

Developing an IT Strategy for Publishing Construction Research Findings for CAD Users.

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ABSTRACT

The Building Research Establishment is developing a strategy for publishing research information to the Construction Industry using IT. In particular it is investigating the most appropriate methods through which its information can be integrated into the operation of Computer Aided Design systems.

The study will also investigate how CAD can be integrated with Desktop Publishing to produce publications. The two techniques are different and the software and procedures are not readily compatible. This is because Desktop Publishing comes from a printing background and is designed for publishers; whilst CAD comes from a Construction Industry background and is designed for use by draughtspersons.

Key Words

Publishing; Desktop Publishing; Computer Aided Design; Construction Research

Background

The UK Building Research Establishment was established in 1921. It carries out research studies for the Government and the Construction Industry into building and materials' performance and construction techniques. It publishes its findings in a variety of printed forms as well as film, video and audio-visual presentations. It is now assessing ways in which its knowledge base can be adapted for use on computers.

Various media are being considered for the storage and presentation of the information. Two distinct product types are emerging. One could be described as "library software"; for the storage and management of information. This would simply give access to text and graphical information such as data, guidance notes, Building Codes or Regulations. The second could be called "design software". These would be computer programs containing data and algorithms and would be used as part of the design process. They would access the building model database in order to assess the building design for, for example, environmental or structural performance. Both types of product can assist the designer to check the building design and specification against recommended practice and design guides.



BRE is developing a strategy for producing both types of products. Its aim is to use IT effectively in the production and delivery of research information to the Construction Industry. This paper sets out some of the considerations in developing this strategy, especially as regards "library software".

Future publication strategy

A construction research and publishing organisation needs to develop a strategy for its future application activities. It should study the Construction Industry's use of IT, particularly Computer Aided Design, and investigate ways to present research findings in forms that are appropriate for the Information Technology of the future. It will need to understand how CAD and DTP programs work and how they are used, both from the point of view of collecting and storing information as well as accessing and displaying it. CAD publications or applications will need to be compatible with the computer systems and software that its customers use.

The Construction Industry is increasingly using Computer Aided Design and computer aided exchange of information. The signs are that the pace will continue and customers for research information will be using CAD and computers in an ever increasing way. Information Technology is progressing rapidly both in the areas of hardware, with reducing costs and increasing performance, and in software, by improving the capability of applications and making data transfer across systems and applications easier, by improved compatibility and the use of translator software.

However one of the major problems at present for the production of information for use in association with CAD computers is the diversity and incompatibility of much of the hardware, operating systems and software in general use. The introduction of data exchange standards such as STEP should help to overcome this. (STEP data exchange format. - international STandard for the Exchange of Product Model Data)

In the future there will be many new methods of accessing text and graphics from databases. As existing systems improve and develop they are likely to overlap or amalgamate. For the immediate future there is the opportunity of incorporating sound and video within computer presentations. This mixture is usually referred to as Multimedia and the use of compact disks for data storage (CD-ROM) makes this possible today.

All of these innovations will be beneficial to publishing organisations in the production and presentation of information and will enable improved access to large databases.

Publication content

Many research organisations already produce a wide range of publications. These may include information on Regulations and Codes, and their application, as well as guides to good building practice, performance data and information on defect prevention.

For example, some of the types of publications produced by BRE include:-

- * How to comply with Building Regulations, Codes and Standards
- * Bibliographies
- * Recommended construction practice and procedures
- * Software for analysing energy performance and wind loading
- * Regular research information and updates.

These may take the form of individual reports or be part of a subscription leaflet series, such as Digests or 'Good Building Guides'. Some of the publications are readily adaptable for CAD users. For example illustrations such as 'good practice' details could be imported from disks directly into CAD drawings representing a considerable saving in time for users as compared to copying the illustrations manually from a book.

Other publications provide information for designers to be read as they prepare drawings, for example guidance notes on Codes or Regulations. It may be convenient to read this type of information from the CAD screen displaying the drawing, but it is not necessary for it to be on the same computer as CAD. In these cases a separate monitor or stand-alone computer could be preferable, especially where it would avoid penalties such as reducing screen size, or slowing the CAD program.

Product format

The correct presentation of the information will be important. Design aids, information, Codes, Standards and Building Regulations can be stored and presented on disk for CAD users in different ways. The best format or method of presentation for a particular product will frequently be suggested by the information content of the product itself. There are many methods available at present.

** Scanned Images:* Pages of information are shown on screen, but the content is not accessible to the user. The computer does not recognise the text as text, but considers each page only as an image, or picture, the information being stored in the form of scanned pages. The software "front end" would consist of a search and find routine using a classified index to enable users to select the book, page, or information that they require for viewing or printing. This method can be useful for looking at information such as Standards, manufacturers lists and products. Examples of this are the Technical Index's and Building Centre's systems of storing British Standards, BRE publications and other information on a series of CD-ROMs (refs 1 and 2).

Computer versions of conventional paper publications can be produced easily in this way, as read-only CDs.

** Hypertext:* Publications comprising of text and illustrations, with active words or buttons which the reader selects to take his own route through the publication. The format of this type of publication would be quite different from a conventional book. Examples of this are:

-The "BUILDING IT 2000" study on the future of Building and Information Technology. (ref 3)

-The CNRC-IRC "Construction Resources" information for the Canadian Construction Industry. (ref 4)

Bibliographies and knowledge based guides based upon the use of search words are particularly suited to this method of publication.

** Multitasking:* This means running two or more programs concurrently which can share the same screen. The pages of text or graphics can be read, and sections can be selected by the user for transferring across documents or drawings, using a "cut and paste" technique. This feature is restricted to the more advanced computers.

An example of a multitasking program is SPECMAN, an information database used to assist in writing specifications (ref 5).

* *CAD Libraries:* Drawings of building components, or fittings held in a CAD format can be accessed and incorporated into other CAD drawings from a library of objects stored on a database. An example of this is RIBACAD (ref 6) stored on CD-ROM.

* *Presentation software:* Text and graphics programs are available which enable illustrations and information to be displayed in the form of slide shows, either manually or automatically. Two variations of this are POWERPOINT for IBM and HYPERCARD for Apple Macintosh computers.

* *Multimedia:* This is a term used to describe a combination of different media. The technique is frequently used for presentation purposes. Application packages can now be written which include sound and video recordings in addition to the program, which may itself be interactive and multitasking. CD-I has the facility to show full length feature films using compact disks as the storage media

* *Building analysis software:* Building performance analysis programs have been developed for use in conjunction with CAD. They are part of the design support system and need to access the building model database in order to function. This type of program is normally used at the initial design stage for, for example, environmental or structural analysis of the building model. They often take several years to produce in a commercial form and in future will probably aim to conform with the STEP data exchange format.

Product media

Identifying the best media for publications may be difficult because of the wide variations to be found between different systems, software and storage. Selection will mainly depend upon what is available and what the potential customers have access to.

* *What system?* IBM, APPLE, UNIX? There are many different computer systems in use today in the UK building industry, IBM compatible systems being the most prevalent.

* *What software?* AutoCAD, Sonata, Intergraph, Caddie? Many different CAD programs are in use in the UK, AutoCAD being the market leader and generally accepted as the industry standard.

* *What storage?* Floppy disks, CD-ROM, CD-I, MO, PCMC? Normally floppy disks only store up to 1.44Mb. At present Compact Disks are potentially the most promising method of storing large amounts of data, up to 650Mbs, on an optical disk of 120mm dia. There are several types of CD, with uses varying from playing HI-FI music, through containing computer data, to the ability to contain full length movies. Some of the formats are compatible with each other whilst others are not - at present a very confusing state of affairs. The most important ones for "publication" products are probably; CD-ROM (for computers) and CD-I (for home TV). Magneto Optical (MO) and Personal Computer Memory Cards (PCMC) are emerging as potential storage media but at present they are new to the market.

There is a wide choice of combinations, but fortunately operating systems are becoming more compatible and data for applications can be used more easily across systems. Future acceptance of STEP for data transfers should improve the situation further. There is a strong argument for publishers to target the most popular systems in order to get the highest potential sales. However, if the product is good, customers will purchase the system to suit, for example the cost of CD-ROM external drives in the UK start at £300.

Where scanned image information is to be displayed, there is a strong argument for ignoring current CAD systems and using a stand-alone computer which could be used as the office 'Information Machine'. This could probably be a dedicated 'outdated' computer, left behind in the race from 286, 386, 486 to Pentium and beyond.

Of course this solution would not be appropriate for running building analysis software, or other programs which require access to the CAD database.

Publication strategy

Publications for use on computer are likely to incorporate different features from those printed on paper, to make the best use of IT. This means that authors must bear this in mind when starting to write. The final format of publications to be used in conjunction with CAD will necessarily be quite different and require new techniques from those produced at present.

It means that publishers for the Construction Industry must have technical knowledge about IT, and especially CAD; both what it is and how it is to be developed for use by the Construction Industry. There is a need to integrate Computer Aided Draughting with Desktop Publishing techniques - but there are problems associated with this. The basic problem is that CAD comes from a drawing office background and is designed for draughtspersons to use, whilst DTP comes from a printing background and is designed for publishers to use. The two applications are essentially different in operation and purpose. Just one example of this is that the file formats for DTP illustrations are different from the file formats for CAD drawings. The draughtspersons who produce illustrations and text for publications which will progress to CAD must be trained in CAD and be conversant with proper building practice and drawing office techniques.

Authors and editors must agree early in a publication's life which format will be used as it will greatly affect the structure of the publication. They must be aware of how the product will be used within the customer's computer system and how it operates in the office environment. One example of this problem, is the necessity to decide which file format to use.

IT strategy

The Construction Industry uses many different computer systems. A research publishing organisation may itself have a wide range which might include Apple Macintosh for publishing, IBM PCs for general applications and a network using a different system for administration. There are differences between computer systems which affect how data is transmitted and used. An organisation developing publishing via IT would need to examine its own use of computers in Desktop Publishing, Document Image Processing and Computer Aided Design applications.

In the commercial world, software manufacturers write programs for specific operating systems and computers. Often graphics or text cannot be transferred between different programs or computers. Translation programs and/or electronic data exchange links are therefore necessary between both hardware and software in an attempt to make systems compatible.

If a research publishing organisation proposes to enter the CAD market its products must be compatible with industry; it would need to identify the format or data exchange

standard to comply with. In the long term STEP is expected to be the internationally accepted standard. For the present, AutoCAD's DXF, which is a subset of the first 2D STEP standard brought out in early 1993, is the UK market standard.

Organisations intending to produce IT products will need to be fully aware of the state of the art in IT products and how they are used. They should have an IT Strategy which would include the purchase of IT equipment, training in its use and an IT philosophy.

IT training

A vital feature of any company or enterprise is the people and the skills that they have. These skills should be continuously regenerated and brought up to date. An organisation needs not just good people, but people that are improving with education. Individuals must be constantly stimulated if they are to continue to contribute, and the leadership must be perpetually renewed.

Belief in people should be second nature to companies and be the basis on which they operate. People want jobs which have continual interest and help them to grow personally. They wish to feel that they are doing a worthwhile job which makes some contribution to society. Adopting a Total Quality Management philosophy will encourage staff to have an initial interest in their product and how it will contribute to the market. (ref 7)

Today many organisations have machines and software whose capabilities are far beyond the technical knowledge of the users. In such cases it is likely that an increase in training could derive more benefit than purchasing more advanced technology.

Training is a vital component of an IT strategy, both to enthuse staff and incorporate an appreciation of the value of IT in the organisation as a whole. Some staff easily become computer literate, others are less adaptable. Selected individuals should receive full training in specific applications. There is usually a learning curve of several months before becoming competent in an application. In CAD this is likely to be about 12 months, assuming that the person already has a knowledge of construction details and drawing office methods and procedure. Some applications, such as CAD, are complex and not easy to learn if you are not using them in the office concurrently with the training program.

Conclusions

At present there is a plethora of different CAD systems, programs and hardware in the Construction Industry. This makes identifying the correct platform for future publications to be associated with CAD impossible to predict with certainty. But the technology exists to produce publications in various computer media and there are some clear trends that can be identified.

* The cost of CAD and computer hardware is reducing year by year.

* Computer operating systems are becoming more compatible with each other and translator programs are usually available to transfer data between different systems or programs.

* Compact Disks are being produced by most commercial firms and used as the standard media for storing and selling large amounts of data.

Publishers assessing the potential market for publications related to CAD would need to identify which market level to address. They would need to assess the Construction Industry's current use of computers and future trends, in order to meet its requirements.

- * How does the Construction Industry use CAD?
- * Where will CAD will be in 5-10 years time, in terms of market size and sophistication?
- * What operating system and CAD programs should publications be linked to?
- * What data exchange methods will be in use, STEP, DXF, IGES?

They will also need to look at the content of the information they provide and at what stage the users will want to access it, as well as the format and media in which it should be offered:-

- * indexes
- * books, digests or pamphlets.
- * data, such as test results
- * computer software accessed from within the CAD program.
- * computer software on stand-alone computers from CD-ROM libraries.
- * computer software on stand-alone tv monitor from CD-I .
- * expert systems
- * other

They will need to assess the IT and computer resources they have. Their aim should be to identify what type of service they are capable of and what they do best. They should specify the standards of service and define the clients whom they are seeking to serve. A commitment to write software will require substantial numbers of staff set aside to design, write, test and support the programs, including market research. This could be of indefinite duration as programs are usually required to be updated, often annually. New partnerships between publishers and design professionals are likely to result.

IT frequently provides the opportunity for persons to work in their own time and at their own pace. Imaginative thinking about the use of computers in business will transform the ways in which work is carried out and objectives are achieved.

References

(1) Stand-alone computer system to search for, access, display and print Building Standards stored on CD-ROMs. Including 'British Standards' and 'European Legislation & Standards.' TI, in conjunction with RIBA Services, also produce 'Construction Information Service' on CD-ROM for use on the same system.

Technical Indexes Ltd
Willoughby Road, Bracknell, Berkshire, RG12 8DW. United Kingdom
telephone: 0344-426311 fax: 0344-424971

(2) QUANTARC is an electronic library of construction information including, materials, manufacturers' details, catalogues and the UK Building Regulations. It is stored on CD-ROM and used on a stand alone computer system.

BCQ. The Building Centre
26 Store Street, London, WC1E 7BT, United Kingdom
telephone: 071-631-1550 fax: 071-436-4043

(3) Building IT 2000. Study to investigate the implications of advances in computers and communications on the structure and working methods of the UK Building Industry. IBM and Apple versions are available on floppy disk.

The Building Centre Trust, 1991.

26 Store Street, London, WC1E 7BT. United Kingdom.

telephone: 071-636-1802. fax: 071-436-7169

(4) "Construction Resources. Putting New Technology to Work with the Canadian Construction Industry". A CD-ROM of electronic technical information for the construction industry, containing over 1.5 million words of text, 600 pages of graphics and 400 pages of tables.

Produced in Beta version on Apple format, by the National Research Council of Canada, Institute for Research in Construction.

Mr Jamie Worling, Information Service, IRC. tel: (613) 993-3773. Fax: (613) 954-5984

(5) RIBA Specification Manager (SPECMAN) is a collaborative venture between NBS, RIBA Services and the University of Newcastle. The software works under Windows 3. It accesses the NBS library of specifications, manufacturers and products, with cut and paste facility to 'on-screen' documents.

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telephone 091-232-9594 fax 091-232-7514

(6) RIBACAD is a product drawings and details library for use on AutoCAD and all CAD systems reading AutoCAD DXF. It is produced on CD-ROM by RIBA Services Ltd.

RIBA Services Ltd.

39 Moreland Street, London, EC1V 8BB. United Kingdom

telephone: 071-251-5885. fax: 071-253-1085

(7) Book Title: "Out of the Crisis", describes the philosophy of total quality management. Author W Edwards Deming. Published by Cambridge University Press.