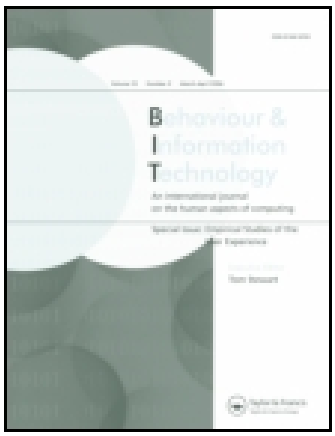

Behaviour & Information Technology
Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/tbit20

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Published online: 08 Nov 2010.

To cite this article: Thompson S. H. Teo & Vivien K. G. Lim (2000) Gender differences in internet usage and task preferences, Behaviour & Information Technology, 19:4, 283-295, DOI: 10.1080/01449290050086390

To link to this article: http://dx.doi.org/10.1080/01449290050086390

BEHAVIOUR & INFORMATION TECHNOLOGY, 2000, VOL. 19, NO. 4, 283–295

Gender differences in internet usage and task preferences

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Abstract. Although there has been much publicity about the Internet, empirical research focusing on it is still relatively sparse. Much of the existent research on the internet has been predicated upon data collected in Europe and America. To date, there is a dearth of published studies on the internet in the Asian context. This study examines gender differences in internet usage in Singapore, a small island of 650 square kilometres in south-east Asia. Data were collected on internet users via a questionnaire survey placed on the World Wide Web. 1370 usable responses were received, of which 89% were males and 11% were females. Gender differences in terms of the demographic profile of internet users, usage patterns, task preferences and factors affecting an enjoyable Internet experience are examined.

1. Introduction

The internet has its roots as early as the 1960s, when the Pentagon commissioned several computer scientists to build a system of decentralized network communications that could remain functional in the event of a nuclear war. As a result, the Arpanet was born initially linking up four research laboratories. This quickly expanded to connect many universities, research institutions and corporations, and became the technological underpinning of the present day internet. Programs were written to enable users to transmit and share files with other users around the world, regardless of the computer platform. In 1993, the popularity of the internet escalated with the creation of a user friendly graphical interface browser called Mosaic. Since then, many other browsers have been created and the number of host sites and internet users have increased exponentially.

Singapore is an ideal country in Asia to examine the internet phenomenon since it is known to have one of the highest densities of internet users in the world, and boasts the biggest number of internet messages and chat groups relative to its population size (Tan 1995). Furthermore, Singapore is also well known world-wide for its IT2000 plan that aims to turn Singapore into an intelligent island by the turn of the century (National Computer Board 1992). Lee (1995) predicted that the number of internet users in Singapore will increase from about 100 000 in 1996 to 250 000 by the end of the decade (Lee 1995). In fact, by early 1999, the figure has reached about 470 000 (or about 15% of the population) (Electronic Commerce Hotbed Homepage 1999).

Despite the popularity of the internet, little empirical research has been done outside of Europe and America. Past research has often focused on the demographics and growth of the internet in terms of the number of host sites and users. For example, Graphics, Visualization and Usability Centre (http://www.cc.gatech.edu/gvu/), Nielsen Media Research (http://nielsenmedia.com/) and CyberAtlas (http://www.cyberatlas.com/) have periodically carried out extensive research on the profile of Internet users and the use of the World Wide Web (WWW). Similarly, King (1996) has examined the use of the WWW among Fortune 500 companies.

Other research has investigated the evolution and diffusion of the internet (Goodman *et al*. 1994, Kahn 1994), the commercial uses of the internet (Hoffman *et al*. 1995, Cockburn and Wilson 1996), the internet as a strategic tool (Nejmeh 1994), and the impact of the internet on education, research (Ives and Jarvenpaa 1996), manufacturing (Upton and McAfee 1996),

ISSN 0144-929X print/ISSN 1362-3001 online
http://www.tandf.co.uk/journals

marketing (Quelch and Klein 1996) and human resource management (Greengard 1995). In addition to having an impact on businesses, Turkle (1995) emphasized that the internet is redefining human identity as people explore the boundaries of their personalities, adopt multiple selves, and form online relationships that can be more intense than real ones.

In Singapore, Goren and Turban (1996) have explored the teaching of internet skills while other researchers such as Palvia *et al.* (1995) have examined Internet awareness and usage at the local universities. Findings of another local study conducted by the Survey Research of Singapore showed that an overwhelming 82% of internet users believe that the internet will become a necessity in the future (Straits Times 1996b). Currently, the National Computer Board, a government institution which oversees the adoption of information technology (IT) in Singapore, has several ongoing studies on the internet, focusing on the demographic profiles of internet users as well as usage patterns in homes and businesses (Lee 1996). Preliminary results showed that the typical internet user is a male, in the age group of 20 to 29 years. He is likely to be a working professional with tertiary education and a monthly household income of more than S$4000. He uses the Internet mainly for entertainment and personal communication (National Computer Board 1997).

Most of the above studies have not been published in academic journals and are very general in nature, examining mainly the demographic profile of internet users and the use of the World Wide Web. Our study is more focused and seeks to further contribute to a better understanding of the internet phenomenon in Singapore. Specifically, we examine gender differences in the following areas: profile of internet users, detailed usage patterns and uses of the internet, and factors affecting an enjoyable internet experience. Although gender differences have been investigated in various topics pertaining to the information systems (IS) field, few have investigated gender differences in the context of the internet.

2. Background

Some studies tend to treat computer users as homogeneous entities in which distinctions of gender are either ignored or considered irrelevant, while other studies have specifically examined gender issues on a number of IT-related topics. Examples of research topics which focus on gender differences pertaining to IT personnel include career success (Baroudi and Igbaria, 1994/95), salary and promotion (Isaacs 1995), occupational stress and coping strategies (Lim and Teo 1996), and preferred job characteristics, personal attributes and work traits (Smits, McLean and Tanner 1993). Researchers have also examined women's exclusion from technological work as well as the nature, development and articulation of technological work with changing gender relations (Henwood 1993). Studies which focus on computer-related topics usually examine gender differences in computer anxiety (Qureshi and Hoppel 1995), computer skills (Harrison and Rainer 1992), technostress (Elder *et al.* 1987), attitudes towards computers (Chen 1986, Kaplan 1994) and factors influencing computer usage (Teo and Lim 1996). Research on gender and technology has generally showed mixed findings.

Qureshi and Hoppel (1995) found that demographic variables such as gender, grade point average (GPA), major area of study (e.g. finance, marketing), prior computer experience and anticipated future use of computers showed significant differences in how students feel about computers. Similarly, Harrison and Rainer (1992) examined individual differences on skill in end-user computing and found that gender, age, prior computer experience, computer anxiety and cognitive style are associated with the level of computer skills. Dunkle *et al.* (1994) found that there are gender differences in the impact of computing on white collar work.

In research on technostress, Elder, Gardner and Ruth (1987) found that females are more likely to experience technostress (physical and emotional burnout caused by inability to adapt to new technology) in using PCs compared to males. Also, older workers are more likely to experience technostress compared to younger workers.

Kaplan (1994) reported that a recent poll by Logitech of Fremont, California found that males and females view computers differently. Females are more likely to think that computers are fun compared to males. Kaplan's findings contradict results of previous research which suggest that males were more likely than females to perceive computer usage as fun. For example, Qureshi and Hoppel (1995) found that males are more likely to perceive that learning about computers is interesting compared to females. Krendl, Broihier and Fleethood's (1989) study across a three year period found that men continued to report more interest and confidence in computers than women.

Chen (1986) conducted a survey of high school students and found that males generally have more positive attitudes and confidence with computers compared to females. However, when the level of experience in computers is controlled for, males and females were found to have similar level of interests in computers. Other researchers found that women appear more afraid of computers than men (Gattiker 1988) and are more

likely to express concerns about how computers would affect the quality of their work life (Gattiker *et al*. 1985). Turkle (1988) suggested that the issue is not computer-phobia (staying away from computers due to fear and panic) but rather computer reticence (staying away from computers because the computer has become a personal and cultural symbol of what a woman is not). She further emphasized that although women have the ability to be proficient in computing, computer reticence discourages them from becoming more deeply involved with computers. Furthermore, Herring *et al*. (1995) found evidence of male dominance and resistance to female participation on the internet. Generally, males adopt various mechanisms to silence women's participation in computer-mediated mixed-sex discussions.

Teo and Lim (1996) found that while respondents may agree that computers are complex and useful, gender differences exist in whether they perceive computers to be easy to use. In a similar vein, Allen (1995) found that females perceived computer-mediated communication (electronic mail) to be easier to use, more efficient , and more effective than males.

Since attitudes toward computers may also influence attitudes toward the internet and its usage, this study examines gender differences in internet usage and task preferences. The results may provide significant insights for policy makers and internet access service providers (IASPs) regarding how to promote internet usage and how to enhance its impact on users. For researchers, such results would lead to a better understanding of the issues pertaining to research on gender and the internet.

3. Method

3.1. *Instrument*

In order to better understand the internet phenomenon, an extensive review of articles in computer-related magazines, journals, books, internet statistics Web sites and local newspapers was conducted. Following this, face-to-face interviews and/or telephone interviews were conducted with 16 internet users. Each interview session lasted about an hour. The main aim of these interviews was to solicit feedback on the generic uses of the internet, the detailed tasks the internet is being used for, and factors affecting an enjoyable internet experience.

Based on the interview results, we found that there are four generic uses of the internet:

(i) Messaging (e-mailing, using discussion groups, internet relay chat, etc.);
(ii) Browsing (using a browser e.g. Netscape, Mosaic, to surf the World Wide Web to read or view HTML (Hyper Text Markup Language) documents);
(iii) Downloading (copying files from the World Wide Web such as images, shareware, etc.); and
(iv) Purchasing (ordering products through the internet).

In addition, information was also obtained on the detailed tasks performed on the internet in terms of different types of information, communication patterns, and features of Web page design.

On the basis of the interview results, a survey questionnaire was drawn up. It was designed to collect data on:

(i) The demographic profile of internet users;
(ii) The frequency of use and daily usage time on the internet defined in terms of four generic activities: messaging, browsing, downloading and purchasing;
(iii) Tasks the internet is used for; and
(iv) Factors affecting an enjoyable internet experience.

3.2. *Data collection*

An electronic version of the questionnaire was created using HTML and placed on the internet. There are several advantages and disadvantages in using the internet for survey purposes. One key advantage (which we leveraged in this survey) is that Javascript programming can be used to check and advise respondents of unacceptable responses, thereby ensuring that all items in the questionnaire are filled in completely and appropriately. For example, if one respondent omits answering certain questions, a reminder can automatically be generated when the respondent tries to submit the survey electronically. This helps to minimize the number of unusable responses.

Another advantage is that the speed of delivery and response is usually faster than mail surveys. Surveys through the internet can reach a much wider sample at very low costs (in terms of time and money) than a mail survey. However, this also leads to a disadvantage in that the sample cannot be ideally controlled. Hence, there may be an inherent bias since individuals with certain characteristics may be more prone to answer the questionnaire (which may also be true of mail surveys). While we know how many people receive the questionnaires in mail surveys, in the case of using the internet, we do not actually know how many people are aware of our surveys. Further, the extent and method of publicizing the survey may influence the profile of

respondents, which make generalizations to the overall population difficult. This is a common problem of all web-based surveys. We have tried to mitigate this problem by publicising the survey as widely as possible.

Extensive pre-testing of the electronic survey was carried out with internet users and modifications were made based on users' feedback to improve the clarity and presentation of items. Since there was no major comment in the third round of pre-testing, the survey was deemed ready for the main study.

In order to increase response rates, 100 S$2 phone cards were offered as tokens to respondents as an incentive to encourage participation. The survey site was publicised in various newsgroups, local newspapers, and Computerworld magazine. Hyperlinks were also placed on the 'What's new page' of Singnet (internet access service provider in Singapore) and the National University of Singapore Homepage. These two sites were chosen because of their popularity with local web surfers. Respondents were also promised an executive summary of the results as an added incentive to participate. A total of 1378 answers were received.

4. Results

Of the 1378 responses which were received, 1370 were usable. Eighty-nine per cent of respondents were males (N= 1219) and 11% (N= 151) were females. In contrast, Heichler (1997) reported that a survey of internet usage in the US found that about two-thirds of internet users are males. Similarly, the National Computer Board (NCB) (1997) found that internet users in Singapore comprise 72% males and 28% females. Note that the NCB survey uses stratified sampling and interviews, and focuses on homes with personal computers. A chi-square test between our sample and NCB sample was statistically significant (chi-square= 25.1, df= 1, $p < 0.001$). One possible reason for the higher percentage of males in our sample is that heavier/more accomplished users (who are more likely to be males) are more likely to participate in a survey conducted via the internet.

These findings are generally reflective of the fact that internet users in Singapore (and perhaps other countries as well) are predominantly males. This is perhaps expected since previous research on personal computer predispositions generally showed that males are more likely to be interested in learning about computers compared to females (Wilder *et al.* 1985, Qureshi and Hoppel 1995). This result is also consistent with findings by the Technowledge Asia (an IT market research firm) that that a higher percentage of males tend to be early adopters of the internet compared to females (Toh 1999). Another reason for the relatively low female usage of the internet, as suggested by Heichler (1997), is that there is a relative lack of female-oriented content on the internet.

Table 1 shows results of chi-square tests for gender differences between demographic variables, such as age, nationality, ethnic group, and educational level.

4.1. *Demographic Profile*

4.1.1. *Age*: The majority of respondents are in the 16–20 years and 21–25 years age group, thereby indicating that Internet users in Singapore are predominantly youths and young adults. This result is generally consistent with the National Computer Board's (1997) findings that internet users are likely to be in the 20–29 years age group. Results of chi-square tests revealed a significant relationship between gender and age (chi-square= 32.36, df= 6, $p < 0.05$). This is expected since the questionnaire survey targets internet users in Singapore rather than world-wide.

4.1.3. *Ethnic group*: Singapore is a multi-racial society with Chinese making up the majority of the population. This is reflected in results of our survey which show that Chinese constitute the majority of the sample for both male and female internet users. No significant result was found between ethnic group and gender (chi-square= 2.00, df= 1, $p > 0.05$).

4.1.4. *Highest educational level*: Significant gender differences were found for the highest educational level of respondents (chi-square= 28.87, df= 5, $p < 0.0001$). The men who responded to our survey are generally more educated than their female counterparts. This is partly due to the younger age of females.

4.1.5. *Current educational pursuit*: Internet users were also asked whether they are currently taking any courses to upgrade their educational level. Results of this survey (table 1) suggest that a greater proportion of females [58% (87 out of 151)] compared to males [48% (581 out of 1219)] are upgrading themselves (chi-square= 29.50, df= 6, $p < 0.001$). This result is perhaps surprising for an Asian culture such as Singapore where males are traditionally viewed as breadwinners. Consequently, as breadwinners, we may expect more males to seek to upgrade themselves to cope with increases in the cost of living and to better provide for their families. Additionally, there may exist more opportunities for men to further their education compared to women whom often had to combine family and work roles, thus leaving them

Table 1. Demographic profile.

	Male		Female		
	No.	%	No.	%	Chi-square
1. Age (years)					
11–15	28	2.3	3	2.0	df= 6
16–20	223	18.3	53	35.1	chi-square= 32.36
21–25	458	37.6	57	37.7	p= 0.0000
26–30	248	20.4	12	7.9	
31–35	116	9.5	15	9.9	
36–40	85	7.0	7	4.6	
>40	60	4.9	4	2.6	
2. Nationality					
Singaporeans/permanent residents	984	80.7	132	88.0	df= 2
Malaysians	36	3.0	6	4.0	chi-square= 1.99
Others	101	8.3	8	5.3	p= 0.3691
3. Ethnic group					
Chinese	1046	85.9	136	90.1	df= 1
Others	172	14.1	15	9.9	chi-square= 2.00
					p= 0.1580
4. Highest educational level					
Primary/secondary	214	17.6	15	9.9	df= 5
Pre-university/junior college	301	24.7	64	42.4	chi-square= 28.87
Polytechnic/diploma	294	24.2	21	13.9	p= 0.0000
Bachelor degree	280	23.0	40	26.5	
Postgraduate degree	103	8.5	8	5.3	
Others	25	2.1	3	2.0	
5. Current educational pursuit					
None	638	52.3	64	42.4	df= 6
Primary/secondary	36	3.0	2	1.3	chi-square= 29.50
Pre-university/junior college	40	3.3	6	3.9	p= 0.0001
Polytechnic/diploma	155	12.7	11	7.3	
Bachelor degree	253	20.8	59	39.1	
Postgraduate degree	75	6.2	5	3.3	
Others	22	1.8	4	2.6	
6. Occupation					
Unemployed	16	1.4	3	2.1	df= 3
Students	451	38.4	79	55.2	chi-square= 16.98
IT-related jobs	180	15.3	19	13.3	p= 0.0007
Non-IT related jobs	528	44.9	42	29.4	

with less time and opportunity to upgrade themselves educationally.

In view of the surprising result, we decided to control for age by dividing the sample into three age bands (<21 years, 21–30 years, >30 years) and conducting chi-square tests to compare the proportions of males and females upgrading their education within each age band. The results indicated a significant difference only for the <21 years age band (chi-square= 28.21, df= 6, $p < 0.001$), with female internet users under 21 years more likely to be studying or upgrading themselves educationally than their male counterparts. There were no significant differences between male and female internet users over 21 years in terms of their current educational pursuits.

4.1.6. *Occupation*: Significant gender differences in occupation were found (chi-square= 16.98, df= 3, $p < 0.001$) as shown in table 1. The majority of female Internet users appeared to be students, while the majority of male internet users appeared to be either students or persons working in non-IT related jobs. Also, a similar percentage of males and females are in IT-related jobs. This indicates that approximately a similar percentage of males and females in the IT profession are internet users.

4.2. *Internet Access Profile*

Table 2 shows the internet access profile in terms of access account types, browsers used, and access locations.

4.2.1. *Access account types*: The majority of respondents in our study reported that they accessed the Internet through a local internet access service provider (IASP). About 20% of internet users have more than one account type. Foreign internet accounts are relatively rare.

4.2.2. *Internet browsers used*: The most common browser used by both males and females internet users is Netscape Navigator, followed by Internet Explorer. Netscape Navigator is the clear leader among all the available browsers in Singapore. Internet Explorer is used by about 10–20% of respondents. This is consistent with previous data reported by the local media (Straits Times 1996a).

4.2.3. *Access locations*: Respondents were asked to indicate their most frequent and second most frequent locations for internet access. No significant gender difference was found for the most frequent access location. Respondents reported that they frequently accessed the internet from home, followed by the office and from campus (chi-square= 3.38, df= 3, $p > 0.05$).

However, in terms of the second most frequent location for internet access, significant gender differences were found. Females are more likely to access the Internet from campus than males. This is perhaps not surprising since a higher percentage of female internet users appeared to be students. Other locations where users can access the internet include friends'/relatives' homes, public libraries and cybercafes.

4.3. *Usage patterns*

Table 3 shows results of chi-square tests which were performed to determine if gender differences in terms of frequency of use and daily usage time exist. However, instead of examining usage patterns in general, as commonly done in previous studies, we focused on the four generic uses of the internet, namely messaging, browsing, downloading, and purchasing.

Table 2. Internet access profile.

	Male		Female		
	No.	%	No.	%	Chi-square
*1. Access account types**					
Local	1030	84.5	106	70.2	
Campus/School	307	25.2	66	43.7	
Company	145	11.9	10	6.6	
Foreign	28	2.3	1	0.7	
*2. Browsers used**					
Netscape Navigator	1211	99.3	149	98.7	
Internet Explorer	285	23.4	16	10.6	
Chameleon	58	4.8	8	5.3	
NSCA Mosaic	25	2.1	5	3.3	
Others	25	2.1	1	0.7	
3. Access location (most frequent)					
Home	904	74.2	103	68.2	df= 3
Office	202	16.6	29	19.2	chi square= 3.38
Campus/School	110	9.0	19	12.6	p= 0.3369
Others	3	0.2	0	0.0	
(2nd most frequent)					
None	439	36.0	57	37.7	df= 4
Home	244	20.0	29	19.2	chi-square= 30.17
Office	258	21.2	10	6.6	p= 0.0000
Campus/School	243	19.9	53	35.1	
Others	35	2.9	2	1.3	

*Several respondents have more than one Internet access account as well as use more than one type of browser. Hence, computation of chi-square is not possible.

Table 3. Usage patterns.

Usage	Male No.	Male %	Female No.	Female %	Chi-square
1. Messaging					
a. Frequency of use					
Never/almost never	22	1.8	7	4.6	df= 5
Less than once a month	23	1.9	6	4.0	chi-square= 8.57
A few times a month	96	7.9	13	8.6	p= 0.1275
A few times a week	247	20.3	29	19.2	
About once a day	363	29.8	40	26.5	
Several times a day	468	38.4	56	37.1	
b. Daily usage time					
Never/almost never	37	3.0	8	5.3	df= 5
Less than ± hour	524	43.0	34	22.5	chi-square= 28.93
± –1 hour	340	27.9	47	31.1	p= 0.0000
1–2 hours	175	14.4	37	24.5	
2–3 hours	71	5.8	10	6.6	
>3 hours	72	5.9	15	9.9	
2. Browsing					
a. Frequency of use					
Never/almost never	2	0.2	1	0.7	df= 5
Less than once a month	8	0.7	2	1.3	chi-square= 66.03
A few times a month	47	3.9	29	19.2	p= 0.0000
A few times a week	341	28.0	43	28.5	
About once a day	387	31.7	40	26.5	
Several times a day	434	35.6	36	23.8	
b. Daily usage time					
Never/almost never	18	1.5	1	0.7	df= 5
Less than ± hour	133	10.9	14	9.3	chi-square= 1.46
± –1 hour	339	27.8	46	30.5	p= 0.9172
1–2 hours	392	32.2	50	33.1	
2–3 hours	183	15.0	21	13.9	
>3 hours	154	12.6	19	12.6	
3. Downloading					
a. Frequency					
Never/almost never	21	1.7	28	18.5	df= 5
Less than once a month	96	7.9	23	15.2	chi-square= 149.84
A few times a month	298	24.4	53	35.1	p= 0.0000
A few times a week	423	34.7	33	21.9	
About once a day	170	13.9	7	4.6	
Several times a day	211	17.3	7	4.6	
b. Daily usage time					
Never/almost never	89	7.3	39	25.8	df= 5
Less than ± hour	308	25.3	41	27.2	chi-square= 63.99
± -1hour	355	29.1	42	27.8	p= 0.0000
1-2 hours	261	21.4	13	8.6	
2-3 hours	108	8.9	9	6.0	
> 3 hours	98	8.0	7	4.6	
4. Purchasing					
a. Frequency of use					
Never/almost never	916	75.1	128	84.8	df= 5
Less than once a month	197	16.2	20	13.2	chi-square= 10.46
A few times a month	65	5.3	3	2.0	p= 0.0631
A few times a week	15	1.2	0	0.0	
About once a day	14	1.1	0	0.0	
Several times a day	12	1.0	0	0.0	
b. Daily usage time					
Never/almost never	± –1 hour	2–3 hours	1026	22	4
Less than ± hour	1–2 hours	>3 hours	153	10	4

Table 3. (cont'd)

± hour	22	1.8	1	0.7	df= 5
1-2 hours	10	0.8	0	0.0	chi-square= 6.46
2-3 hours	4	0.3	0	0.0	p= 0.26
> 3 hours	4	0.3	0	0.0	

4.3.1. *Messaging*: In terms of using the internet for messaging activities, no significant gender difference was found for frequency of use (chi-square= 8.57, df= 5, $p > 0.05$). However, in terms of daily usage, females were found to be more likely to spend more than half an hour on the internet performing messaging tasks compared to males (chi-square= 28.93, df= 5, $p < 0.0001$). This implies that although both males and females equally frequently use messaging facility on internet, females use it for longer messaging sessions than males. One possible reason is that females prefer to chat compared to males who prefer performing other activities on the Internet (Straits Times 1996b).

In order to examine the results in greater detail, we decided to divide the sample into three age bands (< 21 years, 21-30 years and > 30 years) and carry out individual chi-square square tests for gender differences within each age band. Significant results for frequency of use (chi-square= 17.26, df= 5, $p < 0.01$) and daily usage time (chi-square= 24.11, df= 5, $p < 0.001$) were found for the < 21 years group while the other two groups (21 – 30 years and > 30 years) showed no significant gender differences. These results indicate that younger females (< 21 years) tend to use the internet for messaging activities more frequently and spend more time on such activities compared to their male counterparts. The non-significant results for the other two age groups indicate that men and women over the age of 21, regardless of gender, use the internet for messaging activities to a similar extent.

4.3.2. *Browsing*: With respect to browsing the internet, significant gender differences were found for frequency of use (chi-square= 66.03, df= 5, $p < 0.0001$) but not for daily usage time (chi-square= 1.46, df= 5, $p > 0.05$). This implies that although males browse the internet more frequently than females, there is a negligible difference in terms of daily usage time spent. One likely reason is that internet users are generally constrained by the amount of free time that they have each day for surfing the internet. Consequently, the daily usage time spent by males and females is about the same. However, since a higher percentage of males tend to be early adopters of the internet compared to females (Toh 1999), males may also tend to browse the internet more frequently than females.

4.3.3. *Downloading*: In terms of using the internet for downloading files and software, significant gender differences were found for both frequency of use (chi-square= 149.84, df= 5, $p < 0.0001$) and daily usage time (chi-square = 63.99, df = 5, $p < 0.0001$). This implies that males use the internet for downloading activities more frequently and for longer duration than females. One plausible reason is that males may be more interested in obtaining free resources/software from the internet. Another reason is that males may be generally more technically inclined and more skilled in terms of performing downloading activities compared to females.

4.3.4. *Purchasing*: With respect to using the internet for on-line purchasing of products, no significant gender difference was found for both frequency of use (chi-square= 10.46, df= 5, $p > 0.05$) and daily usage time (chi-square= 6.46, df= 5, $p > 0.05$). The majority of internet users do not purchase products through the internet. This is consistent with surveys done in the US which found that many users are browsing, rather than buying (Paulson 1997). One likely reason is that the security of electronic transactions over the internet is still being debated and internet users are hesitant to divulge personal information or credit card numbers over the internet.

Another reason is the fear of product fraud as actual products might differ from what is being advertised on the internet (Kerr 1994, Messmer 1995). Also, the range of products offered for sale via the internet may be limited or may be easily available in conventional stores more cheaply. A third reason is that unlike Europeans or Americans, Singaporeans are generally not used to buying products from catalogues or through electronic means. Consequently, Singaporeans (and perhaps other nationalities as well) generally feel more comfortable if they can see, touch and feel the actual products before making purchases, and this is difficult via the internet. In fact, in a 1996 survey, internet users tend to make purchases that involve a limited number of product categories, as well as few fashion, material or size risks (Fram and Glady 1997).

4.4. *Tasks the internet is used for*

The questionnaire also listed several common tasks which the internet is used for and respondents were asked to assess their extent of use for each task on a 5-point Likert scale ranging from 1 (not at all) to 5 (to a great extent). Results of t-tests for gender differences are reported in table 4.

4.4.1. *Getting information*: As shown in table 4, results of this study generally suggest that males are more likely to use the internet to obtain information than females. This is consistent with previous research which found that most Singapore men use the internet to surf for information (Straits Times 1996b). Specifically, males use the internet to obtain information pertaining to technology, and institutions or companies to a significantly greater extent than females. Both males and females are likely to use the internet to obtain information pertaining to leisure, education, economics, and politics to a similar extent.

4.4.2. *Communication*: Results of t-test in table 4 suggest that no significant gender difference was found with respect to the use of the internet to communicate with local and overseas friends/people. This is not surprising since humans are 'social beings who seek communication with others' (Turkle 1995, p. 102). The majority of respondents use the internet for communication with local and overseas friends. This is consistent with findings discussed earlier that both males and females use the internet for messaging activities frequently. Furthermore, previous research (Teo and Tan 1998) has shown that electronic mail and the World Wide Web are the two most frequently used functionalities of the internet compared to other functionalities such as file transfer protocol (ftp), telnet, chat and discussion groups (Usenet).

Other research has shown that females tend to view computer-mediated communication more favourably than males (Hiltz and Johnson 1990, Allen, 1995). On the other hand, Parry (1994) argued that gender differences in electronic communications can be explained by contextual factors such as field of occupation and associated computer training.

4.4.3. *Other tasks*: Males were significantly more likely to use the Internet to get free resources (e.g. software), and product support compared to females (table 4). One possible reason could be that males may be more technically inclined and more versatile in computer usage than females (Wilder *et al.* 1985). Turkle (1984) found that men were more likely than women to demonstrate a wide variety of computer-related skills while other researchers (Condry and Keith 1983, Gattiker and Nelligan, 1988) suggested that

Table 4. Tasks the internet is used for.

Tasks the internet is used for	Male	Female	t
1. Get information relating to:			
a. Technology	4.13	3.11	9.17***
b. Leisure	3.62	3.66	0.71
c. Education	3.31	3.16	1.40
d. Institutions/companies	2.93	2.61	3.09**
e. Economics	2.19	2.00	1.81
f. Politics	2.16	2.13	0.34
2. Communicate with			
a. Local friends	3.68	3.74	– 0.60
b. Overseas friends	3.56	3.43	0.98
c. Other people overseas	3.20	3.12	0.57
d. Other people locally	3.17	3.35	– 1.50
3. Other uses			
a. Get free resources	3.86	3.08	6.53***
b. Get product support	3.79	2.42	12.40***
c. Swapping transactions	1.68	1.60	0.76
d. Intentionally purchase products	1.62	1.52	1.28
e. Apply for job online	1.49	1.42	0.88
f. Impulse purchase while browsing	1.27	1.21	0.98

Likert scale: 1 – not at all; 5 – to a great extent.
*p < 0.05; **p < 0.01; ***p < 0.001.

Table 5. Factors affecting an enjoyable internet experience.

Factors affecting an enjoyable internet experience	Male	Female	t
1. Access time			
a. Connect to web site	4.61	4.73	– 2.26*
b. Download web page	4.53	4.51	0.22
c. Connect to service provider	4.50	4.60	– 1.40
2. Web page design			
a. Has up-to-date information	4.61	4.65	– 0.54
b. Is easy to read	4.51	4.51	0.02
c. Has required information	4.44	4.39	0.59
d. Is pleasing to look at	4.16	4.21	– 0.58
e. Has required resources	4.14	3.96	2.00*
f. Is customised for visitors	3.49	3.59	– 0.84
3. Animation and multimedia features			
a. Within web page animations	2.73	2.85	– 1.05
b. Java applets/Javascripts	2.71	2.78	– 0.66
c. Movies	2.63	2.86	– 1.89
d. Virtual reality	2.60	2.60	– 0.02
e. Sound effects	2.55	2.80	– 2.24*
f. Background music	2.45	2.74	– 2.46*

Likert scale: 1 – not important; 5 – very important.
*p < 0.05.

women tend to use computers for work only, while men used computers for other tasks. Consequently, males may use the internet to perform a greater variety of tasks compared to females. The results also show that swapping transactions, on-line job applications and purchasing activities are seldom carried out by either males or females, as is evident from the relatively low mean scores. One possible reason could be doubts over the security of electronic transactions.

4.5. *Factors affecting an enjoyable internet experience*

Information pertaining to access speed, web page design, animation and multimedia features that may affect whether the internet user will have an enjoyable internet experience was also included in the questionnaire. Respondents were asked to rate, the importance of these factors in determining whether they would have an enjoyable experience in surfing the internet, on a 5-point Likert scale ranging from 1 (not important) to 5 (very important). Results of t-tests for gender differences are shown in table 5.

4.5.1. *Access speed*: As shown in table 5, no significant gender difference was found in terms of the importance of access time for connecting to service provider and downloading of web pages. Females view connection to web site to be more important than males. The mean score on this item for females was 4.73 compared to the males' mean score of 4.61. Despite this, it is evident that both male and female internet users view access speed to be important as indicated by the relatively high mean scores for items pertaining to access speed. This is generally consistent with previous research which found that internet users are most concerned with response times (Straits Times, 1996b).

In Singapore, proxy servers were initially used to speed up internet access by caching popular web pages. However, due to the presence of undesirable materials on the internet such as instructions for terrorist activities and pornography (Elmer-Dewitt 1995, Quittner 1995), the functions of proxy servers have been extended to act as a screening mechanism to restrict access to undesirable web sites (Goh 1996). Consequently, access speed has slowed down since the number of undesirable sites to be screened out has increased over time. Currently, internet access service providers (IASPs) mitigate the problem of slow access speed by increasing the number and capacity of proxy servers. However, alternatives to the use of proxy servers as screening mechanisms are urgently needed.

One possible solution that is commonly advocated in Western countries is for policy makers and IASPs is to promote the use of screening software such as Surf Watch and Net Nanny, coupled with parental guidance for children. In this way, control and censorship of web sites can be delegated to the parents' responsibility rather than using proxy servers. However, such software can also filter out useful materials along with the undesirable materials. Ang and Nadarajan (1996) commented that censorship in Singapore has an element of differentiation. For example, materials going into the home are more heavily censored than those going into the corporate world; materials for the young are more heavily censored than those for adults; materials for public consumption are more heavily censored than those for private consumption; and materials deemed to have artistic or educational merit are less heavily censored.

4.5.2. *Web page design*: The results in table 5 show that male respondents were more likely than female respondents to emphasise the importance of having web pages which contain required resources (Mean: male= 4.14, female= 3.96, $p < 0.05$). Note that required resources refer to graphics, software, links to other web sites, etc. that the user is looking for while surfing the internet. It is evident that features such as web pages having up-to-date information, being easy to read, having required information, and being pleasing to look at, are viewed as important by both male and female internet users as indicated by their relatively high mean scores.

4.5.3. *Animation and multimedia features*: In general, web pages with animation and multimedia features are not viewed as important factors in effecting an enjoyable internet experience as indicated by their relatively low mean scores in table 5. However, females appear to view sound effects and background music to be more important than males.

5. Limitations

There are three main limitations in this study. First, the gender distribution in our sample has a predominance of male respondents (males= 89%). This may limit the generalizability of the results. However, a survey by the National Computer Board (1997) also found a predominance of male internet users (males= 72%). Conceivably, the use of an electronic mail survey (in contrast to the National Computer Board use of interviews and questionnaire) may have introduced a bias towards more male respondents since a higher percentage of males tend to be early adopters of

the internet compared to females (Toh 1999). However, research has shown that the data quality of responses is not likely to be affected by the use of computer-administered questionnaires (e.g. Mitchell *et al.* 1996).

Second, the use of a questionnaire in data collection does not permit us to probe respondents' answers to the survey questions. Future research can supplement this data gathering technique with interviews.

Third, the use of a web-based survey makes it difficult for us to assess the generalizability of the sample. This is a common problem in all web based surveys. We have tried to mitigate this limitation by advertising the survey web site as widely as possible.

6. Conclusions

Results of this study suggest that internet users in Singapore are predominantly young males in the 16–25 years age group. Females comprise only 11% of internet users. This research therefore confirms previous studies which reported the phenomenon of male dominance on the internet. Reasons for male dominance on the internet include the traditional view that males are more technologically inclined and have more confidence in computers (Krendl *et al.* 1989). Consistent with this view, the results indicate that males are more likely than females to use the internet obtain information relating to technology. This is further reinforced by the results which showed that males (perhaps by virtue of being more technologically inclined) are more likely to get free resources and product support via the internet compared to females.

Other reasons for male dominance include male resistance to female participation on the internet (Herring *et al.* 1995) and the lack of female-oriented-content on the internet (Heichler 1997). Apparently, there may a need to encourage more females to use the internet. This may be accomplished through formal training as well as increasing the amount of female-oriented content available on the internet.

Females under 21 years generally spent more time on messaging activities compared to males. However, no significant differences were detected for 21–30 years and >30 years age groups. This is partially consistent with Hoffman *et al.* (1996) study which found that women are more likely to use the internet for communication (e.g. e-mail) than men. One possible reason is perhaps the greater need for females to form social networks to exchange information and opinions about a wide variety of work and non-work related topics. To capitalize on this preference by females, customized advertisements by IASPs can be made to emphasise the benefits of e-mailing as an instant, cheap and convenient way to communicate with friends both locally and overseas. The non-significant results for age groups (21 – 30 years and >30 years) indicate that regardless of sex, adults are using the internet for messaging activities.

Since males engage in downloading activities more often than females, more resources and product support could be made available on the internet in order to encourage them to use the internet more frequently. The finding that purchasing activities are carried out infrequently by both males and females is consistent with previous research (e.g. Hoffman *et al.* 1996, Paulson 1997) that consumer purchases via the internet are still made by a relatively small percentage of the internet user population. This sends a clear message to companies seeking to promote electronic transactions that more measures need to be carried out. Such measures may include educating the public on the advantages of online purchase, and providing assurances of the security of electronic transactions.

Overall, in terms of the four generic activities, browsing for information and messaging is more prevalent than downloading and purchasing activities for both males and females. This result is consistent with Katz and Aspden's (1997) study which found that sending and receiving e-mail and finding information about special interests are the top two reasons for becoming an internet user.

Results of this study also show that animation and multimedia features such as movies and virtual reality are viewed as relatively less important than access speed and web page design in terms of information content and aesthetic appeal. This has important implications for web page designers in that they should not focus too much on animation and multimedia features which may unnecessarily slow down access speed. Also policy makers, IASPs and web administrators need to take appropriate measures to ensure that access speed is not reduced to an intolerable level through inadequate server capacities or web page design which contains too many fanciful animation and multimedia features that require a long time to download.

The problem of slow access speed on the internet will be mitigated with the development and implementation of Singapore ONE (One Network for Everyone). This involves building the world's first nationwide broadband network to wire up the entire island of Singapore. The network will deliver interactive multimedia applications at high speed to everyone in Singapore at home, at the workplace and in schools (Singapore ONE Homepage 1997).

The results also show that females seem to emphasise animation and multimedia features such as sound effects

and background music to a greater extent than males. Hoffman, Kalsbeek and Novak (1996) also found some evidence that women are more likely to use real-time audio or video than men. This is an interesting finding which needs to be investigated further in future research.

By examining gender differences in internet usage and task preferences, this study has shown that males and females may perceive and use the internet differently. Future research is needed to investigate in greater detail gender differences in other aspects of the internet. Such research would lead to a better understanding of gender differences pertaining to the internet and consequently would pave the way for more appropriate programs and policies to encourage greater use of the internet.

Acknowledgements

The authors wish to thank Raye Lai for his assistance in data collection.

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