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Comparing two digital consumer health television services using transaction log analysis

Paul Huntington BSc
Research Fellow

David Nicholas PhD MPhil ALA
Head of Department of Information Science

Peter Williams MSc BA
Research Fellow

Ciber, Department of Information Science, City University, London, UK

Barrie Gunter
Head of Research, Department of Journalism, University of Sheffield, Sheffield, UK

ABSTRACT

Use is an important characteristic in determining the success or otherwise of any digital information service, and in making comparisons between services. The source of most use data is the server logs that record user activity on a real-time and continuous basis. There is much demand from sponsors, channel owners and marketing departments for this information. The authors evaluate the performance of use metrics, including reach, in order to make comparisons between two services and discuss the methodological problems associated with making such comparisons. The two services

were: *Living Health*, managed by Flextech and distributed by Telewest, and *NHS Direct Digital*, managed by Communicopia Data and distributed by Kingston Interactive Television. The data were collected over the period August 2001 to February 2002. During this period, the two sites were visited by approximately 20 000 people who recorded more than three-quarters of a million page views.

Keywords: digital television, health information, interactive channel, transaction log

Introduction

There is a considerable literature on website metrics, but very little, if any, on digital interactive television (DiTV) metrics. This is not surprising given the relative novelty of DiTV, but given the rapid growth and importance of this medium, metrics will soon have to be developed and pressed into service. In fact, DiTV pages are stored and delivered to the user in much the same way as web pages, hence much of the research conducted on web metrics is applicable to the DiTV environment. Web metrics themselves have been developed over a relatively short period of time.^{1–4} Indeed, most of the metrics are not wholly

new and their origins can be traced back to research on OPAC (Online Public Access Catalogue) log files.^{5,6} Typically, the metrics used are the number of pages or screens viewed (page impressions), number of users/visitors, time spent viewing a page, number of pages viewed per search session, session time length, and the number of screens printed or downloaded.^{4,7,8} Time measures are calculated from the date and time stamp field, and pages viewed by counting and verifying transaction lines.

DiTV logs do follow the Internet conventions of recording the time that the client requests the page, although a log-off time is not recorded; as a consequence, this introduces problems when dealing with highly skewed data. There are, however, important

differences between the two platforms, which have consequences for the metrics employed. Thus, unlike the Internet, DiTV pages are not normally cached to a client's machine. DiTV pages may be cached if the service is routed through local distribution server hubs. Furthermore, there are no active spiders and robots collecting information in the DiTV network. The DiTV network is much more like an intranet where users are paid-up members accessing a server, and thus it is possible to identify individual users, something almost impossible to do on the web.

As part of an ongoing Department of Health funded research project evaluating the impact of DiTV health channels, the authors have been testing metrics to chart the use and impact of these channels.⁹ This work is reported here.

Aims, objectives and scope of the study

The aims of the research were to develop, test and refine measures to enable accurate and valid comparisons to be made between the use made of two DiTV services from the data that are present in access log files. An additional aim was to see how each of the 'competing services' performed when measured over a wide range of use metrics. We needed to provide such a performance comparison for the Department of Health, the funder of the research project of which this study was part.

In addition to the ubiquitous 'visitors' (individual identifiable addresses) and 'hits' (pages/screens viewed) the metrics tested were:

- average time spent viewing a page/screen
- average number of pages viewed per visitor
- session types conducted (single page sessions, single daily session and multiple user sessions in a day) and session numbers
- time spent on a viewing session/visit
- number of pages viewed per session
- reach (the percentage of those people who have access to the service who have viewed the service at least once during a fixed time period)
- number of revisits to the site.

Site backgrounds

Two services are compared, both providing information from *NHS Direct Digital*: those of *Living Health*, managed by Flextech and distributed by Telewest, and

NHS Direct Digital managed by Communicopia and distributed by KIT Interactive. The current paper examines only the on-screen information services of each. However, it is worth describing accompanying transactional elements to put these services into their appropriate contexts.

The *Living Health* service, available to around 38 000 Flextech cable customers in the Birmingham area, consists of three elements:

- 1 a health information database, accessible on DiTV – the subject of this paper
- 2 a one-way video conferencing facility in which users see a 'live' nurse, who can send images, video, etc., to the user's TV set to assist in communication, diagnoses, etc.
- 3 a doctors' surgery online booking facility, available to a minority of viewers, and limited to three participating medical locations.

The Communicopia service, available to 10 000 broadband digital TV-on-demand subscribers in the Hull area, consists of two elements:

- 1 text, images, audio and 'on demand' short video programmes, *NHS Direct Digital*, an analysis of which features in this paper
- 2 an online immunisation diary, whereby subscribers can maintain personal immunisation records on their TV set.

The two services are considered in detail below.

Living Health

The main menu of the *Living Health* service offers seven information topics (including health news, men's/women's health, illnesses and treatment), access to NHS Direct InVision, and a search facility. The hierarchical menu structure has up to six levels but most sections use four or five. 'Today's Health News' simply gives a submenu of eight current topics of interest which lead directly to content, but in most sections the viewer needs to go step-wise through two to four menus before arriving at information content.

The navigation tools are constant and helpful. It is always possible to return to the home screen, back one menu level, or forward or back to individual contents pages. Each menu page has a clear heading, usually giving the names of each of the preceding sections. Each of the nine sections is additionally colour coded to give an extra visual clue to the viewer as to where they are. It is therefore immediately obvious when one has moved to a different section of the service.

Each subsection is logically organised to enable the viewer, by virtue of the links at the end of the content

for each topic, to navigate right through the section from beginning to end, and often directly on to the next section without having to return to the previous menu. Where information content is repeated in various sections, for example 'Contraception', the text has been duplicated within each section using the appropriate headings and colour for that section, rather than taking the viewer into another part of the service.

There is a main search tool, which indexes the content of sections 2–7 and additional topics linked to within the other search menus. The extra topics linked to within the other search indices are additional NHS careers, common conditions and common operations. There are four other search facilities, variously linked to common illnesses, common operations, medicines and careers. The medicines index sits discreetly in the 'Illness & Treatment' section. Its contents are not indexed by the main search facility. To find a topic, the viewer has to select a letter of the alphabet. They are then presented with an alphabetical list of terms. Selecting one takes the viewer to the appropriate part of the service (sections 2–7), appropriately colour coded, in which that topic sits.

There are very few non-textual elements to the content. What images there are, are mostly illustrative (this is what an intrauterine device looks like; this is what a pair of arthritic hands look like) rather than explanatory. Only two instructional images were found by the present authors, one to aid breast self-examination, and a sequence demonstrating cardiopulmonary resuscitation.

NHS Direct Digital

The main menu of the *NHS Direct Digital* service is structured on up to four hierarchical menus before arriving at information content. The content pages list, on the right hand of the screen, the other menu options at the same hierarchical level for that particular topic.

Unlike the *Living Health* service, menu pages also contain some introductory content. It is possible that some viewers may read this text only and not proceed further to content at the next level. The principles of navigation are the same as the *Living Health* service. Numbers are used to move forward and backwards through pages and menus, rather than the words 'next page' or 'previous menu'. However, the name of the previous menu, as well as a digit, is used to guide the viewer back to the previous menu and the menu heading is also displayed on screen. There is much less vertical linking between sections than with *Living Health*, although occasional hyperlinked terms do occur, taking the viewer into a relevant part of another section of the site.

The distribution of content of this *NHS Direct Digital* service differs from the *Living Health* service. There is a greater concentration on conditions and treatment and less on healthy lifestyles and practical advice. The content is more focused on medical information than on information on coping, self-help and the emotional aspects of life. Unlike *Living Health*, the content is not targeted at specific groups (men, women and children). The information is also largely accessible only through a search menu system. Only the 'Healthy Living' section (and to some extent the 'First Aid' section) flow and feel like integrated systems of information. The lack of vertical linking also contributes to this feeling.

Features

Rolling features appear on the main menu screen. These link to various parts of the site. An index of the features exists as a menu but this menu is not linked to by any other part of the site. Examples of features topics are:

- alcohol and prescription drugs
- am I getting enough protein?

Some of the features are also details of current health campaigns below.

NOT FEELING WELL?

This part of the service allows the viewer to choose a part of the body (head and chest, abdomen, limbs, or skin) and to choose from a list of possible symptoms, or to choose from a full list of all 54 symptoms. (Unfortunately, this list has not been sorted alphabetically, but puts the four previous menus on top of each other!) The viewer then has to answer yes or no to a series of questions which leads them to a possible diagnosis and a suggested course of action, such as see your GP or phone 999.

A–Z OF CONDITIONS

This section lists 274 conditions, more than the *Living Health* service, which lists a total of 157 conditions and operations. The section contains 3661 pages of information. For each condition, information includes symptoms, causes, diagnosis, prevention and treatment.

There are also sections on 'First Aid', 'Medicine Cabinet' (a searchable A–Z index of 149 medicines), 'Healthy Living' and 'Local Information'. The latter includes information on blood donation (including a video) and details of local doctors, hospitals and pharmacies. There is a wealth of non-textual information, including 95 videos. These include material on 14 medical conditions. As already mentioned, 49 medical conditions include images.

Methodology

Log files are machine-generated records of user activity. DiTV logs are similar to those of other digital platforms and a detailed explanation of how the data are analysed can be found in a number of articles published by the authors.^{4,7,8} Some essential details do require emphasising here.

DiTV viewed pages may be cached. A typical architecture may route requested pages via server hubs that are then sent on to the user's set. Once a page has been requested, the hub will cache the page and make that page available to other users on the hub without re-requesting the page from the original server. This plainly results in an underreporting of pages viewed. Caching of pages by a DiTV hub may be defeated by the inclusion of a non-cacheable 'gif'. The idea here is that each page includes an image that cannot be cached by the hub and so requests are made to the server every time. *Living Health* pages were routed via a hub, however, Flextech did employ methods to defeat caching and the statistics reported below are not compromised by page caching.

User identification on DiTV depends on the method of routing and access used by the provider. In the case of *Living Health*, users can only be identified by using techniques that defeat caching by router hubs (see below). Furthermore, television sets are treated as multiple-user machines. So, although a user can be identified, once hub caching is defeated, the user may in fact be a family of users. DiTV logs are very similar to Internet log files but extra fields are there to record the user's 'Mac' address. This address relates to the subscribing household. The user's Mac address may be linked to user registration details: gender, age and postcode data. However, because of data protection fears, this has, to date, limited any linking of these data.

DiTV pages may be made up by a number of graphic and text files that are delivered separately then 'pasted up' on the client's machine so that a page can be viewed. Log files are a record of requests and files delivered by the server to the client. Typically, the information recorded is the identification of the client, the time and date of each file delivered to the client, the name of the file delivered. The exact amount of information collected will depend on the software

used and how the server was configured. A typical DiTV log line (from *NHS Direct Digital*) is shown in Figure 1.

The lines in the script in Figure 1 give the following data:

- 2001-12-17 11:42:27 records the date and time of the request
- 213.249.129.2 - W3SVC4 COLIN 217.154.98.250 80 are server details related to Communicopia
- GET /menu.asp instance_id=308626 is the page and directory details; the instant_id number relates to a page and is looked up via a database procedure
- ASPSESSIONIDGGQGQUEO=OCNKNICDFBAGOCFJCOAAIJFD: the number following the equals sign is the user's ID number
- http://www.nhs-itv.co.uk/menu.asp?instance_id=308586 is a record of the previous page viewed by the user.

Across the two DiTV services examined here, logs were available from July 2001 to February 2002. For the *Living Health* service, the analysis of logs was from July to the end of November 2001, however, the service was also available for six weeks prior to this period for piloting purposes. For *NHS Direct Digital*, the logs included in the study were from the start of the Communicopia service at the end of November 2001 to the end of February 2002. During this period, *Living Health* registered 13 718 individual visitors, 19 613 sessions and 631 071 page views, and *NHS Direct Digital* 1924 visitors, 4272 sessions and 145 635 page views.

Results

Page views generally equate with the use of the system. This is a key metric, often (erroneously) referred to as 'hits'. Hits in fact refer to a line in a log. A single page viewed on a client's machine can generate several transactions.

Figures 2 and 3 give the number of pages viewed per day for each service. Use for *Living Health* at the beginning of the period (14 July) stood at approximately 14 000 page views a day (see Figure 2). This represented an early peak in use. Since September, use

```
2001-12-17 11:42:27 213.249.129.2 - W3SVC4 COLIN 217.154.98.250 80 GET /menu.asp
instance_id=308626 200 0 0 486 500 HTTP/1.1 www.nhs-itv.co.uk
Mozilla/3.04+(compatible;+NCBrowser/3.17;+ANTFresco/2.26;+RISC+OS-STB+4.0.0+STB4001807)
ASPSESSIONIDGGQGQUEO=OCNKNICDFBAGOCFJCOAAIJFD
http://www.nhs-itv.co.uk/menu.asp?instance\_id=308586
```

Figure 1 A typical DiTV log line

has stabilised and has fluctuated within the range of between 7300 to 7800 daily page views. Shown on Figure 2 is a sharp decline in use in the last week of November and a period of low use in mid-August; both these drops were a result of server errors.

Use of *NHS Direct Digital* at launch was about 1000 page views, then rose to a daily peak average of 2000 (see Figure 3) in late January: a 100% increase. There was a further peak in early February. Usage eventually stabilised at one-tenth of immediate post-launch levels. Since mid-February use has declined and as at 31 March stood at approximately 500 page views a day.

The actual number of *Living Health* viewers has varied quite considerably over the survey period (see Figure 4). Just after the launch of the channel it stood at just under 400 users a day. On 3 August the service was hit by technical delivery problems that restricted service to just two of the four server hubs that deliver the information locally. Service resumed fully by 23 August. The number of users remained high

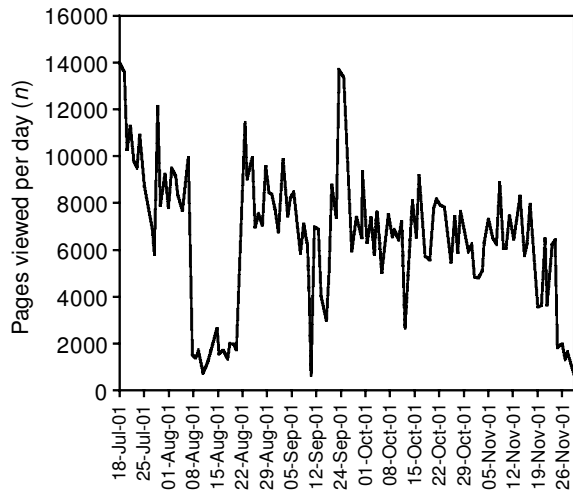


Figure 2 *Living Health* pages viewed per day

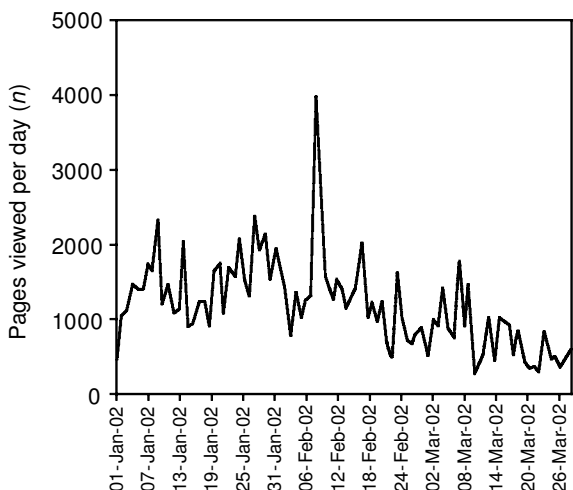
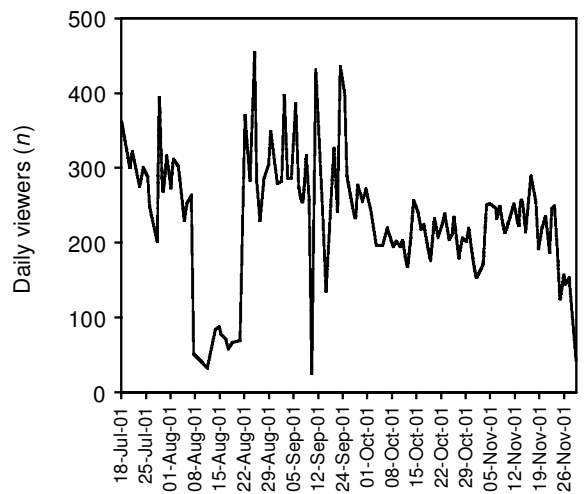


Figure 3 *NHS Direct Digital* pages viewed per day

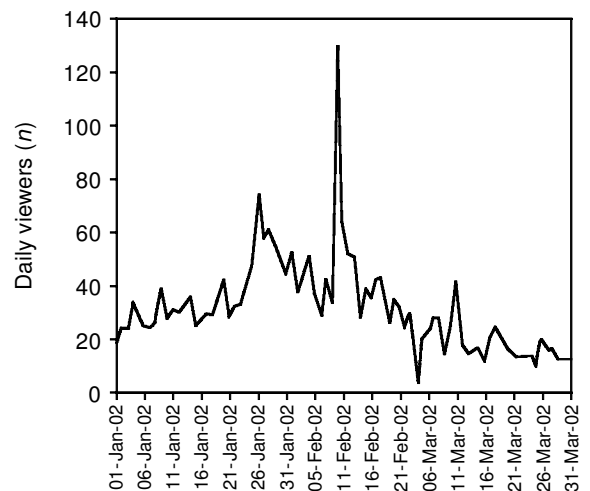
throughout September at about 320 a day. The number of users recorded did fall off after 24 September and reached a low of 200 on 9 October. Since the beginning of October the number of users has remained in the band of between 220 to 270 daily users. The relatively sharp fall towards the end of November is a result of server error.

Figure 5 shows similar data for *NHS Direct Digital* users. Statistics on users are collected on a different server and were not available for December. On average approximately 28 people use the service each day. There is a peak in activity around 9–10 February. There has been a decline in the number of users from about 15 February.



Living Health service started on 12 June 2001; continuous user log data available from 28 June

Figure 4 *Living Health* daily viewer numbers



NHS Direct Digital service started 1 December 2001; continuous user log data available from 1 January 2002

Figure 5 *NHS Direct Digital* daily viewer numbers

Table 1 Estimates for the average number of daily users and the average number of daily page views

	<i>Living Health</i>		<i>NHS Direct Digital</i>	
	Average daily users (<i>n</i>)	Average daily page views (<i>n</i>)	Average daily users (<i>n</i>)	Average daily page views (<i>n</i>)
Mean	235.0	6877.87	30.9	1112.0
Median	249	7355	28.0	1050
5% trimmed mean	235.7	6850	29.3	1081.1
Huber's M-estimator	246.9	7266.1	28.4	1075.1
<i>n</i> (days)	95	95	81	104*

*Includes days from December

Table 2 Estimates for average page view time and average pages viewed in a session

	<i>Living Health</i>			<i>NHS Direct Digital</i>		
	Page view time (seconds)	Session view time (seconds)	Pages viewed per user session (<i>n</i>)	Page view time (seconds)	Session view time (seconds)	Pages viewed per user session (<i>n</i>)
Mean	73.4	1101.3	27.0	33.8	1145	35
Median	13	321.0	16	14.0	400	19
5% trimmed mean	14.78	553.6	12.5	16.4	649	28
Huber's M-estimator	13.23	369.18	18.0	14.8	459	21
<i>n</i> (pages)	631071	19613	19613	115645	3273	3273

Living Health has a higher average number of users and page views compared to *NHS Direct Digital* (see Table 1). The service attracts on average 247 daily users compared to 28 daily users and 7266 page views compared to *NHS Direct Digital's* 1075. Part of this difference is explained by differences in the potential user base or audience. The potential user base that can receive *Living Health* is approximately four times that of *NHS Direct Digital* – 38 000 compared to 10 000 potential users. Therefore, we would expect *Living Health* statistics to be larger. However, *Living Health* appears to have attracted a higher multiple as, on average, it attracts nine to ten times (based on Huber's estimates^a) as many users as *NHS Direct Digital*.

^aStatistics for *NHS Direct Digital* are skewed by the use at service inception, hence a robust estimate of the mean is used.

Time spent viewing a page

How long the user spends on a page, how many pages are viewed and the length of time spent on a DiTV session are important metrics, as together they provide a comprehensive and complementary picture of the use of the service. Time spent online was once the key metric, especially for a commercial online system evaluation; this metric has been somewhat devalued by the web and DiTV, for which services are rarely charged and where there is no discipline (or record) of logging off. Nevertheless, it is a metric, which still has some comparative worth.

Estimates of average page view time, pages viewed in a session and session view time are given in Table 2. The frequency distribution for each was found not to be normally distributed but to be skewed. In such cases the arithmetic mean will be biased and cannot

be relied upon. To compensate for this the robust estimator, Huber's M-estimator, was generated for page view time and session view time and the number of pages in a session. Table 2 also reports the median and 5% trimmed mean. Both Huber's M-estimator and the 5% trimmed mean give estimates of the mean, which are not sensitive to the underlying frequency distribution and give unbiased estimates. The 5% trimmed mean does this by discarding the lowest and highest 2.5% of the values and then computing the mean of the remaining values; Huber's M-estimator is a weighted mean estimate where extreme values are given less weight.

Using Huber's robust M-estimator, the average page view time of the *Living Health* service is about 13 seconds, session time is just over six minutes and the number of pages viewed in a session is around 18. The statistics for the *NHS Direct Digital* service are slightly different. For this service, on average, users spent 15 seconds viewing a page and over seven minutes on a visit (session). During a typical visit they view about 21 screens. All the statistics are higher for the *NHS Direct Digital* service. There maybe a number of reasons for this: the *NHS Direct Digital* service does include an option for the user to download and watch videos; the user cannot start the first session (in a day) without watching an introductory video. Clearly both of these factors would add to the session time estimate.

Page view time, session time, and the number of screens visited fall over time. Figures 6 and 7 give the daily patterns of page view time and number of screens viewed over time – both for *Living Health*.

As can be seen both metrics have declined over time. In Figure 7 the average (median) number of pages viewed during a visit has fallen over the survey period, from approximately 20 pages in a session to

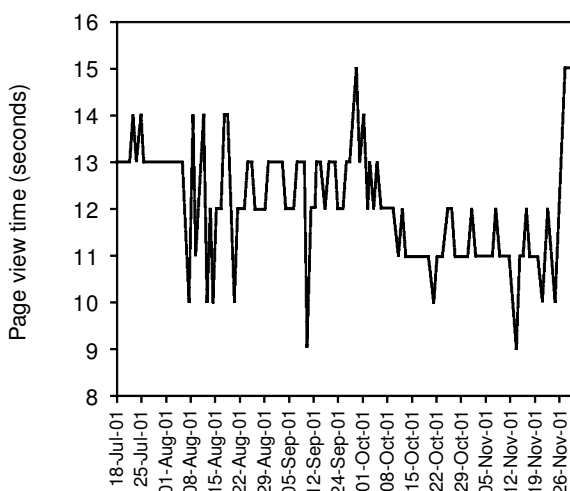


Figure 6 Daily pattern of page view time (median seconds)

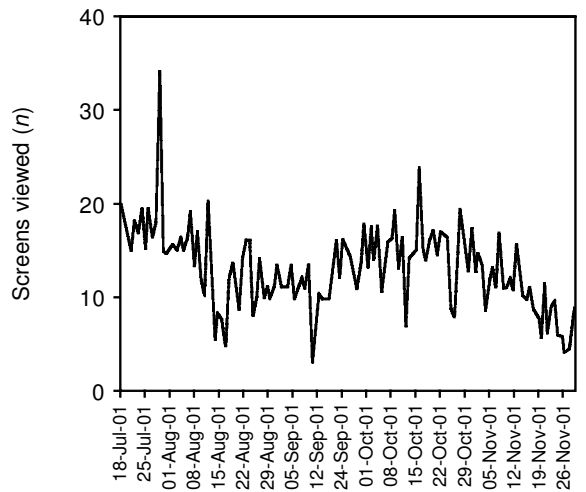


Figure 7 Screens viewed during a visit over time

around 10 pages: a fall of approximately 50%. It is thought that page view time, session time and number of pages viewed in a session will decline as returning users become more experienced in using the site. Therefore, it need not necessarily be seen as negative information.

Both sites are relatively new and time-based metrics will shift during this settling in period. This highlights the problem of comparing metrics between services that have not reached a mature pattern of use.

This idea of experience of the service affecting users is also apparent in Figure 8. It shows the median page view time in seconds by the number of pages viewed (grouped). As expected, users looking at more pages have a shorter page view time, which may result from the experience in navigating between pages. Users viewing between one and ten pages have a view time of approximately 14 seconds, however, this falls to

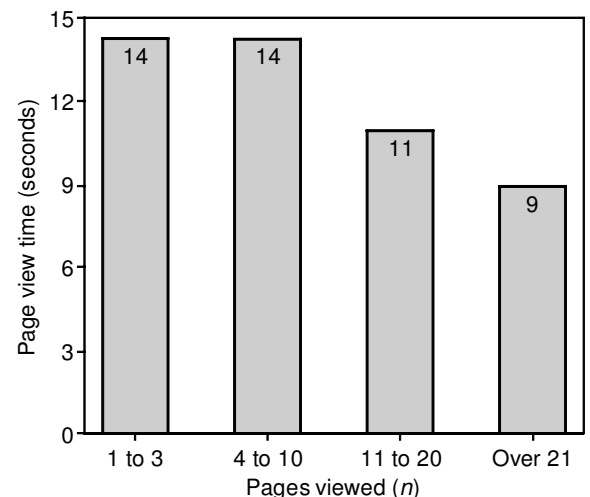


Figure 8 Page view time by the number of pages viewed (grouped)

an estimated nine seconds per page for users viewing over 21 pages.

Screens viewed during a visit (service penetration)

This metric is about measuring how deep users penetrate or burrow into a site or service. This is determined by counting the number of pages viewed by a particular user during a visit to a site/service. It tells us something about the depth (and length) of engagement, the extent of navigation; in sum, how serious the user is. This is an important factor in determining the strength of use and likely information outcome. Thus, for 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 manageable and versatile metric by grouping users by their use.

Users viewing only one to three pages are unlikely to have accessed an actual information page and can be termed 'bouncers'. By contrast, users viewing over 20 pages can be described as 'heavy users' or 'burrowers', with a good understanding of how to jump between pages and to use the technology to find the information they seek. 'Light users' stay long enough to view a couple of pages and as a result show more interest and commitment than bouncers. 'Medium users' clearly have an understanding of the service and have penetrated it to a limited depth (see Table 3).

The statistics are very similar for both services – approximately 19% of users on both services are bouncers. Bouncers are unlikely to have found anything of interest; they have more than probably drawn a blank and have left the service rapidly. The bounce rate for DiTV is significantly less than for the Internet.

This is probably because Internet users have much more choice of sources to choose from – and they avail themselves of this choice.

Table 3 may not give an accurate picture of the services. Firstly the *NHS Direct Digital* statistics do not include views of the video service. Videos can either be introductory videos on how to use the service and parts of the service, or they can be content videos. There is an introductory video to the whole service and each section of the service includes its own introductory video. Every viewer sees an introductory video either on entering the service or when selecting a section of the service. The ordering and downloading of videos necessarily entails the user to view considerably more menu screens (see Table 4).

On this basis *NHS Direct Digital* viewers view approximately one content object for every two menu objects; that is, approximately one-third of views relate to pages with content. For *Living Health* users, 56% of objects viewed relate to content objects and *Living Health* users viewed just less than one menu screen per content object.

However, this impression is biased, though less biased than the penetration index mentioned above, in that the content object has a different meaning depending on the type of service. A content screen is a single screen or page of text information on a topic and there may well be a number of pages for each topic, while for video it is a stream of images. Clearly, watching a video is similar to viewing a number of pages, in that information is being sought in each case, although there is no simple conversion. Specific points of information can only be serially accessed on a video (although DVD format, not available on this service, will make random access easier); and one might speculate that the type of information required may be different – one may, for example, watch a video for a general overview and to get a 'feel' for the topic, whereas consulting a page of text may indicate a more specific and formalised information need.

Table 3 Number of pages viewed in a visit

User type	Pages viewed in a visit (<i>n</i>)	<i>Living Health</i> frequency of users (%)	<i>NHS Direct Digital</i> frequency of users (%)*
Bouncers	1–3	18.9	19.0
Light users	4–10	23.0	20.4
Medium users	11–20	18.9	16.8
Heavy users	20+	39.2	43.9

*excludes rolling pushed content screens

Table 4 The estimated number of menu screens and content objects for each service

	<i>NHS Direct Digital</i>	<i>Living Health</i>
Menu screens for text service	45474	285071
Menu screens for video service	2757	
Introductory videos viewed	7011	n/a
Content text screens viewed	25208	368327
Content videos viewed	618	n/a
Total views	81068	653398

Reach

Reach is a user metric that on the surface should prove valuable in the evaluation of digital platforms as it tells us how well used a resource is in a particular community. This is estimated as the percentage of those who have access to the service who have viewed the service at least once during a fixed time period.

The estimate on reach for both services is given in Table 5.

Living Health is available to approximately 38 000 potential users. Over the period 13 718 users have used the system and upon these statistics it is estimated that 36% accessed the service during the period. The reach statistic for *NHS Direct Digital* is much lower – about 14% – and based on a subscriber base of approximately 10 000. On this metric *Living Health* appears to perform well. Thirty-six percent of users in the Birmingham area have accessed and used the *Living Health* service; however, this was only true for 14% of users who could receive the *NHS Direct Digital* service in the Hull area. However, there are theoretical and methodological reasons why this metric cannot be used to compare the two services.

An obvious theoretical problem with reach is that it weights each user the same, whether they have viewed one page and then left never to have returned or

have been regular users of the service. Furthermore, the metric does not make a distinction between the user who had visited three months previously or had visited just last week. Clearly, simple exposure to a service does not constitute a current, positive or actual use of the service. There are further methodological problems that limit the metric's capability as a means of comparing the services. For example, the metric is sensitive to one-off and unsustainable peaks in activity such as might occur at the inception of a service. The initial peak might relate to a number of 'hit and see' users (bouncers) that have no intention of revisiting the service. Peaks add a complication when using the metric for a comparison.

In addition, the metric is sensitive to the time period over which the metric is based. The longer the period over which the reach statistic is calculated, the higher it will be. If the time period over which the statistic is calculated is different, as is the case here, then the reach statistic cannot be used as a comparison. A further complication is that the number of potential users who make up the subscriber base is hardly likely to be constant over the period on which the reach statistic is calculated. If the potential number of users changes then a choice has to be made as to which subscriber base statistic to choose – an average statistic, the statistic at the beginning of the period, or the statistic at the end.

Table 5 Reach

	Approximate subscriber base (<i>n</i>)	Users in period (<i>n</i>)	Approximate reach (%)
<i>Living Health</i>	38000	13718	36.1
<i>NHS Direct Digital</i>	10000	1354	13.5

Living Health service started on 12 June 2001; continuous user log data available from 28 June

NHS Direct Digital service started 1 December 2001; continuous user log data available from 1 January 2002

An adjusted reach statistic can be calculated, based on either average monthly, weekly or the daily number of users. A metric based on an average statistic is not sensitive to either unsustainable peaks in services, a temporary failure in service, nor is the metric sensitive to differences over which the statistic is calculated.

For this exercise an adjusted daily reach statistic is estimated. The average daily user statistic for *Living Health* is estimated to be 246.9 and that for *NHS Direct Digital* as 28.4 users a day. Given this, and the user base quoted above, the reach statistic for *Living Health* would be about 0.65 compared to a reach statistic for *NHS Direct Digital* of 0.28. By this adjusted reach metric, *Living Health* would perform better by double as much again compared to *NHS Direct Digital*. Although the adjusted reach statistic allows for the differences in time periods, the *NHS Direct Digital* service still performs poorly. The adjusted reach statistic here is based on a daily average and hence adjusts for differences in the period over which the services operated.

There are additional advantages in moving towards using an adjusted reach statistic, in that a reach statistic can be calculated for each day or week, using updated subscriber base statistics. Or, alternatively, a statistic could be calculated based on moving averages and hence give more weight to users who had more recently used the system. Figure 9, for example, estimates the adjusted reach statistic based on a 15-day moving average.^b Comparing the two services,

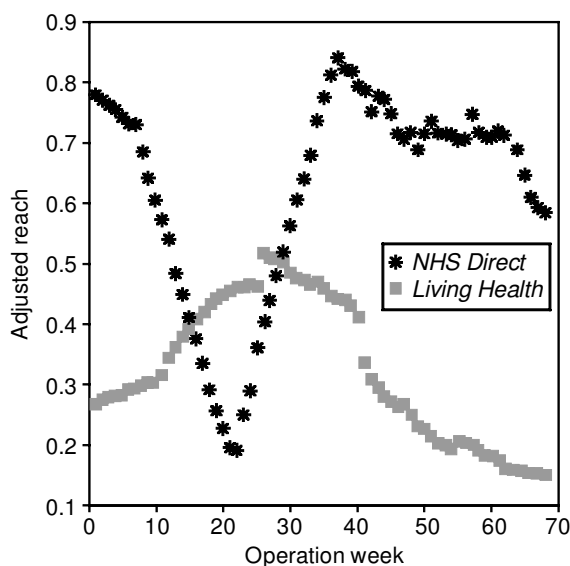


Figure 9 Adjusted reach statistic based on a 15-day moving average – *NHS Direct Digital* and *Living Health*

^bA 15-day moving average was used as this was reasonable, given the relative short period over which data were available. Clearly, it would be more appropriate to calculate the moving average statistic over a longer period.

Living Health has a higher adjusted reach statistic over their operational period except in the period when the service went down. Significantly both services declined from week 30.

Return visitors

Coming back to a service constitutes conscious and directed use – as good an approximation of this as you are likely to get from the logs. People might arrive at a site or TV channel by accident – and, of course, that constitutes ‘use’ according to the logs – but they are unlikely to arrive at the same service again by accident. All this makes return visits a powerful performance indicator. It seems likely that the more times a user returns to the site, the more likely they are to be satisfied with the site – and this is indeed what Morris found.¹⁰

Table 6 shows the pattern of return visitors for the *Living Health* and *NHS Direct Digital* channels.

For *Living Health*, just over 59% of people visited the channel just once in their operational period – meaning that a high 41% visited the service again. For *NHS Direct Digital*, the statistic is quite similar: 65% of users visited the service only once and 35% visited the service again. The *NHS Direct Digital* service does not appear to attract so many repeat visits. However, the metric is sensitive to differences in the period over which the statistic is calculated. Furthermore, the large number of users at the service inception who had a look to see what it was like but as yet have not returned to use it may have thrown out this statistic. Perhaps a better metric is to estimate the average number of weeks between visits; however, there are not enough data to do this for *NHS Direct Digital*.

An alternative would be to calculate returnees between periods of time. Figures 10 and 11 give the estimated number of users returning from month to month over a three-month period for both services. Each figure looks at return visits and new users between months but does not include return visits by users within months. The number of new users attracted by *NHS Direct Digital* has dropped substantially from one month to the next and in March the service attracted only about a quarter of the January number. The situation at *Living Health* is quite different, as the number of new users has, by and large, remained the same from one month to the next. This is surprising, as we would have expected use by new users to decay over time as the population of new users declines. The differences between the services in attracting new users may result from different publicity approaches of the service to their users.

Figures 10 and 11 give an idea of how well each service attracts people to re-use their service. However, a clearer idea of this is given in Figures 12 and 13, which show the relative importance of returnees.

Table 6 Return visits within a period

Days visited (<i>n</i>)	<i>Living Health</i> frequency of users (%)	<i>NHS Digital Direct</i> frequency of users (%)
Once	59.0	67.1
2–5	35.0	28.7
6–15	5.4	3.8
Over 15	0.6	0.4

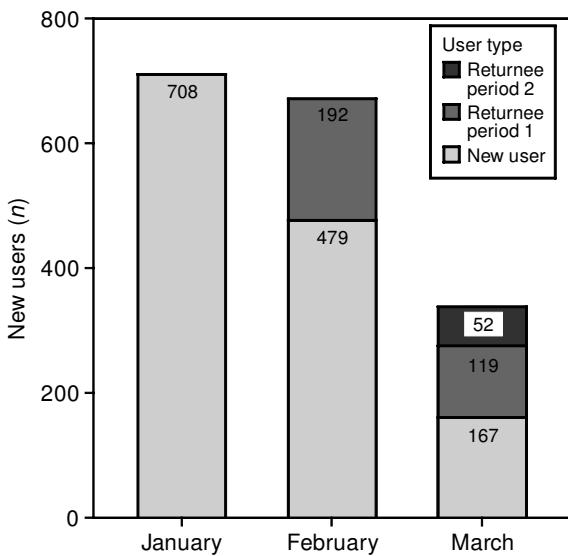


Figure 10 Numbers of new users and returnees between months – *NHS Direct Digital*

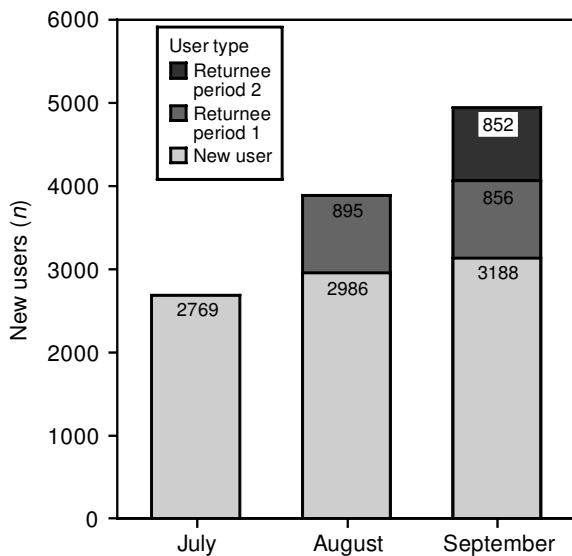


Figure 11 Numbers of new users and returnees between months – *Living Health*

The percentage share of returnees in the second period for each service was similar – 29% for *NHS*

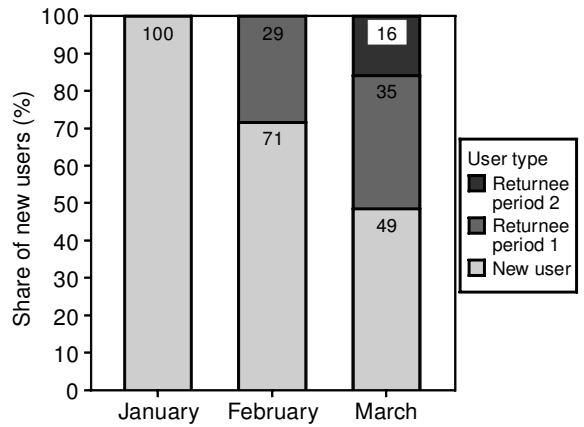


Figure 12 Percentage share of new users and returnees between months – *NHS Direct Digital*

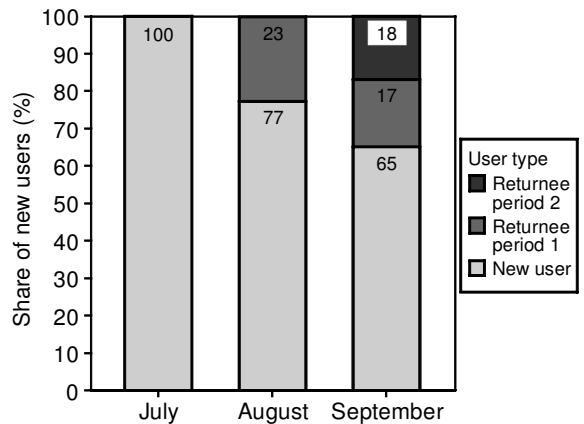


Figure 13 Percentage share of new users and returnees between months – *Living Health*

Direct Digital compared to 23% for *Living Health*. However, in the third period, returnees from periods 1 and 2 to *NHS Direct Digital* made up 50% of users, while for *Living Health*, this statistic was 34%. In part this is explained by the fact that *NHS Direct Digital* is not attracting new users and this is weighting the percentage share towards returnees. In the third period, *NHS Direct Digital* recorded more returnees

from period 1 compared to period 2: 15% compared to 35%.

With regard to the likely period between visits, when asked in a questionnaire associated with the study how often they were likely to view the *Living Health* channel, most people (60%) said that they would view the service as and when needed. Figure 14 gives the number of times users have returned by the first date that they used the system. It confirms an expectation in that those users who visited the site early are more likely to be repeat users as they have had more time to be repeat users (or they were simply more motivated, as shown by their early foray). Users who have only recently visited are less likely to be repeat users. This explains part of the differences between the statistics in Table 6. *Living Health* performs well in users visiting six to 15 times and over 15 times because the service has been established for longer and there has been a greater opportunity for users to revisit the service.

Looking at Figure 14 it can be seen that users who first visited the channel in July/August 2002 have on average visited the channel three times, or about once a month. In looking at just those users who had visited, twice the average number of days between the first and second visit was calculated at 26 days – and also suggests a return visit of approximately once a month. However, this estimate is based on a relatively short period. It is also far from certain that use will stabilise, even over longer periods, into regular visits. Health is not one of those areas, unlike the news, which people consult on regular basis – it is much more ad hoc.

Figure 15 gives the session time by the grouped number of times users have visited the service. Users who have visited once have the shortest session time of approximately two minutes, while users visiting between six and 15 times record the highest of

about seven and half minutes. Those who visited the channel over 15 times had a shorter session time of approximately six minutes. Generally, as the number of user visits increases, so does the time spent on a session, though session time did decline for those users who visited the site over 15 times in the period of study.

Conclusions

One of the main aims of the research was to ‘develop, test and refine measures’ and we believe that we have illustrated that a wide range of metrics work and together offer a holistic view of the performance of each digital channel. We believe that two metrics in particular offer especially rich data – reach (the percentage of those people who have access to the service who have viewed the service at least once during a fixed time period) and the number of re-visits to a channel.

The log research presented here has identified considerable differences between the use made of *NHS Direct Digital* (Communicopia) and *Living Health*, which will be the subject of further (qualitative) research to find out the reasons that might explain these differences. The key differences and possible explanations are summarised below.

- Based on average daily users, *Living Health* appears to have nine to ten times as many users as *NHS Direct Digital*. However, half of this difference is accounted for by differences in the subscriber base of the two services.
- *NHS Direct Digital* users spend approximately 23% more time on a visit as compared to *Living Health*

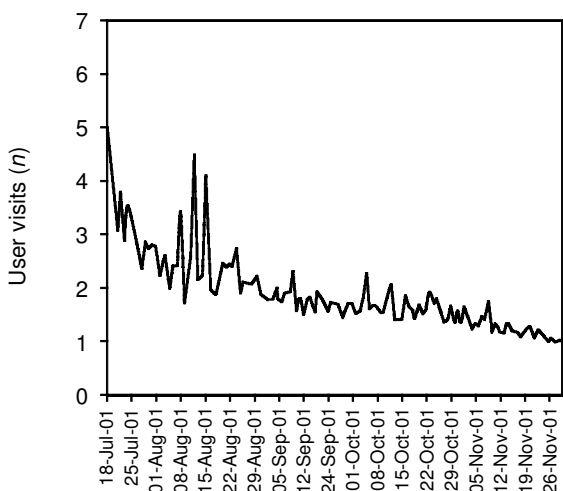


Figure 14 Number of times users have visited by date of first visit

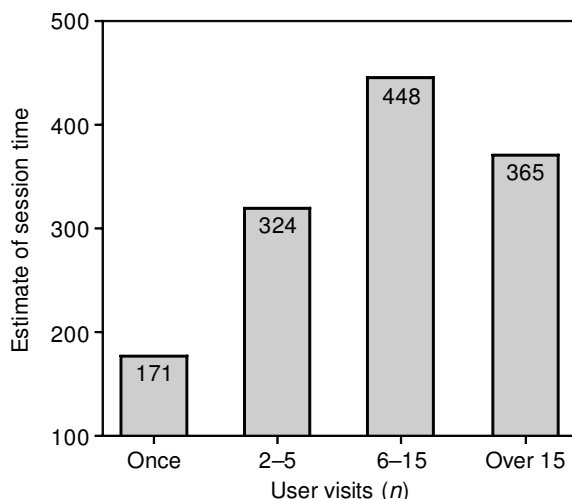


Figure 15 Number of times users have visited by estimate of session time (median)

users. This difference is thought to be due to the viewing of videos by *NHS Direct Digital* users – video viewing is time intensive.

- In terms of customer reach, *Living Health* appears to perform better by double when compared to *NHS Direct Digital*. The adjusted reach statistic for *Living Health* is estimated at about 0.65% compared to 0.28% for *NHS Direct Digital*. This statistic is adjusted for differences in the period over which the statistic is based. The reach statistic of both services declined after about the 35th week of operation.
- In comparing each service over a three-month period it was found that the number of new users attracted to *NHS Direct Digital* fell month on month. By the third month new users had dropped to a third of their level of the first month. This was not so true of the *Living Health* service, where the new user rate remained constant.

There will be a number of reasons why the above differences occur, including differences in the content offered, accessibility and ease of use, and the kind/volume of advertising and promotion engaged in. Furthermore, it is apparent that the digital television platform on which both sit is very different. Through qualitative methods we should be able to get closer to the truth. In the meantime the logs have raised the questions we need to ponder and ask.

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ADDRESS FOR CORRESPONDENCE

David Nicholas
Ciber
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

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