



Final Technical Briefing for 1995/96 Season

Tuesday 16th April 1996

“Readiness is All”:

Making better use of the Technology

Chairman: **Judith Scott**, Chief Executive BCS

Speakers: **Graham Clukas**, Price Waterhouse

John Ford, Quality Methods Manager (IT), Safeway Stores plc

Sue Mathews, Training by Design

Stan Dormer, System Security Ltd.

Organisers: John Bevan - 01992 582439

Diane Skinner - 0117 923 6757

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ANNUAL GENERAL MEETING

Technical Briefings are held at the Royal Aeronautical Society (see back page).

For last minute confirmation contact the relevant organisers.

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Editorial Panel

Executive Editor

John Mitchell

LHS – The Business Control
Consultancy

Tel: 01707 851454

Fax: 01707 851455

Email: jmitchell@lhs.win-uk.net

Academic Editor

George Allan

Portsmouth University

Tel: 01705 876543

Fax: 01705 844006

Email: allangw@cv.port.ac.uk

Book Reviews Editor

Ittaph Khaliq

Royal Bank of Scotland

Tel: 0171 427 8751

Fax: 0171 427 9953

Product Reviews Editor

John Silltow

Security Control and Audit Ltd

Tel: 0181 300 4458

Fax: 0181 300 4458

Email: john@scaltd.demon.co.uk

People Profiles Editor

Jenny Broadbent

Cambridgeshire County Council

Tel: 01223 317256

Fax: 01223 317084

BCS Editor

Colin Thompson

British Computer Society

Tel: 01793 417417

Fax: 01793 480270

Email: cthompson@bcs.org.uk

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Letters to the editor are welcome as are any other contributions. Please contact the appropriate person on the editorial panel.

Editorial address:

47 Grangewood,

Potters Bar

Herts, EN6 1SL

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EDITORIAL

One of the rewards of being editor of *The Journal* is that in the process of searching out contributions you tend to meet interesting people who are not audit professionals, but who operate on the fringes of the profession. This edition has contributions from three such people. Geoff Webster who is the Chief Executive of FAST, Peter Wood who is Managing Partner of First Base and Simon Chalton, a solicitor from Bird & Bird.



I had the pleasure of meeting the first two named gentlemen whilst attending the gala dinner during COMPSEC 96. This was held on a Thames river boat which not only provided a superb jazz band for entertainment, but was also equipped as a mini casino. Geoff and Peter had the misfortune to sit at my table and after copious quantities of good wine I ambushed them with the suggestion that they would like to do an article for *The Journal*. We then went and gambled away our notional £100 stakes, but their biggest loss was my memory. A few days later they received the dreaded letter containing the phrase, 'you do remember offering'. Not only did I receive the articles, but I now have a couple of friends in high places who will always be wondering whether I did destroy those negatives!

Geoff's article on Software Piracy must be priority reading for any computer auditor. Whether your organisation is 'legal' may depend more on you than you realise. Peter's contribution on migrating to Netware 4 should be required reading for network administrators as well as auditors. Do your organisation a favour and ensure that your administrator gets the opportunity to read it before they do anything silly.

Simon, being a solicitor, had to be approached in a far more subtle way, which I will not go into here on the basis that I now intend to patent it. After reading Simon's article I am now certain that one of my approaches to potential contributors meets all Simon's 'essentials for patentability'. The proof of the pudding is in the eating as they say and *The Journal's* content is proof enough.

Yet another anonymous article for you to digest, but this time about so called 'phantom withdrawals'. Unluckily for the bank concerned, their victim was a computer auditor, but the report illustrates just how desperate the banks are to keep the lid on the scale of this type of fraud. Even our intrepid reporter could not break the barriers of silence that were erected and, more importantly, found that he got little help from our law enforcers. If a knowledgeable computer auditor can be made to feel like a criminal, then what chance does the poor chap on the 'Clapham Omnibus' have?

We also have the last in our three part series from Geoge Allan dealing with software development estimating. For those of us that like tackling this difficult area the series has been an eye opener. Here is an attempt to quantify what has previously been considered to be unquantifiable. Even if the

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The views expressed in the *Journal* are not necessarily shared by CASG. Articles are published without responsibility on the part of the publishers or authors for loss occasioned in any person acting, or refraining from acting as a result of any view expressed therein.

Chairman's Corner

Alison Webb

As auditors, we are always aware that our role changes constantly in response to business developments.

Styles of business management, for instance, have changed in the last ten years: and the increasing use of control self-assessment reflects an increasing emphasis on the line manager's responsibility to design and implement effective controls in the systems on which he relies. The way IT is applied to solve business problems has changed too, in ways which influence the way auditors work.

The earliest applications focused on streamlining the humblest business processes. The manual copying of written information from one piece of paper to another which visitors to some third world countries can still see when they buy a railway ticket, were the first transactions to be automated. The next step moved up one stage in the information flow: to the summarising and analysing of transactions. Our spreadsheets, word processors and presentation graphics have taken much of the donkey work out of that.

The next stage must be towards making the information disseminated more meaningful: developments will focus much more on the way the financial information in computer systems is presented. A network engineer who needs to identify quickly potential trouble-spots uses a network management system which typically shows each device as a different sized green blob. When something goes wrong, the blob turns red. Finance Directors need similar financial applications to do the same for cost-centres. Of course, it's much easier to decide if a piece of equipment's going wrong than a



cost-centre, and financial pictures of this sort will represent a particular view of the information: one which is dictated by the design of the system. Effectively, the application will replace the financial analyst, who will now be responsible for setting the processing rules in

the programs, but not for the processing itself.

This has fascinating implications for systems development: for instance, will we include psychologists on the project team, as experts in what people may infer from various colours or images? From the audit perspective, not only will we have to make sure, as we do now, that rogue users don't hijack the project for their own ends, but also that a rogue designer doesn't influence policy by painting a company an unpopular colour. Because management will base key decisions on them, such systems will be crucial. The corollary is that there will be an increased emphasis on how we keep the detailed information on which the decisions are based, and the rules tables themselves, integral and secure, and how we can check the decisions are based on the right data. So - good news for us - it looks as though we won't yet be going the way of all those clerks and typists - and now, perhaps, financial analysts - whose work has been taken over by a computer.

EDITORIAL Continued

'opposition' do not accept the equations, they will be on a sticky wicket if their estimate is not supported by something even half as good.

No response to my request for help in updating Malcolm Lyndsey's book on auditing the AS400 operating system, so I am running the advert again. Now I know that some of our members are also members of the Mid-Range Audit Group so why not come out of your hidey-holes and initiate a joint effort between our two groups? I await your telephone call, fax, e-mail, or snail

mail response, before I have to start naming names!

Finally, please take note of the pending AGM. All paid-up members can attend, whether, or not, you attend that day's Technical Briefing. As a past Chairman of the Group I urge you not only to attend, but also to volunteer for a job on the Management Committee. This is after all, your Group, and we need your help to run it.

John Mitchell

Security Implications of Network Infrastructure Migration

Peter Wood

Managing Partner - First Base

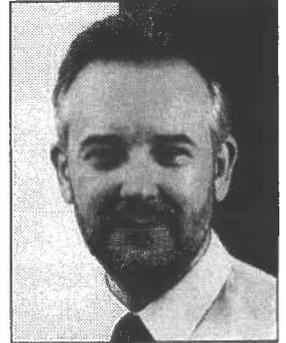
Why is the question of migrating to NetWare 4 or NT Server so important? Well, a recent survey of US network managers¹ reveals that Novell's NetWare 4.x network operating system will be the system of choice by 1998, whilst Microsoft's Windows NT operating system will be the second choice. Already, 25.9% of respondents consider NetWare 4.x as the LAN standard.

NetWare 4.1's most important technical innovation is NetWare Directory Services (NDS), yet this is causing many users difficulties. According to Novell², many of these users are installing NDS themselves and causing many of the problems. As a measure of this problem, there were over 1,000 questions related to NDS technical problems posted on CompuServe's Novell NetWare within one month. Experienced NetWare managers who employed careful planning when installing NDS reported few major problems. Others reported problems ranging from corrupted and inaccessible directories to time synchronisation problems that impede server administration. Clearly training is required to install NetWare 4.1 properly, but despite Novell investing heavily in providing technical materials, free seminars and even satellite broadcasts to educate its users, the problems persist.

The expanding market for enterprise-wide directory services has driven both Microsoft and Novell to promote (different) directory services to establish market share³. Microsoft's new Open Directory Service Interfaces (ODSI) is designed to compete with Novell's NetWare Directory Services (NDS). However, Novell controls Unix, and seems set to make NDS an integral part of UnixWare to counter Microsoft. Vendors have split in support for each technology, but as NetWare remains strong in part because of NDS, and as support for Windows NT as an application server increases, both are likely to remain competitive.

At the same time, resellers and IT departments throughout the US are being affected by the shortage of skilled NetWare 4.1 and Windows NT engineers⁴. While many people have skills in establishing and administrating LANs, there is a shortage of those adept at constructing global directories for thousand-node, multi-site corporations. The shortage of these professionals is affecting not only the channel but large corporate IT departments as well. Thus, higher charges for network services and poaching of good engineers are almost certain to plague the systems-integration business over the next year or two.

The problem with NetWare may seem surprising considering there are more than 80,000 CNEs, but most have experience in setting up and administering departmental LANs, which is markedly different from designing global directories for a large corporation with hundreds or thousands of nodes. What is really needed is someone who knows NetWare and has project-management skills - a rare beast indeed.



The problem with Windows NT is that sales only recently have started to take off. There are 2,500 Microsoft Certified Systems Engineers (MCSEs) worldwide, but maybe as few as 70 in US resellers who have actual NT implementation experience under their belts. Training takes up to a year and costs around \$10,000, thus increasing the incidence of poaching. Naturally, sudden departures of personnel can delay projects.

As already stated, the NetWare 4 feature that offers the biggest benefits for enterprise networks is NDS (NetWare Directory Services), an X.500-based database of all resources on the network, such as individual users, groups of users, printers, and modems. By maintaining a single list of all network resources, NDS turns a server-centric network into a single entity that gives users and administrators a single point of access to the network. NDS organises network resources into what is called a directory tree, which resembles an organisation chart. NDS gives organisations complete flexibility in how they organise their directory tree. This flexibility is also the greatest threat, since so many network administrators are unused to planning and design prior to action.

The easiest way to implement NetWare 4 is to divide the task into small, easily managed pieces. For example, corporations can start building their directory tree by installing NetWare 4 in a single department or workgroup. Later, if they need to, administrators can combine these separate trees into a single corporate-wide tree. In the next few months, Novell say they will provide a set of NDS tools that gives users more flexibility in modifying their directory trees. These tools will let users move a branch of the tree to a new location, merge separate trees into one, and rename a tree or one of its organisational units. This flexibility will enable a corporate tree to change as the corporation changes, but only if Novell delivers the migration tools it promises.

¹ Communications Week, 17 July 1995
² Computerworld Magazine, 17 April 1995
³ Information Week, 24 July 1995
⁴ Computer Reseller News, 14 August 1995

Let's look a little deeper into NDS. NetWare Directory Services is a distributed database. The database is divided into partitions, distributed across different servers on the network. Each partition is then replicated onto additional servers on the network. The reason for partitioning and replication is to increase the reliability of the network - if one or more servers on the network goes down, all network users can still access the network. The NDS database also changes as new users are added, new groups formed, security clearances modified, and so on. When administrators administer the network they see a global view of the network and not individual partitions.

NDS partitioning and replication happen automatically, which ensures that users and administrators are shielded from any underlying complexity. However, manual override is possible, for example if an administrator wants to ensure that a server connected via a wide area link contains a partition replica. Otherwise, when users at that remote location log in to the network, all log-in and authentication transactions will have to travel over the wide area link. If the local server has a partition replica stored on it, then all log-in and authentication can take place locally.

Time synchronisation is an automatic process that ensures that all NetWare servers on a network keep exactly the same time. This is crucial for ensuring that the NDS database remains accurate. Suppose, for example, that a network user changes her password. As this change is being made to the NDS database, NDS stamps the change with the time, thus enabling NDS to determine that this password change is the most current. Since NDS is a distributed database, all servers containing NDS partitions and replicas must keep exactly the same time in order for time stamps to have any value in keeping the NDS database up to date.

NetWare 4 permits various departments to administer their part of the network independently. This is achieved by granting supervisory rights to different portions of the directory tree. For example, if there is an office that wants to manage its own portion of the network, a group with all administrative rights may be created in that section of the global directory services tree, and then as few or as many supervisory users as needed can be added. This lets the office manage their portion of the directory, but it doesn't give them supervisory access to anything else in the tree.

Before beginning the design of an NDS tree, users must have a clear understanding of NDS objects and their use in the tree. NDS objects represent the physical and logical entities of the network such as users, servers, printers, print queues, groups, and so on.

NetWare Directory Services defines a base set of object types that can exist in the NDS Directory. These objects types and their rules form what is called the NDS base schema. Objects are defined as either container objects or non-container objects. Container objects can contain other objects. Non-container objects, which

are also known as leaf objects, cannot contain objects. Users, printers, and servers are leaf objects.

Each object type is defined by a set of rules known as the object class definition. Each class definition includes a set of attributes or properties. Information contained in the attributes are referred to as values. The attributes are defined in terms of data types. The object's attributes contain object information, access control information, and management data to maintain and control the actual network entity that the object represents.

One type of object is a user. The user object represents a particular network user and has particular properties associated with it. For example, users can be granted access rights to manage their own object and properties or a combination of the two. Among the rights granted by default to a user are the read and write rights to their Login Script property. This allows the user to modify or create a personal login script if they wish. These rights can be revoked to prevent a user adding or modifying a user login script. Novell claim that, in most cases, the default rights assigned to objects provide the access and flexibility required by users and that Administrators will only need to add file access for specific applications and create the necessary groups and sub-administrators.

The main types of container objects are the Organisation (O) and Organisational Unit (OU) objects. The O object represents the company name and is generally the first object underneath the [Root], although some trees also include the optional Country object. The tree can consist of more than one O to represent multiple organisations.

Below the O object are the OU objects used to represent geographic locations and organisation departments. For example, an OU could represent an office in London (OU=LONDON), or an engineering department (OU=ENG). Generally, OU objects are nested to provide a further breakdown of a company's locations and departments.

Each OU object may contain leaf objects that provide a one-to-one representation of network resources. Resources and users may often be placed in the lowest level of OU objects.

The admin user object is created automatically when NetWare 4 is first installed. Initially, this special user has rights to the entire tree and includes Supervisor rights of every server added to the tree. The admin user is the first administrator of the tree. This user not only has complete access to the file system (just as the Supervisor does in NetWare 3) but also has full access to NDS as well. NDS grants the admin such power in order to initially install the tree and establish rights for the file system on the first NetWare 4 server. Administration of NDS and the file systems may then be distributed to other administrators. Unlike the NetWare 3 Supervisor, admin is not a reserved user name and may be renamed to something less obvious.

The importance of maintaining the admin user cannot be overemphasised. When NetWare 4 is first installed, the admin user is created at the O=Organization level. The admin user has all rights (NDS and file system) at the [Root] object and, at this point in the installation, is the only user with such complete and extensive access to the network. If the admin user is accidentally deleted, access to the tree is effectively removed from the tree. Restoring access to the tree is a tedious process and can only be accomplished with the assistance of Novell Technical Support. It is possible to protect against this situation by creating a second admin user as a backup. Rather than making this object security equivalent to the original admin user (since if the original admin were to be deleted, this account would have no access to the tree because the security equivalency would be lost), it is better to assign explicit Supervisor rights for this second admin at object [Root].

A special class of object is the alias object, which points to another object specified in the directory tree. An alias can point to either a container object or a non-container object. For example, for users in one OU to access a printer in another OU, the administrator may create an alias that references that printer. It is also possible to alias one OU to another OU, thereby giving one OU rights to the aliased OU's resources. This is a very powerful feature and should be used carefully.

The Organisational Role (OR) is extremely versatile and similar to a Group object. The OR object has an attribute known as role occupant. An occupant can be moved in and out of the OR quickly to facilitate short term assignments. If the regular Administrator is absent for any length of time, another user can be moved into the Administrative OR temporarily to manage the network.

The OR object is created and assigned specific rights depending on the characteristics needed for the role. For example, a user may be allocated the role of administrator for a department (OU) by creating a role called OU_admin and then giving that role some explicit object rights. The user is then made an occupant of that organisational role. Through security equivalency to the OU_admin object the occupant gains the rights that the OR has been assigned. These can be Supervisor rights or less powerful rights as appropriate.

The profile object is used as a special-purpose scripting object that executes a login script after the OU login script. The profile script can contain special drive mappings or environment settings a select group of people should receive. The profile will execute for those users whose profile attribute has specified a profile object for execution. A profile script can act as a global login script, a location login script or a special function login script. Each OU object has its own login script, referred to as the container login script. The order of execution of login scripts is: container login script (if present), profile login script (if used) and lastly, user login script or the default login script (if no other script is available).

Group objects can be used to give users within an OU or multiple OUs specialised rights assignments. This permits specialised assignments to be given to a smaller subset of users within the tree. Group objects in NetWare 4 serve the same function as they do in NetWare 3. Because of security equivalency, any member of a container will receive whatever rights the container possesses. An Inherited Rights Filter (IRF) will not mask these rights. Users inside group objects also receive whatever rights the group possesses.

The directory map object is a special-purpose object used for pointing to a specific volume and directory path on a NetWare server. Using the object name allows a container login script to map a drive letter to the directory map object name. This means that login scripts do not need to be altered if directory paths or names are later changed. Only the directory map object needs to be updated. File rights may be assigned to the directory map object, and then each user made security equivalent to the directory map object. As this is a cumbersome step, the file rights may also be assigned to each OU, as users are always security equivalent to their OU.

In summary, NetWare 4 requires considerable effort on the part of users to understand its new features and to correctly implement the security and resilience it offers. There are many ways for users to unwittingly create security loopholes or even make the network unusable. The reseller channel is under-resourced and so are corporate IT departments, with NetWare 4 and NT experts very thin on the ground. Unless controls are applied at the planning and design stage, many new enterprise networks will fail to deliver the promise they offer.

Peter Wood is Managing Partner of First Base. He can be contacted on 01903 879839 and is profiled elsewhere in this edition.

Patents for Software - Auditors' Concerns

Simon Chalton

THE BACKGROUND

Auditors of companies which use, produce or distribute software may need to verify that those companies' activities are duly authorised, and that the software they use, produce or distribute does not infringe third party intellectual property rights. There may be contingent liabilities, either in damages to a third party whose rights are infringed or to customers to whom software has been distributed in good faith but without good title. There may also be potential criminal liability under the Computer Misuse Act 1990 for having unauthorised access to computer materials.

Intellectual property rights which can subsist in software include copyright, trade marks, trade secrets, contractual rights and patents. Each of these different forms of right has different rules and characteristics, and each can restrict freedom to use or distribute software.

The purpose of this article is to look in broad terms at patents for software-related inventions, and the ways in which such patents might be of concern to an auditor reviewing the activities of a company whose assets or profits depend on the company's continued use of critical programs. If these programs infringe a validly granted patent belonging to another person or company, that patentee may be able to apply to the court for an injunction to restrain further infringing use, with serious consequences for the defendant company if an injunction is issued. The injunction may not be the end of the day: claims for damages and costs may then follow.

THE NATURE OF PATENT PROTECTION

Patents are monopolies granted by the state to protect novel inventions of a technical character which have an industrial application. Patents protect function and not form. Unlike copyright, infringement of a patented invention can occur without copying. Independent creation or discovery of an invention previously patented by another is no defence to an allegation of infringement of the other's patent.

Computer programs can be protected both by copyright and by patent. The borderline between these two forms of protection is sometimes blurred. To some extent, copyright can indirectly protect functionality: this occurs when decompilation of a computer program is necessary to discover features affecting its functions. Decompilation involves reproduction or adaptation which is restricted by copyright, and so copyright may be said indirectly to protect the functionality of a program. Conversely, infringement of a patent for an invention where the invention is implemented through use of a computer program may also involve copyright infringement by copying of the original program.

If a patent is infringed, the patentee may claim damages and an injunction to restrain continued infringement. This can have a double effect on a software developer who infringes a competitor's valid patent: not only can the developer be restrained from continued use and marketing of the infringing software, but the developer's customers can also be restrained from their own continued use of it. Such customers will then look to the developer for recompense.

ESSENTIALS FOR PATENTABILITY

Patents are only available by grant on application made: by contrast, copyright arises automatically on the creation of a copyright work, and requires no application, grant or registration.

To qualify for the grant of a patent, an invention must have three basic characteristics:

- ◆ it must be novel. The requirement for novelty is absolute, and will be defeated if the invention has been previously known and publicly exercised anywhere in the world;
- ◆ it must include an inventive step which is not obvious to a person skilled in the art; and
- ◆ it must have a technical effect with a useful industrial application: that is to say, it must not be a discovery or scientific theory which is not practically applied.

In addition to these basic requirements, the following are not capable of being inventions for the purposes of the UK's patent system:

- ◆ a method of doing business;
- ◆ a method of presenting information;
- ◆ a method of performing a mental act; and
- ◆ a program for a computer, in each case as such.

The last of these disqualifications may appear at first glance to exclude all software from the possibility of patent protection, but that would be an oversimplification: the words "as such" are taken to indicate that, although a program may not itself be patented, an otherwise patentable invention which is implemented by means of a computer program may be patented. Once a patent is granted, unlicensed running of that program or developing another program which replicates the original program's implementation of the patented invention can be an infringement of the patent.

The exclusion of computer programs as such from patent protection has only a limited effect. The fact that a computer program as such cannot be the subject of a

patent grant in the UK does not mean that use of a computer program as a means of implementing an invention which is already the subject of a third party's patent cannot be an infringement of that patent.

PATENTS GRANTED BY THE EUROPEAN PATENT OFFICE AND BY THE US PATENT AND TRADEMARK OFFICE

Although the patent systems of different countries are broadly similar they are not identical. A patent is valid only in the country in which it is granted. There are treaty arrangements between many countries relating to patents and their grant and enforcement, and these treaties provide an element of harmonisation. In particular, the European Patent Convention, to which the UK is a party, was intended to draw together the law and practice governing the grant of patents in those countries which are party to the Convention and the grant of patents by the European Patent Office in Munich.

The European Patent Convention provides for the exclusion of computer programs as such from patentability. In practice, the European Patent Office has granted patents for inventions implemented by means of computer programs on applications which the UK Patent Office would have refused. The main difference between the practice in Munich and UK practice appears to be in relation to inventions to perform mental acts. The UK Office takes the view that, if a computer program performs an act which an unaided human mind could perform, the invention underlying the program is excluded from patentability. A more liberal interpretation is followed in the European Patent Office, provided that the invention has a "technical effect".

The European Patent Office has jurisdiction to grant patents which are valid in the UK unless and until such patents are successfully challenged in the UK courts. In consequence, the differences in approach to patents for software-related inventions as between the European Patent Office and the UK Patent Office can result in different standards being applied to applications for patents for such inventions, depending on the office to which the application is made.

The agreement on trade-related intellectual property rights (TRIPs), to which the UK and the US are parties, requires that patents be available for any invention, whether a product or process, in all fields of technology provided that the invention is new, involves an inventive step and is capable of industrial application. The terms "inventive step" and "capable of industrial application" may be deemed by a contracting State to be synonymous with the terms "non-obvious" and "useful" respectively. Although provision is made under the TRIPs agreement for excluding certain inventions from patentability, none of these permitted exclusions relate to computer programs as such.

If the TRIPs agreement becomes the dominant inter-

national treaty on the protection of intellectual property rights, it will take precedence over national laws and over the European Patent Convention. Existing national provisions which exclude from patentability inventions implemented by means of computer programs will then become weakened or of limited effect.

In late 1995 the US Patent and Trademarks Office (USPTO) released new examination guidelines for computer-implemented inventions. These are substantially more liberal than European Patent Office practice and allow, for example, a series of steps to be patented provided that their effect is "useful". Even before the guidelines were released, it was significantly easier to get a US patent for a computer-implemented invention: examples of US patents granted in recent years include:

- ◆ a system for calculating weather insurance premiums and writing resultant policies;
- ◆ a system for managing retiree healthcare benefits, using a trust to purchase variable life insurance policies; and
- ◆ a system for funding future liabilities by insurance.

CONCERNS

The trading world continues to shrink and the process of harmonising national systems of laws continues to grow. We are moving from early trends towards federal systems of government (the US, Australia) through regional groupings (the EU, NAFTA) to global harmonisation (TRIPs). The need for harmonisation in relation to intellectual property has been recognised since the Berne Convention was launched in 1886. Intellectual property is readily exportable, has international economic value and, with modern electronic communications, can be exploited at minimal cost from almost anywhere in the world. Computer programs are particularly at risk. Without common and readily enforceable forms of protection, those who develop and market them may seek to restrict their availability in countries where intellectual property protection is weak.

The UK is subject to pressures to conform to emerging global norms of patent protection for computer-implemented inventions. Our more immediate exposure results from the differences between the UK and the European Patent Office in relation to the patenting of software-implemented inventions. If world standards become dominated by the US, the administration of our patent system may change radically.

These changes could have undesirable results. Risks include:

- ◆ monopolisation of areas of future development by the granting of patents for key inventions blocking access to new fields;
- ◆ granting of patents for methods which have already been developed and publicly used, but which are not generally known, and which may not be available to

examining staff at the Patent Office; and

- ◆ new software developments requiring either the cost of a patent search before investment is made, or the risk that the resulting product infringes a patent of which the developer is not aware.

In answer to these concerns it may be said that other technically advanced industries have profited by effective use of the patent system to protect and reward investment in research and development, and that the software industry is no different.

AUDITORS' SPECIAL CONCERNS

If patents become more readily available for software-related inventions, auditors will be on notice that software in use by companies may infringe existing patents granted to others. Where a company's software is claimed to be protected by patent, there may be a risk that the patent itself is invalid as having been granted for an invention which was not novel.

These concerns are increased by the double jurisdiction exercised by the UK Patent Office and by the European Patent Office to grant patents which are valid in the UK, and are in addition to familiar copyright infringement and computer misuse risks. Although a user or developer of software may be unaware of copyright infringement alleged by a third party, there is at least a chance that the copying or unauthorised use complained of was not innocent in the accepted sense: the alleged infringer's staff may have copied a third party program product, or wrongfully used confidential information, or had access to a program not licensed to them. In patent infringement cases, the infringer may not know of the existence of the patent he is alleged to have

infringed. Assurances from directors, managers and others are not sufficient to protect against this risk unless backed by knowledge of the existing public domain or of existing patents in the field.

Some changes in the UK's current approach to the granting of patents for software-related inventions seems likely, at least to the extent of conforming our practice to the practice of the European Patent Office. Other changes may go further if the US approach becomes dominant in world terms.

UK policy in this area needs to be clarified, accepted and promoted internationally. If it is not, we may find ourselves being dragged into a world system where the direct cost of patent protection and compliance outweighs its benefit and where excessive protection, instead of stimulating and rewarding development, stifles and restricts it. The result may be that only those who can afford to take patent protection for their new software products will do so, and that less wealthy but nevertheless creative software developers will be excluded by the risk and cost of inadvertent patent infringement.

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Simon Chalton is a solicitor and a consultant to Bird & Bird. He is Chairman of the BCS Intellectual Property Committee. He can be contacted at 90 Fetter Lane, London, EC4A 1JP. Direct Tel: 01347 868641 Direct Fax: 01347 868689

Email: simon_chalton@link.org

The views expressed in this article are personal, and not necessarily those of the British Computer Society or of the Intellectual Property Committee or of Bird & Bird.

Software Theft - Fact or Fiction?

Geoffrey Webster

The Federation Against Software Theft was established in 1984 as a direct result of lobbying by the BCS. This was aimed at protecting the intellectual property of software developers. Why only in 1984 you may well ask.

The answer lies in the advent of widespread use of the PC and the growth of the shrink-wrapped software industry.

Whilst possible it was always considered difficult to copy mainframe and mini computer programmes. It was unlikely they would be used at home and there was a low probability of copying within an organisation - a bit too obvious.

The PC changed all that !

The new software industry found that the copyright laws in the early 1980's did not provide protection - they did not recognise software. Some of you may remember the early versions of Lotus 1-2-3 had copy protection included for this reason.

Today PCs are ubiquitous and becoming so in the home, and the software available is mind boggling in its variety and range.

So what is software theft ? Well simply put, it is the possession and use of software without the licensors (authors) permission.

Yes, it is theft, it is using software without the owners permission and depriving them of the income that is due to them.

What constitutes possession ?

Any copy whether on a storage medium such as a floppy disk or in the memory of a machine. In other words downloading software without authorisation constitutes copying.

At this point you may be wondering what this has got to do with Auditing. The answer is everything.

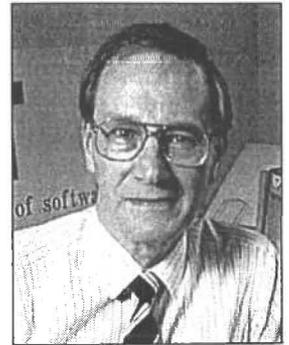
If we ignore the pirating of software which goes on in the channel of distribution and focus on businesses then we can look at the problem of software theft.

We do need to include in the discussion the use of software on networks. Here again we are faced with unlicensed use of software if more users simultaneously access the server based application than are allowed for by the licence. In this regard it must be said that the software publishers did not realise that they were dealing with a cart load of monkeys.

A number of businesses with operations in different time zones believed that using networked software out

of UK hours was ok. It is, but did not fall within the publishers' intentions and most publishers are now correcting this situation.

The issue for auditors is in ensuring compliance with the law or with company policy which hopefully fits inside the law and keeps the employees honest.



Software auditing is a relatively new activity although there are a growing number of organisations now offering this service. The skills required are a mixture of auditor and IT specialist.

We at FAST are actively engaged in looking at how we can establish some standards for software auditors. As with every rapidly growing industry there are companies providing these audit services to a very variable standard, and this needs to be sorted out.

Most companies would admit that copying of PC software happens, many are unaware that it is unlawful.

One of the most important tasks we have at FAST is creating a much greater awareness in the end user community about the licensing of software and what it means.

Not far behind this is the need to make clear that we will not hesitate to prosecute recalcitrant companies and their officers.

So, how big is the problem ?

Estimates for 1994 suggest that in the UK the software industry lost £400m in revenue due to software theft. About 40% of this or £160m is lost due to copying within companies. Further it can be argued that if it wasn't copied then the company concerned would have bought a legitimate version. This argument is less valid in the home market.

The remainder is lost due to copying in the channel but there is a knock-on into end users when the software is passed on usually pre-loaded on the hardware.

Firstly we need to make sure that managers are aware of the law regarding software few are aware of the requirement to have licences for all software.

All managers would agree that today the PC and its software is mission critical, and yet it is not treated as such.

The Government says we must licence our cars to use them on the highway, so we do, the software publishers

say we must licence software to use it, so we don't. Yet company cars are not mission critical, confiscate them and the business would manage, confiscate the software and the business would stop.

Isn't it amazing the value that we place on things, a company car fully licensed at say £10,000 is not a problem, a computer with software fully licensed at say £1500 is a problem it would seem. Only when FAST threatens confiscation does reality set in !

Many organisations are now moving in the right direction but need help in getting control of their software. Increasingly they are turning to FAST and to our members, who provide an audit service, for advice and guidance and to get an audit done.

What has become apparent over the last year or so is that most organisations don't count the cost of using software, or alternatively the benefits of having their software properly managed.

Our task of creating awareness naturally leads to management action. Few Managers want to be at risk, and even fewer want to waste money.

Once the realisation is there, the first step is to carry out a software audit. Provided this is done properly and the follow-up actions are completed then the benefits flow.

Increasingly the audit extends to the hardware as the current risk of losing memory chips grows.

So software theft is real, it is done mainly through ignorance, but it is still defrauding the publishers. More

knowledge, and more effective management will effect a dramatic change in this area.

One of the consequences of the current level of software theft is the damage it does to the industry. At 43% (£400 in 1994) the UK is one of the best countries in Europe but any budding software publisher is facing a real task when he could expect to loose up to 43% of his income.

At FAST we are trying very hard to reduce this level in order to improve the returns to all the publishers and provide an attractive market in which new innovative publishers can create a business.

The UK would be viewed quite differently if we were able to get this figure down to say 25%, a real software developers paradise. There is no reason why this cannot be achieved but it does mean taking software management and control seriously and making it part of good company management.

You could help by making sure your organisation is legal. Join FAST and you join over 500 companies who are using our resources to help them through this process.

Geoffrey Webster is the Chief Executive of FAST. He is profiled elsewhere in the Journal and can be contacted on 01753 527999.

AS400 HELP REQUIRED

Some of you will remember our guide to auditing IBM's AS400 operating system which was authored by Malcolm Lyndsey. Indeed, this valuable guide is still available for the unbelievable price of £15.00 from our membership secretary, Jenny Broadbent.

Since its publication however, OS400 has moved on and Malcolm's work commitments make it difficult for him to find the time to update it. He has very generously however, offered the publication for updating to anyone who is willing to put in a little effort. So, are you willing to help with this task? If so, let me know and I will put together an editorial team. Ed.

The following article was submitted anonymously for reasons which are disclosed in the text, but the issues raised are so important that I have no hesitation in printing it as a true record, especially as I was consulted by the author during the investigation. The last point

made is about 'progress through sharing'. This is something that the law enforcers should seriously consider. At its best secrecy is a poor control and at worse it makes the job of the criminal easier to pursue. Ed.

World Crisis - Computer Auditor Defrauded

From our own correspondent

We are a smug lot, us Computer Auditors. We go quietly about our business, content in the knowledge that we know as much about risks to computers, and the controls to counter them, as the average person knows about supermarket shopping. We smile silently as we hear stories about thieves stealing all the chips out of PCs in an office (oh, poor physical security), hackers breaking into a confidential system via the Internet (hah, inadequate firewall), or insurance clerks paying themselves thousands in bogus claims (hm, poor application controls).

It therefore came as a shock one Sunday evening last Summer as this Computer Auditor stopped at the cashpoint in Hove, on his way to the local pub. I performed my usual check of displaying my balance, before withdrawing cash, and reeled back in horror to find that I had £200 less than I thought I had. What could have happened? Had I withdrawn it in a drunken stupor? Initial thoughts did not turn towards fraud - I could not have my bank account invaded; after all I am a Computer Auditor! I ordered an account print-out from the machine and found a cashpoint withdrawal, dated that day, for £200. Had the bank made a mistake? At the pub, after various discussions, I became convinced that I could, indeed, have been the victim of electronic crime. I phoned the appropriate Helpline and cancelled my cashline card.

The following morning I phoned my branch of the bank (which will remain nameless as they are still custodians of my accounts, plus I fancy the supervisor) to report the phantom withdrawal. I was greeted with disbelief, and was asked to make sure I still had my card (I had), and had it been out of my ownership at all yesterday (it had not). They claimed that there was no such thing as a phantom withdrawal, as computers do not make such mistakes (oh yes they do)! They requested a special print out from their head office to show the date, time and place of the withdrawal in question (good audit trail) and requested that I come in for a meeting the following day.

Tuesday dawned with a curious kind of expectancy. After all, it was quite intriguing for someone in my job to find out exactly what happened, as well as being annoying. At the bank I met Mandy (false name), the

supervisor, who I immediately fell in love with. Smiling face, dark eyes, slim figure (stop it, you are writing for the audit journal this week); however, I thought she was possibly not senior enough to be dealing with this. She advised, though, that the manager of that branch had been made redundant to cut costs, and that the manager at the branch in the next town now acted as their manager as well (foolish erosion of controls). She informed me that the withdrawal had occurred the previous evening at 18:32 at another bank's cashpoint Weymouth, Dorset. More surprisingly, further attempts were made to withdraw cash on the cancelled card later that night at Southampton, and again the following morning in Worthing.

I excitedly announced that I was a Computer Auditor by trade and was very interested in what had happened, and would be willing to lend my expertise to any investigation.

What followed was enough to dampen my enthusiasm. I was greeted with a line of questioning which indicated that they thought I, or someone I knew, had made the withdrawal.

Mandy: Were you in or around Weymouth at around 18:30 Sunday evening?

Me: No.

Mandy: Are you sure?

Me: Of course I am sure - otherwise how would I have made an account enquiry, recorded on your log, in Hove at 19:30 - about two and a half hours drive away.

Mandy: Did you lend your card to anyone yesterday?

Me: No.

Mandy: Are you sure?

Me: Of course I am sure.

After this type of dialogue continued for a while she said that this sort of thing was nearly always perpetrated by the person reporting the crime or one of their family (how insulting), and that they could not investigate further unless I reported it to the police and got a crime investigation number.

I left the bank feeling like a criminal and went to the police station determined to clear my name...sorry, launch an investigation. The next series of events proved

Guidelines for Potential Authors

The Journal publishes many different 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. See the separate 'academic' guidelines panel for details of the preferred format for refereed submissions.

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, or on PC format diskette in ASCII format, or via e-mail in ASCII format. Electronic submission is preferred.

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

Guidelines for Academic Articles

All would-be authors should follow the Harvard system of bibliographic references. At the end of your article list all the references in alphabetical order. Always start with the author's SURNAME followed by initials ALLAN G.W. Then put the year of publication in round brackets ALLAN G.W. (1994) Next comes the title of the article which is put in quote marks ALLAN G.W. (1994) "This is the Title of the Article" Next print the title of the book/journal/periodical magazine in which the article was published. This should be in *italics* ALLAN G.W. (1994) "This is the Title of the Article" *This is the Title of the Periodical*. Then follows the Volume Number and Issue Number ALLAN G.W. (1994) "This is the Title of the Article" *This is the Title of the Periodical* Vol. 12 (3).

CASG Editorial Submission Deadlines

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

even more depressing. I went to the police station to find a crowd of juvenile delinquents, drunks and distressed people all in various forms of chaos, some being dealt with, others just waiting. I reported the nature of my crime at the desk after about half an hour's wait, and was greeted with a look of incredulity as if to say 'can't you see we have real crime here to deal with, and you come in with this?'. Anyway, feeling slightly ashamed, I was told to take a seat and an officer would be with me as soon as possible to take a statement. After a further half hours wait I was met by a WPC who explained that all the statement rooms were full, so we would have to talk in the corridor. She had a piece of paper and a pen to take the details, precariously balanced on her thigh. When I explained what had happened, she said she was not sure if it constituted a crime and she would have to ask. I asked if I could have a crime investigation number, as the bank needed that in order to institute an investigation. She said she could not give me one unless it was definitely classified as a crime, and anyway she did not have the book with her. She took my telephone number and said she would call me. I told the bank what had happened, and they said they would be in touch. Exasperated, I went to the pub and cursed myself that I hadn't taken that Yak- herding position in Mongolia.

The next day a sergeant from the police station called me to say that he thought it was a crime but that it was not the responsibility of that police station, as the alleged crimes had taken place in other towns, and I would have to liaise with the police in the towns where the withdrawals and attempted withdrawals had taken place. Getting little help from them I was on the verge of taking legal advice (having consulted with my esteemed colleague John Mitchell), when the bank called saying a representative of their Fraud Investigation Department was going to visit me! I asked if this meant they accepted a crime had been committed, and that they would reimburse my lost money. She said she could not say anything.

When I was visited by the Investigator, I explained that I was a Computer Auditor and that I was interested in what had happened, and that I would like to help if I could. She said that she could not say anything, but asked if I had noticed a blue van outside the cashpoint machine on the Saturday prior to the withdrawal. Ah-ha!

So other people had been de-frauded as well? Well, maybe, she said. I did not remember the blue van, but when pressed she admitted it was a possibility that one had been there, and that they had filmed peoples PIN numbers using a pin-hole camera. I already knew that people were manufacturing plastic cards with magnetic strips, and this would complete the plot. More details would not be forthcoming, she said, as they had to be kept private, but I would get my money back.

A few days later, my friend told me that he had heard on Radio 4 news that the police were investigating fraudulent withdrawals on 200 people's accounts, perpetrated by a criminal gang. So much for their secrecy!

So what are the morals of this story? As far as controls go, I have now got the new style cashpoint card, which has the PIN Number stored on the magnetic strip, in order to prevent this type of fraud. This is because the local cashpoint can now check the authenticity of the card, even when the host computer is down. However, the main points I draw are not specifically to do with controls, but the management of the investigation itself. Firstly, the supervisor in the bank lied to me. She pretended to be surprised by my fraudulent withdrawal, clearly under instructions not to admit the other cases. In the event, I found it very unhelpful. Secondly, the police were ill-equipped to deal with the case, until, I would imagine, suitable resource was secured from the bank. Thirdly, the bank made a (clearly unsuccessful) attempt to keep what had happened quiet.

This last point is what I consider the most important. In the computer audit world we generally share knowledge of risks and controls, regardless of what company or industry we are in. We regard it as the best way to counter the myriad risks that face us today. The banks premise of keeping it all in the dark was wrong because it did not harm the criminals, or any potential criminals. Gangs of professional villains will find existing and new ways of defrauding, regardless of information black-out. However, this lack of information will certainly inhibit the success of those, like myself, paid to fight fraud and computer abuse. Final lessons are that amateurish management of investigations reduces the confidence of those involved, and the police, bless them, desperately need more resource.

**THE
ANNUAL GENERAL MEETING
OF THE
COMPUTER AUDIT SPECIALIST GROUP
OF
THE BRITISH COMPUTER SOCIETY
WILL BE HELD AT
4.30 pm, TUESDAY 16th APRIL 1996
AT
THE ROYAL AERONAUTICAL SOCIETY
4 HAMILTON PLACE, LONDON W1
(See location map on back cover)**

AGENDA

1. Approval of the minutes of the AGM held on 10th May 1995
2. Chairman's Report
3. Treasurer's Report
4. Election of Officers
5. Election of Auditor
6. Appointment of Committee
7. Plans for 1996/1997
8. Any Other Business

**The meeting will follow the close of the Technical Briefing.
There is no charge for attendance at the AGM which is open to all CASG members
irrespective of whether or not they attend the Technical Briefing.**

NOMINATIONS FOR THE MANAGEMENT COMMITTEE

As usual at this time, I am asking for nominations for the Group's Management Committee.

We hold about six committee meetings a year at a London location. The meetings start at 5.00 pm and we try to finish them by 7.00 pm. Each committee member is allocated a specific task. The committee is definitely not 'cliquey' and we genuinely welcome new people, new ideas and lots of enthusiasm!

If you would like to discuss any of the committee posts, please contact either Alison Webb 01223 461316, Raghu Iyer (0171 311 6023) or any other committee member (their telephone numbers are given elsewhere in the Journal).

Even if you fancy a post which is already filled, just put yourself forward and the AGM can vote on it. No-one on the Committee will be put out by such a display of interest! A blank nomination

form is printed below for your use. Please return completed forms to Raghu Iyer.

Remember, this is your group and you should use this opportunity to have your say.

Alison Webb

THE BRITISH COMPUTER SOCIETY COMPUTER AUDIT SPECIALIST GROUP NOMINATIONS FOR THE 1996/97 COMMITTEE

Position:

Nominee:

Proposer:

Secunder:

Signature of Nominee agreeing

to serve on the CommitteeDate:

REMINDER

The AGM will be held after the Technical Briefing on the 16th April

If you would like to stand for the Management Committee, then please complete the nomination form on page 17.

REPORT FROM THE MONEY BOX



This column is prepared by Bill Barton our Treasurer.

To date we have received approximately £9,500 from our endeavours, £5,000 of which relates to annual subscriptions and the rest from our technical briefing sessions.

Income from our successful second technical briefing session was approximately £3,000. Unfortunately outgoings for the event were approximately £3,500, which leaves a deficit on the day of £500.

In the next edition we should be in a better position to describe the overall position for the financial year.

Do not forget the third of our technical briefing sessions on 16 April 1996 on the subject of "Readiness is All" Making Better Use of the Technology, at The Royal Aeronautical Society. I look forward to making a profit on this event.

We still have a healthy bank balance of £26,000 and would welcome suggestions on how this could be put to some useful purpose.

REMINDER

The final Technical Briefing for the current season will be held on Tuesday 16th April. See the enclosed information sheet for full details, but make a note in your diary now and call that telephone number to reserve your place.

“Readiness is all”

Making Better Use of the Technology

The third of our full-day technical briefings

Tuesday 16 April 1996 at the Royal Aeronautical Society.

What's New

- ◆ There are well-established ways of keeping data and applications on a central mainframe secure. What rules to I suggest if they're on 800 PCs, many of which I know are in warehouses and public offices?
- ◆ We have 150 Unix processors: and we have strict rules for authorising access to them. But how do we make sure we keep access rights on all those boxes up to date as people move job or leave?
- ◆ Windows makes it so easy for users to look at what's on their PCs. How do we stop them or other people in their offices messing up the configuration and how do we keep the data safe?
- ◆ I think I'm quite competent and have some useful ideas, but no-one takes any notice of what I say. They say I don't understand the technical aspects of computer security: how can I improve things?

The Details

Time: 9.30 for 10.00 am

Venue: Royal Aeronautical Society, 4 Hamilton Place, London W1V 0BQ

Fee: For members of BCS, CASG, ISACA, ICAEW IT Faculty, IIA - £40.00 (£47.00 inc VAT)

Non-members £140.00 (£164.50 inc VAT).

This includes the cost of Corporate Membership of the Computer Audit Specialist Group until August 1996. Individual non-members will be accepted at the member rate if they also enrol as CASG members at the same time.

Agenda

1. Auditing Client/Server systems
2. Access control: current issues
3. Audit and Windows
4. The medium not the message
5. From our own correspondents

To Register

Send the enclosed form (or a photocopy) and cheques made payable to BCS/CASG to Diana Skinner, BCS/CASG, 44 Station Road, Wickwar, Wotton-under-Edge, Glos GL12 8NB. Tel 0117 900 1418 Fax: 0117 979 4100.

Please bear in mind we cannot make firm bookings until we receive full payment.

PEOPLE PROFILES

Edited by Jenny Broadbent

If you have a suggestion for someone to be profiled please contact Jenny at her number in the Editorial Panel



PETER WOOD

Current Position:

Managing Partner, First Base

CASG Involvement:

Journal Contributor

Peter Wood has been involved in the electronics and computer industries since 1969. At twenty-five, he was running the UK support operation for Raytheon International Data Systems, one of the leading manufacturers of wide area network computer systems for airlines. He also provided training for Raytheon and customer staff at Raytheon International's headquarters in Amsterdam.



In 1979 he started Amplicon MicroSystems Limited, one of the first personal computer dealerships in the UK. Amplicon grew to be one of the largest suppliers of personal computers in the South of England. In 1983 Amplicon became an Accredited IBM Systems Centre specialising in network systems. As a main board director, Peter became responsible for new product acquisition and promotion, advertising, PR and staff training.

From July 1988 to May 1989 Peter was contracted to South East Computers Limited, where he provided the technical knowledge to achieve IBM Systems Centre and Novell Systems House status. As Technical & Marketing Director he was running the customer support, software and maintenance departments as well as much of the advertising and PR for the company. He was also responsible for staff training on technical and management subjects.

In May 1989, Peter founded his own firm, First Base, offering independent IT consultancy and training. First Base specialises in local and wide area networks, communications and IT security. Key projects include network security audits for a major pharmaceuticals company, PC and network training for a household-name insurance company, and network disaster recovery planning for the group finance division of an international conglomerate.

Peter is associated with the following organisations:

- Member of the British Computer Society
- Member of the Parliamentary Information Technology Committee
- Member of the Institute of Data Processing Managers
- Treasurer of the Real Time Club
- Member of the Network Professional Association
- Member of MENSA

GEOFFREY WEBSTER

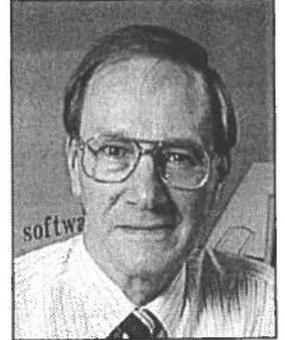
Current position:

Chief Executive of FAST
(Federation Against Software Theft)

CASG Involvement:

Journal Contributor

In his role at FAST Geoff is one of the computer industry's most prominent spokespeople, known for his authority, credibility



and fairness. He is also seen as representing the interests of both computer companies and their corporate user base.

Geoff has 15 years experience in the computer industry and regularly speaks at public events. His role as the public face of FAST is to unite vendors, resellers and corporate users together in protecting IT investment.

FAST itself is the single UK organisation comprising 150 manufacturers including Microsoft, Lotus and IBM, with over 500 corporate members including British Airways, the Department of Health, Lloyds of London and National Westminster Bank.

Geoff held senior positions within ICL, one of the UK's most established computer companies and Norsk Data, the Norwegian computer company. From 1990-1992 he represented the industry as a member of the CBI Economics Situation Committee. Throughout his career he has been particularly involved in the campaign for the protection of intellectual copyright.

Geoff's three priorities for 1996 are:

- * Combating professional counterfeiting
- * Promoting legal use of software
- * Building FAST's profile as a corporate business partner

BCS MATTERS



Colin Thompson
Director of Member Services

This column is edited by Colin Thompson, the BCS Membership Director, and focuses mainly on BCS news and events. The aim is to keep readers in touch with what is going on in the BCS, and to provide background information and explanation where appropriate. Anyone with suggestions for particular issues to be covered in future editions should contact Colin at BCS HQ (Tel: 01793 417410 e-mail: cthompson@bcs.org.uk).

THE BCS AWARDS PROGRAMME

The BCS IT Awards are one of the major activities of the Society calendar. These awards have now been running for 23 years and are sponsored by some of the leading names in the IT world - BT, Bull, Computer People, DTI, Energis, Fraser Williams, IBM, ICL, Logica, Oracle, The Post Office and Tandem.

The 1995 programme reached its climax on the 14 February at an event held at the Institution of Civil Engineers in London. Kate Bellingham, late of Tomorrow's World, introduced the twelve medal winning projects and the three award winners gave presentations to an audience of over 200 people, which included the Duke of Kent.

The awards evening is the final event of a very extensive programme of work which runs throughout the year. A total of 71 projects were nominated in 1995 and the subsequent investigations involved a panel of 18 people in a total of 137 visits before the twelve medal winners were selected in the Autumn of 1995. A distinguished panel of 6 judges then considered the medals and selected three to be the BCS Award winners for the year:

Visage - Visage Developments Limited

Humans recognise a face they know within approximately 20 milliseconds, using a part of the brain specialised for this function. Using this capability, combined with the ability of the com-

puter to display a number of images simultaneously, Visage has devised a highly secure and specialised security system. The computer displays a grid of say nine or twelve faces for a period of no more than a second, and the user then proves his or her identity by entering the positions of the key face or faces through the keyboard. This secure, intuitive and user-friendly system, which has no password that needs to be remembered, provides a radical alternative to the traditional authentication system, yet one which needs no expensive or special hardware.

AMULET 1 - University of Manchester

AMULET 1 heralds the way to more power-efficient high-performance portable computer products such as digital mobile telephones and personal digital assistants, where the application of asynchronous technology will result in longer battery life. It is a fully asynchronous implementation of the Advanced RISC Machine Limited's RISC micro-processor architecture operating without any externally supplied clock. All internal functions measure their own progress and operate as fast as the technology allows. The objective of this work was to demonstrate the potential power savings and on-chip space savings which accrue from removing the clock. In a conventional modern processor, the clock causes power to be consumed at all times. Asynchronous logic, such as that used in Amulet 1 only uses power in proportion to the current workload.

Computer Assisted Orthopaedic Surgical Systems - University of Hull and Hull Royal Infirmary

The CAOSS project assists orthopaedic surgeons, by taking an image guided approach to planning and implementing a trajectory; accurate delivery is achieved via an intelligent drill guide. It is a non-invasive intelligent guide which is able to position itself with the help of the surgeon and a computer with supporting technology, on a trajectory which allows the place-

ment of a surgical implant at a specific site, within anatomical constraints, accurately, speedily and with minimal X-ray radiation exposure.

A key component of the system is an X-ray based vision system which allows implants and tools to be inserted into a patient with an accuracy of 1 mm. The intelligent drill guide has been designed to be as widely applicable as possible for all types of orthopaedic intervention, but is currently being evaluated for the repair of femur fractures, hip fractures and minimal access spinal surgery. As the 1995 programme ends, work is already underway in preparation for 1996. Nominations are open until 31 May and the process of investigation and judging will then begin again. Details of the IT awards, and for the other major BCS awards programme, the IS Management Awards, may be obtained from Anna Duckworth at BCS HQ or by sending an e-mail to awards@bcs.org.uk.

INDUSTRY STRUCTURE MODEL - VERSION 3

Work on ISM3, mentioned in my previous article in this series, has now been completed and the product was officially launched on the 20 of February. To recap, for the benefit of those not familiar with the ISM, it represents a set of performance standards covering all functional areas of work both within, and associated with, information systems engineering. First published in 1986, the ISM is recognised world wide as the most authoritative reference and now forms the basis of the European Informatics Skills Structure (EISS). Version 3 was produced after 18 months consultation with professionals from all areas of IS and has a number of improvements over ear-

BCS MATTERS

lier versions - in particular the move from paper to electronic medium. ISM3 is delivered as standard PC Windows software with full browse, print and help facilities.

The new version also recognises the fact that IS jobs now often involve several different roles. For this reason ISM3 is structured as a simple matrix of over 200 roles categorised by 10 levels of responsibility and competence. The tasks performed within each role are clearly stated along with the experience and skills required, and training and development targets. Details are given of all relevant vocational and professional qualifications, including Scottish/National Vocations Qualifications (S/NVQs).

The Industry Structure Model is an integral part of the Professional Development Scheme. But it is also a very useful tool in its own right and the changes incorporated into the new version have added considerably to its flexibility. The product will now assist IS managers to;

- ◆ Compose customised job descriptions for standardised roles/tasks
- ◆ Assess whether IS staff meet the competence requirements for a particular role
- ◆ Establish individual and corporate training and development needs

- ◆ Provide training to recognise standards
- ◆ Plot career development paths
- ◆ Establish staffing and recruitment needs
- ◆ Identify skill shortages

Further information on ISM3 can be obtained from the Professional Development Department at BCS HQ.

PRIVY COUNCIL SUBMISSION

News is still awaited from the Privy Council following the submission made last Autumn, to amend the Royal Charter. This submission covered, amongst other things, the new grade Companion, intended for those qualified in a discipline other than information systems engineering but who have a significant involvement in IS. The submission also seeks the creation of a new Graduate grade and the right for Members and Fellows to use the title Chartered Information Systems Practitioner.

When do we expect a response? Difficult to say, other than that it should be soon. The Privy Council is required to consult other interested parties, such as the Engineering Council, and as soon as this process has been completed, we should get news.

HQ ORGANISATION

Planning is in progress for a change to a more functional based organisation within BCS HQ. More news of that in the next edition of this newsletter. In the meantime readers may find the following list of HQ email addresses useful.

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AND FINALLY

We still have a number of copies of the 1995 Review and Directory available. The publication, which includes a wealth of information, can be ordered from BCS HQ at £10 for members. Details may be obtained from Tina Tueton at BCS HQ or by sending an e-mail to membemq@bcs.org.uk.

Library Services for BCS members

By Helen Crawford - BCS Librarian



The BCS library, which is held at the Institute for Electrical Engineers, is also available, free of charge, to members of BCS specialist groups. In this column, **Helen Crawford**, the BCS Librarian, describes some of the publications available which are relevant to computer audit. If you wish to take advantage of this BCS service, then contact Helen at the address given at the bottom of the column. Ed.

We have been very busy this month so I am afraid that I have not had time to compile a list, but the full library catalogue is now up on the internet. It can be found at:

<http://www.iee.org.uk/Library/Catalogue/Simple-search.html>

requests for book loans may also be sent from this address.

Helen can be contacted at: The IEE/BCS Library, The Institution of Electrical Engineers, Savoy Place, London, WC2R 0BL. Telephone: 0171 344 5461. Facimilie: 0171 497 3557.

Email: libdesk@iee.org.uk.

BOOK REVIEWS

This column is edited by **Iltaph Khaliq** who would like volunteers to help him with the review process. If you are interested please contact Iltaph at the number provided in the Editorial Panel.

TITLE: Digital Woes: Why we should not depend on software
AUTHOR: Lauren R Wiener
PUBLISHER: Addison-Wesley
ISBN: 0-201-40796-5
Price: £10.95
Pages: 252

TITLE: Computer Related Risks
AUTHOR: Peter G Neumann
PUBLISHER: Addison-Wesley
ISBN: 0-201-55805-X
Price: £18.95
Pages: 367

Both titles reviewed by **Andrew Hawker**, Department of Accounting and Finance, University of Birmingham, Birmingham B15 2TT. Tel: 0121 414 6675/5647

Computer Audit books usually concentrate on explaining how one should get things right, with maybe a few cautionary tales thrown in to show what can happen in the event of failure. These two books, however, turn this kind of approach on its head. They are packed with cautionary tales, and com-

paratively little time is spent in discussing good practice.

There is a temptation, therefore, to peruse all the numerous bad-luck stories - which range from the terrifying to the truly daft, such as the industrial robot which mistakenly injected itself with solvent - and overlook the wider implications.

There is perhaps a particular danger that stories about air traffic control or medical treatments may seem far removed from most businesses, giving rise to a feeling of detachment and the dangerous assumption that one can observe them all from a safe distance.

Both authors would no doubt disagree with this. Peter Neumann has drawn on his work as moderator of the Internet RISKS forum, and as well as quoting many of the examples at his disposal he tries to classify all the individual causes of systems failure and to show how these causes constantly recur. Two of his chapters offer more general analysis, but the treatment is patchy and uneven, and supported by an odd assortment of references.

Lauren Wiener, on the other hand, is a technical writer who has produced a better organised and more focused book. It is journalistic in style, but this



Andrew Hawker

is quality journalism, with an ability to home in on some of the pretensions of the computer industry (why, after all, do we insist on talking about the "maintenance" of software when we are actually correcting or repairing it?).

Both books make an enjoyable read, and may provide useful ammunition for anyone doing battle with a complacent management: there is almost bound to be a case in point in the Neumann collection, and Wiener offers some model examples of how to explain technical issues in layman's language.

On the other hand, if you feel you cannot face being reminded of the many ways in which computer systems can go wrong, then perhaps your best option will be to persuade your management colleagues to take these books home and read them for themselves.

Estimating Software Development Time & Costs

George Allan

Abstract

This paper, which comprises three parts, aims to introduce and explain a process for software estimating. It is anticipated that this will provide auditors, software engineers and project managers with an insight to a stable method for estimating time, cost and staffing requirements. The basic model distinguishes between three different development modes - Organic, Semi-detached and Embedded. These are explained and worked examples are included to illustrate the theoretical points.

Further refinements to the model allow estimates to be made for more detailed partitioning of the development cycle. This paper discusses the time, cost and staffing requirements for Product Design, the actual Programming and the Integration & Testing of software units. A further consideration sub-divides the actual

programming into its two realistic components of Detailed Design and Coding. Worked examples throughout are progressive in difficulty as each point is illustrated and accumulated into the auditor's/software engineer's/project manager's tool kit.



Key Words

Software estimating; CoCoMO; Person months; Development time; Development cost; Organic mode; Semi-detached mode; Embedded mode; Product design; Programming; Integration & Test; Detailed design; Code & unit test.

Part 3 of 3

A FURTHER CONSIDERATION

Before actual programming takes place, the professional programmer will now be in a position to consider levels of program detail. Having spent some time previously on the whole unit *Product Design*, now consider each part of the software unit in detail. The *Programming Phase* is now further divided into 2 sub-phases

- i) Detailed Design
- ii) Code and Unit Test.

Careful consideration to the design of the logic in this phase pays dividends later. It is my experience that an investment of each unit of time in the detailed design (both in the logic and the use of programming devices) saves 2½ units of time later in trying to "sort things out", searching for bugs, rewrites, putting in patches. It also leads to a more professional approach and produces a quality product - including the documentation.

Unfortunately it is an area in which many programmers have been allowed to get away with less than satisfactory preparation and performance by poor/weak Project Managers. This has led to the later need of much time to repair faults and bodge patches to get the software unit through tests to meet deadlines.

At those later stages is when Milestones become Millstones,

NOW is when the seeds are sown for an easy-to-code-and-test-quality-product

or the alternative

- a Millstone to integrate with the rest of the software in the project.

The amount of effort invested in this Detailed Design will aid the next stage which is the actual Coding of the Unit.

Code & Unit Test

Inherent in with Coding is the testing of the software at a Unit level probably in stand-alone mode at this stage. This is to ensure that this particular piece of software satisfies the requirements as laid down in the specification - in other words that the software does what it is supposed to do. The division of the programming effort between Detailed Design and the Code and Unit Test varies from 40:60 to 50:50 depending on development mode and actual size of code in KDSI.

It is interesting to note that the larger the size of code the more even is the division of effort between Detailed Design and actual Code and Unit Test.

Table 4: Phase Effort Distribution

Mode	Phase	Small 2KDSI	Intermediate 8 KDSI	Medium 32 KDSI	Large 128 KDSI	Very Large 512 KDSI
ORGANIC	Product Design	16	16	16	16	—
	Programming	68	65	62	59	—
	Detailed Design	26	25	24	23	—
	Code & Unit Test	42	40	38	36	—
	Integration & Testing	16	19	22	25	—
SEMI-DETACHED	Product Design	17	17	17	17	17
	Programming	64	61	58	55	52
	Detailed Design	27	26	25	24	23
	Code & Unit Test	37	35	33	31	29
	Integration & Testing	19	22	25	28	31
EMBEDDED	Product Design	18	18	18	18	18
	Programming	60	57	54	51	48
	Detailed Design	28	27	26	25	24
	Code & Unit Test	32	30	28	26	24
	Integration & Testing	22	25	28	31	34

Worked Examples

Consider again examples 5, 6 and 7.

For Example 5 Organic Mode 8 KDSI

The programming effort was 65% of overall effort = $65\% \times 21.3 = 13.8$ person months.

This 65% is attributable to 25% of the overall effort to Detailed Design

$$= 25\% \times 21.3 = 5.3 \text{ person months}$$

and 40% of the overall effort to Code and Unit Test

$$= 40\% \times 21.3 = 8.5 \text{ person months}$$

ALWAYS CHECK THAT

the % assigned to Detailed Design + the % assigned to Code and Unit Test

= overall % for Programming Phase

In this case $5.3 + 8.5 = 13.8$

So we now have a further refinement within the rather general phase of “*Programming*” and could now work out the actual manpower requirements for these detailed phases. We saw earlier from Table.3 that TDEV for programming in this example was 59% of overall time.

$$\therefore \text{Duration of this phase is } 0.59 \times 8 \text{ months} = 4.7 \text{ months}$$

\therefore from the general estimate of phase manpower from the programming phase of 13.9 person months that we had earlier, we now can be a little more detailed in the estimate and say that:-

$$\begin{aligned} \text{Phase average staff requirement} &= \frac{\text{phase effort}}{\text{phase duration}} \\ &= \frac{13.9}{4.7} = 3 \text{ people} \end{aligned}$$

One Further Step

When considering any mode of development if the KDSI does not correspond with the column values given, we would interpolate linearly i.e. 20 KDSI is $\frac{1}{2}$ way between 8 KDSI and 32 KDSI, 56 KDSI is $\frac{1}{4}$ of way between 32 KDSI and 128 KDSI.

Again remember, these are only estimates; calculations to umpteen decimal points are meaningless - **DON'T DO IT.**

Worked Example

Consider a Semi-Detached Mode Development of size 80 KDSI. 80 is exactly 1/2 way between 32 and 128 so all figure work will be taken 1/2 way between the tabulated values of columns 32 KDSI and 128 KDSI.

The Effort:-

- ☞ Product Design is still 17% of overall.
- ☞ Programming is 56.5 % further broken into
 - ✓ Detailed Design 24.5 %
 - ✓ Code & Unit Test 32%
- ☞ Integration and Testing is 26.5%

Check that the total still comes to 100%.

The Schedule Distribution would be

- ① Product Design 26.5% of time
 - ① Programming 46% of time
 - ① Integration & Testing 27.5% of time
- 100% of overall time

Worked Example

Estimate the overall effort and time to develop a software unit of expected size 14 KDSI in Organic Mode. Given the average cost of staff as £4,000 per month estimate the cost and duration of the three main phases and calculate an estimate of the staff requirement for the Code and Test sub phase.

The overall effort will be given for Organic Mode development by:-

$$\begin{aligned}
 \text{PM} &= 2.4 \times (\text{KDSI})^{1.05} \text{ person months} \\
 &= 2.4 \times (14)^{1.05} \quad \text{“} \quad \text{“} \\
 &= 2.4 \times (15.97) \quad \text{“} \quad \text{“} \\
 &= 38.3 \text{ person months of effort}
 \end{aligned}$$

TDEV for this unit is

$$\begin{aligned}
 &= 2.5 \times (\text{PM})^{0.38} \text{ months} \\
 &= 2.5 \times (38.3)^{0.38} \quad \text{“} \\
 &= 2.5 \times 4 \quad \text{“} \\
 &= 10 \text{ months}
 \end{aligned}$$

Considering the detailed phases now; for this software unit of size 14 KDSI

Using Table 2, we see that 14 KDSI is between columns 8 KDSI and 32 KDSI. The difference between these two sizes is 24 KDSI and we require $8 + 6 = 14$ KDSI. Therefore we require $\frac{6}{24} = \frac{1}{4}$ of the way from the 8 KDSI towards the 32 KDSI reading.

	Effort	Cost	Duration
Product Design	16% x 38.3	= 6.1 £24512:	19% x 10 = 1.9 months
Programming/	64.25% x 38.3	= 24.6 £98431	58% x 10 = 5.8 months
Integration	19.75% x 38.3	= 7.6 £30257:	23% x 10 = 2.3 months
	100%	£153200	100% 10 months

The effort for the Programming Phase we see from Table 3 that this phase can be further divided into:-

Detailed Design	24.75%
Code & Unit Test	39.5%
	<u>64.25%</u>

∴ the staff requirements for these two sub-phases would be

Detailed Design	24.75% x 38.3/5.8	= 1.6 staff
Code & Unit Test	39.5% x 38.3/5.8	= 2.6 staff

7. A FINAL CONSIDERATION

Program specifications vary enormously from the very professional which includes well thought-out details which communicate exact thoughts to the programmer.....to the very sketchy with some half baked ideas on the “back-of-a-fag-packet”.

A professional software engineer will/should always start a unit by considering the specification and planning how she/he is going to tackle the job in hand.

Having previously calculated an estimate for programmer Effort, the Project Manager must now ADD a further 6%, 7% or 8% of the total overall Effort to, cover the time needed for the programmer to clarify requirements and then formulate her/his own planning for this particular software unit, before commencing any work at all This is to be considered as an OVERHEAD on top of the 3 main phases. The % to be added as an overhead will depend on the Development Mode:-

- ◆ 6% for Organic Mode
- ◆ 7% for Semi-Detached Mode
- ◆ 8% for Embedded Mode

This is to account for the professional programmer planning out the work involved in this software unit and familiarisation with and clarification of the requirements either through the Analyst or direct to the User (care not to allow User interference and introduction of unnecessary changes).

This is an OVERHEAD which the Project Manager will ignore at his/her peril as it is time & effort (person months) very well spent and indeed if it is ignored the final product will undoubtedly suffer. **The auditor must be aware of this overhead.**

Table 5 gives the complete picture for the distribution of effort in the basic CoCoMo method.

8. CONCLUSION

It is hoped that this paper will help the software auditor by giving an appreciation of this method of estimating the effort, time and staffing requirements in a variety of software developments. Many people dismiss this algorithmic method on the grounds that it doesn't address a myriad of detailed objections. The method outlined in this article should be taken as it is meant.....as an ESTIMATOR.

Table 5: Phase Effort Distribution with Overheads

Mode	Phase	Small 2KDSI	Intermediate 8 KDSI	Medium 32 KDSI	Large 128 KDSI	Very Large 512 KDSI
ORGANIC	Planning	6	6	6	6	—
	Product Design	16	16	16	16	—
	Programming	68	65	62	59	—
	Detailed Design	26	25	24	23	—
	Code & Unit Test	42	40	38	36	—
	Integration & Testing	16	19	22	25	—
SEMI- DETACHED	Planning	7	7	7	7	7
	Product Design	17	17	17	17	17
	Programming	64	61	58	55	52
	Detailed Design	27	26	25	24	23
	Code & Unit Test	37	35	33	31	29
	Integration & Testing	19	22	25	28	31
EMBEDDED	Planning	8	8	8	8	8
	Product Design	18	18	18	18	18
	Programming	60	57	54	51	48
	Detailed Design	28	27	26	25	24
	Code & Unit Test	32	30	28	26	24
	Integration & Testing	22	24	26	28	30

SUMMARY

- ◆ Software Units are DEVELOPED in 3 MODES
 - ❖ Organic — Simplest
 - ❖ Semi-Detached — Middle Ground
 - ❖ Embedded — Most Complex

Basic Development Mode Equations for PM & TDEV are given in Table 1

- ◆ Staff Effort is divided among 3 Main PHASES
 - ❖ Product Design
 - ❖ Programming
 - ❖ Integration & Testing
- ◆ PROGRAMMING is further sub-divided into:-
 - ❖ Detailed Design
 - ❖ Code & Unit Test
- ◆ TDEV is divided among the 3 Main PHASES in Table 3
- ◆ There is an OVERHEAD to Staff Effort for INITIAL FAMILIARISATION AND PLANNING
- ◆ The complete EFFORT DISTRIBUTION is given in Table 5

REFERENCE

- Allan G.W. (1995) "Software Estimating using an Algorithmic Method" Technical Notes in Department of Information Science, University of Portsmouth, England
- Boehm B. (1981) Software Engineering Economics Prentice-Hall

————— End of Series —————

The Author

George Allan is a Senior Lecturer in the Department of Information Science at Portsmouth University and the Academic Editor for this Journal. See the contact details under the Editorial Panel.

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