overall, subjects believed they could perform the given email skills well to very well. Subjects rated their skills highest on the question "I can read new mail messages" (mean = 3.91 on a four-point scale). Subjects rated their skills lowest on the question "I can create a signature file" (mean = 2.73 on a four-point

scale). The internal reliability of the subscale was also very high (α = .92). No items were deleted to increase this alpha. After the factor analysis, the remaining email items still showed high internal reliability (α = .89).

Web Navigation and Web Editing. The overall mean for the items originally measuring Internet skills was 3.43 (SD = .59; possible mean range 1 to 4). This means that overall, subjects believed they could perform the given Internet skills just slightly better than well. Subjects rated their skills highest on the question "I can use "back" and "forward" to move between pages" (mean = 3.92 on a four-point scale). Subjects rated their skills lowest on the question "I can create a website" (mean = 2.43 on a four-point scale). The internal reliability of the entire Internet subscale was high (α = .92). Factor analysis later showed that this subscale really consisted of two scales, the web navigation subscale, and the web editing subscale. After the factor analysis the remaining items for the new subscale web navigation showed high internal reliability (α = .84), as did the items for the new subscale web editing (α = .82).

[Insert Table 1 about here.]

Factor Analysis

The principle component varimax rotation factor analysis revealed a four-factor solution, splitting the previously termed "Internet skills" subscale into two different subscales, "web navigation" and "web editing." The remaining two factors were "basic computer skills" and "basic email skills." The varimax rotation factor loadings greater than or equal to .40 are shown in Table 2. Each item loads clearly except for items 47 (I can identify the host server from the web address) and 49 (I can use "back" and "forward" to move between pages), which show moderate loadings on other factors. To achieve this loading, 31 items were deleted for double loading, two- or three- item factors, or other conceptual reasons such as multiple items (see Table 6 in Appendix for deleted item listing). The four-factor solution accounted for more than 67% of the total variance.

[Insert Table 2 about here.]

Correlation Between Subscales

Correlations between the subscales and the total scale were high, and not surprising given the nature of this scale. The computer and the email subscales correlated with the total scale at the .75 level. The web navigation and the web editing subscales correlated with the total scale at the .83 level.

Correlations between the subscales varied from .38 (email skills with web editing) to .60 (computer skills with web navigating). The correlations were thus, low to medium, which supports the conceptual framework in that these skills are related but separate from each other. Table 3 shows the correlations between the subscales. Inter-item correlations between the 21 items in the four factors generally support previously reported results.

[Insert Table 3 about here.]

Discussion

The purpose of pilot 2 was to identify statistically clean subscales of the CEW Fluency scale. Originally, items were divided into three subscales, computer skills, email skills, and web skills.

The principal-components factor analysis rotated into four factors, separating Internet skills into two subscales, web navigation skills and web editing skills. While not predicted, these results are reasonable. In accordance with results from pilot 1 it can be assumed that a person may have (basic) web navigation skills without (intermediate) web editing skills.

Alpha coefficients of all four subscales showed high internal subscale reliability. In addition, results from the principal-components factor analysis and correlations showed strong internal validity for the total scale. Results showed that the subscales were related to each other at a medium level, yet warrant differentiation from each other and the skills they measure. This also implies that using email and World Wide Web use are viewed separately from "computer skills." These skills are related but separate and thus, this new scale is not simply a new computer experience, expertise, or literacy scale.

Limitations

There are two main limitations to the development and testing of the CEW Fluency scale. First, the subjects were drawn through a convenience sample from a generic population. College students are not representative for the entire population of computer, email or web users. They possibly have better technology access than many others do. On the other hand, their experience with computer technology often is more related to word processing and other simple tasks. This leads to the second limitation. Overall, most of the intermediate skill level items were eliminated during the factor analysis. Other related skills, such as programming, network tasks, or computer maintenance skills were not included from the beginning. Research is needed to expand the CEW scale by items of a larger variety and different difficulty levels; and to test the CEW scale with subjects from a more varied population.

Study 3

The purpose of study 3 was to test the CEW fluency scale for reliability and validity. Items from the Georgia Tech (1998) study were used. This international study is based on the responses of thousands of people from across the globe. Results of CEW fluency and the Georgia Tech study should be compared with utmost care, as subject pools differed greatly. However, tendencies can be observed.

Method

The questionnaire of the third study was administered to 143 students of the same population as described in the section "Methods Pilot 2." Subjects were not allowed to participate in study 3 if they had participated in any previous part of this research study. Demographics of this sample approximated the general demographics for the population. Slightly more women (57%) than men (43%) participated in this study, as opposed to the Georgia Tech (1998) results of 34% women and 66% men. Most subjects were between 20 and 21 years (63%) with a range from 31 years to 19 years. The age range in the Georgia Tech study was much wider with only small fractions falling into comparable age groups such as 16-20 (5%) or 21-25 (13%). Thus, comparisons to the Georgia Tech data must be made with care, as the pool of subjects overall differed distinctly in demographics such as age and gender, but also employment status and similar items. The subjects of this study were enrolled in a wide variety of academic majors. Most students (37%) were enrolled in the College of Liberal Arts and Science, the School of Business (16%), the School of Journalism (14%) or the School of Education (13%). Though all students have access to Internet and web technology at the

university, almost nine percent reported that they never use the World Wide Web from school. Twenty-seven percent reported using the WWW from school on a daily basis, and 35% reported using the WWW from school on a weekly basis. Interestingly, 75% of the sample report using the WWW from home on a daily basis with a comparable 79% of the Georgia Tech sample, which speaks for a wide diffusion of Internet technology in the homes of both this sample and the international sample of Georgia Tech.

Description of the CEW Fluency Questionnaire

The five page questionnaire used during study 3 consisted of a total of 77 items (see Appendix). Of this total, 21 items belonged to the CEW Fluency Scale developed during previous pilot studies, arranged on a 5-point Likert scale (5 = very well; 1 = not at all). Eighteen items belonged to the Computer Use Scale (Panero, Lane & Napier 1997), arranged on a 5-point Likert scale (5 = very frequently; 1 = never). The remaining 38 items were taken from the Georgia Tech WWW User Survey (Georgia Tech 1998). Most of these 38 questions were arranged on 5-point Likert scales, with the exceptions of questions about: major, gender, year of birth, number of computer classes, frequency of browser use, number of hours of browser use, web use, and web tasks performed.

Research Design and Method of Analysis

Basic frequencies, including means, standard errors, modes, and standard deviations were assessed for all items. Coefficient alphas were determined for the items of each subscale and total scale of the CEW Fluency and the CUS scales. A correlation matrix was used to assess how each item or each subscale related to the subscales of the CEW Fluency scale, and to the total scale. Correlations between individual items of the CEW Fluency scale and other items will be discussed were appropriate. One-way analysis of variance (ANOVA) and Tukey Post Hoc tests were used to detect differences between the subscales and the total CEW Fluency scale, and several other questions. However, as results did not add to the information provided by the correlation analysis, results are not reported here.[1] Finally, regression analysis was employed to investigate the interrelationship of the highly correlated variables.

Results

Basic Frequencies and Internal Reliability

Slightly more than half of the sample (54%) reported using the Internet for four to six years. Another 29% have been using the Internet for one to three years. Thirteen percent reported using the Internet for more than seven years. During this time, subjects have enrolled in comparatively few computer classes, courses or seminars, with 22% having enrolled in only one class, and 24% having enrolled in 2 classes. Ten percent have never enrolled in any computer class. Subjects access the WWW mostly from home on a daily basis (75%). Most subjects (46%) open a web browser between one and four times a day, while spending an average of only two to hour hours per week (36%) using a web browser. This indicates that subjects use the WWW mostly for quick tasks rather than prolonged projects.

Subjects indicated that they use the web for a wide variety of purposes. The majority (85%) uses it for educational purposes, entertainment (61%), information gathering (57%), communication (50%), or simply for wasting time (51%). Interestingly, only about a third (36%) uses the web for shopping, and hardly anyone is required to use the web at work (16%).

A twelve-question cluster taken from the Georgia Tech WWW User Survey asked whether subjects had done specific tasks on the web or Internet. A subject's level of expertise is

[1] A detailed write-up of the Anova results is available from the first author.

determined by the number of tasks he or she has completed. According to this calculation, 39% of the sample are classified as "novice," and 42% are classified as having "intermediate" skills. Another 13% are classified as having "expertise," and only 7% of the sample are classified as "experts." The two tasks performed by most subjects were the use of an online chat or discussion (73%), and ordering products (66%) despite the earlier question that established that only 36% of the sample use the web for shopping. Even though only 10% reported never having taken a computer class in an earlier question, in this cluster of questions 78% reported not having taken a seminar or class about the web or Internet. Possibly, computer and web related classes must be differentiated.

Overall, subjects feel somewhat comfortable (44%) or very comfortable (45%) using computers. Equally, subjects feel somewhat comfortable (36%) or very comfortable (56%) using the Internet. Subjects were generally somewhat satisfied (62%) with their current skills for using the Internet.

CEW Fluency Scale. Respondents assessed their computer-email-web fluency to be "very well" (62%) or "well" (34%). The overall mean for fluency was 4.5 (SD = .45; possible mean range 1 to 5). They judged their computer fluency to be very well (87%). The overall mean for the items measuring computer skills was 4.8 (SD = .11; possible mean range 1 to 5). They judged their email fluency to be "very well" (86%). The overall mean for the items measuring email skills was 4.8 (SD = .11; possible mean range 1 to 5). They judged their web navigation abilities to be "very well" (73%). The overall mean for the items measuring web navigation was 4.6 (SD = .11; possible mean range 1 to 5). In the subscale of web editing, the results were less unanimous, as 32% judged they could perform those skills "very well" and equally 32% judged they could do "well", 23% "okay", and 12% "not so well", and 1% "not at all." This trend resulted mostly from a wide spread distribution on the question "I can create a website." The overall mean for the items measuring web editing skills was 3.7 (SD = .20; possible mean range 1 to 5).

The overall internal reliability for the entire fluency scale was high (α = .89), though lower than during the previous pilot study. The internal reliability coefficients for the subscales all were lower than during the previous study, but still acceptable. The internal reliability for the computer subscale was .72 (previously α = .85); for the email subscale .75 (previously α = 89); for the web navigation subscale .64 (previously α = 84); and for the web editing subscale .79 (previously α = .82). This study provides moderate reliability support for the CEW Fluency scale.

Computer Use Scale. Overall, subjects reported that they perform the tasks described by the computer use scale "sometimes" (50%) or frequently (38%). The overall mean for computer use was 3.2 (SD = .62; possible mean range 1 to 5). Subjects reported that they rarely (49%) performed tasks categorized as expressing enthusiasm. The overall mean for the items measuring enthusiasm was 2.3 (SD = .89; possible mean range 1 to 5). Subjects reported that they frequently performed efficiency tasks (55%). The overall mean for the items measuring efficiency was 4.1 (SD = .57; possible mean range 1 to 5). Subjects sometimes (34%) or frequently (31%) perform entertainment tasks. The overall mean for the items measuring entertainment was 3.3 (SD = 1.02; possible mean range 1 to 5). Finally, subjects reported they used a network for communication tasks sometimes (30%), frequently (29%), or very frequently (28%). The overall mean for the two items measuring communication was 3.4 (SD = 1.09; possible mean range 1 to 5).

The internal reliability for the computer use scale was high ($\alpha = .86$). The internal reliabilities for the subscales were similar to those reported by the authors (Panero, Lane & Napier 1997). The enthusiasm subscale showed high reliability at .83 (reported $\alpha = .87$). The efficiency subscale showed acceptable reliability at .63 (reported $\alpha = .82$). The entertainment subscale showed high reliability at .83 (reported $\alpha = .77$). Finally, the communication subscale, consisting of only two items, showed acceptable reliability at .66 (reported $\alpha = 71$). This data supports the original study and provides reliability for that study.

Correlation Analysis

Correlations between the subscales and the total scale were high. The computer, email, and web navigation subscales correlated with the total fluency scale at the .85 level; the web editing subscale correlated at the .86 level. Correlations between the subscales varied from .56 (computer with web editing) to .78 (computer with web navigating), as represented in Table 4. These correlations were higher than in the previous pilot study.

[Insert Table 4 about here.]

Additional correlations were also calculated between the total fluency scale and its subscales, and the other questions and subscales used on the questionnaire. Overall, few correlations reached a medium level (.41-.67), though they were usually highly significant. Specifically, perceived comfort with the computer or the Internet, or satisfaction with one's skills correlated highly with CEW Fluency items. Table 5 represents those correlations.

[Insert Table 5 about here.]

Some correlations will be pointed out here specifically. First, by comparison subjects' perceived comfort level with computers correlated highest of all items (.66) with the CEW fluency scale, and also correlated highly with all subscales. This may seem counter to the claim that computer fluency is separate from other fluencies. However, several aspects need be considered. The question asked about self-evaluation and perceptions, and included the words "in general." There is little way of knowing how subjects interpreted the question. To many people, "computers" nowadays implies the Internet, to others the term implies only using word processing. Thus, while this correlation is interesting and should be investigated further, it does not prove the initial hypothesis wrong.

Some correlations are not surprising, such as the comparatively high correlation between communication and email fluency (.504), as email is a communication medium. Another example is the length of time using the Internet and its correlation with web editing fluency (.515). Newcomers to the web are less likely to engage in web site design and similar activities right away.

The question regarding people's satisfaction with their Internet skills correlated comparatively high with email fluency (.514) and web navigation fluency (.504), but not as high with web editing fluency (.444), which supports the above argument.

Finally, interestingly, pure frequency of Internet access to find a variety of kind of information did not correlate high, not even with the web navigation fluency scale (.285). There might be a difference between people's motivation, and their fluency.

Regression Analysis

To examine some of the highly correlated items more closely, regression analysis was run. Regression analysis revealed that duration of Internet usage and level of expertise significantly predicted CEW Fluency, $\underline{R} = .614$, adjusted $\underline{R}^2 = .368$, $\underline{F}\ (2, 131) = 39.643$, $\underline{p} < .001$. An additional 15.6% of variance was explained by subjects' perceptions of their comfort level with the computer and the Internet, and their satisfaction with their current skills, $\underline{R} = .736$,

adjusted $R^2 = .524$, F (3, 128) = 15.410, $p < .001$. Finally, 1.8% of the variance was explained by subjects' computer use according to the Computer Use Scale, $R = .750$, adjusted $R^2 = .542$, F (1, 127) = 6.016, $p < .05$. Subjects' perceived comfort level with the computer was the strongest predictor of CEW Fluency, $\beta = .221$, t (127) = 2.092, $p < .05$, adjusted $R^2 = .542$, F (1, 127) = 6.016, $p < .05$. CEW Fluency was also predicted by the length of time subjects had been using the Internet, $\beta = .196$, t (127) = 2.814, $p < .05$, and their computer use according to the Computer Use Scale, $\beta = .186$, t (127) = 2.453, $p < .05$. Thus, while items are highly correlated to the CEW fluency scale, they still make individual contributions to explaining its variance.

Discussion

In this study we sought to continue the validation process of a new measure of computer, email, and web fluency (CEW Fluency). The sample consisted of student volunteers enrolled at a large U. S. Midwestern university.

Based on the Georgia Tech (1998) survey instructions, subjects in this study were ranked into experience categories depending on the number of Internet and World Wide Web related tasks they had performed. According to this ranking most subjects were classified as novices or as having intermediate World Wide Web skills. Subjects report using the Internet for no longer than six years and have taken two or fewer classes on either computer or Internet related topics. A large majority of subjects in this sample access the Internet from home on a daily basis, and from school at least on a weekly basis, but mostly the time spent online is comparatively short. As can be expected in a sample drawn from a student population, most subjects use the web for educational or information gathering purposes. Specifically, subjects indicated they use the web mostly for online chat or discussion, or for ordering products.

Subjects reported their self-assessed computer-email-web fluency to be very high, especially regarding computer, email, and web navigation fluency. Web editing fluency was reported at a slightly lower level, mostly due to a wide variation regarding subjects' ability to create a website. Reliabilities of the subscales and the total scales were lower than during the previous study, but still within acceptable range. Correlations between the subscales were higher than in the previous studies. The scale needs more testing before its stability can be ascertained.

The computer use scale (Panero, Lane & Napier 1997) used in this study also resulted in slightly lower reliabilities than reported by the authors. This could possibly be due to the homogeneity of the student sample.

CEW Fluency scores were correlated to a number of demographic variables, including gender, major, or ability to access the Internet from home without significant results. However, a variety of interesting findings did emerge.

Overall, results indicated that the longer subjects had been using the Internet, the greater their overall CEW Fluency. Results indicated that subjects had to be classified at least at an "intermediate" level of web expertise to have higher CEW Fluency. Results also indicated that there was no statistical difference between "experience" and "expertise" with regard to web editing fluency. Overall, the more comfortable subjects felt with computers or the Internet, the higher their reported CEW Fluency. One exception to this overall trend was that only subjects who felt very comfortable with the computer reported high web editing fluency. Also, only subjects who felt very comfortable with the Internet reported high computer fluency. No systematic trend was found for the relationship between Internet comfort level and subjects' web navigation fluency. Subjects reported that they must feel at least somewhat satisfied with their current Internet skills in order to report high CEW Fluency. Equally, subjects who used

computers frequently on the Computer Use Scale (Panero, Lane & Napier 1997) reported higher CEW Fluency.

Regression analysis revealed that, despite being highly correlated, subjects' perceived level of comfort using a computer, the length of time they have been using the Internet, and subjects' computer use according to the Computer Use Scale all made independent contributions to the variance explained in CEW Fluency.

Since the measures utilized in the investigation used self-report, results might not be surprising. Subjects who feel like they have more experience and a higher comfort level tend to self-report higher CEW Fluency. Clearly further investigations are needed to compare self-reported CEW Fluency to actual ability to perform CEW tasks in a laboratory situation. In addition, further studies may be needed to expand the CEW Fluency scale to include more sophisticated items. It might also be necessary to develop and test this expanded version of the scale with subjects other than university students. At this point this study provides preliminary support for the CEW Fluency scale.

CONCLUSION

In summary, the purpose of this project was to develop a new scale based on existing literature and computer literacy and expertise scales. The Computer-Email-Web Fluency scale differs from the existing scales because it incorporates email and web items. Support was found that email and web skills are to be differentiated from computer skills. Thus, the CEW Fluency scale can be differentiated from existing scales. More research is clearly needed both to establish, test, and evolve this instrument.

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APPENDIX

Table 1
Means, Standard Deviations, and Item Correlations for CEW Fluency, Pilot 2 (N = 284)

Mean	SD[a]	IC[b]	Item	Computer Skills
3.94	.23	.61	8.	I can switch a computer on
3.88	.37	.66	9.	I can restart a computer
3.89	.34	.72	10.	I can begin a new document
3.76	.38	.61	12.	I can open a previously saved file from any drive/directory
3.89	.33	.73	16.	I can use "save as" when appropriate
3.92	.29	.56	26.	I can print a document
3.88	.27	.85[c]		*Total Subscale*

Mean	SD[a]	IC[b]	Item	Email Skills
3.82	.46	.75	27.	I can open an email program
3.91	.32	.85	28.	I can read new mail messages
3.74	.55	.65	29.	I can open a file attached to an email
3.87	.39	.83	31.	I can delete read mail
3.87	.43	.78	32.	I can send an email message
3.77	.61	.64	34.	I can use the "reply" and "forward" features for email
3.83	.38	.89[c]		*Total Subscale*

Mean	SD[a]	IC[b]	Item	Web Navigation Skills
3.77	.50	.75	45.	I can use a browser such as Netscape or Explorer to navigate the World Wide Web
3.78	.52	.78	46.	I can open a web address directly
3.43	.85	.59	47.	I can identify the host server from the web address
3.92	.32	.59	49.	I can use "back" and "forward" to move between web pages
3.84	.44	.77	52.	I can use search engines such as Yahoo and Alta Vista
3.75	.43	.84[c]		*Total Subscale*

Mean	SD[a]	IC[b]	Item	Web Editing Skills
3.05	1.05	.61	51.	I can edit bookmarks
3.32	.94	.76	54.	I can save text contents off web pages to a disk
3.33	.97	.74	55.	I can save images off web pages to a disk
2.43	1.14	.49	58.	I can create a website
3.03	.83	.82[c]		*Total Subscale*

Note. [a]Standard deviation. [b]Item-total correlation. [c]Cronbach alpha coefficient for subscale after factor analysis.

Table 2
Varimax Rotated Factor Loadings for CEW Fluency Scale

Subscale	Item	Fac 1	Fac 2	Fac 3	Fac 4
Basic email skills	28	.861			
	31	.846			
	32	.801			
	27	.747			
	29	.700			
	34	.664			
Basic computer skills	10		.830		
	16		.755		
	8		.704		
	9		.660		
	26		.619		
	12		.591		
Web navigation skills	46			.791	
	45			.775	
	52			.760	
	47			.635	.427
	49		.403	.623	
Web editing skills	54				.853
	55				.839
	51				.701
	58				.650

FACTOR	EIGENVALUE	% OF VAR	CUM %
1	8.9	42.3	42.3
2	2.3	10.8	53.1
3	1.7	8.0	61.1
4	1.3	6.2	67.3

Note. Only factor loadings ≥.40 are included in table.

Table 3
Correlations Between CEW Fluency Subscales Pilot 2

	Total Scale	Computer Skills	Email Skills	Web Navigation
Total Scale	1.00			
Computer Skills	.75	1.00		
Email Skills	.75	.59	1.00	
Web Navigation	.83	.60	.53	1.00
Web Editing	.83	.43	.38	.56

Note. All correlations significant at the $p < .01$ level.

Table 4
Correlations Between CEW Fluency Subscales Study 3

	Total Scale	Computer Skills	Email Skills	Web Navigation
Total Scale	1.00			
Computer Skills	.85	1.00		
Email Skills	.85	.74	1.00	
Web Navigation	.85	.78	.73	1.00
Web Editing	.86	.56	.59	.57

Note. All correlations significant at the p < .01 level.

Table 5
Correlations Between CEW Fluency and Other Questions and Scales

	Fluency	Comp.	Email	Web_Nav.	Web_Edit.
Q4	.512**	.344**	.417**	.430**	.515**
Q5	.396**	.266**	.373**	.339**	.388**
Q11	.292**	.198*	.239**	.250**	.292**
Q13	.222**	.115	.206*	.169*	.260**
Q14	.468**	.326**	.351**	.350**	.505**
Q15	.660**	.573**	.597**	.607**	.568**
Q16	.563**	.441**	.541**	.489**	.454**
Q17	.554**	.477**	.514**	.504**	.444**
Enthus.	.409**	.295**	.409**	.372**	.497**
Effic.	.423**	.474**	.354**	.375**	.342**
Entertain.	.301**	.283**	.325**	.270**	.225**
Comm.	.369**	.357**	.504**	.296**	.249**
CUS	.550**	.468**	.532**	.458**	.485**
Access	.368**	.219**	.359**	.285**	.393**
Instead	.315**	.296**	.286**	.293**	.272**

Note. ** correlations significant at the p < .01 level. * correlations significant at the p < .05 level

Legend:

Fluency	total CEW Fluency scale
Computer	computer subscale
Email	email subscale
Web_Nav.	web navigating subscale
Web_Edit.	web editing subscale
Q4	How long have you been using the Internet?
Q5	How many computer classes, courses or seminars have you attended throughout your lifetime?
Q11	On average, how often do you use a WWW browser?
Q13	What do you primarily use the web for?
Q 14	Which of the following *(Internet tasks)* have you done?
Q 15	How comfortable do you feel using computers, in general?
Q16	How comfortable do you feel using the Internet?
Q17	How satisfied are you with your current skills for using the Internet?
Enthus.	enthusiasm subscale of CUS
Effic.	efficiency subscale of CUS
Entertain.	entertainment subscale of CUS
Comm.	communication subscale of CUS
CUS	computer use scale (Panero, Lane & Napier 1997)
Access	How frequently do you access the Internet to find the following kind of information?
Instead	How frequently do you use the web instead of doing one of the following activities?

Table 6.
Deleted Item Listing
Items deleted due to double loading (a minimum of .2 difference between loadings had to be observed):

15. I can save a file in a specified drive/directory
18. I can format a floppy disk
19. I can rename a floppy disk
20. I can use the hard drive
23. I can switch between currently open applications
24. I can rename files
25. I can delete unwanted files
30. I can save an attached file
33. I can attach and send a file with a message
35. I can block unwanted email senders
36. I can create folders for saving mail
37. I can use message settings, i.e. "important"
38. I can set preferences, i.e. "save sent emails"
39. I can create a signature file
41. I can create an address in the address book
42. I can use the address book to find an address
48. I can use hypertext links on World Wide Web pages
50. I can add bookmarks of useful sites
53. I can use advanced search techniques in search engines
56. I can turn on/off auto load images
57. I can use a dial-in account to log on to the Internet

Items deleted for conceptual reasons, such as two- or three-item factors, multiple items, or problematic wording:

11. I can begin a new document based on a template
13. I can save a file
14. I can save a document as a template
17. I can save on a floppy disk
21. I can create folders/directories
22. I can copy or move files between drives and directories
40. I can explain the difference between Address Book & Distribution List
43. I can create my own distribution list
44. I can use a distribution list to send email
59. I can use Internet email such as Yahoo, Hotmail, etc.

Please note:
By completing this questionnaire, you are agreeing to participate in this research study. You must be above the age of 18, and can NOT have participated in a previous "Internet Fluency" study. You are also acknowledging the receipt of an information sheet informing you of the purpose of this study, and the researcher's name and contact information.

Internet Fluency III

The purpose of this study is to assess your perceptions and use of the computer, email, the World Wide Web and the Internet. Please read each question carefully before filling in or choosing the appropriate answer choice.

1. What is your major? _____

2. Please circle your gender: male female

3. What year were you born? _____

4. How long have you been using Internet (including using email, gopher, ftp, etc.)?
   ____ Less than 6 months
   ____ 6 to 12 months
   ____ 1 to 3 years
   ____ 4 to 6 years
   ____ 7 years or more

5. How many computer classes, courses, or seminars have you attended throughout your lifetime? _____

How frequently do you access the World Wide Web (WWW) from the following locations?

	Daily	Weekly	Monthly	< Once a month	Never
6. From home?	5	4	3	2	1
7. From work?	5	4	3	2	1
8. From school?	5	4	3	2	1
9. From public terminals?	5	4	3	2	1
10. From other locations?	5	4	3	2	1

11. On average, how often do you use a WWW browser? *By this, we mean using your browser for a specific set of tasks or activities. We do not mean how many times you launch your browser per day.*
    ____ More than 9 times/day
    ____ 5 to 8 times/day
    ____ 1 to 4 times/day
    ____ A few times a week
    ____ Once a week
    ____ Once a month

12. On average, how many hours a week do you use a WWW browser?

____ 0 to 1 hours/week
____ 2 to 4 hours/week
____ 5 to 6 hours/week
____ 7 to 9 hours/week
____ 10 to 20 hours/week
____ 21 to 40 hours/week
____ Over 40 hours/week

13. What do you primarily use the Web for?
(Please check all that apply.)

____ Education
____ Shopping/gathering product information
____ Entertainment
____ Work/Business
____ Communication with others (not including email)
____ Gathering information for personal needs
____ Wasting time
____ Other

14. Which of the following have you done?
(Please check all that apply.)

____ Ordered a product/service by filling out an online form
____ Made a purchase online for more than $100
____ Created a web page
____ Customized a web page for yourself (e.g. MyYahoo, CNN Custom News)
____ Changed your browser's "startup" or "home" page
____ Changed your "cookie" preferences
____ Participated in an online chat or discussion (not including email)
____ Listened to a radio broadcast online
____ Made a telephone call online
____ Used a nationwide online directory to find an address or telephone number
____ Taken a seminar or class about the Web or Internet
____ Bought a book to learn more about the Web or Internet

15. How comfortable do you feel using computers, in general?

____ Very comfortable
____ Somewhat comfortable
____ Neither comfortable nor uncomfortable
____ Somewhat uncomfortable
____ Very uncomfortable

16. How comfortable to you feel using the Internet?
    ____ Very comfortable
    ____ Somewhat comfortable
    ____ Neither comfortable nor uncomfortable
    ____ Somewhat uncomfortable
    ____ Very uncomfortable

17. How satisfied are you with your current skills for using the Internet?
    ____ Very satisfied – I can do everything that I want to do
    ____ Somewhat satisfied – I can do most things I want to do
    ____ Neither satisfied nor unsatisfied
    ____ Somewhat unsatisfied – I can't so many things I would like to do
    ____ Very unsatisfied – I can't do most things I would like to do

The following questions are about a variety of computer, email and web-related tasks. Please read each question carefully and circle the appropriate number according to the scale below.

	very well	well	okay	not so well	not at all
18. I can print a document.	5	4	3	2	1
19. I can open a web address directly.	5	4	3	2	1
20. I can use search engines such as Yahoo or Alta Vista.	5	4	3	2	1
21. I can use "save as" when appropriate.	5	4	3	2	1
22. I can use the "reply" and "forward" features for email.	5	4	3	2	1
23. I can save text contents off web pages to a disk	5	4	3	2	1
24. I can identify the host server from the web address.	5	4	3	2	1
25. I can read new mail messages.	5	4	3	2	1
26. I can delete read email.	5	4	3	2	1
27. I can send an email message.	5	4	3	2	1
28. I can save images off web pages to a disk.	5	4	3	2	1
29. I can open an email program.	5	4	3	2	1
30. I can edit bookmarks.	5	4	3	2	1
31. I can open a previously saved file from any drive/directory.	5	4	3	2	1
32. I can open a file attached to an email.	5	4	3	2	1
33. I can restart a computer.	5	4	3	2	1
34. I can begin a new document.	5	4	3	2	1
35. I can use a browser such as Netscape or Explorer to navigate the World Wide Web.	5	4	3	2	1
36. I can create a website.	5	4	3	2	1
37. I can switch a computer on.	5	4	3	2	1
38. I can use "back" and "forward" to move between pages.	5	4	3	2	1

The following questions are about a variety of computer and network uses. The term "network" is defined as any kind of interconnected computer system, including the Internet, email, the World Wide Web, Telnet, online services, bulletin boards, etc. Please read each question carefully and circle the appropriate number according to the scale below.

	very frequently	frequently	sometimes	rarely	never
39. I use a computer to save time on work that would take me longer otherwise.	5	4	3	2	1
40. I use a computer to create professional-looking work.	5	4	3	2	1
41. I play games on a computer.	5	4	3	2	1
42. I do work by hand even though it would be faster on a computer.	5	4	3	2	1
43. I use a computer to fill free time.	5	4	3	2	1
44. I lose track of time while using a computer.	5	4	3	2	1
45. I use a computer to procrastinate from doing work.	5	4	3	2	1
46. I do work by hand because it is faster than doing it on a computer.	5	4	3	2	1
47. I do work by hand that would look better if I did it on a computer.	5	4	3	2	1
48. I use a computer to do higher-quality work than I could do otherwise.	5	4	3	2	1
49. I use a Network to meet new people.	5	4	3	2	1
50. I use a Network to talk to people I see regularly in person.	5	4	3	2	1
51. I use a Network to shop/look at products I would like to buy.	5	4	3	2	1
52. I spend time learning about the computer or Network itself.	5	4	3	2	1
53. I shop for computer hardware or software by going to stores or looking at catalogs.	5	4	3	2	1
54. I spend time downloading and/or installing software.	5	4	3	2	1
55. I use a Network to keep in touch with friends and family who are far away.	5	4	3	2	1
56. I spend time configuring the computer to look and act as I want it to.	5	4	3	2	1

How frequently do you access the Internet to find the following kind of information?

< Once

	Daily	Weekly	Monthly	a month	Never
57. To access newsgroups?	5	4	3	2	1
58. To access online news?	5	4	3	2	1
59. To access information about commercial products/services?	5	4	3	2	1
60. To purchase commercial products/services?	5	4	3	2	1
61. To access reference materials?	5	4	3	2	1
62. To access research reports & projects?	5	4	3	2	1
63. To access financial information?	5	4	3	2	1
64. To access health/medical information?	5	4	3	2	1
65. To access online chat groups?	5	4	3	2	1
66. To access online job listings?	5	4	3	2	1
67. To access online home/rental listings?	5	4	3	2	1
68. To access online telephone listings?	5	4	3	2	1
69. To access online maps?	5	4	3	2	1

How frequently to you use the Web instead of doing one of the following activities?

	Daily	Weekly	Monthly	< Once a month	Never
70. Instead of watching TV?	5	4	3	2	1
71. Instead of talking on the phone?	5	4	3	2	1
72. Instead of sleeping?	5	4	3	2	1
73. Instead of exercising?	5	4	3	2	1
74. Instead of reading books/magazines/newspapers?	5	4	3	2	1
75. Instead of going to the movies?	5	4	3	2	1
76. Instead of going out/socializing?	5	4	3	2	1
77. Instead of doing household work?	5	4	3	2	1

This completes this survey.
Thank you for your participation.

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