

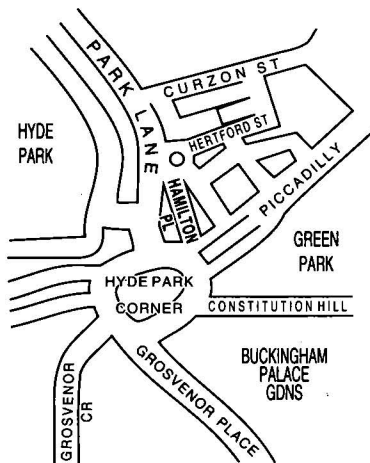


Programme for the 1999/2000 season of members' meetings

April 4th 2000	E-commerce security, going beyond basic: Internet risks covered in the earlier meeting	Full day briefing
May 16th 2000	BS 7799 developments Derek Oliver - Ravenswood Consultants	Late afternoon

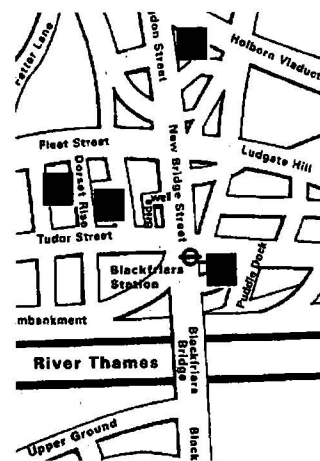
The late afternoon meetings are free of charge to members. For full day briefings a modest, very competitive, charge is made, to cover both lunch and a full printed delegate's pack.

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EDITORIAL

As some of you will be aware, I have long been a proponent of using spare computer power for research purposes and for the last six months I have been helping the search for extra terrestrial intelligence (SETI).

The SETI project is using spare computer time around the world to analyse radio signals from outer space for signs of life. So far about 250,000 people have signed up to the project which works on the basis of using your computer's idle moments (and most machines are only used for about two hours per day) to process a block of radio data which is passed to you from a central computer.

Once the block is analysed it is passed back to the centre and your machine receives another one. Your involvement is minimal as the analyser is a screen saver (very pretty too) which kicks in when the machine has nothing else to do. The central computer knows who has analysed each block, so if it is your block which contains the equivalent of 'here we are', then you get the recognition. If you want to give it a go, point your browser to www.setiathome.ssl.berkeley.edu. You never know, there may be computer auditors out there looking for signs of intelligent life over here, but please do not use your firm's machine for this without authority.

What has this got to do with the content of this edition?

Well, the main article is about Internet search engines which is almost the same as SETI. Getting something useful from your search is about as likely as finding intelligent life in the universe. Indeed, you probably have more chance with the latter. Emma Duke-Williams of Portsmouth University examines the 'psychology' of the various search engines and introduces a few engines of which you may not be aware. David Chadwick, in conjunction with Gillian Windall, raises the thorny subject of computing ethics and Carole Fennelly discusses those 'audits from hell', in a heart rending plea from our client base. Colin Thompson does his usual fine job in explaining what our parent body is up to regarding the new membership requirements, which finally de-mystifies and simplifies what some of us had come to believe was the alchemy of the membership application process. I have also thrown in some useful tips for the annual appraisal process which you may find of interest. Enjoy.

John Mitchell



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Chairman's Corner

John Bevan

We are probably relieved that Feb. 29th 2000 has now passed, without major loss or embarrassment for us. New, more exciting, tasks beckon. However I would like to discuss first what I have learned from the Year 2000 experience. I do not believe it was completely over hyped, just because few problems hit the headlines. Good planning and PR may have kept news of other Y2k problems out of public view! I also know that many potential problems were avoided by major programmes of preventive action. Did some organisations spend too much on these? Possibly a few did, but then they should have realised other benefits, such as gaining a more modern technology infrastructure, or a competitive advantage if they finished work early and capitalised on this. There are lessons here for other projects without an obvious contribution to profitability, like those to satisfy new regulatory demands. Other



organisations, which spent little or nothing on Y2k, may just have been lucky, and their suppliers delivered the compliance promised.

As auditors you no doubt welcomed those Business Continuity Plans that were at last completed, and will seek to ensure they are improved and kept up to date. Because of both Business Continuity and Y2k Programme Planning, more people in your organisation now have a better understanding of business processes, how they interact, which are critical, what role IS and IT plays in them, etc. Some organisations have formalised and recorded this knowledge, but unfortunately I suspect that most will not maintain it, so it can only make a reducing contribution to future business and technology planning. In mainland Europe I saw that some organisations hired respected, external, third party auditors (e.g. TUV) to produce public compliance certificates for Y2k programmes, providing reassurance to both customers and shareholders. Was this better than relying just on private audit reviews of the Y2k programme, or than participation in the closed, industrial sector specific, groups that some organisations joined? Is there more scope for more external, third party, audits and certificates in future? Do you support this trend, and plan to change your approach to computer auditing accordingly?

GUIDELINES FOR POTENTIAL AUTHORS

The *Journal* publishes various types of article.

Refereed articles are academic in nature and reflect the Group's links with the BCS, which is a learned institute governed by the rules of the Privy Council. Articles of this nature will be reviewed by our academic editor prior to publication and may undergo several iterations before publication. Lengthy dissertations may be serialised.

Technical articles on any IS audit, security, or control issue are welcome. Articles of this nature will be reviewed by the editor and will usually receive minimal suggestions for change prior to publication. News and comment articles, dealing with areas of topical interest, will generally be accepted as provided, with the proviso of being edited for brevity. Book and product reviews should be discussed with the appropriate member of the editorial panel prior to submission. All submissions should either be on double spaced, single-sided A4 paper, e-mail, or on PC format diskette in Microsoft Word, Ami-Pro, or ASCII format. Electronic submission is preferred.

Submissions should be accompanied by a short biography of the author(s) and a good quality monochrome photograph, or electronic image.

Submission Deadlines

Spring Edition	7th February
Summer Edition	7th May
Autumn Edition	7th August
Winter Edition	7th November

*Most of us use search engines in to attempt to pinpoint information on the web.
This article examines the psychology of the engines. Know thine enemy perhaps? - Ed.*

Seek and ye shall find . . .

On the Internet - perhaps not?

Emma Duke-Williams

My mother frequently phones with "Emma, can you just find . . . on the Internet", this is usually an elusive answer to some general knowledge quiz she is doing or my nephew's homework. As those of use who use the web know, it is generally not always as easy a task as we would like. We all tend to turn to a search engine - of which we usually have a favourite, and key in useful words - then are frequently confronted with

"AltaVista has found 28,192 pages on chocolate cake" (are there really that many people creating web pages about cake!)

For every person that can effectively use search techniques a fair proportion of the time there are far more who get frustrated by a seemingly endless list of pages that do not apparently answer the question - or, worse still, nothing at all.

One simple reason for this is simply the scale of the problem. While no-one knows for sure exactly how many pages there are on the Internet, most would see Lawrence and Giles' estimate in June 1999 of 800,000,000 pages as being a fair estimate. (Newspapers in January 2000 were suggesting that the total now exceeds 1 [American] billion). They also estimated that 83% contain commercial information. Of the rest they classified some 6% as educational/scientific (and, contrary to popular belief, only a mere 1.5% as pornography). (Lawrence and Giles 1999)

In order to understand the reasons why we are getting such results we first need to understand how search engines work.

Search Engines and Directories

In fact there are search engines and directories - and increasingly services that are hybrids of the two. Many people though use these terms interchangeably. That people use them is not debated. The 10th Gvu survey (1999) suggested that 84% of people used search engines to find new material.

Directories are created by people, the best known and used being Yahoo! (Yahoo is frequently listed by MediaMetrix [www.mediametrix.com] as being the most visited site on the whole web). Sites are submitted, generally in the appropriate category selected by the submitter, and experts on the appropriate areas review the page, accepting it or not as the case may be. A database is then created.

In addition to services such as Yahoo, there are rating services such as Argus (www.clearinghouse.net/) in which the reviewers are trained in their subject. While this means that the number of pages listed is restricted, they are generally accurate, and related more to academic areas than social. Using the chocolate cake example from earlier no results were found.

Search engines rely on "spiders" or "web bots" - a program that retrieves data from web pages, then creates a database from the text.

Once a user has entered a search term into the database, the actual algorithms used to locate relevant material vary - though in general the frequency of the word and its location in the document are considered.

Looking at the whole range of services we can see that there is generally a trade off between number of pages indexed and likely accuracy.

Search Engines

Looking in more detail at search engines, gives us useful information to both searchers and those trying to get web pages ranked highly in the databases.

Prior to the development of the World Wide Web, there were many files on the Internet, which were generally stored/retrieved by FTP. In order to access them users had to know the address of the computer on which they were stored. And so Archie was born. It was

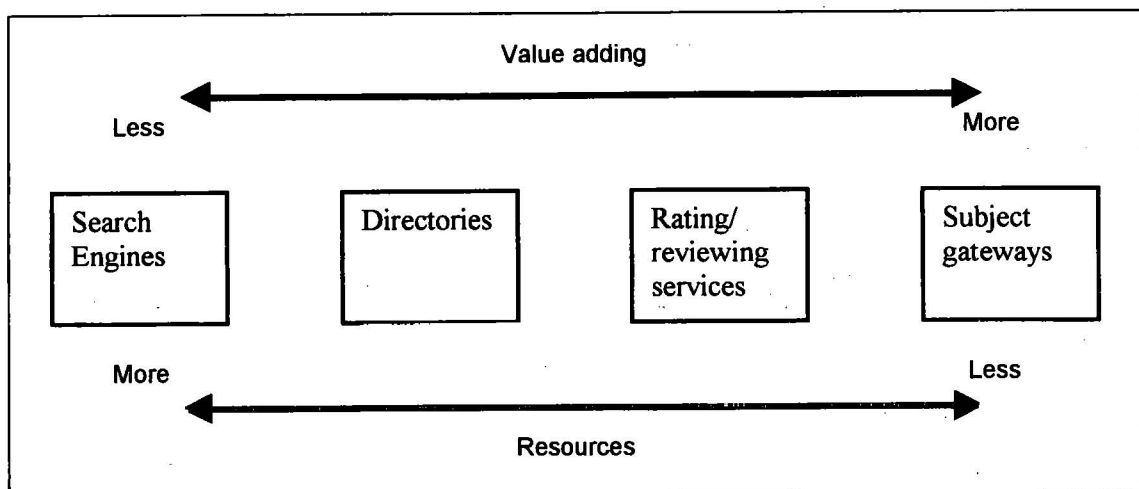


Figure 1 Advantages of different types of search facilities (after Cooke 1999)

a program that found the files and entered them into a database. This could then be searched and would return the address of the holding computer to the requester. The next stage was the development of Veronica - which located the growing number of documents available over the Internet.

However, the next significant stage was the introduction of the World Wide Web; the ability to transmit both textual and graphical data. In June 1993 the first automated program to visit web pages was launched . . . the World Wide Web Wanderer.

It located:

"more than 100 HTTP sites and a total of well over two hundred thousand pages"

the program was re-run in November 1993 causing the author to comment:

"one new site every day since June"

Matthew Gray (date unknown).

It was not without faults, however, primarily the rate at which it visited other sites caused a slowdown in traffic, and some sites to object.

A number of the other early programs lead to problems for administrators, and many sites attempted to ban their visits.

Even today there are many web masters who for one reason or another do not want their web pages listed, and thus exclude visits from the spiders.

All these early programs were essentially data gatherers - there was little attention paid to the data processing.

Yahoo! and Galaxy were in existence by that time, so researchers had two choices:

- ◆ A directory; where sites were read by humans, and put into categories
- ◆ Lists of URLs; longer; but hard to determine the content.

As a result a group of students developed a robot that would extract all the text from a web site, put it into a database. The next stage was to create an interface to allow users to enter a series of keywords. These were matched with the words in the database, and those articles containing the words the most often were deemed to be "best". WebCrawler was launched in 1994. It was so popular that

the number of hits it got (up to 15,000 a day) that it caused its server, the University of Washington's System, to crash virtually every day.

A number of rivals to WebCrawler were introduced over 1994, some of them still in use today - such as Lycos - others no longer exist - such as Open Text. At the end of 1995 however AltaVista was launched. AltaVista saw a change in the interface design. It was much easier to use, the concept of Boolean searching (using 'AND', 'OR' and 'NOT') was introduced, and users could type questions such as "What is the climate of Papua New Guinea" and not receive thousands of pages containing the word "what". In addition the use of very powerful computers meant that users could receive their results in a short time.

The Algorithms

When a user enters a search term, the algorithm attempts to find the "best" result. There are a number of differing methods, and as we have already seen different spiders collect different types of information. The weighting that they put on each type also varies. However, the following are usually used:

- ◆ Frequency of search terms in the documents in the database
- ◆ Combination of all search terms rather than just one.
- ◆ Where in the text term occurs; in the title/ headings/ near beginning/ in the meta tags . . .¹

The search engines however are programmed to ignore spam. This term is used to cover the practice of repeating the same word over and over, in the meta tags, as very small print on the pages, or as text of the same colour as the background. Spamming is done in order to increase the ranking of a page.

Comparing the actual results of the algorithms is hard - however interesting comparisons can be gleaned from the engines powered by Inktomi. Many of the engines actually get their raw data from the same source - Inktomi. However the results from the same query can vary. Entering the same query (Prime Minister Papua New Guinea - with no operators) into several of the engines powered by Inktomi produced a number of different pages as the number one page. (Table 1)

How well is the web covered?

We have seen that the number of web pages is vast . . . the largest engines currently claim to index 300,000,000 pages, i.e. less than half the number there are thought to be.

Engine	First Site
Hotbot	http://www.pngnetsearch.com/Government
MSNSearch	<a href="http://encarta.msn.com/find/Concise.asp?ti=0BDF6000<sup>2</sup">http://encarta.msn.com/find/Concise.asp?ti=0BDF6000²
Snap	http://www.datec.com.pg/pmsoffice/pmsoffice.nsf/pages/home
Anzwers.co.au	<a href="http://www.pngnetsearch.com/Government<sup>3</sup">http://www.pngnetsearch.com/Government³

Table 1 Results for the same query sent to different Inktomi powered engines.

¹ These uses of Meta tags among developers leads to great discussion. While most Engines use them, the extent to which they use them varies. It would seem that many engines look at the correlation between the text in the tag - and that on the actual page. Some do not use tags at all. For further information see Danny Sullivan's web pages. (www.searchenginewatch.com)

² Reference to Sir Julius Chan. As of writing there have been 2 subsequent Prime Ministers since his forced resignation

³ Using the World search rather than Australia - which is the default.

In considering this there are a number of aspects that we need to look at.

- ◆ Coverage.
The percentage of the potential universe that is covered by the database.
- ◆ Recall.
The percentage of relevant documents that are returned from the database to the user.
- ◆ Precision.
The percentage of the returned documents that actually match the query.

Frequent complaints by users regard the low values of precision. The average user cannot estimate the coverage or the recall; he is acutely aware however that a web search frequently finds the whole haystack, rather than the needle.

Search engines frequently boast of their coverage, to try to gain users.

Lawrence and Giles (1999), estimated that the web in February 1999 consisted of 800 million indexable pages.

A random selection of 2,500 servers was then fully crawled, and all the pages analysed manually.

Using a list of 1,050 terms they created queries and sent them to 11 different search engines. These terms were devised at NEC, and thus tend to be science orientated. In their previous work, (Lawrence & Giles 1998), they commented that coverage may be better for more popular topics. All documents retrieved were checked, to ensure that they queries were being correctly processed. They then calculated the coverage of the web as a whole, by comparing the material returned with the random sample they had previously obtained.

It is very easy to see the small coverage by search engines in this diagram. Earlier studies by Lawrence and Giles (1998) had shown higher coverage (up to 34% for HotBot). There is some hope though for searchers in search of elusive material; the overall coverage was around 42%, as there was comparatively little overlap between different engines.

What concerns most users however is precision. They want to be

able to get a site that will answer the question that they had originally.

This is somewhat easier to test, and there have been a number of surveys. There are some differing results; often this depends on the material being searched for.

Filman and Peña-Mora (1998) carried out a survey they declared to be

“...arbitrarily. In an unscientific sampling technique...”

In order to do this they listed 5 items of information that they wanted to find:

- ◆ The text of the Magna Carta
- ◆ The specific gravity of mercury
- ◆ An image; Tchitchew's Hide and Seek
- ◆ The software topic 'event-based programming using publish and subscribe'
- ◆ Names:
 - Feniosky
 - John McCarthy (working at Stanford)

While they claim it to be “unscientific” it covers a range of the type of topics that are likely to be searched for, by those using the Internet for research, at school, university or in the work place. They have not considered though either the social types of searches - such as restaurants in London; nor commercial/financial - should I buy shares in . . .

They used the following engines

- ◆ Lycos
- ◆ infoseek
- ◆ Excite
- ◆ WebCrawler
- ◆ HotBot
- ◆ AltaVista

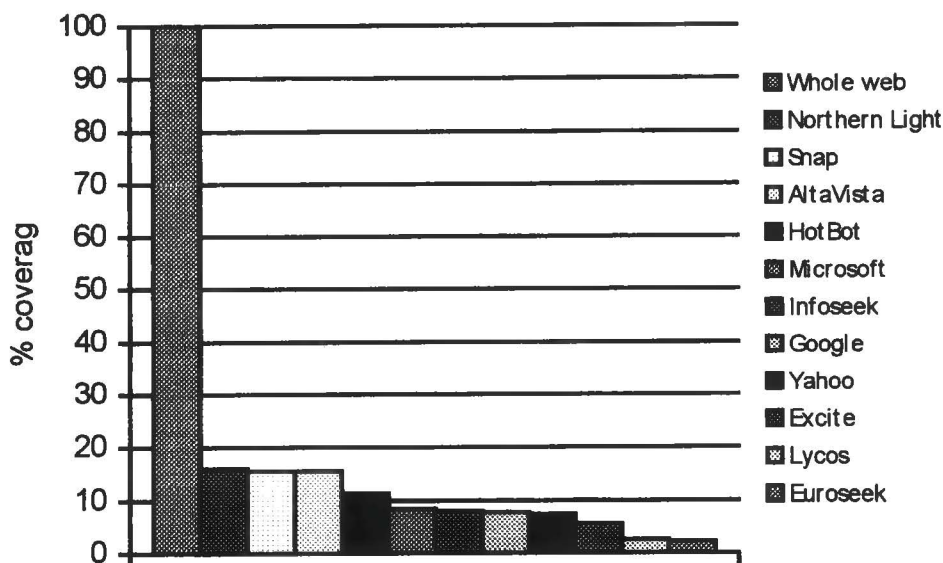


Figure 2 Coverage by different Search Engines (from Lawrence and Giles 1999)

They rated each engine as to the ease of finding the required material. Overall they rated AltaVista as the "best", while HotBot rated least well. Since they performed the survey a number of new engines have come into existence. The author therefore sent the same set of queries to the following engines:

- ◆ Northernlight
- ◆ Google
- ◆ Fast

Due to lack of time only a single simple query was sent to each engine, and the results scanned until the relevant information was found. In addition the query for 'event-based programming using publish and subscribe' was not used (as the author was not confident in analysing such results for accuracy).

Of the other searches, references to Filman's article were found in some cases, before the desired information. "Google" produced the desired results the most frequently, with 3 queries producing the required result 1st, and the other two, 3rd. This would appear to be better than the original results for AltaVista.

It is hard to assess recall, and there would appear to be no studies in this area. In order to do this a researcher would have to have access to all the data stored within the database, and more importantly access to the algorithm matching queries to data; these tend to be closely guarded secrets.

Recent Developments in search Engine technology

Recently Search Engines are looking at increasing the size of their databases, with several now claiming to cover over 300,000,000 pages. For the latest information (which can change weekly), Danny Sullivan (www.searchenginewatch.com) and Greg Notess (www.notess.com) maintain up-to-date statistics that are considered to be as accurate as is possible to be.

As the size of the databases has grown, so the original methods were retrieving far too many irrelevant pages in many cases.

Two increasingly popular search engines are starting to tackle this problem - Northernlight and Google.

Northernlight.

Northernlight has a method of grouping similar pages together in "folders".

These folders will often help a searcher to narrow down the actual information required, particularly in such a case of a very general search term.

Hyperlink Vector Voting

In the past methods of analysing the content of a document relied on analysis of the text. As already noted the types of text included varies from engine to engine, but the general principle remains the same.

In the same way that papers are more highly rated the more other papers cite them, so, the theory goes, a http document that has many links to it is more likely to be a valuable source than one that has few.

It has been suggested that documents can be divided into "authorities" - pages pointed to by many others and "hubs" - pages

pointing to many others. It is felt that the anchor text of most hyperlinks is a brief summary of the overall content of the page being pointed to.

In order to prevent spamming in a commercial version, Li suggests that only one link from any one site to any other should be included in the algorithm.

(Li, 1998)

Consider the fictional pages shown in Figure 4.

In this very simple example Doc B represents a "hub" pointing to two "authorities". Submitting a search to a standard search engine for Mount Everest would suggest that document C is the most relevant as it mentions the phrase "Mount Everest" 3 times. Documents A and B would rank equally.

However a system that relies on the analysis of the text of the hyperlink would suggest that the document being linked to with the phrase "Mt Everest" is the most relevant; which in this case it is.

Clearly those designers who use the ubiquitous "click here" create difficulties for such a system. AltaVista field searching allows the anchor text to be searched. A search term of anchor: "click here" produced 8,980,304 results.

A team of scientists at IBM is working on this theory. They noted that, for example, the IBM home page does not contain the word "computer". This prototype engine starts by gathering the first 200 results from a standard search engine to a standard type of request. It then adds all the pages that either link to or from that set. This algorithm, Clever, then finds the hubs and authorities within the set of pages. The developers acknowledge that rival companies frequently don't point to pages belonging to their rivals. Not unsurprisingly a search in AltaVista for "host:microsoft AND link:netscape" produced no hits! (Though one for "host:netscape AND link:microsoft" produced 7).

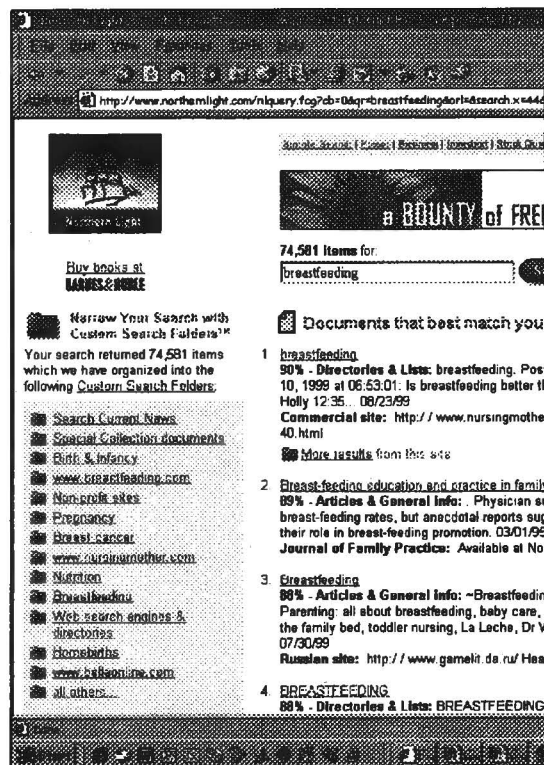


Figure 3 Screen shot of Northernlight, following a search on breastfeeding

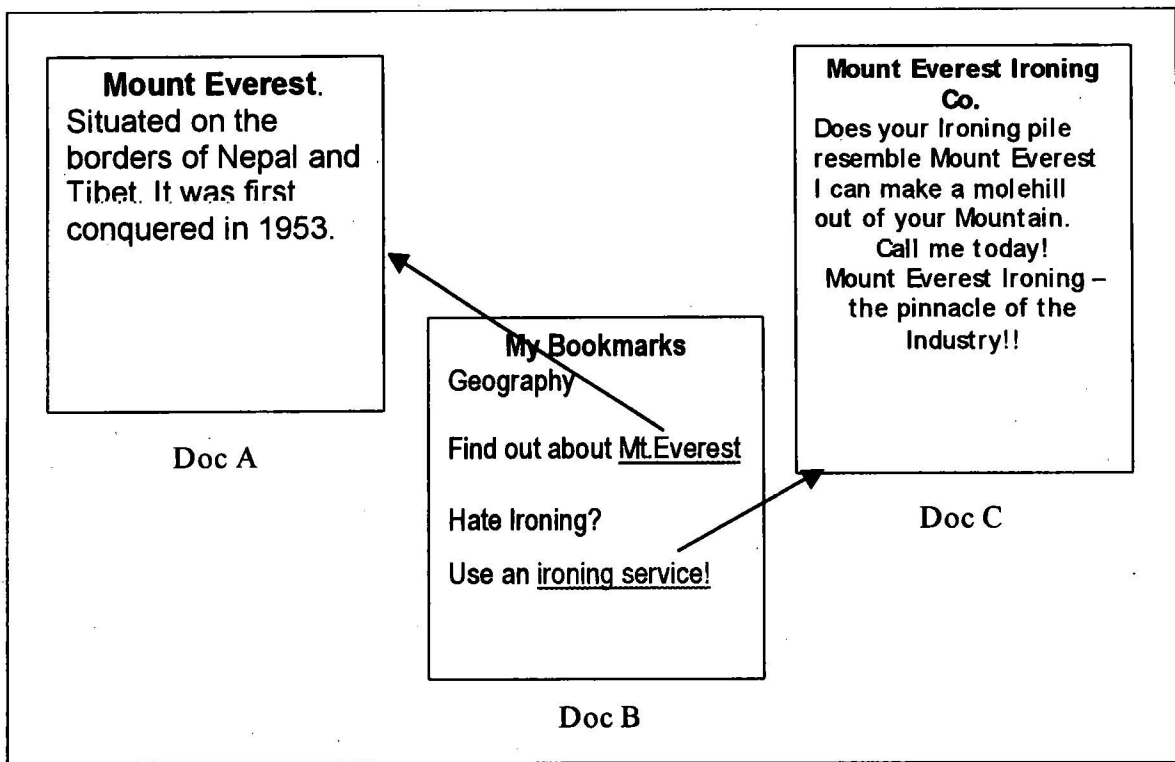


Figure 4 A set of fictional pages

They also suggest that some pages - such as the front page of a major newspaper might be linked to frequently, but with differing anchor text daily, thus leading to complications.

The Clever algorithm aims to give different pages different weights depending on the search term used. This can mean that a search takes longer than one on Google, where the rank of a page is calculated when the page is crawled, but it can mean that the most relevant page for a particular search is returned.

At present this is still in the development stage.

(Chakrabarti, 1999)

Google

One Search Engine that is currently enjoying the greatest rate of growth is Google. It is also increasingly winning awards for "Best Search Engine" or the equivalent, from assorted companies, including Time magazine, USA Today, PC magazine, ZDNet. (All linked to from www.google.com).

There are a number of things that make it quite so popular; primarily the fact that you can generally get what you want - quickly. In addition the developers (like WebCrawler it grew from student research) have made a point of keeping the site very simple; there are no banner ads; no superfluous links. (Though the logo does change - adding pumpkins for Halloween, hearts for Valentines day . . .). The technology relies on using links to ascertain the site's worth, and also places a value on the site from where the link comes. This can lead to complex algorithms,

"Last time we did it was with an equation of 400 million unknown variables, which showed the ranks of all the pages and three billion terms"

(Thompson, 2000)

Another strong selling point for me, is the fact that Google caches

all the pages as they are indexed; and gives the user a link. Thus a promising page that returns a 404 (cannot find page) error, can be retrieved from the Google database.

Performing your search

Armed with all this knowledge of how search engines work how can we best use them?

Know what you want. In other words, the more precise the search is, the better the result you are likely to get regardless of the engine you use.

If we look at the tests done on accuracy (such as that by Filman and Peña-Mora (1998)) they are searching for factoids - definite pieces of information. A quick glance at the screen shot of the search on "Breast Feeding" shows that pages covering many aspects of the area were located.

Define the search terms. This is crucial. If I were to go into a library and say to the librarian "Turkey" she would initially ascertain if I wanted to go there, read up on its history, cook one, raise one, had an interest in North American history . . .

Search Engines are generally not capable of this type of further questioning.

We therefore need to create a list of terms relevant to the search area, with synonyms and alternate spellings where appropriate.

Know the search engine you are using. Many have different defaults and requirements: For example do you use "AND" or "+" to ensure that both terms are included. Is "AND" or "OR" the default setting? Increasingly though sites are using "AND" as the default. (A switch made recently by AltaVista when the site was relaunched in Autumn 1999) What specialist searches can we use (for example can we define that we want only academic sites - not commercial).

To discover which does which it is best to read their help files, or consult the tables available at [searchenginewatch](http://searchenginewatch.com).

If the first engine doesn't work - try another!

MetaSearch Tools

There are a number of MetaSearch tools that will enable you to search several other sites at the same time. These can often throw up very large numbers of results; especially for a very general term. There are limited options for search types - you are often restricted to "all words" "some words" or "phrase" (though realistically that is what the vast majority of searchers use anyway.)

However, to locate elusive material, they can save a great deal of time. (And let's face it - would you rather enter the same term into 6 different engines - or do it once and put the kettle on?!)

Suggested tools

Here is a list of search tools I have found particularly useful; and that are likely to be less well known. Sites such as AltaVista, HotBot and Yahoo are always useful tools in the armoury.

www.google.com for most searching - especially for specific terms.

www.northernlight.com for when the term is very general - also because it has a large database, and there is the possibility of field searching

www.surfmax.com A metasearch tool that allows you to preview some pages (headings/ links/ etc)

Copernic A downloadable MetaSearch tool from www.copernic.com which will allow you to store results, and has more control over the type of searches.

www.oingo.com A search engine that will ask you if Turkey refers to a place/ bird/ cookery/ . . .

www.anzwers.co.au Would seem from various tests to be the most efficient of the inktomi powered engines.

The Bottom Line

Get to know your engines - be aware though that they change.

Try and locate the specialist directories for your particular subject area.

Remember that not all pages are indexed, and many of those that are are created for commercial purposes - when the listing on search engines is vital - and thus the designers have many ways of getting that high listing.

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Computing Ethics: A Control Issue But Who's In Control?

David Chadwick and Gillian Windall

Margaret Ross, of Southampton Institute, believes that ethics is very much an issue that affects the reliability and integrity of information systems. So much so, in fact, that she is arranging the 'BCS Quality and Ethics' workshop on the 13th April, immediately following the BCS SQM2000 conference. Representatives from the BCS, academia and business are expected to highlight the issues involved and perhaps point the way for greater BCS involvement in the general debate. But why should they bother with ethics at all?

Recently, a university computing student, when asked to think about how he should behave as a future professional, said "I don't know the difference between ethics and morals and why should I care anyway?" This sums up the confusion of young computing students. Many feel their only duty is to make money without upsetting those more powerful and whilst taking advantage of those much weaker. To be cynical, it could be said that this extreme attitude only mirrors the general business ethics of our time. In reply to the above student, his lecturer pointed out "Today, a computer can be used to do more harm, more quickly, at a greater distance and with minimum retribution to the operator than at anytime before". This may be a paraphrase of a better known saying but there is much truth in it. This brief exchange of views between student and lecturer highlights the sense of confusion in young people about to become the working IT professionals of tomorrow. They will have increasingly more control over our information, businesses and over our lives. For this reason, UK universities are attempting to bring computing ethics onto the timetable and into the research arena.

Simon Rogerson, head of the Centre for Computing & Social Responsibility at De Montfort university, has done some interesting research on behalf of the IMIS (Institute for the Management of Information Systems). In 1998, Simon and his colleagues conducted a survey on the attitudes of information system professionals to a range of ethical issues. From the responses of the 170 respondents Simon and his team produced the "Is IT Ethical?" 1998 Ethicomp report. Happily, Simon found that over 90% of respondents strongly agreed that organisations should require all employees to abide by a code of professional ethics and that employees who violated such a code should be appropriately disciplined. Many of the findings of the report suggest that IT professionals generally are a clean-living, good-natured, trustworthy bunch!

This is in contrast, however, to the findings of Phil Clipsham of the Information Integrity Research Centre at the university of Greenwich who introduces first year undergraduates to professional codes of conduct and discusses the finer points of ethical decision making with final year students and post-graduates. Phil and his team

look at aspects of teaching ethics such as : what are the important influences on defining students moral behaviour? can professional ethics be taught to non-professionals? and why do students appear to have conflicting sets of morals - one they apply to themselves and one which they apply to others especially to large organisations? "There is also an ethics about teaching ethics" says Phil "should it be taught as an integral part of other topics or as 'Ethics' a stand-alone topic? And what should such teaching consist of? Do we open debate and tell students to make up their own minds, tell them to do as the BCS directs or is it, quite frankly, none of the business of educators and we shouldn't mention ethics at all?"

Carl Adams, a lecturer at Southampton Institute involved in teaching computer audit to business students, gave a talk entitled 'Teaching Undergraduates Computer Auditing' at the CASG April 1996 technical briefing. Carl asked the delegates whether it was desirable to teach audit and aspects of security to young undergraduates. He pointed out the inherent danger of preparing them for a life of computer fraud and abuse with the inside knowledge of how to circumvent basic controls. On a show of hands, delegates at the meeting considered it was better to teach than not teach as the awareness of the good 90% often outweighs the malicious acts of the bad 10%. One wonders if CASG members would think the same today now that high profile security issues, e-commerce and the Turnbull report are in the public consciousness.

In the next issue of CASG Journal we hope to report on the 'BCS Quality and Ethics' workshop, the issues raised, the viewpoints and arguments. We would also be interested in hearing the professional auditors view on the teaching of computing ethics in our universities - is ethics a control issue? Should it be taught - and if so, how should it be taught?

For further details:

Simon Rogerson :

www.ccsr.cse.dmu.ac.uk/resources/general/ethicol/

Phil Clipsham : www.gre.ac.uk/~cd02/iirc/

Carl Adams : www.solent.ac.uk then search on his name

Margaret Ross: www.mullsoft.co.uk, then Hosted Home Pages followed by SQM2000

David Chadwick and Gillian Windall : www.gre.ac.uk/~cd02/iirc/

Audits from hell

How to avoid those audit nightmares

Carole Fennelly

The very word produces groans from system administrators at any company you care to name. Quite often, an audit is more intrusive and consumes more resources than a hostile break-in. Carole Fennelly examines some audits she's participated in to learn from how they went wrong — or right. The experiences of one of our clients - Ed.

Introduction

An audit often becomes a political contest between the audit department and the information technology (IT) department. Ensuring a secure architecture becomes almost secondary. Generally, about a month is spent attending meetings and writing memos to explain, clarify, or refute the audit findings. Sometimes, security improvements are actually implemented. Please note that such an unproductive scenario is not always the case — nor should it be. Hopefully, the real-world experiences I offer here will help to prevent hellish audits from happening in the future.

Ugly audits

Each of the following events actually happened at some point during the 15 years I've been in this business. There have been many others, but these examples demonstrate some major points.

Case #1: Auditor with a tool, but no clue

An internal audit department performed its own audits, believing it could save money by having its people certified and buying an auditing tool. I think the auditor in this case had received mainframe certification about 20 years back.

The department on the receiving end wasn't very interested in security, much as I tried to change that. When the audit was announced, I was asked to cover the exposures.

The auditor had a tool he needed installed and run on all the servers. The tool turned out to be a commercial version of COPS and flagged insignificant items with the same weight as major problems. I hoped to use this as an opportunity to implement better security practices without getting my department in too much trouble.

The auditor and I spent one minute reviewing the "root can log in from anywhere" exposure and two hours on the user directory permission problems. Some items flagged as exposures really depended on policy. When I asked to see the policy, I was told that, as a consultant, I could not. I spent two hours every day for three weeks trying to teach the auditor Unix security. When he announced that he wanted to run the tool on the production systems with me, I stalled. Since the systems were downtown, I said I would have to load the software over the network, which could slow down production. We would have to schedule this out of hours.

I went back to my desk, loaded and installed the software on the production systems, and fixed most of the problems. When we met to do the run "together," he never noticed that I did a tar -tvf, or that the software was already installed.

The upshot of this is that neither one of us really improved security, despite my minor corrections. Having to explain every item the audit tool reported on was so time consuming that I quietly fixed problems and reran the report. If I had left it alone, upper management may have dictated the security overhaul I originally wanted.

Case #2: Unauthorized audit

An organization within a company brought in a small company to perform an audit of its Web server. The corporate audit department wasn't involved. The outside company produced a report that extolled the wonderful security of the Web server it was contracted to audit. (The audit department later found this to be less than true.) In an apparent excess of zeal, the outside company decided to audit the Web server of another organization within the company. Here's what happened:

- ◆ The organization that paid for the audit saw this as an opportunity to play politics and seize control of the other Web server.
- ◆ The target organization, which had already acknowledged the need to improve security, had to refute the charges and retain control of its Web server.
- ◆ The audit department had to establish that it was the only organization authorized to perform interdepartmental audits.
- ◆ My job was to shoot down the report.

It wasn't hard. Despite the outside company's pledge to provide straight answers, the report was full of smug innuendo and few verifiable facts. It was clearly biased to make the paying organization look good. While there were indeed security problems on the system in question, the pathnames were incorrect and statements were made based on a SunOS operating system rather than Solaris. It was easy to see that they were false statements. The most damning statement was the auditor's claim to having downloaded software onto the corporate Web server. The company that performed the audit wasn't local and wouldn't make a special trip to discuss the report or provide detailed documentation. Because they claimed to have downloaded software onto the system and considering that the audit department had no contract with them, a decision was made to reload the system from scratch. But this procedure would cause about two days of downtime for the corporate Web server and would attract the attention of the CEO. So in order to keep the whole mess quiet, the organization that contracted for the audit agreed to buy a new system for the attacked organization. This way the old system stayed up until the new one was ready, limiting the amount of downtime.

Case #3: Uncontrolled audit

Believe it or not, I actually look at log files. Automatic intrusion detection may be preferable, but in this instance we didn't yet have a system in place. Besides, looking at log files can fill in the time spent waiting for people. One day, I was looking at the tcp wrappers log file while waiting for the router to come back up. I noticed about six attempts to get in from one site. I left messages for the originating site contact and for my manager. No big deal.

The next day, while waiting for some people, I decided to check the logs. We were actively being hit about six times per second. I told everyone to drop what they were doing because we had an active incident. The VP said he would call the internal audit team to find out whether or not it was them. We tried to contact the originating ISP with no luck. The logs showed that every external system was being actively attacked. We called other organizations to no avail. There was no response from the audit department, and the ISP didn't return our calls. I logged everything with appropriate times and had my partner initial them. The senior VP walked in and said he spoke to the general auditor who had no knowledge of an audit.

With no word from the ISP or the audit department, we considered the ISP an accomplice in an attack. We contacted its provider, who was very responsive. We provided logs and prepared to have the ISP shut down. Our management authorized us to contact the FBI to report an intrusion. We finally reached the contact at the originating ISP and informed him that we planned to report him to the FBI unless he had an explanation. He called us back in a few minutes and gave us the home number of a person at a well known big-company auditor. After seven hours of about 20 people dropping everything else, the incident was finally acknowledged to be an audit. The follow-up meeting required earplugs.

Bottom line: A lot of time was wasted by a lot of people — some of whom were working on production problems during primetime. The audit department wasn't prepared for detection and didn't inform its upper management of the test. Also, the tool that was run caused a massive amount of network traffic during production hours.

The good audits

Yes, there actually were a few! The two examples I give here had one thing in common: both sysadmins and auditors were truly interested in security and had an appreciation of each others' work. In the first situation, I was the auditor. In the second, I was the audited.

As the auditor

I don't really like doing audits. Having spent too many years as a system administrator, I have a healthy respect for the demands on sysadmins' time. Therefore, if I do an audit, I like to show every way that the administrator is doing a good job. In this case, I was surprised to be brought to a workstation and logged in as root. The VP shrugged and stated that he didn't want to waste time and assumed I could get into a system with physical access. He wanted to know if I could get into the trusted servers. I actually felt bad when I showed him I could. Rather than try to backpedal, he acknowledged the problem and outlined a plan of action to correct it. I still wrote up the problem in my report, but was able to state that it had already been addressed.

As the audited

From my experience, big-company audits are a pain and aren't to be taken very seriously. Therefore, I was caught off guard when a big company brought in a known hacker to perform the technical analysis on one of my systems. Realizing the system wasn't as hardened as it could have been, I was a bit wary. The hacker clearly expected an argument. We sat down over lunch and talked about security in general. When we went back to the lab, we both reviewed the system and came up with areas that could be improved. I actually enjoyed this audit. Unfortunately, we never received a written report so management didn't count the audit. However, it enabled me to improve security of the system and taught me to consider "impossible" scenarios. Therefore, I consider it a successful audit.

Audit recommendations

Here are a few important points to keep in mind when dealing with external auditors, reports, auditing departments, and system administrators.

The external auditors

Background check

It doesn't matter if the auditors are known hackers or not. They could just as easily be corporate spies hired out to perform audits. The company running the audit should provide background documentation on every person involved in the audit. Also, they should provide the audited department with a signed nondisclosure agreement from each person.

Qualification checks

Don't take the company's word for it. If possible, have one of the system administrators interview the auditors to make sure they understand the architecture. Many companies will object to this, stating that it interferes with keeping the audit a secret. I don't see the value in surprise audits.

Audit parameters

A contract should detail exactly which address spaces and/or telephone exchanges are to be probed. It should also specify the time of day and duration of the audit. The contract should have a realistic expectation of results as in hard exposures and theoretical exposures.

Authorization and indemnification

The auditors must have proper written authorization to perform the audit. This protects the auditors from being shut down by their ISP if the audit is detected.

The report

- ◆ Accuracy counts! If you list a path for a program, make sure it is correct. Show as much actual screen data as possible. If there is a vulnerability, detail how it could be exploited.
- ◆ Document every test. Even if the system was protected, show that an exploit was tried and failed. Give the system administrators credit when they've done a good job!
- ◆ Don't play politics. The report should be used as a tool to improve security of the systems. It should not be used as an opportunity to make an organization look bad or to create a revenue stream.
- ◆ Make sure the report reflects the company's policy.
- ◆ Blind audits consume more time and can produce inaccurate reports. I once reviewed a report that stated that "rootkit" was installed on a Cisco router.

The audit department

Scheduling

Audit departments often schedule surprise audits. This can backfire if the audit impacts a production schedule. Running scans against a live trading floor is generally considered to be a bad idea.

Control

During an audit (especially a secret one) the audit department must be available 24 hours a day. The entire audit department must know that there is an audit in progress and be prepared for detection.

Tools

Understand the impact of every tool that will be used during the audit. Demonstrate these tools on a test network to see how "noisy" they are. Make sure the tool will not impact production.

The system administrators

If external auditors are used, acknowledge that they will probably have more credibility than you. Use this as an opportunity to implement security measures that you may have wanted. Keep an open mind. Don't consider the audit to be a personal attack. Use it as a chance to learn. If security needs to be improved, acknowledge it and show plans for improvement. You may even get the budget for it.

Don't strike back

Whether you know this is an audit or not, resist the temptation to attack back. Follow an appropriate incident response procedure.

Documentation

Keep a log of everything — phone calls, logs checked, etc. And make sure you log times.

Cover your assets

In these days of "hacking," the more mundane aspects of asset protection seem to have fallen by the wayside. A company can suffer just as much, if not more, if it's found to be running software without proper licensing. Many companies fail to consider that "freeware" may be for noncommercial use only. Source control is another boring but important factor in asset protection. Also, it's crucial that all necessary software can either be reloaded from distribution or recompiled from source. Don't neglect the traditional aspects of asset protection for the trendy ones.

Audit Bingo

Do you keep falling asleep in meetings and seminars? What about those long and boring conference calls? Here is a way to change all of that!

How to play: Check off each block when you hear these words during a meeting, seminar, or phone call. When you get five blocks horizontally, vertically, or diagonally, stand up and shout GOTCHA!!

Process	Team	Folks	Opportunity	Bottom Line
Revisit	Revenue	Customer	Out of the Loop	Benchmark
Value-Added	Proactive	Win-Win	Think Outside the Box	FastTrack
Result-Driven	Empower [or] Empowerment	Knowledge Base	Total Quality [or] Quality Driven	Touch Base
Diversity	Client Focus[ed]	Ball Park	Game Plan	Leverage

Testimonials from satisfied players:

"I had only been in the meeting for five minutes when I won." - Jack W. - Boston

"My attention span at meetings has improved dramatically." - David D. - Florida

"What a gas. Meetings will never be the same for me after my first win." - Bill R - New York City

"The atmosphere was tense in the last process meeting as 14 of us waited for the 5th box." - Ben G. - Denver

"The speaker was stunned as eight of us screamed 'Gotcha' for the third time in 2 hours." - Kathleen L. - Atlanta

BCS MATTERS!



Colin Thompson
BCS Deputy Chief Executive

Colin Thompson, BCS Deputy Chief Executive, reviews some of the current BCS news items. Further information on these or any other BCS related issues may be found on the BCS Web site ("<http://www.bcs.org.uk/>")

Information is also available from Customer Services at The British Computer Society, 1 Sanford St, Swindon SN1 1HJ (e-mail to marketing@hq.bcs.org.uk)

Colin Thompson, BCS Deputy Chief Executive and Director of the Society's Programme 2000Plus, outlines some major changes in the entry arrangements for professional membership.

Good news this time for all those who have considered applying for BCS professional membership in the past but found that rules were too complex or that they had the wrong type of experience. From 1 May 2000 eligibility to apply for professional membership will be based on a relatively simple, points-based system. The new rules, approved by Council in February, also reduce the experience requirement for application, broaden the definition of experience to include anyone professionally involved in IS and eliminate virtually all requirements relating to age. All in all this represents a major modernisation of our entry requirements.

Under the new arrangements points will be allocated within 4 main headings - academic qualifications, training/professional development, experience and other relevant factors. 70 points will be required to apply for Associate Member (AMBCS) and 100 for Member (MBCS). Points are awarded as indicated in the following paragraphs:

Academic Qualifications

Points are allocated for BCS examinations, or equivalent external qualifications. Information of specific qualifications is available from Customer Services at BCS HQ but the following examples will provide a guide:

50 points - Full BCS Exams or an exempting degree

30 points - BCS Part 1 and project Any Honours level degree with significant relevant content

20 points - BCS Part 1 (papers only) Any Honours level degree Any HNC or above with significant relevant content

10 points - Any HNC or above

'Significant' in this context is defined as

the equivalent of one year of full time study and will generally include 3-year courses, such as Computing and Business Studies, which have computing in the title.

Applicants with no academic qualification at or above HNC level will, of course, have no academic points under these arrangements. However, they can make up the necessary points score on the basis of training, experience and other relevant factors.

Training/Professional Development

Applicants who have received training within an employer's scheme that is formally accredited by the BCS may add 10 points for each complete year of such training - subject to a maximum of 20 points.

Alternatively, applicants who have not been involved in an accredited training scheme may add 10 points if they have been in BCS membership (in any grade including Affiliate) for a full year immediately preceding their application and have met the requirements of the BCS Continuing Professional Development scheme.

This latter provision is designed to give some advantage to existing BCS members demonstrating commitment to professional development and is aimed principally at those in the early stages of their career. It will mean that applicants with full BCS exams or an exempting degree will be eligible to apply for AMBCS after just one year if they remain in membership and follow CPD.

Relevant Experience

Experience will be counted on the basis of 10 points for each year in which the applicant has been:

Professionally engaged in any aspect of building, maintaining, managing or operating information systems, or in teaching or training related to the knowledge and skills appropriate to that activity.

As mentioned earlier, this is a wider definition that has been used in the past and is intended to open professional membership of the Society to all those professionally involved in IS.

Other Relevant Factors

It is the intention that points should be available for a wide range of other factors, including ISEB certificates, NVQs, the examinations of other professional bodies and the certification schemes of commercial organisations such as Novell and Microsoft. Specific qualifications have yet to be defined but work on this is under way and we expect to add the first items to the list in the near future.

It should be noted that points are available for these other factors only within the limit of 50 points for academic qualifications - i.e. the total points for academic qualifications plus other relevant factors cannot exceed 50.

Translating Points to Experience Requirements

As indicated earlier, the threshold for AMBCS application is set at 70 points and that for MBCS at 100. Given that points are allocated in multiples of 10, translating all this into experience requirements for individual applicants is a relatively simple arithmetical process. Essentially it will mean that the maximum requirement, for those with no academic qualifications will be 7 years for AMBCS and 10 years for MBCS. In both cases this requirement is reduced by 1 year for existing members who are following the CPD requirements. Further reductions will be appropriate where applicants have an academic qualification, at or above HNC level, on the basis of a 1-year reduction in experience for each 10 academic points. If all this still seems a bit confusing, you will find further information and a self-assessment form on the BCS Web site.

BCS MATTERS

Age Requirements

Given that entry to professional membership is essentially a matter of competence, it has always seemed difficult to understand the need for age requirements. Why, for instance, should someone without a recognised academic qualification have to wait until they reach age 35 to apply? Happily, that requirement has now been removed, as have all others except those contained in BCS By-laws. These specify minima of 22 and 24 for AMBCS and MBCS respectively and have been retained simply because a By-law change involves submission to the Privy Council and a lengthy consultation process.

The Application Process

It is important to stress that the scheme described above will be used only to judge whether an applicant is eligible to apply for AMBCS or MBCS, not to determine whether they are eligible for entry to those grades. All applicants will be required to

demonstrate that they have achieved the appropriate level of competence.

Application processing will follow a similar pattern to the existing arrangements but there will be some significant changes to the Mature Candidate Route and the Senior Entry Arrangements:

Mature Candidate Route - the points-based scheme will result in a significantly shorter experience requirement for experience-only applications (a maximum of 7 years for AMBCS and 10 years for MBCS). As mentioned earlier, the existing age requirement of 35 will also disappear. One further important innovation is the option of a presentation to Membership assessors in place of the technical submission currently required.

Senior Entry - the simplified procedure for senior professional will remain in place and will be available to those holding responsibility at levels 8 and 9 of the Industry Structure Model.

Engineering Council Registration

For those interested in Engineering Council registration, I should make the point that the requirements for Chartered and Incorporated Engineer remain unchanged by the new arrangements outlined above. Registration does of course remain an option for those members who satisfy the Engineering Council requirements and further information on this is available from Customer Services.

And Finally

Anyone interested in applying for professional membership under the new arrangements should contact Customer Services on 01793 417424 or e-mail marketing@hq.bcs.org.uk

Letter to the Editor

I found the article by Sally Burfoot on e-mail policy setting extremely useful and very well researched. The coverage was extensive and I hope that you and the author don't object if I use it to initiate the formulation of a policy in my organisation. We have an Internet policy which I helped to formulate which deals with e-mail. But it does not go into the detail that is undoubtedly needed as e-mail becomes as common place as the telephone. Also we are moving from a mainframe text based e-mail system to MS Exchange and MS Outlook which will make use of e-mail easier and extend the uses, such as the exchange of documents.

The one omission from the article however was mention of free Internet e-mail such as Hotmail. This is a much more difficult entity to control or police. It can be set up as a personal address but still used from work via the company PC and browser. Acceptable use of this type of e-mail is harder to enforce and monitoring may also become harder to justify especially as EU rules on privacy become law in the UK. I wonder whether Sally considered this phenomenon and what views she and the Journal has on its use.

Other than that, an excellent article fully justifying the annual fee to CASG.

Yours truly,

Martin Welsford

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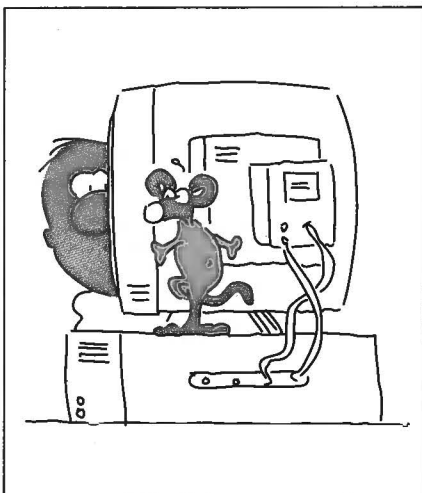
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BUG SPAWNS 100 YEAR OLD BABIES

The Millennium Bug has 'hit thousands of newborn babies, making them 100 years old at birth. A software problem meant computers at register offices around Britain refused to recognise the year 2000 and instead printed the date 1900 on birth certificates. Staff were forced to re-write birth certificates by hand. Updated software is being sent to 382 register offices which have been affected. A spokesman for the Office for National Statistics said: 'Births are still being collated in each register office's main record book, but a copy cannot be printed off on the computer. In some cases, the date was a jumble of odd characters.' Elizabeth Allen, of Action 2000, the Government body set up to tackle the Bug, said- 'This is a typical case of computers not recognising the date. It is thought that nothing has been hit by the Bug, but examples are starting to creep out.

Winning Caption

The best caption to the cartoon below was sent to the Editor by Andrew Hawker who wins a £20 wine voucher - congratulations.



"Look, if it was Bugs Bunny you wanted, you should have signed up with AOL."

APPRAISAL TIME

It's that time of the year again when performance appraisals are in the mind of both management and staff alike. Here are a few ideas to help you with the process. - Ed.

THESE ARE TAKEN FROM REAL CVs AND COVERING LETTERS AND WERE PRINTED IN THE JULY 21, 1997 ISSUE OF FORTUNE MAGAZINE.

1. "I have lurnt Word Perfect 6.0 computer and spreadsheet programs."
2. "Am a perfectionist and rarely if ever forget details."
3. "Received a plague for Salesperson of the Year."
4. "Wholly responsible for two (2) failed financial institutions."
5. "Reason for leaving last job: maturity leave."
6. "Failed bar exam with relatively high grades."
7. "It's best for employers that I not work with people."
8. "Let's meet, so you can 'ooh' and 'aah' over my experience."
9. "I was working for my mom until she decided to move."
10. "Marital status: single. Unmarried. Unengaged. Uninvolved. No commitments."
11. "I have an excellent track record, although I am not a horse."
12. "I am loyal to my employer at all costs. Please feel free to respond to my resume on my office voice mail."
13. "My goal is to be a meteorologist. But since I possess no training in meteorology, I suppose I should try stock brokerage."
14. "I procrastinate, especially when the task is unpleasant."
15. "Personal interests: donating blood. Fourteen gallons so far."
16. "Instrumental in ruining entire operation for a Midwest chain store."
17. "Note: Please don't misconstrue my 14 jobs as 'job-hopping'. I have never quit a job."
18. "Marital status: often. Children: various."
19. "The company made me a scapegoat, just like my three previous employers."
20. "Finished eighth in my class of ten."
21. "References: none. I've left a path of destruction behind me."

THESE QUOTES WERE TAKEN FROM ACTUAL PERFORMANCE EVALUATIONS.

1. "Since my last report, this employee has reached rock bottom and has started to dig."
2. "I would not allow this employee to breed."
3. "This associate is really not so much of a has-been, but more of definitely won't be."
4. "This young lady has delusions of adequacy."
5. "Works well when under constant supervision and cornered like a rat in a trap."
6. "When she opens her mouth, it seems that this is only to change whichever foot was previously in there."
7. "He sets low personal standards and then consistently fails to achieve them."
8. "This employee is depriving a village somewhere of an idiot."
9. "This employee should go far-and the sooner he starts, the better."

THESE ARE ACTUAL LINES FROM MILITARY PERFORMANCE APPRAISALS

1. Got into the gene pool while the lifeguard wasn't watching.
2. A room temperature IQ.
3. Got a full 6-pack, but lacks the plastic thingy to hold it all together.
4. A gross ignoramus — 144 times worse than an ordinary ignoramus.
5. A photographic memory but with the lens cover glued on.
6. As bright as Alaska in December.
7. Gates are down, the lights are flashing, but the train isn't coming.
8. He's so dense, light bends around him.
9. If he were any more stupid, he'd have to be watered twice a week.
10. It's hard to believe that he beat 1,000,000 other sperm.
11. Takes him 2 hours to watch 60 minutes.
12. Wheel is turning, but the hamster is dead.

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Membership Application
 (Membership runs from July to the following June each year)

I wish to APPLY FOR membership of the Group in the following category and enclose the appropriate subscription.

CORPORATE MEMBERSHIP (Up to 5 members) * £75

* Corporate members may nominate up to 4 additional recipients for direct mailing of the Journal (*see over*)

INDIVIDUAL MEMBERSHIP (NOT a member of the BCS) £25

INDIVIDUAL MEMBERSHIP (A members of the BCS) £15

BCS membership number: _____

STUDENT MEMBERSHIP (Full-time only and must be supported by a letter from the educational establishment).

Educational Establishment: _____ £10

Please circle the appropriate subscription amount and complete the details below.

INDIVIDUAL NAME: (Title/Initials/Surname)	
POSITION:	
ORGANISATION:	
ADDRESS:	
POST CODE:	
TELEPHONE: (STD Code/Number/Extension)	
E-mail:	
PROFESSIONAL CATEGORY: (Please circle)	
1 = Internal Audit	4 = Academic
2 = External Audit	5 = Full-Time Student
3 = Data Processor	6 = Other (please specify)
SIGNATURE:	DATE:

**PLEASE MAKE CHEQUES PAYABLE TO "BCS CASG"
 AND RETURN WITH THIS FORM TO THE ADDRESS SHOWN ABOVE**

ADDITIONAL CORPORATE MEMBERS

INDIVIDUAL NAME: (Title/Initials/Surname)
POSITION:
ORGANISATION:
ADDRESS:
POST CODE:
TELEPHONE: (STD Code/Number/Extension)
E-mail:
PROFESSIONAL CATEGORY: 1 = Internal Audit 4 = Academic 2 = External Audit 5 = Full-Time Student 3 = Data Processor 6 = Other (please specify)

INDIVIDUAL NAME: (Title/Initials/Surname)
POSITION:
ORGANISATION:
ADDRESS:
POST CODE:
TELEPHONE: (STD Code/Number/Extension)
E-mail:
PROFESSIONAL CATEGORY: 1 = Internal Audit 4 = Academic 2 = External Audit 5 = Full-Time Student 3 = Data Processor 6 = Other (please specify)

INDIVIDUAL NAME: (Title/Initials/Surname)
POSITION:
ORGANISATION:
ADDRESS:
POST CODE:
TELEPHONE: (STD Code/Number/Extension)
E-mail:
PROFESSIONAL CATEGORY: 1 = Internal Audit 4 = Academic 2 = External Audit 5 = Full-Time Student 3 = Data Processor 6 = Other (please specify)

INDIVIDUAL NAME: (Title/Initials/Surname)
POSITION:
ORGANISATION:
ADDRESS:
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TELEPHONE: (STD Code/Number/Extension)
E-mail:
PROFESSIONAL CATEGORY: 1 = Internal Audit 4 = Academic 2 = External Audit 5 = Full-Time Student 3 = Data Processor 6 = Other (please specify)