

Refereed papers

Age and gender user differences of a touch-screen kiosk: a study of kiosk transaction log files

Paul Huntington

Peter Williams

David Nicholas

The Internet Studies Research Group, City University, London, UK

ABSTRACT

More and more health information is provided to the consumer in a digital form but research on who actually accesses and uses this information is unclear. This research identifies age and gender user differences of a touch-screen health kiosk. In a departure from previous research, extensive use is made of electronically recorded user transaction files. In all 1378 user sessions covering 17 039 page views were analysed for this study. This research forms part of a research project funded by the Department of Health.

Men accounted for about 53% of use but this hides an important gender difference: additionally women under 15 are significant under-users of such facilities. Qualitative research is needed to clarify the relationship. Further, it was found that those aged over 75 were not making use of kiosk content pages when compared to other age groups.

Keywords: age, gender, user differences

Introduction

Electronic health information can be found in abundance. Quite apart from the government's NHS Direct presence on the Internet, thousands of health websites exist, of commercial, voluntary and individual origin. Despite the huge economic and political investment in digital health information provision, there has been little evaluation of the investment in terms of its impact on consumers' information uptake.

Digital Health is a far-reaching Department of Health-funded study of the developing use of digital consumer health information services; it is being undertaken by City University in co-operation with *INTOUCH with health*. The aims of the study are to develop a context-specific understanding of the extent and way in which the public interact with the digital delivery of healthcare information, and to examine the wider issues involved.

The study reported here describes gender and age use based on an analysis of transaction logs from one

of *INTOUCH's* kiosks, the Harpenden general practice surgery's terminal. Logs between 4 January 2000 and 26 June 2000 were used covering 1378 user sessions and 17 039 kiosk page views.

Literature review

Perhaps the first touch-screen health information system was Healthpoint, developed by Glasgow University. A questionnaire survey of users found that use was not related to gender, age, neighbourhood type, or length of time spent in the waiting room.¹ A further analysis of Healthpoint information kiosks also found no difference in use between women and men.² However, this contradicts prevailing wisdom. From their survey of Internet demographics, Eysenbach, Sa and Diepgen observe that health and medical content 'seems to be one of only a few categories online that women are more likely to use than men'.³ Health on the Net Foundation found that women made up 64% of

North American health information users.⁴ Surprisingly, no researcher has identified kiosk use by women as being different from other online health information systems.

Regarding kiosk use, Sieving cites a rise in the numbers of elderly as one of the contributory pressures creating the demand for health information.⁵ However, research to date has found that older people are less likely to avail themselves of information online; such research shows that the elderly are still under-represented.⁶ Research into kiosk use reflects this, too. Naven *et al.* found that older people were less likely to use a health kiosk.² The elderly might well not use new technology for a variety of reasons: Hoot and Hayslip point out that people lose their manual dexterity with age, Carey cites ever more complicated image-based pages.^{7,8}

INTOUCH with health kiosks

INTOUCH with health kiosks are PC-based touch-sensitive-screen medical information systems. To start a session, users have to enter their age and gender and from here users are led to a main index page. This has six options: medical conditions, surgical operations, health news, support groups, healthy living, and health directory. A tab indicating 'more options' is situated at the bottom of the screen. This leads to two more entries: A–Z of the NHS and travel clinic.

Although the construction and layout of each section is not quite the same, activating any of the main menu items leads to a further list of contents. Further content selections are then displayed. Indeed, in some cases five screens are required to arrive at the required information.

What are kiosk logs?

Log files are a machine-generated record of user activity. Figure 1 is an example of a user session. The first column codes the page. 'H' indicates a beginning of a session, 'D' a successful page view and 'T' a termination sequence generated by the user. If the user does not terminate their session, the kiosk times-out after two minutes of inactivity. The next three columns record the date, day and time. The column starting '0000' records the seconds from entry. This system does not record the time taken by the user to fill in age and gender details; the clock starts when the user selects 'continue' from this page. Note the following '0001' is the time taken to download the first menu page. This user spent seven seconds in negotiating the first menu page. The '1' to the right of 'Male' is the age group and repeats the 'under 15' information. The numbers and hash signs relate to page identification codes. The '001' at the end of this line is a page counter (the line counter though does not count the opening dialogue page where the user records their age and gender). This user session lasted 85 seconds; the longest page view was for 21 seconds and the shortest for four seconds.

Results and discussion

Table 1 profiles the gender and age distribution of kiosk use. As can be seen, women made slightly less use of kiosks than men: 47.5% compared with 52.5%. The age distribution shows that use by under 15s predominates, with just under half of recorded use by this age group.

H	10-Jan-1999	Sun	15:14:17	0000	_Male_ 1 under 15
D	10-Jan-1999	Sun	15:14:18	0001	1#####001#XXX
D	10-Jan-1999	Sun	15:14:26	0008	#6#####002#XXX
D	10-Jan-1999	Sun	15:14:32	0014	#6a0#####00001#####003#XXX
D	10-Jan-1999	Sun	15:14:50	0032	#6a2#####00001#####004#XXX
D	10-Jan-1999	Sun	15:15:10	0052	#3-#####600001###005#XXX
D	10-Jan-1999	Sun	15:15:14	0056	#3--###0015#####600001###006#XXX
D	10-Jan-1999	Sun	15:15:21	0064	#3--a###0015#00090#600001###007#XXX
T	10-Jan-1999	Sun	15:15:43	0085	

Figure 1 An example of a kiosk information log file

Table 1 Gender and age frequency of use of the Harpenden kiosk

	Frequency	%
Female	8099	47.5
Male	8940	52.5
Total	17039	100.0
Under 15	7878	46.2
16 to 35	3506	20.6
36 to 55	2532	14.9
56 to 75	1591	9.3
Over 75	1532	9.0
Total	17039	100.0

Table 2 looks at additional measures between men and women. Women appear to view slightly more pages: 9.3 pages per session compared with 8.8 pages per session for men; women also have a longer session time by about three-and-a-half seconds.

Figure 2 looks at the gender distribution of use over time. As can be seen, there is considerable variation. In looking at the distribution, it appears that men are likely to use kiosks in the early morning and mid-afternoon, while women appear to favour use in the mid-morning and evening.

When gender use is looked at in tandem with age use over time (see Figure 3) some interesting patterns emerge. High use by under 15 year olds is accompanied by low use by females. This was especially true between 5 and 6 pm. At this time under 15 year olds recorded a high use of 57% of all users (see Figure 3), while women recorded a low use of 43% (see Figure 2). Looking at the reverse, high use by women is accompanied by low use by under 15 year olds. See,

for example, between 2 and 3 pm and to a lesser extent between 12 noon and 1 pm, and between 3 and 4 pm. Between 2 and 3 pm under 15 year olds recorded 27% of use (see Figure 3), while females accounted for a high 74% of use (see Figure 2).

Clearly, there are a number of factors at work and the data does argue for further qualitative interview research. Among questions raised:

- Are women with children too busy looking after their children to use the kiosk themselves?
- Or perhaps there is an attitude among mothers to 'let them play on the kiosk'.
- Do women come back at certain times without the children?

Whatever the exact reason, it is clear that use of health touch-screen kiosks by women is dependent upon a number of factors. In particular, their use is likely to be affected by their specific role in the family and this seems more apparent with touch-screen kiosks compared to other online information systems.

Age differences

Little previous research has been undertaken on age-related factors in use of electronic information systems. Comparisons of user numbers have, of course, appeared in the literature.¹ The current research, however, goes further than this, by testing whether age is a factor affecting the users' penetration of kiosk pages – not simply their use in terms of simply being logged on. This is an important factor in measuring use – in many menu-based kiosk information systems the user has to navigate through a number of menu screens to arrive at what can be termed an information page. Clearly, what constitutes positive use must imply that the information seeker navigates beyond the collection of initial menu screens to the actual information pages. This idea of pages viewed can be developed into a

Table 2 Estimates of kiosk page view time, session length and number of pages viewed by gender^a

	Page view time (M-estimator) in seconds	Length of session (M-estimator) in seconds	Number of pages viewed in a session (5% trimmed mean)
Female	11.16	115.80	9.30
Male	11.27	112.39	8.88

^aThe distribution of session and page view time is highly skewed and Huber's robust estimator is used. The distribution of the number of pages viewed is also skewed, but less so, and the 5% trimmed mean is reported.

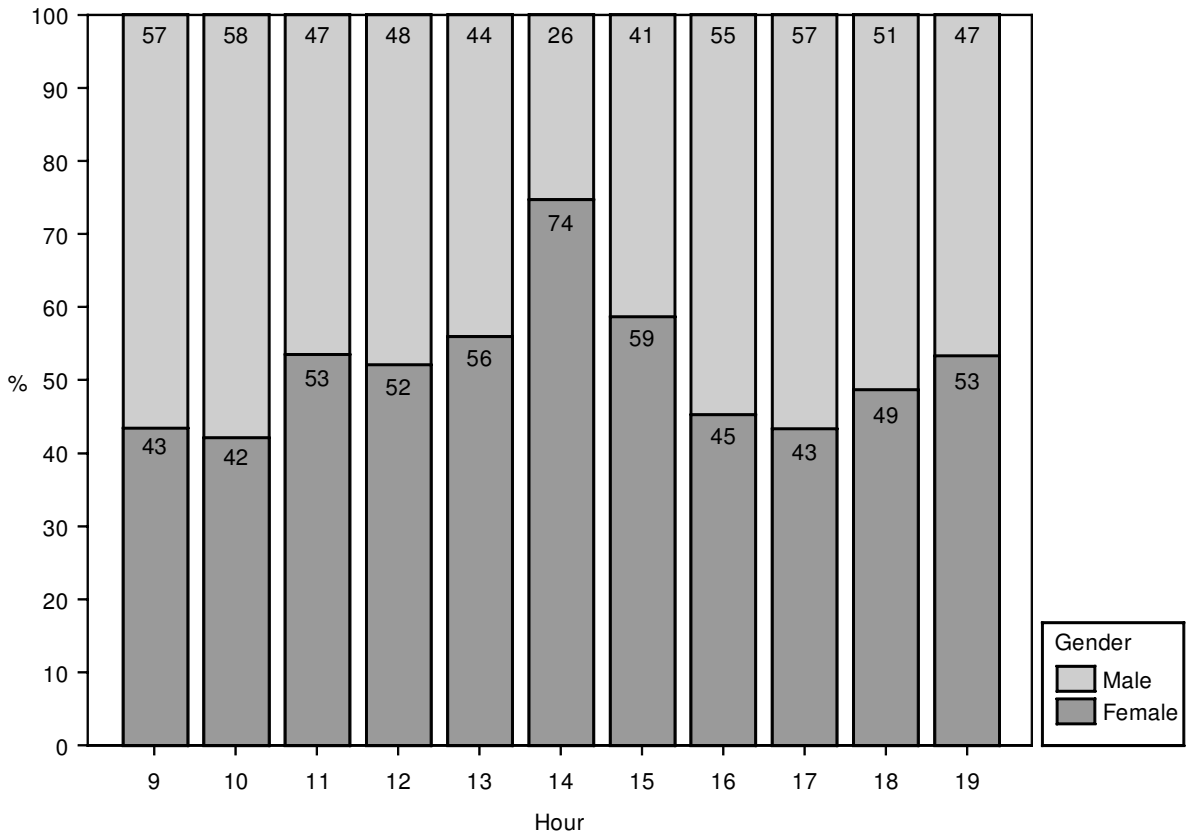


Figure 2 Kiosk use by gender and time of day

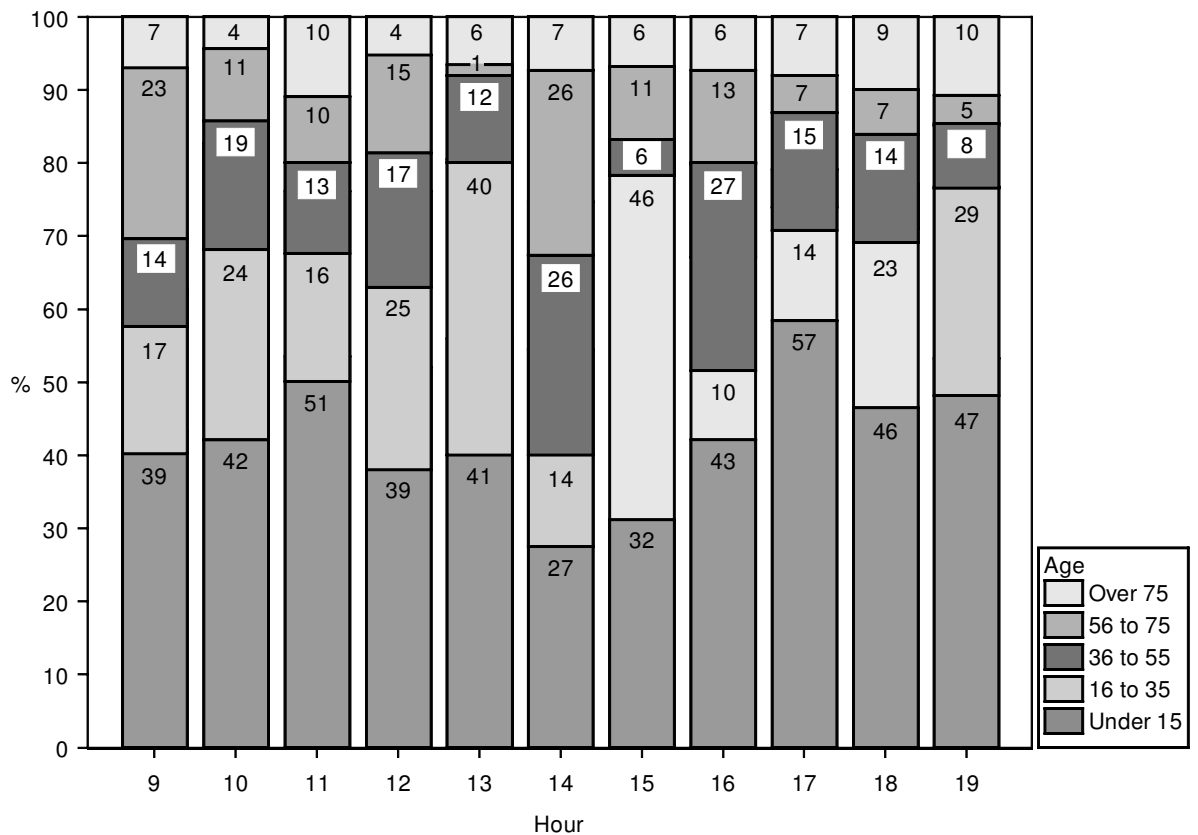


Figure 3 Kiosk use by age and time of day

manageable and versatile metric by grouping users by their use. It is an estimate of penetration and of kiosk use. The following groupings of users by use were applied:

- 1–4 pages viewed in a session
- 5–10 pages viewed in a session
- 11–20 pages viewed in a session
- 21 or more pages viewed in a session.

For the *INTOUCH with health* kiosks, the user often has to navigate through up to five screens to arrive at what can be termed an information page. Users viewing only one to four pages are less likely to have accessed an actual information page. By contrast, users viewing more than 11 pages can be described as heavy users with a good understanding of how to jump between pages and to use the technology to find the information they seek. The use groupings were cross-classified by age group.

The hypothesis of no association between age and number of screens viewed can be rejected at the 1% significance level ($\chi = 55.18$ 12 *df*). It appears that users aged over 75 are more likely to limit their session length to four pages or fewer compared to other age groups. Of those over 75, 45% recorded session lengths of four pages or fewer; this compares to between 17% and 30% recorded by other age groups, having a session length between one to four pages (see Figure 4). This implies that those aged over 75 are not necessarily reaching the information content pages

and are, thus, failing to avail themselves of the services the kiosk provides, despite actually ‘having a go’.

This was not true of the next age band down. The 56 to 75 and the 16 to 35 age groups were most likely to be heavy users – about 39% of both these groups had session lengths over 11 pages. Only 14% of those aged over 75 viewed 11 pages or more.

Looking at other measures of use, substantial differences can be found between age groups. Table 3 records the average number of page views, session length and page view time across age bands. Those aged over 75 record the smallest number of page views per session. On average this group viewed about 5.6 pages – just over half the average number of pages viewed by the 16 to 35 age group. The over 75s recorded an average session length of about 44 seconds, a far shorter session length than any other age group, and under a quarter of the session length recorded by the 56 to 75 age group. The over 75 age group also recorded the shortest average page view time of 8.90 seconds, approximately half that recorded by kiosk users falling within the 56 to 75 age band.

The 16 to 35 age group recorded the largest average number of pages viewed while the age band 56 to 75 year olds spent the longest time reading pages, and recorded the longest sessions. The 36 to 55 age band do not appear to make as much use of the kiosk compared to either the 16 to 35 age group or the 56 to 75 age band. It is thought that this age group may have more of a time constraint.

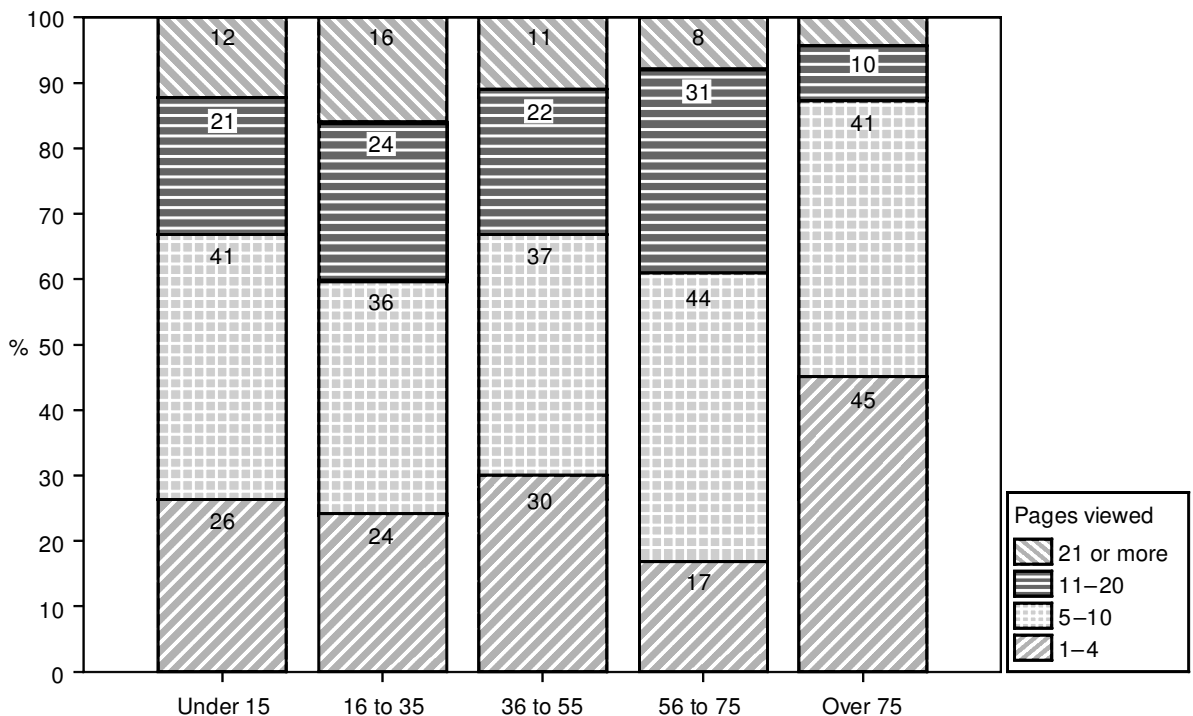


Figure 4 Kiosk use by age and number of pages viewed

Table 3 Estimates of kiosk page view time, session length and number of pages viewed by age^b

	Average number of page views in a session (5% trimmed mean)	Average session length (M-estimator) in seconds	Average page view time (M-estimator) in seconds
Under 15	9.52	104.39	9.82
16 to 35	10.95	154.77	12.60
36 to 55	8.88	117.92	13.10
56 to 75	9.60	184.57	15.74
Over 75	5.60	44.49	8.90

^bThe distribution of session and page view time is highly skewed and Huber's robust estimator is used. The distribution of the number of pages viewed is also skewed, but less so, and the 5% trimmed mean is reported.

Conclusions

Log files provide the most detailed record of use, short of an intrusive observation of users. However, little use has been made of log files by previous researchers. The study reported here has found considerable variations in kiosk use by both gender and by age. In particular, there appears to be variation in gender use by time of day. At certain periods low use by women is matched by high use by under 15s, and the reverse is true at other times of day. The research argues that kiosk use by women may be affected by their specific role in the family, and this seems more apparent with touch-screen kiosks when positioned in a general practice surgery, compared with other online medical information sources such as the Internet. Future qualitative and observational research will further look for evidence of a negative relationship between use by women and by under 15 year olds.

This research also found significant variations in kiosk use by age, with evidence that users aged over 75 are less likely to penetrate kiosk pages compared to other users. This age group was also found to have a shorter session time and a shorter page view time compared to other age groups. The findings do not support the research of Jones, McLachlan and Bell who found no difference in age and kiosk use.¹ Robust estimators of page view time and session length were also reported and variations in use between age groups were found. In particular the age group 56 to 75 recorded the longest page view time and the longest session time, while the 16 to 35 age group recorded the greatest number of pages viewed in a session. Surprisingly the 36 to 55 age band appeared not to take as much interest in kiosk use as these two age groups.

REFERENCES

- 1 Jones R, McLachlan K and Bell G (1990) Healthpoint: a public-access health information system. In: de Glanville H and Roberts J (eds) *Conference Proceedings: current perspectives in health computing 1990*. BJHC Books: Weybridge.
- 2 Naven L, Jones R, Kohli H and Crawford J (1996) How should we evaluate a public-access health information system? In: Richards B (ed) *Healthcare Computing 1996*. BJHC Books: Weybridge.
- 3 Eysenbach G, Sa ER and Diepgen TL (1999) Shopping around the Internet today and tomorrow: towards the millennium of cybermedicine. *British Medical Journal* **319**: 1294.
- 4 Health on the Net Foundation. HON's fourth survey on the use of the Internet for medical and health purposes. www.hon.ch/Survey/ (accessed 17.04.00)
- 5 Sieving PC (1999) Factors driving the increase in medical information on the web – one American perspective. *Journal of Medical Internet Research* **1** (1): e3. www.symposium.com/jmir/1999/1/e3/index.htm
- 6 Schreiber D and Husak M (2000) Income and age, not ethnicity, to remain largest gap for US digital divide. *Jupiter Communications* press release. www.jup.com/company/pressrelease.jsp?doc=pr000615
- 7 Hoot JL and Hayslip B (1983) Microcomputers and the elderly: new directions for self-sufficiency and lifelong learning. *Educational Gerontology* **9** (5,6): September–December.
- 8 Carey K (1997) Comparative disadvantage and special opportunities and the information technology revolution: general considerations and the examination of visual impairment as a case study. *ASLIB Proceedings* **49** (4): 77–81.

FURTHER READING

- Blake M (1999) Internet access for older people. *ASLIB Proceedings* **50** (10): 308–15.
- Douglas F, Jones R and Naven L (1995) Schoolchildren's use of, and ideas for, a computer-based health information

- system. In: Richards B (ed) *Healthcare Computing 1995: conference proceedings*. BJHC Books: Weybridge, pp. 139–44.
- Gibson F (1994) Computers and older people. *Reminiscence* 8: 3.
 - Jones R, Labajo R, Soler Lopez M, Sanz J, Alonso P and Claveria L (2000) Evaluation of a Scottish touch-screen health information system in rural Spain. In: Bryant J (ed) *Healthcare Computing 2000*. BJHC Books: Weybridge.
 - Jones R, Naven L and Murray K (1993) Use of a community based touch-screen public-access health information system. *Health Bulletin* 51: 34–42.
 - Jones R, Pearson J, McGregor S *et al.* (1993) Randomised trial of personal computer-based information for cancer patients. *British Medical Journal* 19: 1241–7.
 - Nicholas D, Huntington P and Williams P (1999) Developing and testing methods to determine the use of websites: case study newspapers. *ASLIB Proceedings* 51 (5): 144–54.
 - Pearson J, Jones R, Cawsey A *et al.* (1999) The accessibility of information systems for patients: use of touch-screen information systems by 345 patients with cancer in Scotland. *American Medical Informatics Association Annual Symposium 1999: Session 66 – Consumer Health Informatics II*. www.amia.org/pubs/symposia/D005289.htm
- ADDRESS FOR CORRESPONDENCE**
- Professor David Nicholas
The Internet Studies Research Group
Department of Information Science
City University
London EC1V 0HB
UK
Tel: +44 (0)20 7040 8800
Fax: +44 (0)20 7040 8587
Email: nicky@soi.city.ac.uk
Website: www.digitalhealth.soi.city.ac.uk/isrg/doh.htm
- Accepted March 2001*