

Psychological barriers to Internet usage among older adults in the UK

NICHOLA ADAMS, DAVID STUBBS & VALERIE WOODS

Robens Centre for Health Ergonomics, EIHMS, University of Surrey, Guildford, UK

Abstract

The Internet is an important tool in assisting the older population to lead independent and social lives. However, the majority of Internet users are under 55. This study investigated the following psychological barriers to Internet use by older adults: perceived usefulness, perceived ease of use, Internet efficacy, perceived complexity of navigation and perceived complexity of terminology. Twenty-three subjects (aged 55–75 years) were interviewed in the UK. The influences of age, computer and Internet experience, and training on these psychological barriers were explored. The results showed that the majority of the older adults who had a positive perception of usefulness, ease of use, and efficacy of the Internet or e-mail, used the Internet or e-mail more often. In addition, it was found that computer or Internet experience increased perceptions of ease of use and efficacy of the Internet and reduced perceived complexity of navigation. There was no difference between the two age groups (55–65 and 66–75 years) in these psychological barriers. It was concluded that increased marketing of the Internet (aimed at the older user), more simple and uniformly designed Internet pages, more user-friendly online help and error message terminology, and increased provision of training for the older user would assist uptake of the World Wide Web.

Key words: *Older adult, Internet, psychological barriers.*

1. Introduction

The Internet has significantly expanded over the past 5–10 years to become part of our everyday lives. However, the majority of users are young. Statistics from the UK National Statistics Omnibus Survey [1] showed that in the 16–24 year age group, 95% of men and 84% of women use the Internet. Usage then decreases steadily with age, with only 41% of men and 34% of women in the 55–64 year age group. In the 65-year plus group, usage falls to 14% of men and only 8% of women.

Yet, the Internet, with its breadth of information and resources, provides an important tool for the rapidly increasing older population to lead independent lives, to keep in touch with friends and family through e-mail, and to make informed decisions on many issues from health information to travel and hobby interests [2]. In fact, despite the low usage figures among older adults, there is a £6bn government plan to ensure that all provision of public services is available electronically [3].

A survey by ICM Direct [4] also found that once the over 55s used the web, they became enthusiastic users, with two-thirds agreeing that it had a positive impact on their lives [5]. Furthermore, McConatha [6] found that life satisfaction, some mental functioning, and activities of daily living can be increased, and depression can be reduced for nursing-home residents who are taught to use the Internet. A study by White and others [2] found that social isolation can be reduced, and additional psychosocial benefits (such as communication with friends and family, and exploration of hobbies) can be realized from access to e-mail and the Internet.

Previous researchers have investigated what initially motivates Internet use: availability of easily understood learning material and access to general health or specific medical condition information [2], using e-mail, and accessing travel information [7]. The major reasons for not using the Internet were found to be a lack of knowledge about the web, as well as computer ownership and access [7].

1.1. Psychological barriers to Internet usage

Once the initial practical issues (e.g. access and cost) to Internet usage have been overcome, there are still the psychological barriers to cross. These have been found to be:

1. *Perceived usefulness*: Morrell and others [7] found that some older adults did not use the web because they saw no purpose for it in their lives. Perceived usefulness has been found to be influenced by the quality of information provided by the Internet site and amount of response time [8], as well as encouragement from friends and family [9].
2. *Perceived ease of use*: Research has shown that perceived ease of use can affect usage, indirectly, through perceived usefulness. It ‘affects the user’s feelings of self-competence’, encouraging exploration of the system and increasing perceived usefulness [10].
3. *Perceived complexity of navigation*: Using a Web site may be considered analogous to understanding how to perform a series of step-by-step or procedural tasks to reach a goal. Demands on working memory [11] and spatial ability [12] necessarily increase as web navigation tasks become more complex. Because older adults frequently show deficits in working memory and spatial visualization, we may expect older adults to find navigation of the Internet more difficult. Indeed, White and others [2] concluded that older adults are less efficient in their search strategy.

1.2. Psychological barriers to computer usage

It has been suggested that computing and the internet will be closely linked [13]. Previous research has shown these additional barriers to computer usage:

1. *Internet efficacy*: Internet efficacy is defined as an individual’s beliefs about their ability to competently use the Internet [14]. Lack of efficacy can lead towards anxiety about using a system. Computer anxiety has been found to predict Internet participation by older adults, it has been defined as negative emotional reactions (including a desire to withdraw from the anxiety-provoking situation) to the use or anticipated use of computers [15]. However, Morrell and others [16] cite Bandura [17] who found that social persuasion, from family and friends, can help older adults overcome their apprehensions.
2. *Experience*: The influence of computer or Internet experience on Internet attitudes, specifically, has not been researched, but this study postulates that the effect may be

similar to those found for computer attitudes. Researchers maintain that experience with computers may negate some of the ageing effects and have an overall positive impact [16]. Experience has been shown to affect navigational behaviours, with novice searchers being more likely to 'get lost' [12].

1.3. Other barriers to Internet/computer usage

1. *Age*: Morrell and others [7] also found age (among older users) influences Internet usage. They found that the middle-old (40–59 year olds) were the highest users, with the old-old (75–92 year olds) the lowest. Morrell and others [7] determined that the most significant differences occur between middle-old and old-old only (defined as ages 40–59 and 75–92). The middle-old and older users are similar in the amount of web use, perceived problems and efficacy. The middle-old, though had more interest in the web. Age influences the ability to navigate and learn to use computers, due to the cognitive changes associated with ageing (including slower speed of processing, and decline and decrease in both sustained and divided attention) [2]. However, Cody and others [15] found that according to many studies, middle-aged and elderly people can learn new theories and new practical skills, albeit somewhat slower [18].
2. *Training*: Research has also shown that training programmes which increase an individual's knowledge about computer technology may be beneficial in reducing potential barriers and increasing the individual's perception of ease of use [11]. It can also encourage older users to use a wider variety of navigation tools [12]. As research has shown that training older adults may take somewhat longer, age-specific training is needed. In addition, Morrell and Echt [11] found that older computer users needed a large amount of reassurance and encouragement initially.

1.4. This study

The majority of existing research on psychological barriers to system usage has been based outside the UK (mainly in the USA), especially when looking specifically at the older age group and Internet usage. As there is a slow uptake of the Internet among older adults in the UK, and the provision of essential services is increasing on the Internet, it would be valuable to attempt to resolve the issues that are preventing the over 55s from adopting the new technology. As the use of the Internet is a complex dynamic interaction between the person and the computer, the barriers to Internet use are likely to be a complex interaction between psychological and ability factors.

The aim of this study was therefore to identify the psychological barriers to Internet usage among older adults in the UK, and the four main objectives were:

1. To investigate if psychological barriers (i.e. perceived usefulness, perceived ease of use, perceived complexity of terminology, perceived complexity of navigation, Internet efficacy) affect Internet usage.
2. To investigate if Internet/computer experience affects these psychological barriers to Internet usage.
3. To investigate if age (55–65 vs. over 66 years) affects these psychological barriers to Internet usage.
4. To make recommendations towards increasing Internet usage among older adults, based on previous research and the findings of this study.

2. Methods

2.1. Study design

2.1.1 Subject selection: ‘Purposive sampling’ [19] was used. New users were selected to investigate the barriers beyond the initial ones of cost and access, and experienced users were selected to enquire as to whether experience breaks down those barriers. Subjects were recruited through word of mouth, by friends of friends, and from computer courses. They were then selected through a short questionnaire, to fulfil a balance in the groups of age, or computer and Internet experience, so that these groups (which were split into two) could be compared.

2.1.2. Sample group: The study participants comprised 23 subjects ranging in age from 55 to 75 years (Table I).

2.2. Techniques

The method of one-to-one interviews using semi-structured questionnaires was selected to gain in-depth material. This allowed the researcher to fully explore the issues surrounding the psychological barriers. Subjects were initially selected using a short questionnaire of closed structured questions, both to recruit subjects and to accurately define the sample into age and experience groups. A literature search was conducted to compile the interview questionnaire (Table II). This comprised yes/no questions in each section, to categorize the data without bias, with more open questions leading on from those, to illustrate why subjects felt that way.

The interviews were approximately 20–40 min each. Questionnaires on similar subjects were designed to be distributed and were consequently very long [10, 14, 20]. The questions, therefore, had to be summarized and adapted for both the open-ended nature of the questions and the specific focus on the Internet rather than computer barriers. The

Table I. Profile of the subjects.

Profile of the subjects	Percentage distribution
<i>Gender</i>	
Female	60
Male	40
<i>Age</i>	
55–65	60
66–76	40
<i>Computer experience</i>	
New user	30
Experienced user	70
<i>Internet experience</i>	
New user	48
Experienced user	52
<i>Internet usage</i>	
Little	43
Often	57
<i>E-mail usage</i>	
Little	26
Often	74

Table II. Interview questions.

Interview questions	
Issue	Question
Experience	When did you first start to use a computer/Internet? How experienced would you say you were at using the computer/Internet/e-mail?
Perceived use	Why did you start to use the Internet?
Training	How did you first learn to use the Internet/e-mail?
Perceived use	What do you use the Internet for (both regularly and occasionally)? Do you find the Internet useful in your work/leisure activities? Do you find e-mail more useful than letters when keeping in touch with friends/relatives/work?
Perceived ease of use	Do you find the Internet/e-mail easy to use? Do you enjoy using the Internet/e-mail? Are you willing to try new sites/new functions? Do you have any concerns about using the Internet/e-mail (security or ability)?
Efficacy	Do you worry about making mistakes? Do you feel able to competently use the Internet/e-mail? Do you find the Internet/e-mail gets easier to use the more you use it?
Perceived complexity of terminology	Do you have any problems when using Internet/e-mail? Do you find the error messages helpful when you make a mistake? Do you use the on-line help facility?
Perceived complexity of navigation	Do you find it easy to locate what website you are looking for/to find the required information within that site?
Health	Do you have any problems that make it harder for you to use the Internet, i.e. pain in limbs, unsteady hands, difficulty concentrating for long periods of time, difficulty sitting for long periods of time, eyes that tire easily?
Perceived Younger Environment	Do you access the Internet in a place other than your home/work (i.e. an Internet café)? If so, how comfortable do you feel in that environment?
General	Please could you tell me what your highest educational qualification is? Please could you tell me what sites you visit most frequently? Are there any points you would like to raise, that you feel haven't been covered in this interview?

researcher's own questions, based on the pilot study (see Section 2.4), were included to cover perceived complexity of terminology, perceived complexity of navigation, comfort, health, and training.

2.3. Statistical analysis

Responses from the interviews were put into positive, neutral, or negative categories, but as some answers were not a simple 'yes' or 'no', the researcher had to make informed decisions regarding their categorization. The data from the selection questionnaire and the closed questions in the interviews were then used to create contingency tables. These contingency tables presented a comparison of the sets of nominal data and also acted as the basis for the statistical tests of association.

As the data were non-parametric and only included two classes (such as age and experience), chi-square tests were used to evaluate the significance of the data (with a significance level $p < 0.05$). However, they do not guarantee magnitude or direction of effect, as this involves qualitative, as well as quantitative, consideration.

As the data for the 2×2 tables resulted in the majority of cells having an expected frequency of less than 5, it was decided to take the Fisher’s Exact Test as the p -value (as recommended by Kinnear and Gray [21]). The SPSS software system [22] was used to calculate the values.

Qualitative analysis was used for the more information-rich data gleaned from the interviews. The data were put into categories and analysed for common themes [23]. This information was then used to provide supporting evidence to the chi-square results.

2.4. Pilot study

Three subjects were initially interviewed to test the reliability of the questions and to ensure that significant material was being collected. This resulted in a number of questions being added to explore the possible barriers to Internet usage this highlighted:

1. Perceived complexity of terminology, including error message and online help terminology.
2. Lack of training and the resulting reliance on informal help from friends and family.

A conceptual model (Figure 1) was then developed, based on the hypothesis that psychological barriers affect Internet usage for the over 55s in the UK. The model demonstrates that the study will investigate whether age (55–75) and training influence the psychological barriers to Internet and e-mail usage, and whether experience of the computer or Internet has a further effect.

3. Results

Twenty-three subjects were selected for the study. However, upon interviewing, it became clear that there was a slightly unbalanced number of subjects in some of the research categories (Table I).

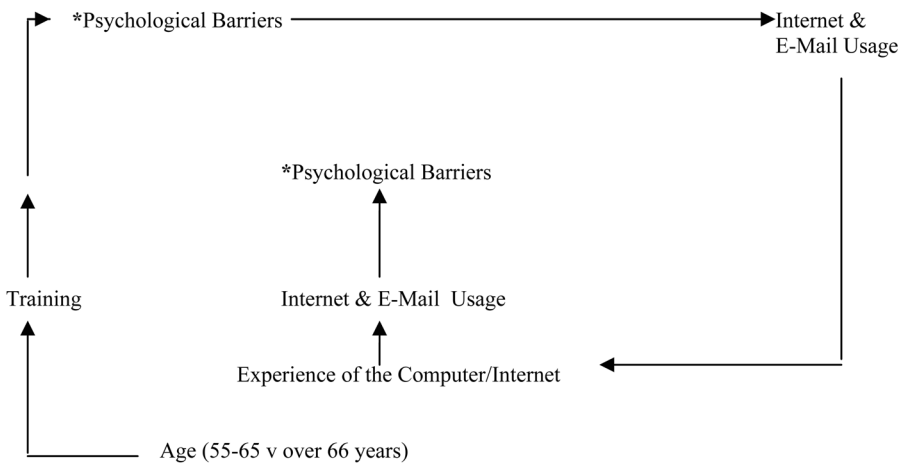


Figure 1. Conceptual model of psychological barriers affecting Internet usage for the over 55s vs. 66s in the UK. *Psychological barriers: perceived ease of use, perceived usefulness, Internet and e-mail efficacy, perceived complexity of terminology, perceived complexity of navigation.

An analysis of the questionnaire responses was conducted to explore users' psychological barriers. Table III lists those results that were found to be significant.

3.1. Perceived usefulness

3.1.1. Internet and e-mail usage: The chi-square factor indicated some significant (but more than 0.05) positive effect of perceived usefulness of the Internet on Internet usage ($p = 0.068$, $p > 0.05$), but not on e-mail usage. The majority of subjects who perceived the Internet as useful used it more often than those with a negative perception.

Perceived usefulness of the e-mail had a significant positive effect on Internet usage ($p = 0.019$, $p < 0.05$) and e-mail usage ($p = 0.003$, $p < 0.05$). The contingency results for the perceived usefulness of the e-mail strengthened the chi-square results in that they showed a positive effect on Internet and e-mail usage. The majority of subjects who perceived the e-mail as useful used the Internet (52%) and e-mail (69%) often. The following quotes are illustrative examples behind this effect:

- Subject with negative perceived usefulness and low usage: 'Prefer to use the phone to book holidays. I find the e-mail very formal and not good for exchanging ideas'.
- Subject with positive perceived usefulness and high usage: 'Fascinated by the clever things you can do'.

3.1.2. Experience: The chi-square test showed that only Internet experience affected perceived usefulness of e-mail. However, the contingency results show that the majority of all users, whether new or experienced computer/Internet users, perceived the Internet (87%) and e-mail (74%) as useful. Although the chi-square result shows a significant effect ($p = 0.027$, $p < 0.05$), it is not in the direction that the study hypothesized, i.e. that new users will have a negative perceived usefulness and that experienced users will have a positive perceived usefulness.

Table III. Significant chi-square test results-using Fisher's exact test.

Barrier	Fisher's exact test	
	<i>p</i> -value	Percentage of cells less than 5
<i>Perceived usefulness</i>		
Perceived usefulness of e-mail		
Affects Internet usage	0.019	50
Affects e-mail usage	0.003	50
Affected by Internet experience	0.027	50
<i>Perceived ease of use</i>		
Perceived ease of use of Internet		
Affected by computer experience	0.005	50
Perceived ease of use of e-mail		
Affects e-mail usage	0.04	75
Affected by Internet experience	0.037	50
<i>Internet efficacy</i>		
Affects Internet usage	0.04	25
Affected by computer experience	0.019	50
Affected by Internet experience	0.012	25
<i>E-mail efficacy</i>		
Affects Internet usage	0.052	50
Affects e-mail usage	0.021	75

Instead, it shows a significance in a universal direction, that all users perceive the Internet as useful. Experience, therefore, does not affect perceived usefulness directly. The following quotes highlight the positive perception of usefulness:

- Subject is a new user with positive perceived use: ‘Started to use the Internet as so much was becoming important’.
- Subject is an experienced user with positive perceived use: ‘I do find it quite fascinating . . . first inspired to use it to keep up to date’.

3.2. *Perceived ease of use*

3.2.1. *Internet and e-mail usage:* The chi-square test showed that the only significant effect was the perceived ease of use of the e-mail on e-mail usage ($p = 0.04$, $p < 0.05$). The following quotes illustrate this effect:

- Subject does not perceive the e-mail as easy to use, so uses it little: ‘I only use the e-mail with the assistance of other people’.
- Subject perceives the e-mail as easy to use, so uses it often: ‘I find it easy to use and enjoy it’.

Perceived ease of use of the Internet did not have a significant effect on Internet or e-mail usage. The contingency results showed that the majority of all Internet users still used the e-mail often, even if they perceived the Internet as difficult (74%).

3.2.2. *Experience:* The chi-square tests showed that there was a significant ($p = 0.005$, $p < 0.05$) positive effect of computer experience on perceived ease of use of the Internet, but not on perceived ease of use of the e-mail. There was a significant positive effect of Internet experience on perceived ease of use of e-mail ($p = 0.037$, $p < 0.05$), but not on perceived ease of use of the Internet.

The contingency results strengthen these figures, as they show that while the majority of new computer users did not perceive the Internet as easy to use (71%), they did perceive the e-mail as easy to use (71%). New Internet users were equally negative and positive about perceived ease of use of the Internet, and the majority also perceived e-mail as easy to use (60%). The results showed that the majority of both experienced computer and Internet users did perceive both the Internet and e-mail as easy to use. The following quotes illustrate this effect:

- Subject is a new user and has a negative perceived ease of use of the Internet: ‘I don’t have the time. I find it frustrating and prefers traditional methods’.
- Subject is an experienced user and has a positive perceived ease of use of the Internet: ‘I think the more you use it, the more you learn. You teach yourself a lot of things’.

3.3. *Perceived complexity of terminology*

3.3.1. *Internet and e-mail usage:* There was no continuity for the chi-square tests; the contingency results, however, clearly showed that perceived complexity of terminology does not affect Internet or e-mail usage. It made no difference in the positive group as to how frequently they used the Internet. Those that did not find it complex (negative perceived complexity of terminology) used both the Internet and e-mail often (67%), but even in those that did find it complex (positive perceived complexity of terminology), the majority still used the e-mail often (75%).

The subjects' comments showed how error messages are often simply ignored if they are not understood. They do not seem to hinder usage; for instance, one subject commented 'they (error messages) usually say the wrong things and don't really help . . . solve by trial and error'.

3.3.2. Experience: There was no continuity for the chi-square tests; the contingency results, however, showed that experience does not affect perceived complexity of terminology. It was found that the majority of both new and experienced computer (73%) and Internet (73%) users perceived Internet terminology as complex. The following comments illustrate reasons behind this:

A new user: 'receiving messages for no rhyme or reason . . . I just ignore them now . . . I used to get into a panic and wonder what to do, and now I close it down and start again'. An experienced user: 'as quite experienced, aware that now I don't know short cuts . . . and therefore perceive myself as less experienced and more aware of the Internet's complexity'.

3.4. Perceived complexity of navigation

3.4.1. Internet and e-mail usage: The interview explored perceived complexity of navigation of the Internet only.

There was no continuity for the chi-square tests; however, the contingency results showed that perceived complexity of navigation of the Internet affects Internet usage (but not e-mail usage): the majority of those that do not perceive navigation of the Internet complex (negative) use both the Internet (77%) and e-mail (85%) often. The majority of those that do perceive it as complex (positive) used the Internet little (78%). The following quotes illustrate this influence:

- A subject with negative perceived complexity of navigation and high usage: 'Finds all Web sites different, some seem rather more user friendly than others'.
- A subject with positive perceived complexity of navigation and low usage: 'Imagines finding Web sites terribly difficult'.

Perceived complexity of navigation of the Internet did not affect e-mail usage. The majority of users still used the e-mail often, even if they perceived the navigation of the Internet as complex.

3.4.2. Experience: There was no continuity for the chi-square tests. However, the contingency results showed that computer and Internet experience affects perceived complexity of Internet navigation. The majority of new computer (86%) and Internet (73%) users found Internet navigation as complex and the majority of experienced computer (80%) and Internet (91%) users did not find it complex. The qualitative data demonstrated that even experienced users find navigation hard sometimes, but they know that some sites are easier than others, e.g. 'Finds all Web sites different, some seem rather more user friendly than others, some more complicated'.

3.5. Internet efficacy

3.5.1. Internet usage: The chi-square tests showed a significant effect of Internet efficacy on Internet usage ($p = 0.04$, $p < 0.05$). E-mail efficacy's effect was also significant on Internet usage ($p = 0.052$, $p < 0.05$), and on e-mail usage ($p = 0.021$, $p < 0.05$).

This is strengthened by the contingency results, which showed that Internet efficacy does have an influence on Internet usage (43% of positive replies used the Internet often) and that e-mail efficacy can affect both Internet (52% of positive replies used the Internet often) and e-mail (65% of positive replies used the e-mail often) usage. The following quotes illustrate this effect:

- A subject with negative perceived Internet efficacy and low usage: ‘Finds the whole computer/Internet thing very ominous and I worry that I will collapse the whole thing’.
- A subject with positive perceived Internet efficacy and high usage: ‘I don’t worry about making mistakes because it seemed to me that you can always get out of them somehow’.

3.5.2. Experience: The chi-square tests showed a significant effect of computer experience on Internet efficacy ($p = 0.019$, $p < 0.05$), but not on e-mail efficacy. The effect of Internet experience on Internet efficacy was also significant ($p = 0.012$, $p < 0.05$).

This was further strengthened by the contingency results, which showed that computer and Internet experience affects Internet efficacy (52% of experienced computer users and 43% of experienced Internet users reported positive Internet efficacy), but not e-mail efficacy. Efficacy was shown to increase with use. The following quote from an experienced user with positive Internet efficacy demonstrates this effect: ‘There is still masses for me to learn, but I don’t go there now thinking I haven’t a clue what I am doing’.

3.6. Age

The results showed that age (55–65 vs. 66–75 years) had no significant influence on the psychological barriers. The significance level was above 0.05 for all.

3.7. Other findings

The qualitative nature of the research allowed other important information to surface. These form valuable data behind the subjects’ psychological barriers and are as follows:

1. *Social relations:* The main reasons for learning to use the Internet were the desire not to be left behind (30%) and by the need to use it for work (26%). The remainder were inspired by grandchildren or for maintaining contact with friends and family.
2. *Training:* The majority of users (57%) were self-taught or relied on friends and family, with the remainder being taught formally (43%). However, in both these groups, the continued support of family and friends was often called upon for ongoing use. The following is a selection of quotes that are particularly illustrative of the need for training aimed at the older user: ‘Now wanting to move up a gear, but needs to find the time and person to learn’; ‘At the beginning you feel totally stuck, because it’s such a new medium and the teaching’ but after a specifically targeted course ‘feels confident now . . . that I will improve’; ‘I am hopeless at reading instructions, I’m trying to get there too quickly, so miss the vital thing . . . whereas if someone is talking over my shoulder, I find it more useful and practical . . . the learning ‘takes so much time and you are so isolated’.
3. *Perceived younger environment:* Only two of the subjects had accessed the Internet outside a course or their home, and there was therefore not enough data to assess whether comfort in a perceived younger environment had any influence.

4. Discussion

4.1. Introduction

The study aimed to test the conceptual model of psychological barriers affecting Internet usage for the over 55s vs. the over 66s, in the UK, shown by Figure 1, and explored the significance of each of these barriers to Internet and e-mail usage. The findings for each of these potential psychological barriers will be discussed in turn.

4.2. Perceived usefulness

Only perceived usefulness of e-mail was found to significantly affect both Internet and e-mail usage. Perceived usefulness of the Internet did not influence usage, but it is worth noting that even though there were only three (out of 23) subjects who had negative attitudes regarding perceived usefulness of the Internet, the subjects seldom used the Internet. The fact that the majority perceived the Internet as useful could be explained by the fact that all subjects had already made attempts to use it and were therefore more likely to perceive it as useful. Previous research [8, 24] had also found perceived usefulness to be 'strongly associated with the impacts of Internet usage' [14]. However, it was determined in this study that computer and Internet experience had no direct influence on perceived usefulness. The majority of new and experienced users perceived both the Internet and e-mail to be useful. This result could affect Internet uptake in the future, as it shows that there is an increasing demand to use the Internet due to increased perception and awareness of its use.

In line with Katz and Aspden's [25] USA study (of all ages), this research found that the main motivations for using the Internet and e-mail were communicating with people (including friends and family abroad), obtaining information on special interests, and keeping up to date.

4.3. Perceived ease of use

The findings show that only a perceived ease of use of the e-mail had a significant positive effect on e-mail usage. This is similar to the effect that previous research [10] had found for the younger age group (for Internet use). However, the majority of Internet users still used e-mail often, even if they found the Internet difficult to use.

This research revealed that perceived ease of use of the Internet was also found to be significantly affected by computer experience and that Internet experience had a significant effect on perceived ease of use of the e-mail. However, the majority of both new and experienced computer and Internet users perceived the e-mail as easy to use, compared with the Internet. This could be due to a more simple system, which is less complex to learn. However, the e-mail system does have fewer functions to perform than the Internet, and it is not as open to the different design ideas of the many different organizations' Web sites. This would explain the consistency with the lack of effect that e-mail experience has on e-mail efficacy (see Section 4.6). If the e-mail is perceived as easier to use, the uptake will be greater than that for the Internet.

4.4. Perceived complexity of terminology

Perceived complexity of terminology was not found to affect Internet or e-mail usage. Neither was it found to be influenced by experience, as the majority of users perceived it to be complex. This demonstrates that users are prepared to cope with some difficulties

provided that they perceive it as useful or overall easy to use. Indeed, the qualitative data showed that if users do find it complex, they find ways to get around it or simply learn to ignore areas they did not understand. A large majority of the subjects reported not understanding error messages for example, but had learned to ignore them. It also appears that there is more perceived complexity of terminology in relation to the Internet than for e-mail.

Although perceived complexity of terminology is therefore shown not to affect usage, these results show that the language used by the Internet and e-mail systems needs to be addressed and become more user friendly to enhance the user's experience of the Internet. In fact, one user (age 55–65) stated that the 'Internet has very bad language for old ladies . . . finds online help incomprehensible'. There has been no previous research on this issue with which to compare the results.

4.5. Perceived complexity of navigation

The contingency results showed some effect of perceived complexity of navigation of the Internet on Internet usage, but not e-mail usage. However, as only navigation of the Internet was tested, and there is less navigation required of the e-mail, one would not expect it to affect usage of the e-mail. It appears, though, that users did perceive the e-mail as separate from the Internet.

Previous research has shown an influence of complexity of navigation on Internet usage. Katz and Aspden [25] showed that a significant barrier was the complexity of navigating the network. Navigation of the Internet taxes both working memory and spatial ability, in which older adults frequently show deficits. We can therefore expect older adults to exhibit more of these behaviours [12].

When looking at the influence of experience, it was found that the majority of the new users did perceive the Internet to be more complex than those with more experience (computer and Internet). This shows that it is a barrier that is overcome, at least partly, with experience. Previous research has also shown that new users are more likely to get lost [12]. It was also evident from qualitative data that ease of navigation differed from site to site, which seems to indicate that Web sites need to be designed more simply and uniformly.

4.6. Internet efficacy

A significant positive effect of e-mail efficacy was found for Internet and e-mail usage. There was also a significant positive effect of Internet efficacy on Internet usage. This is consistent with previous research [26, 27] on computer efficacy and its effect on computer usage.

It may be that novices are often frightened by the anticipated interaction with the machine, despite their willingness to expend effort. An alternative explanation is that many people may not believe that they will ever be able to interact successfully with computers, i.e. control them. Indeed, in this study, many new and experienced users commented that they were afraid of breaking the computer by making a mistake. This is consistent with previous research [11].

Internet and computer experience was found to significantly affect perceived Internet efficacy, and Internet experience had some influence on e-mail efficacy. It may be that users just need experience to help them overcome their concerns. Indeed, Morrell and others [16] found that previous successes contribute significantly to the desire and ability to learn (citing Bandura [17]). Levels of efficacy can also be increased through support (from peers, family and friends) and experience [7].

4.7. Age

No significant effects of age (between the two age groups of 55–65 and 66–75 years) were found in this study. The two age groups showed similar attitudes towards Internet and e-mail use. Previous research such as Teo and Lim's [28] study found that age does not have an effect on perceived ease of use. However, this study only compared differences between two older age groups, and did not seek to compare the younger age group. Research on cognitive ageing indicated that older users are more likely to experience barriers such as perceived ease of use and navigation, through the influence of cognitive and physiological changes. The researchers maintain, though, that experience with computers may negate some of the ageing effects and have an overall positive impact [16]. White and others [2] state that research has determined that computer experience does tend to modify the age difference in performance, but it does not completely eradicate it.

There were no health problems, which significantly affected usage, in this study.

4.8. Training

This research found that the majority of users (56%) were taught at home by friends and family or were self-taught. Forty-three per cent went on a course, which was often limited to a few days only, or learned at work. A large number (39%) in both groups sought ongoing advice from friends or family.

This is consistent with previous research [11, 25] and demonstrates that social and work networks are important in the uptake of the Internet. It may be that older people are lacking in this support area compared with younger people, who often learn through work (only three subjects in this study learned through work). Instead, if users learn when they are retired, they may not have the same back-up to help overcome fears and apprehension at the beginning. If they are relying on family or friends to help, they may have to wait until they are available.

Training has been found to reduce anxiety as well as increase efficacy [15, 27]. However, training has not been found to influence navigational success, as it seems to be affected by memory rather than navigation strategies, although it has been found to help encourage older users to use a wider variety of navigation tools. This, therefore, may suggest that design interventions should be considered [12].

5. Conclusion

Participation in the Internet age is an important factor in the full social inclusion of older people, particularly as more public services go online (Director of Age Concern, Gordon Lishman quoted on BBC News online [3]). More research is also needed as to why only a minority of users are going on courses and whether training has a significant effect on psychological barriers. It would be useful to look at the 75 year old plus age group, as previously most differences were found between young-old and old-old. This group is more likely to have increasing health problems that affect usage. Furthermore, previous research has found that social support influences efficacy [11] and perception of usefulness [9]. Does it significantly affect the older age group's usage of the Internet in the UK?

A simpler and more uniformly designed Internet would help to breakdown the psychological barriers outlined. Based on the findings of this study and previous research

[8, 29], the following suggestions are made for Web page design to make the Internet easier to use for older age groups:

Ensure web pages are:

1. Transparent
2. Comprehensive
3. Responsive
4. Self-explanatory
5. Adaptive
6. Efficient
7. Forgiving
8. Flexible
9. Informative and timely
10. Consistent with the user's other familiar designs.

From the subjective comments, it appears that the ease of navigation of the Internet is easier on some sites, and that some web pages have achieved more user-friendly designs. Other Web site designers need to follow their example. Indeed, if the 10 factors listed above are addressed, it is hypothesized that anxiety will be lessened and efficacy increased, thereby raising usage. It is vital to reduce people's fear of computers and the Internet, and to increase their comfort with technology. Age-specific training programmes and manuals may also help reduce potential barriers and increase the older adults' perception of ease of use of the web.

In addition, a simplification of the existing online help and error message terminology may be beneficial, making it more user-friendly and less technological. A provision (or adequate marketing) of a telephone advice centre, to assist with difficulties as they arise, may also aid usage. This would provide more immediate help than having to rely on friends and family who may not always be available. Finally, in order to increase knowledge of the World Wide Web, its wide scope of possibilities should be sufficiently marketed to the older age group.

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