

Searching Intention and Information Outcome: A Case Study of Digital Health Information

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A relationship might be expected to occur between the kind of search people say they are undertaking and the information they actually find. For example those with a longstanding illness will have particular information needs and we would expect those needs to be reflected in what they view and what they are interested in. The research reported here uses questionnaire data to establish links between the reason for a user's search and what they actually found. The research confirms that, indeed, people do act rationally and with motivation and that the reason for their visit does have

an impact on their information seeking behaviour. This was true for touch screen health information kiosks and for the Internet – the two information platforms featured in the research. The research also pinpoints and evaluates curious and general users as a consumer health information group and examines their information behaviour. Further, four types of Internet users were derived as identified by their topic of interest: 'Alternative remedy' user; 'I want to stay healthy' user; 'Keep up to date' user; and 'I'm ill but want to know' user.

Introduction

The British Government is set on using digital information platforms to expand the provision of health information to the general public. The policy document *Information for Health*, for example, is underpinned by the notion that 'access to the right information at the right time is a crucial ingredient of modern healthcare' (NHS Executive 1999). The major NHS Direct initiative, resulting from this approach, employs a battery of information services, such as the Web (NHS Direct Online), telephone 'hotline' and touch-screen kiosks. Access via mobile phones and digital interactive television is being planned, with the latter beginning pilots in June 2001, as the final draft of this paper was being written. Behind all these initiatives lies the presumption that the very act of providing people with information leads to a better health outcome, although this could, of course, simply mean improving the dialogue between patient and health professional, which might then

lead on to better treatment. Studies have, indeed, shown that, written information, for example, can increase patient compliance with their GP's (General Practitioner) instructions and so help the healing process (Arthur 1995; Ley 1982), and that information leaflets contribute to better health outcomes (Greenfield *et al.* 1985; Mazzuca 1982).

It is somewhat surprising, that little research has been carried out which examines what people actually look for in an information system and why – issues that are important for information providers and organisers to know about. Clearly, there may be some people who are simply curious about or interested in health issues in a general sense. Others might want to supplement the information that they have been given by a doctor about their condition, or to find alternative views, which might challenge their GP. Still more may want basic information to enable them to decide whether a particular symptom they or a family member may be exhibiting warrants a trip to the surgery.

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Aims and objectives

The particular aim of the research reported here is to explore the relationship between the expressed health information needs of people and what information they actually found as a result of consulting a digital information system. The data used to explore the relationship was obtained from users of a consumer health Web site (SurgeryDoor) and a touch screen health information kiosk located in Nottingham, England. Both systems are produced and maintained by the company InTouch With Health. This study is one of a number of studies the authors are undertaking into the impact of digital health information provision on the consumer. The research is being conducted for the Department of Health [1].

Literature review

A wealth of literature has accumulated on health information needs, although this has been almost exclusively concerned with those related to people with specific ailments – not the general public at large. Kai (1996), for example, examined ‘disadvantaged’ parents’ difficulties and the information needs that arose in coping with acute illnesses in their pre-school children. Subjects stressed the need for a wide variety of information, and ‘emphasised the importance of this being accessible’ in terms of ease of understanding. They learned more ‘about specific illness,’ from ‘the media, parenting magazines, television dramas and publicity campaigns’ than from doctors or the medical literature.

Coulter *et al.* (1998) explored patient information needs in the context of an evaluation of information services available to them. The research elicited twelve specific needs, as identified by patients themselves. Those that would be appropriate for mediation via remote electronic or paper based means included:

- gaining a realistic idea of prognosis,
- making the most of consultations,
- learning about available services and sources of help,
- identifying self-help groups, and
- preventing further illness.

In a qualitative study of GP patients not related to a particular condition, that was undertaken as

part of the present research, Williams *et al.* (2001) identified the following information needs of a randomly chosen sample of people at the surgery for treatment. These included:

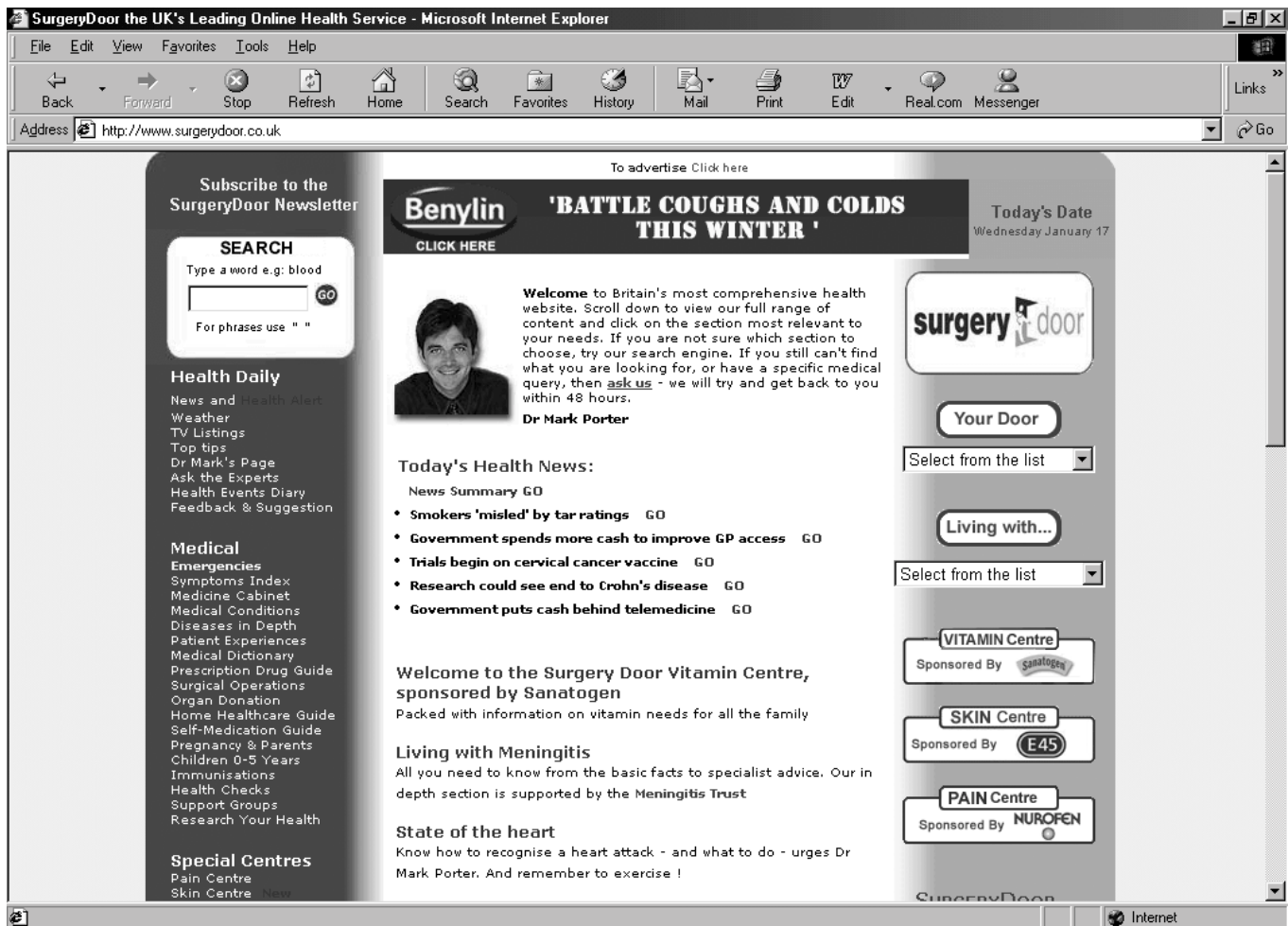
- to take prescribed medication successfully
- to understand/provide reassurance about the condition and its severity
- to cope with the condition
- to understand/provide reassurance about the treatment of the condition
- to help make a treatment decision
- to deal with or challenge a doctor

Pinder (1990) developed a typology of health information seeker from her study of how sufferers and carers coped with the onset and development of Parkinson’s Disease. These were ‘seekers’, ‘weavers’ and ‘avoiders’. The former sought as much information as possible, and used it as a central weapon in their strategies to cope with the disease. Weavers sometimes sought information, and were selective about that which they took on board. Avoiders coped on the assumption that ‘the anxiety of not knowing was preferable to having their ... fears about the condition confirmed.’ Leydon *et al.* (2000) also found some reluctance to imbibe information, in their study of cancer patients.

It is hard to assess the information needs of those not immediately affected by illness – i.e. members of the public who may require health information for general uses unrelated to specific conditions. However users may have a curiosity or general interest to stay healthy or an interest to look healthy.

Some work has been carried out on general seeking and use of electronic information. Cyber Dialogue (2000), for example, found that approximately half of all Internet using health information seekers advised a family member or friend to see a doctor, changed their exercise or eating habits or made a ‘positive’ decision related to their health treatment. A rather mixed bag of information need is shown in these results, with seekers looking for information on behalf of others, to improve their general health or to decide on the next steps they should take with regard to a current condition. Many others joined an illness support group after visiting a disease-specific Web site. Some work has been carried out on the

Figure 1: SurgeryDoor Web site.



impact of the Internet on such specialist online groups. Gann (1998) reports, for example, that participation in these fora focused around “peer support and sharing of information on treatment advances, clinical trials etc.”.

Nicholas et al. (2001) in a study of health outcomes found that people used an Internet health site to be better informed and to help change the way they felt about a condition and this was particularly true for those searching on someone else’s behalf. This implies that users may be using information for peace of mind and reassurance.

As with much else on the Web, it is often the marketers and consultancies which are leading the way in usage research, albeit in a fairly superficial way and with commercial rather than altruistic or academic ends. One interesting study looking at online health information seeking has been that carried out by the Boston Consulting

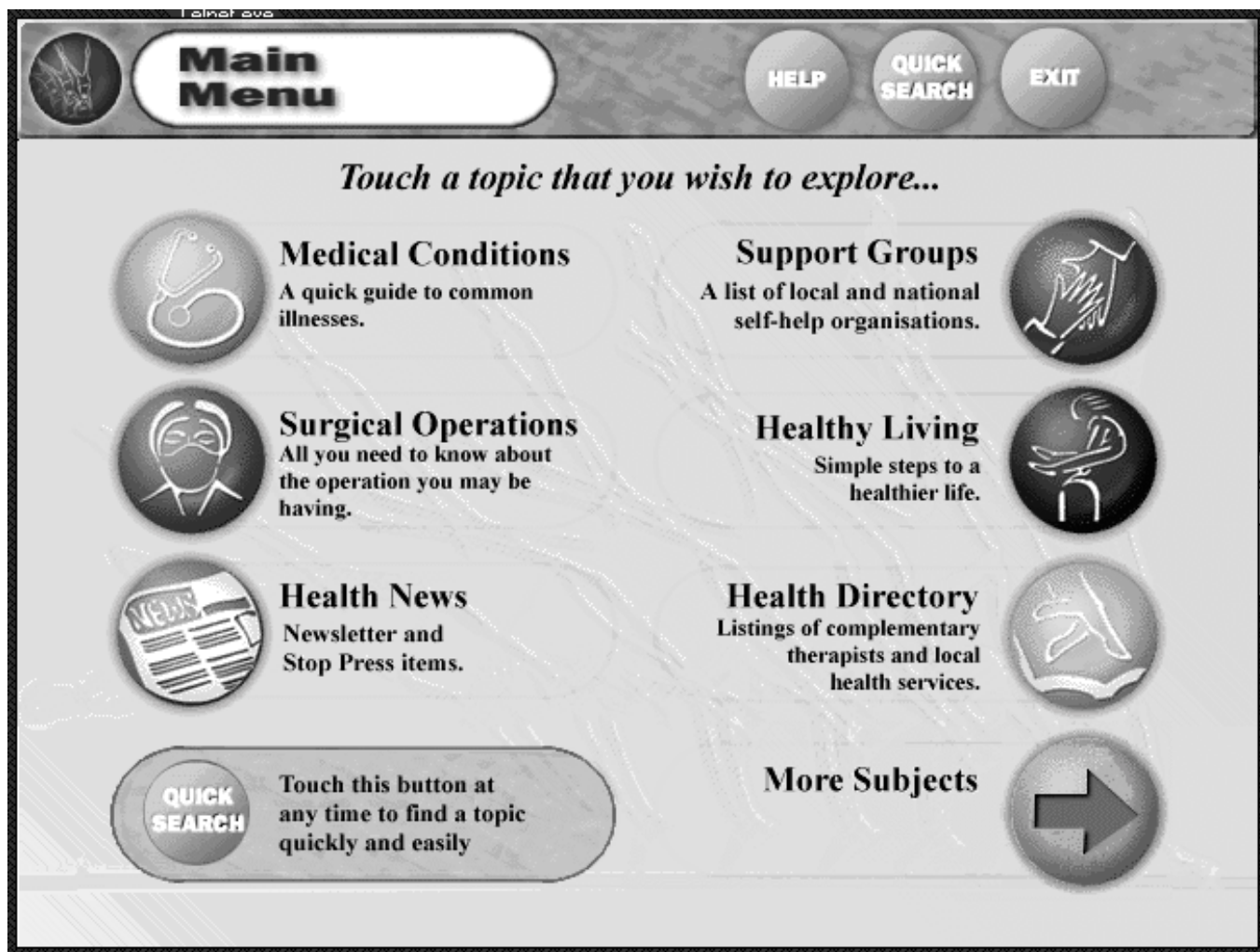
Group (BCG 2001, Poensgen and Larsson 2001) with European health consumers. Their researchers found that users tend to have a focused and deep interest in information only about their specific condition or disease. They do not regularly surf the Web for *general* health-related material, but want sites offering specific information, and show little interest in using the Web to obtain general health related information or products. Those more actively involved in their diagnoses and treatment decisions are more likely to use the Internet as a resource for information.

Methods

Data for the project was obtained from three sources:

1. A questionnaire hosted on the SurgeryDoor Web site [2] for the month of November 2000. In total 1068 users

Figure 2: InTouch with Health Kiosk.



answered the questionnaire, which represented 5% of the 21,118 visitors (as denoted by unique IP addresses) that to the site in November 2000. Questions covered a variety of topics including personal information, the site's content and health outcomes.

2. Questionnaire data collected from a touch-screen health information kiosk located at the Dale Surgery, Sneinton, Nottingham. Intouch With Health, a leading UK consumer health information company, developed the kiosk located at the surgery. Responses were collected over a 4-month period between the 26 of September 2000 and the 31 of January 2001. About 17% of patients or 329 people used the kiosk. All the 329 kiosk users filled in the questionnaire and in all 3,046 pages were viewed by them.
3. Kiosk transaction logs were available for the kiosk situated at Dale surgery, Nottingham for the survey period. Metrics that can be derived from transaction logs has been discussed by Nicholas et al. (2001). The metric used here were:

- Amount of use as constituted by the average number of pages viewed per session.
- Number of pages printed.
- Page view time.

Platform features and differences

Both the publicly accessible Web site www.surgerydoor.co.uk (Figure 1), and the touch screen information kiosk (Figure 2) were the product of the health information company InTouch With Health. The former is frames based, and has menus on both left and the right frames (with 'content' displayed on a middle frame). The latter does not imitate a Web page, and was written in 'Director' which is not similar to html. Plainly the structure and navigational opportunities of these two platforms are different, but so too is the content sometimes.

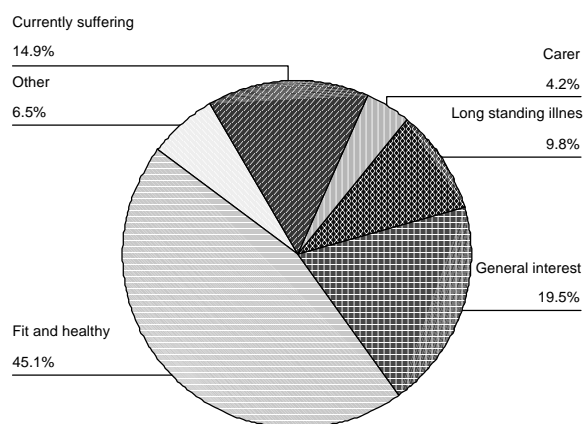
Table 1: Comparison of main contents pages of Web site and kiosk.

| Web site | Kiosk |
|------------------------|---------------------|
| Community and fun | Support groups |
| Complementary medicine | Health news |
| Health daily | Surgical operations |
| Healthy living | Healthy living |
| Medical | Medical conditions |
| NHS and benefits | A-Z of the NHS |
| Shopping | Health directory |
| Travel health | Travel clinic |

To make topic comparisons between the Web site and the kiosk it is necessary to only look at the left-hand frame – entries on the right are for online purchases only. The kiosk ‘home page’ consists of eight menu buttons (toggled between two screens). The menu options for the two platforms are different, but there is some overlap. As can be seen in Table 1, one menu item – Healthy Living – is the same. Others (NHS and Benefits on the Web site, and A-Z of the NHS on the kiosk) are similar.

Entries that are completely different are Community and Fun, Complementary medicine and Shopping, all on the Web site, and Support groups, Surgical operations and Health directory on the kiosk. It is important to distinguish between differences in structure and in content. Differences concerned with support groups and surgical operations, for example, are principally in structure. Although they are not listed as main content items on the Web, they can be found in the menu hierarchy, and the content related to these topics is similar on both media. Content differences occur principally where material appears on the Web site but not on the kiosk. The structural differences can be illustrated by the example of surgical operations. Firstly, this is a main menu item on the kiosk, whilst being a submenu on the Web site, under the main heading of Medical. Activating the Surgical Operations link on the kiosk leads directly to a scrollable list of topics (Blood vessel systems, Bones, joints and tendons, Breast, Children’s operations etc.) whereas activating the link on the Web leads simply to a display of each letter of the alphabet. Each letter is a link, and activating any of them leads to the same list of topics as on the kiosk – except that only those for the particular letter activated are shown.

Figure 3: Surgery door users by reason for visit.



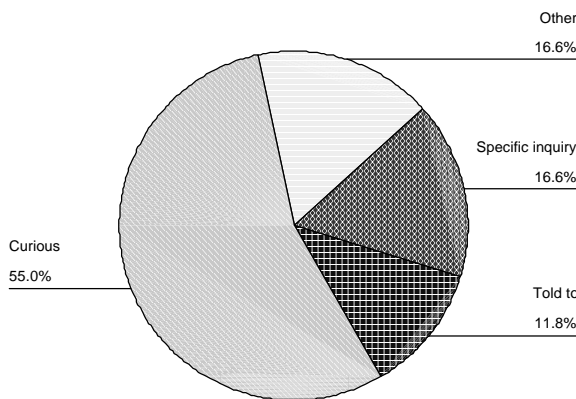
Going to the next level, by ‘clicking’ on a topic (Web) or touch activating the kiosk screen leads to the same information, arranged under the headings: What is it (i.e. the condition)?; The Operation; Any Alternatives; Before the operation; After – In Hospital; After – At Home; Possible Complications; and General Advice.

The differences in the content highlight the different functions of the two platforms, with the kiosk concentrating more on specific health related information. This befits a system predominantly located in doctors’ waiting rooms and other medical settings whose users are likely to be principally suffering from a particular condition or in the location on behalf of and/or with someone who is ill. The Web site, by contrast, includes ‘fun’ pages and magazine type content, something which is entirely absent from the kiosk.

Results

Figures 3 and 4 show the reasons why people visit digital health information sources. On the Web (SurgeryDoor) the vast majority (46.1%) of online questionnaire respondents described themselves as being fit and healthy and presumably keen on remaining so – and hence their visit. A significant proportion (19.5%) came as a result of “general interest”. These two groups together account for nearly two-thirds of visitors. For the InTouch with Health kiosk the largest grouping, 55%, said that they used the kiosk out of curiosity

Figure 4: Kiosk (Nottingham) users by reason for visit.



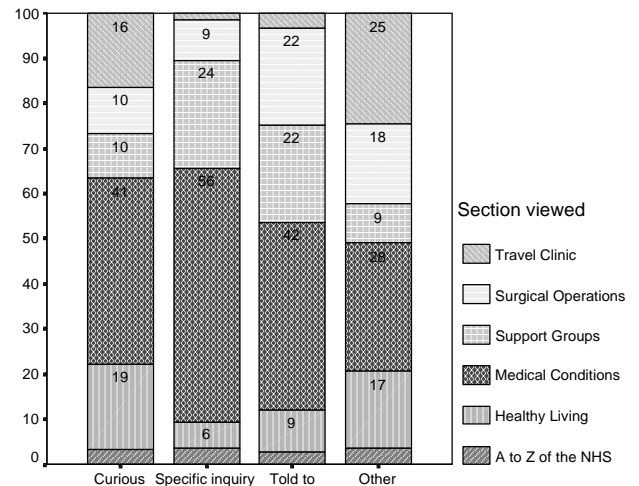
(perhaps, while waiting for the doctor), 17% of patients had a specific inquiry and 12% were instructed to use it, presumably by their GP. The two figures are not directly comparable because of the different circumstances associated with searching the two digital platforms and because the questions presented were different. However, what is in common is that the reason for a user's visit has a significant impact on what section of the kiosk/site the user viewed.

Kiosk users

Figure 5 shows the percentage distribution of pages viewed by reason for the user's visit. Type of user data was based on questionnaire data and users self selected the option that they considered most described themselves while figures based on pages viewed were extracted from the transaction log file and is a record of actual pages viewed.

Plainly curious users were much more likely to look at healthy living issues while those with a specific inquiry or who were told to use the kiosk were more likely to visit more specific medically related pages. Those with a specific inquiry were more likely to visit sections covering medical conditions and support groups compared to curious users – 80% compared to 51%. While those who were told to use the kiosk were more likely to visit sections covering surgical operations and support groups compared to curious users, 44% compared to 20%.

Figure 5: Percentage of pages viewed on a kiosk by section and type of user.



Chi (15)=282.6 p=.000

The above would seem to argue that:

- The users' information need/circumstance is important for understanding how they interact with the kiosk.
- Doctors do tell patients to use the kiosk but this seems more likely when the user has a serious condition, hence the increased prevalence of this group accessing surgical operations.

Curious users are a significant group numerically.

Table 2 looks more closely at the individual pages found by the various user groups and it is immediately clear that they are very different. Indeed there is virtually no overlap with just Smoking and Brazil occurring more than once, the former being consulted by both the curious users and those being told to search, and the latter by the curious and those with specific enquiries.

Figure 5 furnishes the overall use of kiosk topic sections though users might visit more than one section in a session. Of those who looked at a section, 6% did not in fact reach a section and only looked at a menu screen, 38% looked at only 1 section and 76% looked at between 1 and 3 sections. Perhaps surprisingly, those with a specific inquiry tended to look at the largest number of sections, 4 on average. This may indicate a certain difficulty in finding the specific information required. Those told to use the kiosk accessed just under 4 (3.9) sections – a similar number to the specific

Table 2: Top 15 pages viewed by reason for visit.

| Curious Users | Specific inquiry | Told to |
|-------------------------|-----------------------------|-------------------------------------|
| Good eating | Salmonella enteritis | Adenoidectomy |
| Pakistan | Cancers of the testis | Hirsutism |
| Smoking | Eczema- hand | Anal fissures |
| Backpain – strain | Good eating | Eczema – atopic |
| Acute leukaemia | Menopause | Wisdom teeth removal |
| Bhutan | Migraine | Combined contraceptive pill |
| Nappy rash | Acute leukaemia | Hiatus hernia |
| Brazil | Healthy eating diet | Alcohol |
| Cape verde | Cancer of the uterus - womb | Tinnitus |
| Saudi arabia | Asthma drugs | Radius and ulna fracture – internal |
| Caesarean section | Retinal detachment | Acne rosacea |
| Breast biopsy | Raynauds syndrome | Smoking |
| Infertility – female | Athletes foot | Stress |
| Preparing for pregnancy | Brazil | Condoms – male and female |
| Angola | Laparoscopy | Vitiligo |

enquirers, and curious users used the least number of sections, on average 2.5 sections [3]. One would imagine the latter group to retrieve the largest number of pages, as they might use the kiosk as they would flick through the pages of a magazine.

There is also evidence to suggest that those searching for a specific inquiry or who were told to use the kiosk by the GP viewed a greater number of pages, spent more time viewing a page and printed off a greater number of pages compared to those people using the kiosk for curious browsing or for some other reason. Table 3 lists robust estimates of pages viewed, page view time and pages printed by reason for a visit. Those users who were directed to search the kiosk tended to view approximately one third more pages than curious users, spent just under twice the time viewing a page – 40 seconds compared to 27 seconds, and tended to print off half as many pages again as compared to curious users – respectively 1.75 and 1.19 pages. Though users with a specific enquiry viewed just under 2 more pages, and had printed off more pages, 1.59 compared to 1.19, compared to curious users this group had the shortest page view time, 25 compared to 27 seconds.

Curious users are a very interesting category because, despite their large numbers, they appear to be the least motivated group. Table 4 provides the results of a model fitting variables to the outcome determining who a curious user is.

This model points to gender and employment status as being the likely determinants of what

Table 3: Reason for visit by pages viewed, page view time and number of pages printed (kiosk users).

| | Average number of pages viewed | Average time spent viewing a page (seconds) | Average number of pages printed |
|------------------|--------------------------------|---|---------------------------------|
| Curious | 7.06 | 27.29 | 1.19 |
| Specific inquiry | 8.87 | 24.78 | 1.59 |
| Told to | 9.73 | 39.60 | 1.75 |
| Other | 7.96 | 38.93 | 1.27 |

Table 4: Logistic regression model estimating the odds of being a curious user.

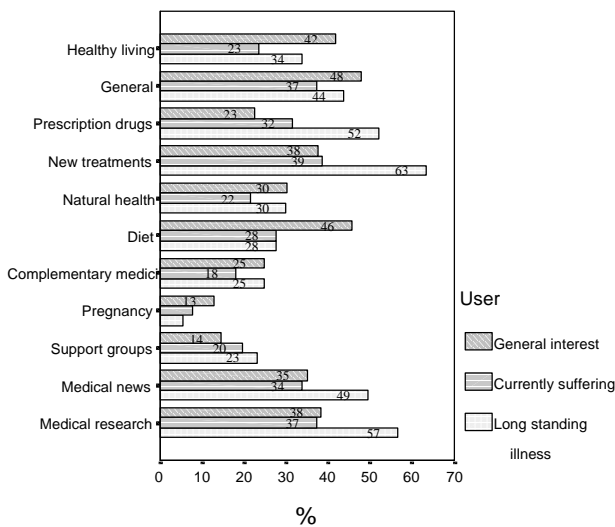
| | N | Odds ratio (SE) |
|-----------------------------|-----|-----------------|
| Gender | | |
| Female | 203 | |
| Male | 134 | 0.50** (0.23) |
| Employment status | | |
| Other employment groups | 189 | |
| Skilled Employment | 148 | 1.96** (0.24) |
| Employment Status by Gender | | |
| Other groups | 304 | |
| Unskilled Males | 33 | 0.42* (0.43) |

Levels of Significance (Wald’s Statistic):

*P<0.05, ** p<0.01; *** p<0.001

constitutes a curious user. It appears that men are half as likely to be a curious user as compared with women and that those in skilled employment were twice as likely to be curious as compared to skilled unemployed and unskilled employed and unemployed. Unskilled males were also just under half as likely to be curious as compared to

Figure 6: Percentage of users reporting how very important a topic on the Surgery door Web site was by reason for visit.



other users. This is all as may be predicted. Women are generally considered to be the custodian of their families' health, and other studies (HONF 1999, Eysenbach et al. 1999) have shown that they buck the male dominated online trend by being a majority of those who look for health information. Similarly, those in skilled work, who may come into contact with both information technology and may generally have to deal more with information of various sorts than their unskilled colleagues, may be expected to be bigger users of the system. Age, country of origin and perceived ease of system use were not found to have a significant impact.

Web users

The reason for a person's visit to the Web also has an impact on what sections of the Web site they found important. The on-line questionnaire asked respondents to rate 12 medical topics, such as new treatments, natural health, pregnancy etc., as either very important, important, not so important and not important. We compared those finding a topic very important to the other three categories. For this analysis those who described themselves as fit and health and as having a general interest were grouped together.

Figure 6 shows the percentage of users reporting how very important a topic was by reason for visit. For example 42% of those with a general in-

Table 5: Types of user attitudes identified by how they have rated 9 health topics*.

| Alternative remedy (17% of variance) | I want to stay healthy (17% of variance) | Keep up to date (16% of variance) | Ill but wants to know (10% of variance) |
|--------------------------------------|--|-----------------------------------|---|
| Natural health (0.85) | Healthy living (0.72) | Medical news (0.73) | Prescription drugs (0.72) |
| Complementary medicine (0.81) | General (0.63) | Medical research (0.86) | New treatments (0.56) |
| | Diet (0.68) | | |

* Principal axis factoring, Varimax rotation, KMO=0.70, pregnancy, medical conditions and support groups dropped on the basis of a low communality score. Factors, given in brackets, scores greater than 0.4 included.

terest found healthy living topics very important compared to 23% of those users who said they were currently suffering from an illness and 34% who had a long standing illness.

Those users with a long standing illness were, not surprisingly, more likely to find information on prescription drugs, new treatments, medical news and medical research very important compared to those users who described themselves as having a general interest [4]. Fifty two percent, 63%, 49% and 57% respectively of those with a long standing illness were very interested in prescription drug, new treatments, medical news and medical research topics compared to 32%, 38%, 35% and 38% of those who had a general interest. General interest users, which includes those respondents who described themselves as fit and healthy, were more likely to say that sections covering diet and healthy living were very important compared to those users currently suffering or those with a long standing illness [5]: 46%, 42% respectively compared to 28% and 23%. Again the users' need/circumstance is proving important for understanding interaction with the kiosk.

A factor analysis, which identifies un-correlated or independent combinations of variables on the responses on how users rated each topic on the Surgery door Web site indicated that 60% of the variance was explained by four factors (Table 5). These are combinations of topics and identify types of topic that interested users.

The first user type is the alternative remedy user who rates the two topics natural health and complementary medicine highly, the second user type rates healthy living, general and diet topics highly and suggests a “I want to stay healthy” attitude. The third user type identified rates medical news and research highly and suggests that these users “want to keep up to date”. The fourth user type seems to rate prescription drugs and new treatments highly and suggests a type of user who maybe “ill but wants to know” about what they’ve been prescribed and about new treatments.

In examining the users’ reasons for their visit those with a general interest tended to score high on the attitude “I want to stay healthy” while those with a long term illness scored highly on “keeping up to date” and “ill but wants to know”. Those with who were currently suffering tended to score high on “ill but wants to know” [6]. There was not a significant difference between reason for visiting and score on the alternative health remedy attitude, however younger female users’ aged between 35 to 55 tended to score highly on this attitude. There was one other identifiable age effect, users aged between 55 and 75 tended also to be users who were “keeping up to date”.

Conclusion

- The users’ need/search circumstance is very important for understanding their interaction with health and medical information. This is true for both the Internet and touch screen kiosk digital health information. The type of reason for a visit to the system does impact on the type of information viewed.
- Curious users (the equivalent of the Web surfer, perhaps) play an important part in kiosk use. Women and skilled workers are more likely to be curious users. These users will be generally looking at more general health interests, such as healthy living.
- Those users who were told to use the kiosk were likely to view a greater number of pages, have a longer page view time and print off more pages.
- Four user types can be identified by examining the topics that questionnaire respondents rated as important. They are the “alternative remedy” user; the “I want to stay healthy” user; “Keep up to date” type user; and “I’m ill but want to know” user. The identified users types were associated with the reason for visiting the site, with those with a long standing illness scoring high on ‘keeping up to date’ and ‘ill but want to know more’.

Notes

1. The Web, the kiosk, digital TV and the changing face of consumer health information provision: a national impact study. April 2000 – January 2002.
2. www.surgerydoor.co.uk. 3W Marketing Ltd, were responsible for gathering the information but not its analysis.
3. ANOVA $F=4.29$ (3, 288), $p=0.006$.
4. Reason by prescription drugs $\text{Chi}(2)=39.51$, $p=.000$
Reason for visit by new treatment $\text{Chi}(2)=24.31$, $p=.000$
Reason for visit by medical news $\text{Chi}(2)=8.12$, $p=.017$
Reason for visit by medical research $\text{Chi}(2)=12.73$, $p=.002$
5. Reason by healthy living $\text{Chi}(2)=17.75$, $p=.000$
Reason for visit by diet $\text{Chi}(2)=24.01$, $p=.000$
Reason for visit by general $\text{Chi}(2)=6.02$, $p=0.49$
6. The mean scores and F-values are as follows:

| | General interest | Currently Suffering | Long standing illness | F values |
|-----------------------|------------------|---------------------|-----------------------|--------------------------|
| Stay healthy | 0.13 | -0.21 | -0.34 | $F=19.1$ (2,796), 0.0 |
| Up to date | -0.03 | -0.09 | 0.23 | $F=3.8$ (2,796), 0.02 |
| Ill but wants to know | -0.12 | 0.15 | 0.45 | $F=25.6$ (2,796), 0.0 |

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