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# Google Generation II: web behaviour experiments with the BBC

28

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## Abstract

**Purpose** – The purpose of this paper is to report on continuing research undertaken on the way the Google Generation behave on the internet and to compare this with an earlier highly publicised study by the paper's authors.

**Design/methodology/approach** – This research use a televised practical experiment and a remote web global test incorporating search, working memory and multi-tasking experiments.

**Findings** – The Google Generation appears to behave very differently from older generations. By their own admission they are less confident about their searching prowess and this is also demonstrated by the fact that they viewed fewer pages, visited fewer domains and undertook fewer searches. Also, tellingly, their search statements were much more the product of cut and paste. The Google Generation also have poorer working memories and are less competent at multi-tasking, both of which may have implications for researching in an online environment.

**Originality/value** – The paper introduces of multi-tasking and cognitive measurement in evaluating and describing information-seeking behaviour; comparing the web behaviour of young and old; the first time this has been shown on public television.

**Keywords** Search engines, Worldwide web, Age groups, Information media, Group behaviour, Television

**Paper type** Research paper

## Introduction

The virtual revolution is in full swing and it is transforming many aspects of our lives: the ways in which we socialise, shop, entertain ourselves, obtain knowledge and information, manage our health, and interact with public services have all undergone profound change. These transformations have taken place in a remarkably short period of time, leading many to wonder how today's children and teenagers, the "Google Generation", who have little or no recollection of a life before broadband, mobile technologies and ubiquitous search (Google) will cope. The big question that fascinates (or worries) everyone – parents, teachers, lecturers and employers – is whether this generation, when they hit university and the workplace, will turn out to be fundamentally different from older generations in their attitudes, expectations, behaviour and even in the way they "think" – Nicholas Carr (2010), for instance, argues that their brains are being "rewired". If this indeed turns out to be the case then existing institutions such as schools, universities and libraries, are going to have to



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undergo fundamental change or face marginalisation. These and questions like them, drive CIBER's Google Generation Research programme. In 2008 we published our early research in this journal (Rowlands *et al.*, 2008). That paper was the most downloaded Aslib Proceedings article since and the report (CIBER, 2008) on which the article was based one of the most downloaded JISC (2007) reports ever. In this paper we return to a topic that has captivated readers, the profession and the media and report on continuing Google Generation research work undertaken as part of the BBC's award winning Virtual Revolution Series (BBC, 2009).

### **The Google Generation**

The "Google Generation" is a popular phrase that refers to a generation of young people, born after 1993, growing up in a world dominated by the internet and mobile devices. They have been born digital. According to Wikipedia (2010) the phrase has entered popular usage as "a shorthand way of referring to a generation whose first port of call for knowledge is the internet and a search engine, Google being the most popular". This is offered in contrast to earlier generations who "gained their knowledge through books and conventional libraries", understood the concept of a collection and were familiar with the fruits of intermediation. Indeed, even most students entering our colleges and universities today (Generation Y, born after 1973 and before 1994) are younger than the microcomputer, are more comfortable working on a keyboard than writing in a spiral notebook, and are happier reading from a computer screen than from paper in hand. Constant connectivity – being in touch with friends and family at any time and from any place – is of utmost importance.

### **Google Generation research at UCL**

#### *The original BL/JISC study*

First a brief summary of our earlier work which was published in the British Library and JISC funded report: *Information Behaviour of the Researcher of the Future* and reported in this journal in 2008 (Rowlands *et al.*, 2008). The aim of the study was to profile the information-seeking and using habits of today's teenagers, those born from 1993 onwards, who have grown up in a world of ubiquitous search, rich and involving multimedia, high bandwidth connections to the internet, incredible choice of information, communication and entertainment media, affordable mobile devices, games consoles and the like. The research question was, is there any evidence that this generation has different aptitudes, attitudes, expectations and even different communication and information literacies? If so, what are the implications if young people bring these values with them when they use libraries and information services as they enter higher education or research careers? We soon realised that our thinking needed to be much more nuanced and sophisticated than this: because we actually found that the differences within generations are sometimes as great as or greater than the differences between generations. Like the rest of us, young people show enormous diversity in their tastes, preferences and behaviours.

The research for the *Information Behaviour of the Researcher of the Future* project was approached by systematically analysing the literature on young people's use of new technology over a 30-year period and by conducting an intergenerational experiment, using web logs (digital footprints) to see how people of different ages used the same educational web resources. A number of consistent themes emerged:

- (1) The information literacy of young people has not improved with the widening access to, and greater familiarity with, information technology: in fact, their apparent facility with computers disguises some worrying problems.
- (2) The speed of young people's web searching meant that little time was spent in evaluating information, either for relevance, accuracy or authority – they skitter along the digital surface never staying for long in one place or going very deep.
- (3) Skittering in turn leads to information promiscuity by which young people seldom come back to the same web site.
- (4) Young people have a poor understanding of their information needs and thus find it difficult to develop effective search strategies as a result; they exhibit a strong preference for expressing themselves in natural language rather than determining which key words might be more important.
- (5) The ubiquitous use of highly branded search engines by the young raises other issues:
  - young people have unsophisticated mental maps of what the internet is, often failing to appreciate that it is a collection of networked resources from different providers; the search engine, be that Yahoo! or Google, becomes the primary brand that they associate with the internet; and
  - consequentially, young people do not find library-sponsored resources intuitive and therefore prefer to use Google or Yahoo! instead: these offer a familiar, if simplistic solution, for their study needs.

It is very dangerous to stereotype a whole generation; in a real sense we are all Google Generation now: the demographics of internet and media consumption are rapidly eroding this presumed generational difference. The reality is that more people across all age groups are using the internet and Web 2.0 technologies widely and for a variety of purposes. The young (not just the Google Generation but also Generation Y, the next age group up) may have been the earliest adopters but now older users are fast catching up, the so-called Silver Surfers. All of us search and acquire knowledge in very different ways these days. The key difference, however, is that the Google Generation know no different and being young and immature are more easily influenced, so we need to follow and monitor their behaviour on the web (and everyone else's of course) very carefully.

*The BBC television programme and Lab UK experiment*

The widespread publicity attracted by the *Information Behaviour of the Future Researcher (Google Generation)* study led to an invitation from the BBC to take part in a television series, *The Virtual Revolution*, which was intended to mark the twentieth anniversary of the founding of the web by Sir Tim Berners-Lee. The BBC undertook a live-filmed experiment at UCL (held on 14 November 2009), whereby members of the public conducted web searches and related tests. The experiment sought to characterise and evaluate information seeking behaviour by tracking what the volunteers did online and relating it to demographic background (age and gender), memory and multi-tasking ability. Over 80 people of various ages and backgrounds took part in the filmed experiment. A number of additional sessions were conducted at

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public locations in London to increase the representativeness and size of the sample, eventually giving us 138 people in total.

The experiment provided excellent television pictures of massed ranks of people of all ages and types searching computers in UCL's Science Library but it had another function, it was also to serve as a pilot for an associated BBC Lab UK[1] big experiment – a web test, which sought to characterise the web behaviour of the general public using animal characters. It was rolled out to a global audience on the BBC web site[2] in February 2010. The experiment was run out under the title “What species of web animal are you?” The strap line disclosed its purpose and orientation:

Over the last 20 years the web has changed the world, but what, if anything, has it done to us? Take part in a unique experiment to discover the impact the web is having on our brains, and discover which species of web animal you are.

The animal idea made the test appealing to the general public - gave them something memorable back. But our inspiration was more academic: the gnomic line of the Greek poet Archilochus, “The fox knows many things, but the hedgehog knows one big thing.” The enigmatic sense of itself seemed to speak to what was happening as a consequence of the digital transition. It seemed to us that the digital world, by creating bouncers and skitterers of us all (light and fleeting searchers ever moving on), was rapidly increasing the population of foxes, and especially among the young; the hedgehog looked like becoming an endangered species. In information seeking terms: the difference between one who expects a single right answer (hedgehog) and one who accepts answers that are good enough (foxes). More broadly perhaps the difference is between those who learn from experience and adapt to a changing world (foxes) and those who assume a fixed response in an unchanging world (hedgehogs).

Based on the complexity and diversity of responses encountered during the first, filmed part of the experiment eight animal characters were developed (see below). The categorisation was based on three of the most diverse attributes: time taken to complete a search, multitasking ability, and the importance attached to social networking. Thus, in three dimensions the space of possible responses forms a cube, each animal dominant in its own corner.

The animals and their characteristics were as follows:

- *Web hedgehog*. Hedgehogs are careful internet users, taking their time to find the right information. They prefer to go it alone, rarely relying on social networks and are specialised web users, best suited to concentrating on one thing at a time. The pilot study found that web hedgehogs tend to be the less-experienced web users.
- *Web fox*. Web foxes are good at finding information quickly. They are highly social, maintaining complex relationships with the other members of their social group, often using social networks, or other sites whose content is created by its users, as sources of information. Web foxes are multi-taskers, able to do several things at the same time. The pilot study found that web foxes tend to be younger (16-24), less experienced web users.
- *Web bear*. Web bears like to browse the internet at a leisurely pace. They tend to be solitary animals and when they are looking for information, they are less likely to use social networks. Web bears are highly adaptable multi-taskers, able

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to do several things at the same time. The pilot study found that web bears tend to be older (30 + ) and female.

- *Web leopard.* Web leopards are adept at getting information from the internet very quickly. The web leopard likes to go it alone when looking for information, and they are best suited to performing one task at a time. In the pilot study we found that web leopards tend to be young (16-24) and male.
- *Web elk.* Web elks take their time finding exactly the right information. They are social creatures but perform best when they focus on one thing at a time, rather than trying to multitask. The pilot study found that web elks tend to be more experienced, older users.
- *Web octopus.* Web octopuses surf fast and when looking for information they tend to go it alone rather than rely on social networks. Web octopuses are highly adaptable and show a range of sophisticated online behaviours, successfully keeping track of several different things simultaneously. In the pilot study, web octopuses tended to be young (16-24), male and spend a lot of time online.
- *Web ostrich.* Web ostriches are speedy surfers and take full advantage of social networks when looking for information. The web ostrich is a true specialist. They are focused and do best when they concentrate on one task at a time. In the pilot study, ostrich-type users tended to be young (16-24), male and spend a lot of time online.
- *Web elephant.* Web elephants browse the internet at a stately, methodical pace. They often use social networking sites to keep track of friends or family and are happy to rely on information from sites whose content is created by its users. Web elephants are well-suited to carrying out several different tasks at the same time. The pilot study suggested that web elephants are often older, more experienced web users.

These animals were very much a first stab, a work in progress, and they will be refined after the results of the global test have been fully analysed. It is highly likely that other attributes will be introduced, like trust and authority scores, to future characterisations. The Lab UK global experiment, to which more than 70,000 people responded, will be reported in a later paper; in the interim we discuss here the results of the pilot study, which produced very interesting data indeed.

### **Methodology**

The pilot study involved a filmed practical experiment incorporating searching, working memory and multi-tasking tests. Session participants were seated at a PC in the UCL Library. The PCs were set up as for a normal student user with full access to the web with a Firefox browser. The only modification was the addition of a Firefox “plugin” developed by BBC Lab UK which captured the click-stream data from the Firefox browser. We were thus able to record time taken, URL’s entered, and use of features such as the back button. The data collected from all participants was then processed using log analysis software developed at UCL.

Search questions were piloted and tested before the live sessions - the type of questions and reasons for choosing are discussed later. Working memory tests were developed by the BBC Lab UK for the Brain Training and the Multi-tasking tests were

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undertaken with the aid of University of Stanford researchers who had developed a relatively straightforward scoring system for measuring the extent of and proficiency in multitasking (Ophir *et al.*, 2009).

## Results

Although the main objective of the study was to determine whether the Google Generation was using the web and searching for information in distinctive ways this, of course, could only be achieved by making comparisons with other generations. This is especially important because a big mistake made by many commentators is to assume that older age groups are not shaped and changed by the same factors as the young. To avoid the danger of stereotyping on the basis of age, something that we are all guilty of doing, the original intention was to cluster the users in order to define groups of users by common attributes and behavioural patterns and then see whether the key differences were age/generation related. This proved not to be possible for the pilot data as the relatively small numbers of people recruited to the pilot meant there were too many missing cells in the spreadsheet. The alternative approach taken therefore was to divide the responses into three categories by age:

- (1) *Google Generation* – born after 1993 (GG).
- (2) *Generation Y* – born after 1973 and before 1994 (GY).
- (3) *Generation X* – born 1973 or earlier (GX).

The generational breakdown of the sample population was as follows:

- *Google Generation*, 19.4 per cent ( $n = 27$ );
- *Generation Y*, 38.8 per cent ( $n = 54$ ); and
- *Generation X*, 41.7 per cent ( $n = 58$ ).

This last group was in fact more diverse, the oldest participant being 83. Thus, it includes not only “Generation X” but also “Baby Boomers” and “Silver Surfers”, perhaps it is better labelled “Generation X++”.

We are describing here a pilot study whose intention was to inform and shape the main experiment, in particular by signalling possible major differences. The data therefore presented in this paper should be regarded as informative and illustrative rather than definitive: the definitive analysis will be furnished in the main experiment, when we can also return to the clustering approach mentioned earlier.

Three metrics are used throughout the following analyses: two covered use, regularity and time; and the third was importance. The scales for regularity and importance are as follows.

- (1) *Regularity* measured on a six-point scale, where: 0 = never; 1 = irregularly; 2 = monthly; 3 = weekly; 4 = daily; 5 = hourly; and
- (2) *Importance* measured on a ten-point scale, where 10 is very important.

For each analysis we have used symbols to denote the level of statistical significance of the differences between generations of users:

- \*\*\*\* Significant difference at the 1 per cent level;
- \*\*\* Significant difference at the 5 per cent level;

- \*\* Significant difference at the 10 per cent level; and
- \* No significant difference.

The data are complex as there are three things to compare: GG, GY and GX. An overall statistic that shows significant differences (e.g. the four asterisks) does not give enough information to make a clear interpretation. If the research question is simply “are there differences between generations?” then a single statistic is enough. Either the generations are different, or not different. But if there are differences, which way do the differences go? Is it the case that GX and GY are much the same, but both are very different from GG; or that there is clear blue water between all three? In order to determine this we have introduced 95 per cent confidence limits (the upper and lower bounds) for each analysis. In the first analysis we show how to interpret the confidence levels.

Where differences between the three generations are shown, these should be interpreted as age-related differences. The point is that these people are at different stages in their lives and are using the internet for different purposes and in different contexts. The findings should not be interpreted as indicating real generational differences. A simple example should make the point: at a given point in time, it will be observed that baby boys drink milk and eat rusks. Men drink beer and eat meat pies. This does not mean one should rush out and sell shares in Guinness and buy Farley’s, come back in 20 years and the babies will be swilling lager top! We have no strong baseline evidence to track whether today’s Google Generation is fundamentally any different from where we were at the same age but what we can determine is how the same thing (the digital) is impacting on us all and how this impact varies by age.

Four aspects of behaviour were investigated:

- (1) general purposes to which the internet is used;
- (2) multi-tasking;
- (3) characteristics of information seeking; and
- (4) working memory.

The multi-tasking and working memory aspects were exploratory to see whether there were generational differences and, if so, whether these variables could be examined in the main test in order to help explain web behaviour and searching style.

### **The purposes to which the internet is put**

Broad questions were asked about searching, e-mailing, blogging, social networking and posting information on the web. There were also questions on shopping, banking, making travel plans and listening to music in the pilot test, which is not discussed here. There are clear age-related differences in the purposes for which people use the internet and the importance they attach to those activities.

#### *Searching for information*

Participants were asked how regularly they searched the web, how important it was for obtaining information and how many hours per week they spent doing so (Table I). The generational differences were statistically significant, especially so for hours per week and regularity. Generation Y searched the web most regularly and for longer, for

|                           | <i>n</i> | Mean | 95% Confidence interval for mean |             |
|---------------------------|----------|------|----------------------------------|-------------|
|                           |          |      | Lower bound                      | Upper bound |
| <i>Regularity</i> ****    |          |      |                                  |             |
| Google Generation         | 27       | 3.44 | 3.17                             | 3.72        |
| Generation Y              | 54       | 3.93 | 3.69                             | 4.16        |
| Generation X              | 55       | 2.98 | 2.54                             | 3.43        |
| <i>Importance</i> ****    |          |      |                                  |             |
| Google Generation         | 27       | 7.15 | 6.01                             | 8.29        |
| Generation Y              | 54       | 8.96 | 8.44                             | 9.49        |
| Generation X              | 58       | 7.02 | 6.00                             | 8.04        |
| <i>Hours per week</i> *** |          |      |                                  |             |
| Google Generation         | 27       | 2.34 | 1.62                             | 3.06        |
| Generation Y              | 54       | 9.29 | 6.24                             | 12.33       |
| Generation X              | 58       | 6.70 | 3.39                             | 10.01       |

**Table I.**  
Searching for information  
(self-report data)

more than nine hours per week. In fact it was the very youngest participants (Google Generation) that used it the least. There were also significant differences in regards to the importance attached to web searching, with Generation Y giving it nearly a 10 out of 10 (8.96), some way ahead of the other two generations.

The confidence interval analysis for regularity shows that the scales (lower to upper confidence intervals) for the Google Generation (3.17 to 3.72) and Generation Y (3.69 to 4.16) overlap. Thus, it cannot be said that there is a significant difference between GG and GY with any great confidence. There is no clear blue water between them in the way that there is between GY (3.69 to 4.16) and GX (2.54 to 3.43) where there is an obvious break. So while the top level analysis is that there are significant differences between generations regarding regularity the more detailed interpretation is that the difference between GG and GY is not great (they overlap), similarly between GG and GX (they overlap), but a significant difference between GX and GY (there is a clear break).

In the case of importance there are clear differences between the Google Generation and Generation Y and for hours per week the real difference is between Generation Y and the other groups.

### *E-mail*

There were marked differences between the generations in terms of the importance attributed to e-mail (Table II) and it was the young adults, Generation Y, that rated it the highest (8.14) and the Google Generation, by far, the least (5.56). There were also differences concerning regularity and it was Generation Y who e-mailed most regularly (4.13). People averaged around *five* hours a week but with wide variation and the differences between generations were not significant.

### *Social networking*

There were very marked statistical differences between generations in regard to social networking (Table III). As might have been expected the Google Generation spent much time on social network sites (5.33 hours) and rated social networking the highest (7.52) – higher than e-mailing – but it was Generation Y who spent most time on social networking (6.08 hours). In marked contrast Generation X showed little interest in



| AP<br>63,1 | <i>n</i>               | Mean | 95% Confidence interval for mean |             |      |
|------------|------------------------|------|----------------------------------|-------------|------|
|            |                        |      | Lower bound                      | Upper bound |      |
| <b>36</b>  | <i>Regularity***</i>   |      |                                  |             |      |
|            | Google Generation      | 26   | 3.46                             | 2.89        | 4.04 |
|            | Generation Y           | 54   | 4.13                             | 3.86        | 4.40 |
|            | Generation X           | 54   | 3.43                             | 2.98        | 3.87 |
|            | <i>Importance****</i>  |      |                                  |             |      |
|            | Google Generation      | 27   | 5.56                             | 4.39        | 6.72 |
|            | Generation Y           | 54   | 8.14                             | 7.46        | 8.81 |
|            | Generation X           | 58   | 7.84                             | 7.03        | 8.66 |
|            | <i>Hours per week*</i> |      |                                  |             |      |
|            | Google Generation      | 27   | 2.63                             | 1.07        | 4.19 |
|            | Generation Y           | 52   | 4.76                             | 2.97        | 6.54 |
|            | Generation X           | 57   | 4.50                             | 2.81        | 6.19 |

**Table II.**  
E-mailing (self-report data)

|                           | <i>n</i> | Mean | 95% Confidence interval for mean |             |
|---------------------------|----------|------|----------------------------------|-------------|
|                           |          |      | Lower bound                      | Upper bound |
| <i>Regularity****</i>     |          |      |                                  |             |
| Google Generation         | 27       | 3.93 | 3.46                             | 4.39        |
| Generation Y              | 54       | 3.93 | 3.65                             | 4.21        |
| Generation X              | 55       | 1.27 | 0.81                             | 1.73        |
| <i>Importance****</i>     |          |      |                                  |             |
| Google Generation         | 27       | 7.52 | 6.35                             | 8.69        |
| Generation Y              | 54       | 6.76 | 6.06                             | 7.46        |
| Generation X              | 58       | 1.98 | 1.35                             | 2.61        |
| <i>Hours per week****</i> |          |      |                                  |             |
| Google Generation         | 27       | 5.33 | 3.72                             | 6.95        |
| Generation Y              | 54       | 6.08 | 3.33                             | 8.84        |
| Generation X              | 58       | 0.85 | 0.25                             | 1.44        |

**Table III.**  
Social networking (self-report data)

social networking (1.98) and there was clear water between it and both the other generations on all three metrics.

#### *Posting content*

The interest here lay in finding out about the sharing of personal information online through the use of webcams, microphones, and digital cameras for posting videos, photos, and audio files and engaging in video conversations. It was a question about the use of YouTube and similar services. Generation X is plainly the odd one out (Table IV) showing little interest in posting (1.97). The Google Generation rated it most highly (4.96) and were most engaged in hours spent (1.88); Generation Y were the most regular posters (2.57) but there was not much daylight between these two groups.

#### *Writing blogs and web sites*

Generally speaking, people did not spend a lot of time blogging or working on their web sites, on average about half an hour a week (Table V). Interestingly, nobody really

|                         | <i>n</i> | Mean | 95% Confidence interval for mean |             |
|-------------------------|----------|------|----------------------------------|-------------|
|                         |          |      | Lower bound                      | Upper bound |
| <i>Regularity</i> ****  |          |      |                                  |             |
| Google Generation       | 27       | 2.15 | 1.48                             | 2.81        |
| Generation Y            | 53       | 2.57 | 2.12                             | 3.01        |
| Generation X            | 52       | 0.92 | 0.52                             | 1.33        |
| <i>Importance</i> ****  |          |      |                                  |             |
| Google Generation       | 27       | 4.96 | 3.68                             | 6.24        |
| Generation Y            | 54       | 4.15 | 3.29                             | 5.01        |
| Generation X            | 58       | 1.97 | 1.38                             | 2.55        |
| <i>Hours per week</i> * |          |      |                                  |             |
| Google Generation       | 27       | 1.88 | 0.53                             | 3.22        |
| Generation Y            | 54       | 1.56 | 0.63                             | 2.49        |
| Generation X            | 58       | 0.83 | -0.21                            | 1.88        |

**Table IV.**  
Posting content on the  
web (self-report data)

|                         | <i>n</i> | Mean | 95% Confidence interval for mean |             |
|-------------------------|----------|------|----------------------------------|-------------|
|                         |          |      | Lower bound                      | Upper bound |
| <i>Regularity</i> ***   |          |      |                                  |             |
| Google Generation       | 26       | 1.31 | 0.61                             | 2.00        |
| Generation Y            | 53       | 1.02 | 0.64                             | 1.40        |
| Generation X            | 52       | 0.52 | 0.23                             | 0.81        |
| <i>Importance</i> *     |          |      |                                  |             |
| Google Generation       | 27       | 2.78 | 1.57                             | 3.99        |
| Generation Y            | 54       | 2.91 | 2.07                             | 3.74        |
| Generation X            | 58       | 2.09 | 1.30                             | 2.87        |
| <i>Hours per week</i> * |          |      |                                  |             |
| Google Generation       | 27       | 0.93 | 0.11                             | 1.74        |
| Generation Y            | 54       | 0.48 | -0.05                            | 1.02        |
| Generation X            | 58       | 0.39 | 0.01                             | 0.76        |

**Table V.**  
Writing blogs and  
maintaining personal  
web sites (self-report  
data)

thought that these web activities were that important. There was a real difference between generations in regard to regularity only and the Google Generation blogged most regularly and for longer (1.31 and 0.93 respectively).

### Multi-tasking

It is a widely held belief that people multi-task a lot in the digital environment and that the young are alleged to multi-task more. Indeed, according to an Ofcom report (Mostrous, 2010), two-thirds of the time that 16-24 year olds were consuming “media” they were using more than one device (however television and radio were included which limits the findings somewhat because we have been doing that for decades now). What we wanted to do for the BBC experiment was to obtain information on generational differences, measure the differences and, in the full study, use this data to determine whether the information seeking behaviour of those people who scored highly as media multi-taskers differed from those who media multi-tasked least. As mentioned we used tests devised by researchers at Stanford University.

The following questions were asked about the extent of multi-tasking:

- Q1. While watching or listening to one piece of entertainment media (video or audio), how much of the time are you also:
  1. Watching or listening to another piece of entertainment media at the same time?
  2. Using a computer application or programme at the same time?
  3. Reading or browsing a book, web page, or document at the same time?
  4. Holding a mediated conversation at the same time?
- Q2. While using one computer application or program, how much time are you also:  
Responses as above.
- Q3. While reading one thing (a book, web page, or document), how much time are you also:  
Responses as above.
- Q4. While holding one mediated conversation, how much time are you also:  
Responses 1-3 above plus:
  4. Holding a second mediated conversation at the same time?
- Q5. How many hours a week do you spend watching or listening to entertainment media?
- Q6. How many hours a week do you spend working or interacting with computer applications or programs?
- Q7. How many hours a week do you spend reading or browsing web sites?
- Q8. How many hours a week do you spend having mediated conversations?

The results showed (Table VI) that it was Generation Y and not the Google Generation that media multi-tasked the most and clearly Generation X the least.

A Task Switching test was also designed by Stanford to determine how good a person's multitasking ability actually was. Participants had to switch between analysing vowels and numbers. The data provided below in Table VII is the average score for a correct response – the lower the score, the better the multitasking ability. Generation Y performed best, a finding that adds weight to the belief that the young might well multi-task the most but they are not necessarily the best at doing so.

**Table VI.**  
Extent of multitasking  
(self report data: Stanford  
Media Multi-tasking  
Index (MMI))

|                   | <i>n</i> | Mean  | 95% Confidence interval for mean |             |
|-------------------|----------|-------|----------------------------------|-------------|
|                   |          |       | Lower bound                      | Upper bound |
| MMI ****          |          |       |                                  |             |
| Google Generation | 14       | 1.457 | 0.857                            | 2.057       |
| Generation Y      | 19       | 1.831 | 1.337                            | 2.324       |
| Generation X      | 28       | 0.686 | 0.368                            | 1.003       |

### Answering questions on the web

Question formulation, framing and seeking strategies was at the heart of the searching experiment. Four questions were posed and they ranged from the simple fact-finding (*Q1*) to the highly ambiguous and open-ended (*Q4*):

- Q1.* What was Robbie Williams' first single after he left Take That?
- Q2.* Is the government's "5 fruit and veg a day" campaign based on valid science?
- Q3.* Do you think that Hillary Clinton has had a face-lift and, if so, what?
- Q4.* Where did the first commercial passenger flight land?

### Time taken on a question

What was most interesting about this analysis is that it took everyone longer to answer the highly specific, fact finding question (*Q1*) than the most difficult one (*Q4*). It might be because it was the first question and people were finding their feet. On average, the older the person the more time they spent combing the internet for an answer (Table VIII). The differences between the Google and X generations were enormous, in one case, that of *Q2*, there was a nine-fold difference in time. For all questions Generation X performed very differently. This finding could be read in two ways:

|                           | <i>n</i> | Mean    | 95% Confidence interval for mean |             |
|---------------------------|----------|---------|----------------------------------|-------------|
|                           |          |         | Lower bound                      | Upper bound |
| <i>Multi-tasking</i> **** |          |         |                                  |             |
| Google Generation         | 11.0     | 1,269.3 | 967.2                            | 1,571.3     |
| Generation Y              | 34.0     | 1,016.0 | 901.0                            | 1,131.1     |
| Generation X              | 26.0     | 1,375.8 | 1,243.9                          | 1,507.7     |

**Table VII.**  
Multi-tasking proficiency  
(experimental data:  
letter-number-time test  
scores)

|                     | <i>n</i> | Mean  | 95% Confidence interval for mean |             |
|---------------------|----------|-------|----------------------------------|-------------|
|                     |          |       | Lower bound                      | Upper bound |
| <i>Time Q1</i> **** |          |       |                                  |             |
| Google Generation   | 13       | 74.4  | 33.5                             | 115.3       |
| Generation Y        | 16       | 92.8  | 30.4                             | 155.1       |
| Generation X        | 29       | 371.6 | 209.3                            | 533.8       |
| <i>Time Q2</i> **** |          |       |                                  |             |
| Google Generation   | 11       | 34.1  | 21.9                             | 46.3        |
| Generation Y        | 15       | 53.8  | 23.7                             | 83.9        |
| Generation X        | 27       | 314.0 | 203.8                            | 424.1       |
| <i>Time Q3</i> ***  |          |       |                                  |             |
| Google Generation   | 8        | 61.0  | 17.2                             | 104.8       |
| Generation Y        | 15       | 47.3  | 18.2                             | 76.3        |
| Generation X        | 27       | 142.7 | 81.6                             | 203.8       |
| <i>Time Q4</i> **** |          |       |                                  |             |
| Google Generation   | 12       | 38.6  | 7.2                              | 69.9        |
| Generation Y        | 13       | 61.3  | 17.2                             | 105.4       |
| Generation X        | 26       | 233.1 | 129.0                            | 337.2       |

**Table VIII.**  
Time taken per question  
(experimental data  
(seconds))

- (1) older people are more thorough and younger people less fussy; and
- (2) young people are faster to the answer.

*Pages viewed in order to answer a question*

They were big variations in the number of pages viewed per question (Table IX): 3.88 in the case of Q3 (Generation Y) and 12.63 Q4 (Generation Y). There was also a big variation within questions between the generations. While the Google Generation tended to view far fewer pages in order to answer a question it is in fact Generation Y who viewed the most pages, around three times as many as the Google Generation for Q4. In general all these figures are higher than CIBER has found to be the norm (Nicholas *et al.*, 2008), which is that half of all visitors to a site view three or less pages and the difference could well be explained by the fact that the BBC data were obtained in exam-like conditions and there was a genuine query attached to the visit – they were not just window shopping for instance.

*Domains/sites visited in order to answer a question*

Typically, it took visits to two or three sites to answer a question and, interestingly, it was the most factual/specific question (Q1), which occasioned the most visits. On the whole, it tended to be the Google Generation who visited the fewest sites (Table X).

*Edit distance*

We wished to research the alleged cut and paste behaviour of young people and as a simple, quantitative measure used a calculation of edit distance. Edit distance is a measure of the similarity between two strings of characters; in this case the question text presented in the experiment and text typed into a search box. For the pilot study we used a simple implementation: comparing the minimum number of character insert/delete/swap actions needed to transmute one string into another with total string length. So, 1.0 means identical text, 0.0 means completely different text. For the BBC

|                      | <i>n</i> | Mean  | 95% Confidence interval for mean |             |
|----------------------|----------|-------|----------------------------------|-------------|
|                      |          |       | Lower bound                      | Upper bound |
| <i>Pages Q1</i> *    |          |       |                                  |             |
| Google Generation    | 26       | 5.35  | 3.57                             | 7.12        |
| Generation Y         | 43       | 4.65  | 3.28                             | 6.03        |
| Generation X         | 52       | 6.77  | 4.62                             | 8.92        |
| <i>Pages Q2</i> **** |          |       |                                  |             |
| Google Generation    | 26       | 4.27  | 2.60                             | 5.93        |
| Generation Y         | 43       | 9.16  | 5.88                             | 12.44       |
| Generation X         | 52       | 8.12  | 6.19                             | 10.04       |
| <i>Pages Q3</i> **** |          |       |                                  |             |
| Google Generation    | 26       | 3.88  | 2.57                             | 5.20        |
| Generation Y         | 43       | 7.93  | 5.92                             | 9.94        |
| Generation X         | 52       | 4.58  | 3.55                             | 5.60        |
| <i>Pages Q4</i> **** |          |       |                                  |             |
| Google Generation    | 26       | 4.23  | 2.46                             | 6.01        |
| Generation Y         | 43       | 12.63 | 8.17                             | 17.08       |
| Generation X         | 52       | 8.67  | 6.20                             | 11.15       |

**Table IX.**  
Number of pages viewed  
(experimental data)

|                     | <i>n</i> | Mean | 95% Confidence interval for mean |             |
|---------------------|----------|------|----------------------------------|-------------|
|                     |          |      | Lower bound                      | Upper bound |
| <i>Sites Q1</i> *   |          |      |                                  |             |
| Google Generation   | 26       | 2.62 | 2.03                             | 3.20        |
| Generation Y        | 43       | 2.33 | 1.90                             | 2.75        |
| Generation X        | 52       | 2.52 | 1.99                             | 3.05        |
| <i>Sites Q2</i> *   |          |      |                                  |             |
| Google Generation   | 26       | 2.27 | 1.43                             | 3.11        |
| Generation Y        | 43       | 3.63 | 2.57                             | 4.68        |
| Generation X        | 52       | 3.58 | 2.69                             | 4.47        |
| <i>Sites Q3</i> *** |          |      |                                  |             |
| Google Generation   | 26       | 2.12 | 1.45                             | 2.78        |
| Generation Y        | 43       | 3.86 | 3.08                             | 4.64        |
| Generation X        | 52       | 2.65 | 2.03                             | 3.28        |
| <i>Sites Q4</i> *** |          |      |                                  |             |
| Google Generation   | 26       | 2.15 | 1.42                             | 2.89        |
| Generation Y        | 43       | 4.14 | 3.18                             | 5.10        |
| Generation X        | 52       | 3.63 | 2.66                             | 4.61        |

**Table X.**  
Number of sites viewed  
(experimental data)

data we calculated a minimum and maximum edit distance. In general the data is not conclusive for *Q1* and *Q3* (Table XI). Nevertheless, there is enough evidence to suggest that the Google Generation has a propensity to cut and paste or repeat the search question more or less verbatim and not to reason through or formulate a query.

*Numbers of searches undertaken per question per visit*

The data for *Q1* and *Q2* are not significant. From the results for the other questions it can be seen that the Google Generation generally employed marginally fewer individual searches, in the case of *Q4* 1.88 terms as compared to 4.56 for Generation Y. This is possibly because they are more likely to be content with what they find first (Table XII), despite showing a greater lack of confidence in their answers than other age-groups – as shown next.

*Confidence in answering questions*

Participants were asked how confident they were about their answers on a ten-point scale – the higher the number the greater the confidence. The data are highly significant and it is very clear that the Google Generation is far from confident about their answers, none of the questions attracting more than a 50 per cent confidence rating and some (*Q4*) as low as 25 per cent (Table XIII). Generation Y were the most confident of all, registering extreme confidence in the case of *Q1*, with a score of 7.64.

*Working memory*

Two games, a digit span flash game and a watch the windows flash game provided information on working memory and these games were derived from the Lab UK Brain Training experiment which preceded the web behaviour one (Table XIV). Digit Span was a test to determine how many numbers can be remembered in a row and the higher the score the better the working memory. Generation Y group did the best by far (21.49) and were almost twice as good as the Google Generation (11.70), who clearly have poor

|                        | <i>n</i> | Mean  | 95% Confidence interval for mean |             |
|------------------------|----------|-------|----------------------------------|-------------|
|                        |          |       | Lower bound                      | Upper bound |
| <i>Maxedit Q1</i> *    |          |       |                                  |             |
| Google Generation      | 25       | 0.627 | 0.542                            | 0.712       |
| Generation Y           | 41       | 0.584 | 0.529                            | 0.640       |
| Generation X           | 50       | 0.591 | 0.542                            | 0.640       |
| <i>Minedit Q1</i> *    |          |       |                                  |             |
| Google Generation      | 41       | 0.492 | 0.453                            | 0.530       |
| Generation Y           | 50       | 0.433 | 0.388                            | 0.478       |
| Generation X           | 25       | 0.477 | 0.396                            | 0.559       |
| <i>Maxedit Q2</i> **** |          |       |                                  |             |
| Google Generation      | 18       | 0.824 | 0.695                            | 0.953       |
| Generation Y           | 41       | 0.638 | 0.560                            | 0.715       |
| Generation X           | 46       | 0.572 | 0.501                            | 0.644       |
| <i>Minedit Q2</i> **   |          |       |                                  |             |
| Google Generation      | 41       | 0.484 | 0.401                            | 0.568       |
| Generation Y           | 46       | 0.411 | 0.336                            | 0.485       |
| Generation X           | 18       | 0.586 | 0.419                            | 0.753       |
| <i>Maxedit Q3</i> *    |          |       |                                  |             |
| Google Generation      | 17       | 0.601 | 0.514                            | 0.689       |
| Generation Y           | 41       | 0.543 | 0.492                            | 0.594       |
| Generation X           | 45       | 0.548 | 0.501                            | 0.594       |
| <i>Minedit Q3</i> *    |          |       |                                  |             |
| Google Generation      | 41       | 0.479 | 0.421                            | 0.537       |
| Generation Y           | 45       | 0.501 | 0.443                            | 0.558       |
| Generation X           | 17       | 0.496 | 0.395                            | 0.597       |
| <i>Maxedit Q4</i> **   |          |       |                                  |             |
| Google Generation      | 21       | 0.895 | 0.836                            | 0.954       |
| Generation Y           | 39       | 0.824 | 0.770                            | 0.878       |
| Generation X           | 46       | 0.792 | 0.737                            | 0.847       |
| <i>Minedit Q4</i> **** |          |       |                                  |             |
| Google Generation      | 21       | 0.776 | 0.668                            | 0.883       |
| Generation Y           | 39       | 0.516 | 0.409                            | 0.623       |
| Generation X           | 46       | 0.565 | 0.489                            | 0.640       |

**Table XI.**  
Edit distances  
(experimental data)

working memories. Watch the Windows was a pelmanism-style game and again the higher the score the better the working memory. This test confirmed the better working memories of Generation Y although the differences were not so statistically significant this time around. The data from this test will be used in the main test where it will be related to searching style.

### Conclusions

How then did the BBC pilot experiment further our understanding of the Google Generation? Most importantly of all, it provided confirmation that there were profound and, possibly, concerning, differences between younger and older members of the general public in terms of their web behaviour. Critically, also it provided us with some important explanations of why this might be so. Thus, as the logs had previously demonstrated, the Google Generation proved to be the quickest information searchers, spending the least amount of time on a question (a fraction of the time spent by older adults), in the case of two questions just half a minute each! The knee-jerk “digital natives” interpretation of these

|                         | <i>n</i> | Mean | 95% Confidence interval for mean |             |
|-------------------------|----------|------|----------------------------------|-------------|
|                         |          |      | Lower bound                      | Upper bound |
| <i>Searches Q1</i> *    |          |      |                                  |             |
| Google Generation       | 26       | 2.12 | 1.44                             | 2.79        |
| Generation Y            | 43       | 1.65 | 1.25                             | 2.05        |
| Generation X            | 52       | 2.48 | 1.81                             | 3.15        |
| <i>Searches Q2</i> *    |          |      |                                  |             |
| Google Generation       | 26       | 1.85 | 0.86                             | 2.83        |
| Generation Y            | 43       | 2.95 | 2.06                             | 3.85        |
| Generation X            | 52       | 2.29 | 1.73                             | 2.85        |
| <i>Searches Q3</i> **** |          |      |                                  |             |
| Google Generation       | 26       | 1.38 | 0.80                             | 1.97        |
| Generation Y            | 43       | 2.74 | 1.97                             | 3.52        |
| Generation X            | 52       | 1.37 | 1.07                             | 1.66        |
| <i>Searches Q4</i> **** |          |      |                                  |             |
| Google Generation       | 26       | 1.88 | 1.03                             | 2.73        |
| Generation Y            | 43       | 4.56 | 3.27                             | 5.84        |
| Generation X            | 52       | 3.21 | 2.31                             | 4.12        |

**Table XII.**  
Number of searches per question per visit (experimental data)

|                           | <i>n</i> | Mean | 95% Confidence interval for mean |             |
|---------------------------|----------|------|----------------------------------|-------------|
|                           |          |      | Lower bound                      | Upper bound |
| <i>Confidence Q1</i> **** |          |      |                                  |             |
| Google Generation         | 27       | 4.56 | 2.87                             | 6.24        |
| Generation Y              | 54       | 7.64 | 6.71                             | 8.57        |
| Generation X              | 58       | 5.40 | 4.22                             | 6.57        |
| <i>Confidence Q2</i> **** |          |      |                                  |             |
| Google Generation         | 27       | 3.07 | 1.56                             | 4.59        |
| Generation Y              | 54       | 6.02 | 5.12                             | 6.91        |
| Generation X              | 58       | 4.26 | 3.25                             | 5.27        |
| <i>Confidence Q3</i> **** |          |      |                                  |             |
| Google Generation         | 27       | 2.85 | 1.49                             | 4.21        |
| Generation Y              | 54       | 5.31 | 4.50                             | 6.13        |
| Generation X              | 58       | 3.43 | 2.51                             | 4.35        |
| <i>Confidence Q4</i> **** |          |      |                                  |             |
| Google Generation         | 27       | 2.52 | 1.09                             | 3.95        |
| Generation Y              | 54       | 5.99 | 5.02                             | 6.97        |
| Generation X              | 56       | 3.82 | 2.79                             | 4.85        |

**Table XIII.**  
Self-reported confidence in answering questions (self-report data)

|                            | <i>n</i> | Mean  | 95% Confidence interval for mean |             |
|----------------------------|----------|-------|----------------------------------|-------------|
|                            |          |       | Lower bound                      | Upper bound |
| <i>Digit span</i> ****     |          |       |                                  |             |
| Google Generation          | 27       | 11.70 | 8.36                             | 15.05       |
| Generation Y               | 53       | 21.49 | 17.60                            | 25.38       |
| Generation X               | 57       | 15.68 | 12.11                            | 19.26       |
| <i>Watch the window</i> ** |          |       |                                  |             |
| Google Generation          | 27       | 11.33 | 7.89                             | 14.77       |
| Generation Y               | 52       | 12.44 | 9.98                             | 14.91       |
| Generation X               | 56       | 9.00  | 7.15                             | 10.85       |

**Table XIV.**  
Working memory scores (experimental data)



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findings is obvious: young people are whizzes at technology, and searching information is almost as natural as breathing to them. This, unsurprisingly, does not appear to be the case, as by their own admission, they were the least confident about their answers. The reasons for their lack of confidence might well be explained by their behaviour online - they viewed fewer pages, visited fewer domains and undertook fewer searches in answering the questions. Similarly, tellingly, their search statements (as demonstrated by our edit distance metric) were much closer textually to the question posed, making the Google Generation also the “cut and paste”, fast information generation. It seemed that for a number of the Google Generation participants the experiment was a race (the first to the finishing line) and once they felt they had won they returned to their docking bay – FaceBook, and returned to real life! Hurried and unconfident searching might well be a function of the amount of time they spend searching, they spent a fraction of the time spent by older adults and despite rating searching the web almost as highly as social networking they spent half as much time on it.

As for the crowd sourcing that comes from social media this was not evidenced in the tests, probably because they were tests, but certainly the Google Generation rated social media most highly. As regards multitasking, in which anecdote has it the Google Generation excel, it was true that they turned in much higher scores than the oldest generation (X) but recorded still significantly lower scores than the intermediate Generation Y. There is also evidence to suggest they do not multitask very well.

The propensity to rush, rely on point-and-click, first-up-on-Google answers, along with growing unwillingness to wrestle with nuances or uncertainties (a consequence of laziness?) or inability to evaluate information, keeps the young especially stuck on the surface of the “information” age, too often sacrificing depth for breadth.

Not surprisingly then, there is much speculation about whether the digital and the way we use it (doing many things at the same time) is making us all stupid; indeed actually damaging our brain. Neuroscientists who are increasingly called in to comment believe that it is changing how the brain works, it changes the pattern of connections – introducing new ones and dispensing with old ones (BBC, 2010a) - and because of the plasticity of young people’s brains theirs change more quickly, but no damage has been detected yet! However, according to Nicholas Carr (2010) the skittering and viewing that are endemic in the virtual world have serious consequences for some fundamental human skills or at least skills we once regarded as fundamental. Carr believes that the way we, young and old, behave in the digital world is chipping away at our capacity to concentrate and contemplate, which leads to problems with us (not) reading. Recent news reports suggest that the writing might in fact already be on the wall. Thus it is reported that in the UK primary school reading levels are falling for the second year running (*The Telegraph*, 2010) and that public library lending has dropped by as much as a third in the past few years (BBC, 2010b). Carr believes this is just the beginning (of the end!).

Possibly the most interesting development to emerge from the BBC web behaviour experiment has been the interest that has been shown by industry, professions and policy makers in the implications and opportunities there is for them in the findings. The experiment has clearly helped in knowledge transfer from researchers to practitioners.

Much of what we have learned about the Google Generation comes from self-report questionnaires and we know that people have poor recall when it comes to what they did in the virtual space (which tends to lead to exaggeration or falsehoods) and it is not easy to craft questions in this arena; for these reasons we need to treat these data with

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care and triangulate it with evidence based findings. Thus, for this study we have combined questionnaire data with log analysis and practical tests. However, finally, a word of warning, we are just presenting pilot data here, albeit data that dovetail with what we have discovered elsewhere on very large-scale projects, such as *The Information Behaviour of the Researcher of the Future* study (CIBER, 2008). For confirmation of the data and further insights we must await the analysis of the Lab UK test which will be published in 2011.

### Notes

1. BBC Lab UK, available at: [www.bbc.co.uk/labuk/](http://www.bbc.co.uk/labuk/)
2. BBC web site, available at: [www.bbc.co.uk/virtualrevolution](http://www.bbc.co.uk/virtualrevolution)

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