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Metacognition and web credibility

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1. Introduction

This paper investigates two important questions relating to the information behaviour of Internet users:

1) What criteria do users apply when determining whether or not a website is trustworthy?
2) Does the application of users' evaluation criteria provide evidence of metacognition?

Many studies have focused on the issue of trust relating to websites. A number of these have explored issues associated with websites which serve a specific purpose: eg, e-commerce (Grabner-Kräuter et al. 2006), e-health (Sillence *et al*, 2007), e-government (Bélanger and Carter, 2008), and news (e.g. Yang, 2007). Some (e.g. Fritch and Cromwell (2001), Rieh, (2002) have explored the issues more generally; and a number of models have been developed to describe evaluation processes.

Researchers in the library and information sciences have, in the past, drawn up lists and guidelines designed to help with evaluation of websites, but these drew on the experience and training of their authors (eg, Cooke, 1999, ch3). A similarly theoretical approach was taken by Fritch and Cromwell (2001), who provided a comprehensive literature-based model of factors affecting website credibility.

However, as Metzger (2007:2087) found, such lists of guidelines were often poorly followed. She concluded that

> "An area of immediate concern for scholars studying Internet credibility is the need for more research on what users actually do to assess credibility."

Only recently have there been efforts to determine empirically the criteria by which users themselves assess the sites they encounter (eg, Rieh, 2002, Tombros *et al*, 2005, Pickard *et al*, 2010). The purpose of the research presented here was to perform another empirical study of factors that affect students' evaluations of Web material. Specifically, the study analysed web site evaluation by postgraduate students from the University of Placename. In addition, the study was part of a project investigating the role of metacognition in Internet searching (Gorrell *et al*, 2009). As well as providing a general overview of evaluative factors therefore, it attempts to identify those in which metacognition plays a part.

1.1 Metacognition

The idea of metacognition appears to have first emerged in the 1970s. Gleitman *et al*, (1972:161) referred to the 'meta-cognitive' processes by which:

> "We think and we sometimes know that we think; we remember and sometimes know that we remember.".

Flavell (1979) developed the concept further when he argued that metacognition involves the thinker thinking about his or her own thought processes. It involves people understanding themselves and the nature of the task, in addition to understanding the specifics of the task. Flavell (1999:22) summarized metacognition as including: "knowledge about the nature of people as cognizers, about the nature of different cognitive tasks, and about possible strategies that can be applied to the solution of different tasks. It also includes executive skills for monitoring and regulating one's cognitive activities."

Because of the increasing complexity of the Internet, there has been a growing interest in metacognition in the context of web search and online enquiry, and various

studies have attempted to investigate the impact of interventions designed to promote metacognitive behaviours amongst online searchers (eg, Stadtler and Bromme (2007), Wiley, *et al*, 2009)

However, metacognition is a complex construct. Gorrell *et al,* 2009, in their literature review, identify metacognitive skills appropriate to a given task, as being
- Evaluation (or criticality of sources or task success),
- Metamemory (a person's knowledge and awareness of his or her memory usage)
- Metacomprehension (an awareness of the extent to which a task is understood)
- Monitoring (the assessment of progress through a cognitive task)
- Planning (appropriate structure is assigned to the task.)
- Schema training (the generation of a cognitive framework to help understand the task)
- Transfer (the ability to transfer strategies to tasks other than the one on which they were learned)

This complexity makes assessment problematic (Schraw and Moshman, 1995). Consequently, only evaluation was considered here.

This study engaged volunteers in a series of search tasks during each of which they were encouraged to discuss the reliability of the websites they were considering. One of the purposes of the exercise was to encourage volunteers to 'think aloud' in order to generate a list of the criteria they adopted when evaluating websites. In generating this list, the volunteers were also asked to reflect on their choices. This provided insights into how they acquired and applied the evaluation criteria they were using.

2. Methodology

This study was purely qualitative. It aimed to identify, describe and classify behaviours. This enabled a list of evaluation criteria to be derived. This list is presented below, and is summarized in Figure 1. The study did not provide information relating to the frequency of observed behaviours. It does however, provide groundwork for future quantitative research.

Participants were encouraged to think aloud and to describe their perceptions of the websites they were studying. Such think aloud techniques have been found useful in identifying metacognition (Stadtler and Bromme, 2007) and were used by Tombros *et al* (2005), in their study of Web page assessment.

Tombros *et al* asked their volunteers to explain what constituted useful information on the Web pages they chose to view. In this study, by contrast, volunteers were asked to state which features of a website helped them decide whether or not the site itself was likely to be of value, and to describe how they used those features to help them arrive at a decision.

The resulting descriptions by volunteers of their thought processes, helped to make explicit the evaluation criteria they were using, and the extent to which they were aware of the appropriateness of those criteria to the tasks in which they were engaged. This helped to make explicit any metacognition in the students' evaluation strategies.

The search exercises in which volunteers participated were designed to bring the volunteers into contact with a variety of Web pages, ranging from blogs and forums to authoritative sites.

2.1 Methods

Postgraduate students from across the University of Placename were invited to the Department of Information Studies to take part in a study of search behaviour funded by the Arts & Humanities Research Council. The subjects represented a cross-section of disciplines taught at the university (Table 1). Volunteers were paid for their time.

Before a search session, volunteers were sent an email which asked them to come to the session with an idea for something they wished to search for. They were told that they should not investigate it prior to the session. The topic was to be selected according to the following instruction:

The Internet is a great place for circulating myths and passing them off as facts. For example, you may read that
- *"You're never more than six feet from a rat".*
- *"Yak's milk is pink".*
- *"We only use 30% of our brain power".*
- *"Everyone should drink at least two litres of water per day".*
For this exercise, we would like you to use an Internet search engine to research a 'fact' which you think may not be true. Please do NOT use any of examples above.

On presenting themselves volunteers were told that their selected search would be the first of three exercises. The second search undertaken was to find evidence that supported or countered the following statement:

> *It is widely believed in Britain that a swan's wing is strong enough to break a man's leg.*

For the third search exercise, volunteers were told to use any online resource to answer the following question:

> *At which sport did Oscar Wilde represent his first college?*

Volunteers were informed that, on completing each of the first two exercises, they would be required to state whether they thought the myth they were investigating was true, false or unverifiable. Implicit within the exercise therefore, was the need to balance sources and to make assessments about the credibility of sources.

The first exercise helped to ensure that volunteers had a personal interest in at least one of the searches, and so provided a useful starting point for discussion. The second was based on a belief that has persisted for hundreds of years (eg, De Buffon,1810) for which there appears to be only anecdotal evidence. It therefore provided insurance in the event of the first exercise proving too trivial, and it allowed the researchers to further explore themes that had arisen when discussing the search based on the volunteer's chosen topic.

The second exercise required volunteers to assess websites which contained accounts based on personal experience. The final exercise by contrast, was a search for a specific 'fact'. Volunteers were therefore seeking authoritative sites and making judgements about how authoritative the sites were.

All volunteers were informed prior to their appointment that search sessions would be recorded. Recordings were made using My Screen Recorder (Deskshare software). Volunteers were encouraged to "think aloud" as they searched, and to explain their actions and strategies.

Rieh and Danielson (2007) identify the key question to be asked in determining whether or not information is credible as being "Can I trust this information?" At the start of each session therefore, when volunteers had begun to select and read websites, they were asked:

> "When you come to a website, what sort of questions do you ask yourself about it in order to decide whether or not it's trustworthy?"

Most of the other questions asked in the course of a search session were context specific and related to the volunteer's actions and explanation for those actions. The only other question asked of all participants was:

> "Have you received formal tuition in searching the Internet?"

If the student answered "Yes", he or she was then asked whether that tuition had been received during their current course, and whether they had received any before that.

Recordings were transcribed and analysed using Atlas.ti. Transcripts were then subjected to ethnographic content analysis (ECA)

> "to document and understand the communication of meaning, as well as to verify theoretical relationships" (Altheide, 1987:68).

ECA is a wholly qualitative form of analysis. As such, it avoids making the sort of positivist assumptions about objectivity that are implied by measures such as intercoder reliability. Occasionally, where there is appropriate evidence, quantitative elements have been introduced into this paper. Being primarily qualitative however, it is intended to indicate the possibility of issues and to describe their nature, rather than to assess their extent.

3. Results

3.1 The sampled
A total of 48 postgraduate students from a range of disciplines took part in the study (see Table 1).

Subject	No.	Mean age in years (sd)	Mean no. of years since first Internet use (sd)
Science & engineering	27	27 (5.2)	10 (1.9)
Arts, humanities & social sciences	21	28 (6.8)	12 (3.8)

Table 1: Student profile

No. of volunteers who received Internet search training…	No.	Percentage (N = 48)
...before their current course	2	4.17
…during their current course	11	22.92
...before and during the current course	0	0

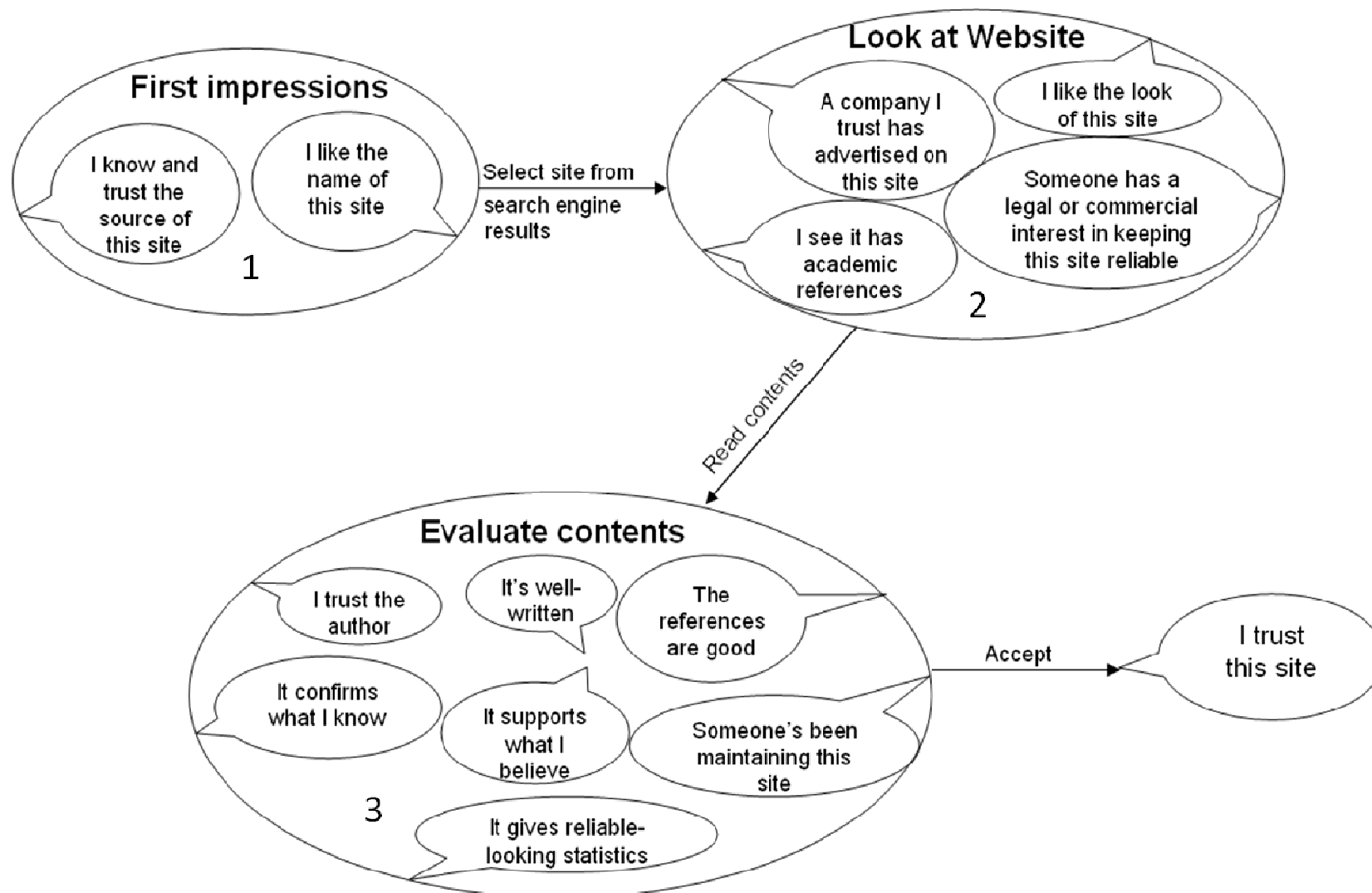**Table 2**: Percentages of students who received formal search training

Figure 1: A summary of factors used by students to evaluate Website credibility.

3.1 Evaluation criteria
The criteria adopted by the students taking part in this study are summarized below, and in Figure 1. Metacognitive aspects of the evaluation are discussed after Figure 1.

3.1.1 First impressions
Some assessments of a site were made without any examination of its contents. Factors important in helping searchers decide to reject a site or to open it included
- Name
- User prejudice
- Web site description
- URL.

Often, the above criteria were used to determine provenance, but occasionally other judgements were based on them as well.

Name
The website name clearly influenced whether or not a link was selected from the results list. Volunteers were drawn to familiar sites, for example:

>*"I'm clicking on this because I trust CNN" (NH1707)*

>*"…because it's BBC, I will trust it" (EN2707).*

In such cases, the name was clearly linked to an organisation with a reputation of which the searchers were aware; but even where the site was new to them, they would use the name to help assess it.

>*"That website doesn't look very good… This 'MumsNet'… Sounds like a strange name. (LF2407)*

>*"I like the name of this website. 'Scientific Daily'. I trust a website like this. (CL2107).*

User prejudice
The reaction that some volunteers showed in response to certain names was often due to prejudice. The trust expressed in organisations such as the BBC and CNN for example, could be regarded as a positive prejudice. Only two volunteers explicitly voiced a negative prejudice when explaining why they rejected certain websites. In both cases it was against American sites.:

>*"I don't trust, much, American sites… Because I know the spin that goes on there". (JW1208)*

>*"Sometimes things from America might not be relevant to what I'm looking for. And I tend to distrust… I think they have a lot more pseudoscience out there. Though that could be totally biased." (JK2807)*

Web site description
The short description that was provided beneath the website title in the list of search engine results also played a part in whether or not the site was used.

>*"That I like the sound of: 'Water Fluoridation – The Facts'. Hard. No nonsense." (PW2207)*

>*"This one says it's the official [Oscar Wilde] website… it looks like, whoever wrote it, knows about Oscar Wilde." (EN2707)*

URL

Volunteers used URLs to help them assess the nature and quality of sites

> *"I was kind of looking at the actual URL and the edu ending kind of made me want to go and look at it" (CD0708)*

> *"I look for the website URL – whether it's gov or edu. So based upon that I look for the information." (SS0608)*

3.1.2 Website appearance

Once a site was selected, factors such as design and layout had a noticeable effect on how it was evaluated. Volunteers explicitly mentioned
- Advertising
- Layout
- Presence of references.

Advertising

Advertisements were seen as an indicator of quality. Some participants considered sponsorship of any sort to be suspect:

> *"One of the reasons that I... cannot trust the website is that… scientific websites do not use some sort of logos or some sort of advertisement like these. (RR2807)*

Other volunteers felt that advertisements relating to the theme of the site showed confidence on the part of the advertiser:

> *"…looking at it, I can see that it has a lot of sponsored links relating to it… Stuff in the medical field. So it looks like they know what they're doing." (IA1108)*

Where a site was unspecific, the nature of the advertisements it bore helped to shape opinions:

> *"From the looks of the advertisements, it doesn't look very useful." (MM2407)*

One volunteer immediately expressed suspicion of a website because of the adverts it displayed:

> *"…trustworthiness is never improved by having all these Viagra adverts down the side of it… because it shows that… basically they'll take advertising from anyone…*

He later encountered another site which he considered to be more reliable, at least partly because of the advertisers who funded it:

> *"In terms of the sponsorship and advertising on the page, it's not trying to sell me some sort of bootleg Viagra. It's Specsavers. I shop in Specsavers. I'm more likely to trust a page that's advertising something that's respectable... (AD1108)*

Layout

Volunteers drew conclusions about the nature of the people or bodies that authored websites based on their layout:

> *"I'd almost say, in this example, the relative lack of design is reflective of something that's probably quite academic … It's just text"* (PW2207)

> *"It looks fairly professional. It looks like a group of people that are concerned more about ornithology than actually that myth in particular..."* (OW0508)

Ironically, both professional and unprofessional-looking websites were regarded with mistrust. On the one hand, there were concerns that the site's authors were uninformed

> *"…I don't think it's one that I would necessarily trust. Mainly cos it looks like one that anyone could have put up, so you never know whether what they're saying is true."* (NH3007)

On the other, slickness led to suspicion, possibly of bias:

> *"… the fluoridation website that I was looking at seemed very happy, clappy, slappy, friendly. You know. Take it with a pinch of salt – it has a very very polished front to it".*

The same volunteer later made more favourable associations based on the amateurish nature of a site:

> *"You almost get the impression that this wasn't designed for the Internet. This is literally just the text dumped from some journal. It's not referenced… It does seem to be an opinion piece almost. So I'm getting the sense that it's soft academia."* (PW2207)

Presence of references

The presence or absence of references in an article was used as an indicator of quality.

> *"I like good references for whatever answers are being provided."* (FO0608)

Websites without references were thought to be dubious:

> *"First of all, this page has no reference… without reference, I would say it's not a hundred percent sure whether this one's reliable…"* (SS3007)

Where they were present however, references helped to persuade volunteers that the website was supported by research:

> *"If it was an actual, like, scientific website that… was referencing things so that it really sounded like it knew what it was talking about, then I would probably trust it."* (NH3007)

References gave confidence to searchers that they would be able to corroborate whatever was written on the site being considered:

> *"For example, from this web page, someone may answer this question and will use some reference to support their statement, so I just want to find that reference."* (CL2107)

3.1.3 Accountability

Another factor which affected whether or not users trusted a website was perceived accountability. If volunteers believed that the site's authors were answerable for the content, they were more inclined to believe it. Accountability was identified from three different sources:

- Customer relations
- Brand reputation
- Legal protection

Customer relations

Some users held the view that, if websites were being used for commercial purposes, then unreliability was bad for business.

> *"If they're company websites, I feel that they would be reliable because they're trying to present to their customers that they understand the process of what they're doing and they wouldn't put information that is not true. Because… it's a public page, and people could easily question them – 'that's not true – your product is wrong'"* (IA1108)

> *"… we can believe it to a fair degree… Because this website is basically a business website for selling something, so if they give some wrong information… that's not good for their business."* (AR2307)

Brand reputation

Some websites were trusted because the organisation responsible for them had a reputation to uphold.

> *"…most times organizations want to protect the integrity of name, so they wouldn't want to post something that is a hoax…"* (MA0708)

One of the volunteers was a student of journalism, and this consideration obviously played a part in his assessment of websites.

> *"… cos it's BBC… they would get it right because they've got a reputation to uphold."* ...

> *"I do think that websites where it's a known kind of brand, like the Guardian… would probably have to substantiate what they said a bit better than just any old forum would."* (NH3007)

Legal protection

One volunteer took the view that the law played a part in ensuring the reliability of websites:

> *"It's all part of the New York Times. I think it can be trusted. At least, they're a very big company who can be sued if they're telling lies."*

Later, she gave a similar reason for trusting an online book:

> *"It's a book they just put on the website. I think the owner would scream if he saw a difference in what he wrote and what has been published on the website."* (IA1108)

3.1.4 Contents

All the evaluation criteria listed so far have been based on aspects that were considered before the volunteers actually began to read the site being assessed. When they did so, other criteria emerged, in particular:

- Authorship
- Quality of writing
- Quality of references
- Corroboration
- Bias
- Evidence of maintenance
- Evidence of research.

Authorship

Some volunteers expressed frustration when no clue was given to the identity of the author:

> *"Who are you? I don't know who the person is. I don't know. No references, so I really can't tell" (FO0608)*

Details of authorship were considered helpful in assessing the quality of a site:

> *"I try to critically evaluate things… .Who is behind this, who has written it, and his or her background as well, and then those sources, references they are using... It's difficult to… evaluate if I know none of them" (ST2907)*

Quality of Writing

Volunteers drew several conclusions about a website from an analysis of the language used. Writing style was associated with certain types of document:

> *"I judge this web page is useful from its writing style…Its writing style is just like a scientific paper. (CL2107)*

Use of specialist vocabulary was taken as indicating expertise:

> *"I am prone to trusting this article because it is written by someone who obviously knows the lingo... It has the sheen of competency to it…. Lots of technical terms that are all referenced…. If I wanted to, I could chase every term and get an idea of what it meant." (PW2207)*

None of the participants mentioned grammar as a factor in their evaluations, and PW2207 was the only volunteer to refer to spelling. He felt that it was "*indicative of the standard of a forum.*"

Quality of references

As was discussed under *site presentation (presence of references)*, some volunteers found the presence of references helpful in determining whether or not a site was worth further study. Where websites were studied further, the quality of the references played a part in helping volunteers to decide whether or not what they read was trustworthy:

> *"It's a bit like, when you read a journal article, you always go and check where something has been taken from because – yeah – it might make a difference if you know the source, or if you don't" (CD0708).*

> *"I look at the name and I look at what they've done, and then I look at the reference list to see what research work is involved with what they place on site" (MA0708).*

Corroboration

If the information on a website confirmed what searchers already knew, it increased their confidence in the reliability of the contents.

> "…if it's useful and they're saying something really true, then only, I trust the website. I compare it with my knowledge…" (YT0508).

> "I'd always think that what they're telling me is untrue primarily – until it's verified. So I'd look for things that I'd probably know to be true and see if it's corroborated" (OW0508).

Alternatively, if volunteers were searching for something about which they knew nothing, they would seek corroboration on other sites:

> "Most of the time I'm not really, really bothered about how reliable it is, because after I've searched, like, two or four websites, you can compare what everyone is saying and come to your own conclusions. So really, if five people are saying the same thing, then you can't go wrong" (IA1108).

> "Then I found this information. I'm not sure whether it is correct or not. Again, I need to find another website or another information, paper, website or whatever, to be reassured that information that I read here for the first time is true or not" (RR2807).

Bias

As was discussed under *First impressions (User prejudice),* volunteers were clearly aware of the possibility of bias. Where bias was assumed, the normal response was to ignore the site:

> "…Healthspan [sponsored link] – *that's a company, so they're going to be biased, so I'm not really interested in that" (JK2807).

> "the views that the BBC has on China, you can see that it's…biased" (NC0608).

One volunteer however, deliberately amended his search in an attempt to find sites with a different bias. He had been searching to see whether or not there was evidence to support the view that mobile phone usage caused health problems.

> "I'll try to type in the word myth to try to get a different angle on this search. I was afraid if I say 'mobile radiation' and link it with a word like 'tumour' or 'blood pressure' that I will more find websites who say there is a link than websites who claim that there is actually just a myth – that it's made up…   Just to give the other side more or less a chance" (SP2407).

Evidence of maintenance

Website maintenance was not explicitly raised as an issue by any of the participants in the study, though two volunteers were influenced by factors which indicated the frequency of maintenance. One noted, with approval, the presence of a date on the page she was studying:

> "I'd want to see an author – which there is, and a date - which there is as well, which would make me believe more" (EN2707).

Another volunteer commented critically on the fact that some hyperlinks on the page no longer worked:

> "The organisation of the website is also another issue… they are not organised very well … Some of the links are broken" (AR2307).

Evidence of research
Sites such as forums and blogs tended to be dismissed as opinion sites.

> "…these are just 'I have heard this' and 'I saw this' and 'I heard this" (HK3107).

> "…it's just posts from different people concerning their views... It doesn't give me any concrete information to base my search on – just some views of people about what I'm thinking about – people who are as confused as I am" (IA1108).

Other sites, with official-sounding names, were better received:

> "It seems to be an organisation. It seems to state some proper facts" (GB2907).

One recognized source of "concrete information" and "proper facts" was refereed papers:

> "So - to take scientific information, it should be a peer-reviewed journal" (GB2907).

> "…if you look at papers and stuff then they've got some merit to them, you would have thought" (AT2007).

Another sign that facts, rather than opinions, were being presented, was the presence of statistics:

> "I'd probably be looking for some statistics. Maybe some news report, or maybe some statistics" (FO0608).

> "I think it's believable… It's from Harvard University and also some research data" (JL1707).

3.2. Evaluation processes
The lists above present a series of criteria adopted in the evaluation of websites. Figure 1 summarizes the thoughts expressed by volunteers who decided to select a link and read the associated website.

Volunteers were, in effect, attempting to answer two implicit questions. The first is "Which of the available sources (i.e., search results) should be considered further?" In Figure 1, sections 1 and 2 show the range of criteria used to help answer this question.

The second implicit question is: "Having chosen to consider a source further, should its contents be trusted?" Section 3 in Figure 1 summarizes the reasons given for trusting contents.

In judging the trustworthiness of a site, volunteers based their assessment on characteristics inherent in the site (such as design and layout), on whether the contents of the site supported what they knew or believed, or on the assumption that an organisation associated with the site would confer reliability. The associated organisation could either be the producer of the website, or one responsible for ensuring the legality of claims.

As is clear from Table 2, most (73%) of the participating students had received no formal tuition in Internet searching. In retrospect, more questions should have been asked about the nature of the training that was received. However, comments made by the interviewees suggest that, at the University of Placename, the teaching of Internet search skills focuses largely on descriptions of the technology, and explanations of how to use it. Students participating in the study appeared to have been given little structured guidance on the evaluation of websites. Some of them therefore, will have developed their own guidelines for evaluation, and it is these that give the clearest evidence of metacognition, as discussed below.

Impact of training
Where volunteers had been given advice on the reliability of websites, it appears often to have been superficial and, on occasions (as described below) proved counterproductive.

According to Bonds *et al,* (1992), a student showing metacognitive behaviour will not only possess knowledge relevant to the task being undertaken, he or she will apply that knowledge in ways that vary depending on the nature of the task. Some of the volunteers in this study clearly engaged in such behaviour. Others by contrast, rigidly applied lessons learned at school or university

What is the purpose of this search?
When considering the reliability of websites, some of the users were obviously asking themselves how reliable the information needed to be for the purposes of the search they were undertaking:

> *"Now when I search something like this, I won't do a thorough search to make sure that this is a true fact. When it's something scientific, related to my work, it will be more thorough than this."* (GB2907)

This volunteer was engaging in the kind of behaviour described by Metzger (2007:2080):

> *"In general, Internet users scored highest on the actions that are easiest to perform and that only require their opinion…, and lowest on the recommendations that are more time consuming and that require effort to perform..."*

In this case however, the student had made a conscious assessment of his needs and tailored his search accordingly. Such tailoring of search behaviour was particularly noticeable amongst users of Wikipedia:

> *"I use it* [Wikipedia] *sometimes when I need some quick, very general information about some topic…. But I don't really use it when I need some very reliable information.* (CD0708)

> *"…for professional work, I wouldn't go near it. I don't even want to see what's there. But for informal work, probably I want to find out something about a country, or where it is, yeah, I would use Wiki."* (IA1108)

What have I been taught about this site?
Unsurprisingly, Wikipedia proved a popular site; but it was obvious from the comments of volunteers that they had been warned to treat it with caution:

> "[At the] *University of Placename, they do not accept this as a reliable source.*" (AK0308)

> "*…throughout university you're told not to go on Wikipedia because it's not that reputable*" (AT2007)

Similar caution was expressed by some of the academics contacted by Chen (2010). However, he also found that academics who used Wikipedia were more likely to approve of its use by their students, particularly as a means of gaining an introduction to a subject and finding peer-reviewed resources.

None of the participants in this study reported any such guidance. However, some clearly recognized that Wikipedia could be helpful if used in such a manner:

> "*If I'm looking for a particular topic and Wikipedia has it, I would go there to first of all look at the definition – usually helps me with that. And if it has references, I would go there to search for the references.* (OO3007)

> "*I don't trust the Wikipedia straight away, but I trust the references.*" (AR2307)

There was however, one instance where a volunteer (SP2007) would have benefited from the sort of reflection associated with metacognition. Her unquestioning response to a tutor's warnings about Wikipedia led to rejection of Wikipedia in favour of Uncyclopedia. To the student, this appeared "*sort of related*" to Wikipedia, but "*could be a good source*". Uncyclopedia is, in fact, a parody of Wikipedia and describes itself as a "content-free" encyclopaedia.

This incident accords with the findings of Lim (2009:2199), who reported that

> "the uneasiness associated with the anonymous authorships of Wikipedia has led to nonexpert users' underestimation of the reliability of Wikipedia, which has apparently affected their perceptions of information quality."

How authoritative are sites of this nature?
Similar rigid application of learned rules adversely affected evaluation of the authority of some web-based resources.

Just as consumers of news media rank their sources according to their perception of relative credibility (Roper, 1985), so too did participants in this study. A tentative summary of this ranking is given in Figure 2. This ranking differs from the findings of Martin (2008), whose survey of undergraduates suggested that academic journals were seen as the most credible source. However, since it is derived from a qualitative study, it should be treated as the basis for further research, rather than as a definitive model.
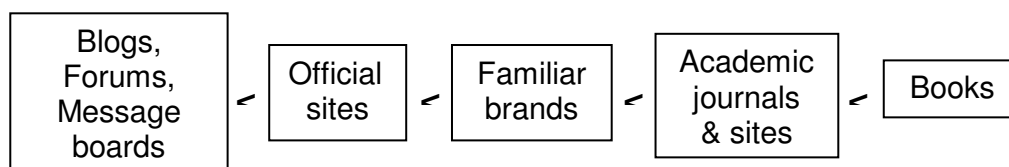
Figure 2: Implicit ranking of website reliability

Blogs and forums
There was widespread suspicion of forums and blogs. Everyone who commented on them expressed reservations, but the extent of the reservations varied. Some volunteers were totally dismissive of such sites:

> *"I never trust any of those." (LF2407)*

> *"I think that's a problem with all these forums: a lot of gibberish" (MM2407)*

Others were more nuanced in their analysis of the content. One volunteer was seeking to determine whether or not there was truth in the belief that running shoes should be replaced every 500 miles. He came across a message board which looked relevant:

> *"…you get a lot of rubbish, but there are some people who say some really good things." (NH1707).*

His comments were interesting in that he was explicitly attempting to evaluate, not only the message board's content, but also the people responsible for the content. One entry purported to give the views of unspecified health professionals, and the volunteer's comments clearly indicated that he was thinking about his thinking and adjusting his evaluation of the entry accordingly:

> *"But now that I think about it - I'm only thinking about it because I'm telling you – qualified health professionals… A doctor. I would say a doctor wouldn't really know the answer to that question."*

Official sites
Sites which were considered to be the official sites of recognised organisations (particularly government bodies) were accorded some respect:

> *"….it might make a difference if you know the source, or if you don't… Like if it's an official source of statistics, or something like that." (CD0408)*

> *"You have to look at who it's set up by. Is it affiliated with anything more official or more academic, or something like that?" (LH0708)*

Government websites were actively sought by some volunteers:

> *"I'm kind of thinking that it might be worth looking at some sort of government websites, you know – health advisory websites." (AT2007)*

There were reservations expressed about information from such a source however. Some were based on generic mistrust:

> *"…this is a government website… I rely more on the scientists rather than the government…" (TR2907)*

Occasionally though, volunteers made an explicit effort to evaluate the contents of the site in the light of their own thoughts on the matter rather than on criteria applied *a priori* :

> *"It's quite nice. You'd have to take it very - this is a government trying to justify fluoridation, but it's nice and bullet pointed and interesting. I don't know how that weighs in with my opinion and things." (PW2207)*

Familiar brands
As was stated earlier, websites associated with familiar brands were respected. Those mentioned as being trusted brands included BBC, CNN, Daily Mail, Guardian, Independent, NASA, National Geographic, Times.

Academic journals and university sites
Considerable faith was expressed in the reliability of journals and academic websites:

> *"…if you look at any site then anyone could write whatever, but if you look at papers and stuff then they've got some merit to them, you would have thought."* (AT2007)

> *"We can go to these people's research papers or journals, so that we can get the appropriate information. Because they cannot make mistakes in journals when they publish."* (SS0608)

Sometimes, it was enough for the website under review just to resemble a journal article:

> *"It reminds me of scientific paper, so I think that should be more accurate - more scientific."* (CL2107)

Only one volunteer expressed any doubt about the content of peer-reviewed publications:

> *"…when we look for certain things in well-respected journals – the best scientific journals, you find some misleading scientific information."* (GB2907)

Books
No reservations were expressed about books, including electronic versions of books available on-line.

> *"I was taught using books. And because I was taught using books, so far they've been proved to be correct. I just assume that they will continue to be correct."* (IA1108)

> *"Books are published – got peer reviewed and publishers and editors… It's not just anybody can publish books I think. And especially things on Google Books should be reasonably… not just dodgy books"* (LF2407).

In dealing with sites that were considered authoritative therefore, there was a tendency in some cases to accept the contents without thought or reflection.

3.2.2 Rules or guidelines?
Use of the heuristics varied in nature. At one extreme, searchers imposed them on their search as though they were rules. At the other extreme, volunteers were more metacognitive and treated them as guidelines.

In such cases, the heuristics helped to direct the students' thinking concerning the quality of material in a website. Before coming to a conclusion however, they gave thought to contextual factors, such as the purpose of their search, how much effort was needed, and how reliable the information needed to be.

The instance of the student who used Uncyclopedia in preference to Wikipedia is an example of rule-based evaluation. Another example occurred when a student was

searching to discover whether or not a swan's wing can break a leg. She found mention of the belief in Google Books and declared

> *"This one should be reliable – it's a book."* (LF2407)

She found a phrase in the online book that referred to the fierceness of swans and their ability to "break a man's leg", and exclaimed:

> *"Ah! I've got my answer!"*

Asked if she believed it, she simply stated:

> *"Yes. It's a book."*

Another student finding the same reference responded differently. Earlier, when he had found a discrepancy between information on a website and information derived from a quotation in a book review, he declared that he would trust the book more. When he read the passage that had convinced LF2407 however, he observed that

> *"…the book is named 'Brief Therapy: Myths, methods and metaphors' so it's not stating a fact."* (GB2907)

The fact that he was reading from a book probably influenced his assessment of the information's reliability but, unlike LF2407, it was a contributory rather than a deciding factor.

Another example of a more pragmatic adoption of heuristics is the use of Wikipedia reported earlier, by students who heeded the warnings of their lecturers, but felt that Wikipedia was good enough for their current search.

3.2.3 Filtering

Volunteers who had a mental ranking of websites made use of that ranking to help filter out less reliable sites from their searches. Some did this on inspection of their search results. Examples of such behaviour are the students (such as those quoted above under *First impressions* (URL)) who sifted their results to find government and academic sites.   Others adopted a search strategy intended to get the search engine to filter out untrustworthy sites. Some volunteers for example, chose to limit their search to PDF files:

> *"…when I am searching for some kind of information, sometimes I just write 'search within results .pdf' so that only the pdfs in the documents come…."* (DM0708)

Another volunteer added pdf as a term in the search box because

> *"Usually they publish papers in pdf. Papers are quite reliable because they're published."* (PK2107)

Filtering behaviour also revealed incidences of heuristics being used as rules rather than guidelines. One of the two students quoted above under *First impressions* (URL) was actively looking for gov or edu sites. He was an Indian student and appeared not to realise that such behaviour would eliminate many potentially valuable academic and government sites in the UK.

4. Conclusions

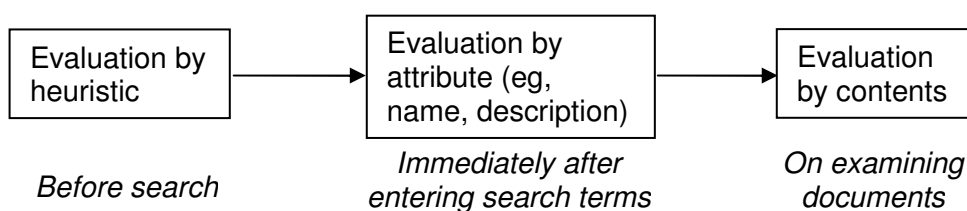| Evaluation by heuristic	→	Evaluation by attribute (eg, name, description)	→	Evaluation by contents
Before search		*Immediately after entering search terms*		*On examining documents*

Figure 3: Stage of search at which evaluative factors begin to come into effect.

Not surprisingly, the different evaluative factors identified came into effect at different stages of the search (Figure 3). The heuristics were in place before the search began, and affected all subsequent stages. Other evaluative factors required interaction with search results.

The findings of this study suggest that, with regard to the issue of website evaluation, metacognition is most relevant where it is lacking. This was particularly obvious where heuristics were applied without question.

Two noteworthy instances were referred to above: the student who selected Uncylopedia in preference to Wikipedia, and the student who concluded that swans could break a man's leg because the belief was referred to in a book. That such simplistic evaluations could be adopted by postgraduates is a source of concern.

Conversely however, some of the volunteers were clearly able to examine their own evaluation criteria and processes and adapt them to the search context in a way that could be considered metacognitive. Some of the comments made about Wikipedia, for example, indicated a habit of thinking about which evaluation criteria were relevant to the task in hand. Similarly, the student who explicitly reflected on the relevance of the views of health professionals regarding running shoes was clearly thinking about his own thoughts.

A number of studies (eg, Martin, 2008, Currie *et al*, 2010) have questioned the effectiveness of information literacy training in helping students to assess the credibility of Internet-based resources. However, care should be taken to ensure that trainers do not attempt to provide students with a set of rules. Amongst her conclusions, Lim (2009:2120) includes the recommendation
"that educators and librarians need to provide better guidelines for using Wikipedia, rather than prohibiting its use altogether."

The findings of this study would certainly endorse this recommendation, and not only for Wikipedia . Any guidelines should be extended to a more nuanced evaluation of websites in general. Some students who used the hierarchy of website reliability presented in Figure 2 appeared to suspend all their critical faculties. In the worst instances, they rejected, without question, information from blogs, forums and message boards; and accepted, without question, anything that came from academic papers and books.   Although some of the students demonstrated a clear understanding of the processes (such as peer-review and editorial control) that generally make books and academic journals more reliable than blogs and forums, such an understanding was far from universal.

Some of participants in this study did approach the tasks set for them with a degree of reflection and self-questioning suggestive of metacognition. Others however, blindly applied simplistic evaluation criteria. Such a practice may be appropriate within schools, but all the volunteers being interviewed for this research were post-graduates.

The nature of the sample is such that it cannot be regarded as representative of the student body as a whole. However, since this was a qualitative study, it has value in indicating the possibility of problems and in describing their nature: it cannot be used to assess their extent. Given the fact that the study sample comprised only postgraduates, it seems reasonable to suppose that the issues identified in the course of this study are no less problematic amongst other groups of students. An appropriately framed quantitative study could prove invaluable in determining whether or not problems with the evaluation of websites are sufficiently widespread to be of concern.

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