

The Barbour Report 1997

Electronic Delivery of Product Information  
a guide for building product manufacturers

### **Barbour Index plc**

Barbour Index is a leading supplier of specialist information services to construction industry professionals, to facilities managers and to those responsible for health and safety at work. The company publishes technical and product information in printed form, on microfiche and electronically.

Barbour Index now serves more than 10,000 customers, employs 160 people and has an annual turnover of £13 million.

The company makes a significant investment in improving existing and developing new services. In the last four years alone, over £4 million has been spent in developing electronic methods of delivering and accessing information.

Barbour Index has a long term commitment to meeting its customers' changing information needs and delivering them in the formats they demand.

### **Lychgate Projects Ltd**

Lychgate is a marketing, market research and strategic development organisation offering a specialist service throughout the construction and property industry, and more recently, to the IT industry.

Formed in 1986, it is wholly independent and owned by the Directors. Its services are supplied across the full breadth of the building industry, from design professionals to product manufacturers, main contractors, developers and end users. The company has direct experience of electronic technologies and delivery media and regularly conducts surveys for leading companies in the IT sector. In recent years, Lychgate has developed a particular expertise in satisfaction measurement related to telephone based customer support.

The company's nationwide fieldforce of interviewers are highly experienced in the challenges of identifying and questioning decision-makers within business environments. Coupled with the range of skills, research expertise and market knowledge, the company specialises in providing tailored solutions to clients' specific information needs.

## **Electronic Delivery of Product Information**

a guide for building product manufacturers

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## **FOREWORD**

Nigel Chaldecott OBE, Director-General, National Council of Building Material Producers

The construction industry, along with many other UK industries, is being forced to address the challenges of Information Technology. Failure to do so could result in loss of competitiveness to other producers from home or abroad. This report on how product information is being used electronically is therefore particularly welcome and timely for building material producers.

As the industry emerges from a period of lower demand, manufacturers will need to differentiate themselves by the information they provide as well as by the materials they produce.

The use of new technologies for the effective communication of technical and commercial data to specifiers, contractors and merchants will become an essential part of the producer's marketing programme. Research into how this should be done and what users want to see, together with examples of the lessons learnt by others, will help the industry adopt these new forms of delivery quickly and effectively.

This comprehensive report provides relevant, usable information which I feel sure the industry, and particularly the members of BMP, will find invaluable.

## 1. INTRODUCTION

Katherine Tickle, Managing Director, Barbour Index plc

Major construction clients have become increasingly reliant upon information technology to drive their businesses. The pressures for change from the IT sector and the greater adoption of computer technologies into our everyday lives, inevitably mean that the pace of change within all construction related companies will increase. But by how much and in which directions and to what timescales?

If the industry is putting information technology to work, is it adopting computer technology to communicate the product information it requires? Which of the various delivery methods are being used by product decision-makers, how are they using them in their day-to-day tasks and how do they foresee them integrating into their business practices in the future? These are some of the key questions for the '97 Barbour Report.

Many building product manufacturers recognise the need to include electronic communications in their future thinking. It is, perhaps, the most talked about subject amongst the manufacturers we meet. What they have lacked, until now, is in-depth feedback from the construction industry to give them a clear and up to date picture of what has happened so far and what is required in the future.

It is vital for us all to base our activity in this complex and fast moving area on hard facts and figures, and not to rely on the numerous pundits many of whom, it would appear, have conflicting visions of the future.

The potential which electronic media can offer to both buyer and seller, whichever industry sector they are in, is clearly vast. But the issues that have been paramount in conventional information media - delivery of the right information to the right audience in the right format and, crucially, at the right time - are just as important and relevant to electronic channels of communication.

Technological wizardry is only of value if it is a clear means to a quantifiably better end.

Barbour Index has been grappling with the same questions as have many of our customers in recent years. How far and how fast should we be moving to ensure that the users of our services get best value? I have no doubt that it is the needs of the user, at any point in the whole complex business of construction, that must remain paramount for us all.

If we are to interpret those needs effectively and respond with solutions not technological gimmickry, quantifiable research becomes not a bonus, but a necessity.

This report provides essential feedback from the marketplace and combines it with comprehensive, clear and objective guidance on the various media options available. It will, I believe, help us all to make the most of the opportunities that advances in technology present us with today and into the future.

## 2. THE '97 REPORT HIGHLIGHTS

The '97 Barbour Report brings together the results of a number of important pieces of research. Lychgate has analysed almost 6,000 questionnaires and carried out in-depth interviews with some 550 industry professionals and building product manufacturers.

Some of the key findings are:

- More than 80% of professionals across the industry have access to PCs, around two thirds with a PC at their workstation.
- Use of CD-ROM has more than doubled over the last two years and now around 50% of product decision-makers use this medium.
- 25% have access to the Internet - an increase from 12% in 1996.
- During 1997, more than 50% of professionals expect to increase their expenditure on IT above 1996 levels.
- Current use of electronic media is not consistent. There are significant differences in the levels of usage, both across the professions and types of organisation.
- In large and medium size organisations, 60% are already using electronic media to access manufacturers' product information.
- Disk has the highest use for product information supplied electronically by individual manufacturers across all professions.
- CD-ROM is the Users' preferred delivery medium. This is at variance with the indicated investment in electronic tools planned by manufacturers who are favouring Web sites on the Internet.
- Technical detailing of products is the major application for which electronic information is currently used.
- Technical drawings and details, together with the range of products available, sizes/dimensions and specification clauses, are the main features which construction professionals want to see included in the future.
- Almost nine out of ten product decision-makers still refer to the hard copy brochure having viewed the information electronically.
- 47% of the specifiers and buyers interviewed agreed that "electronic product information is of interest but not really useable yet". This is reflected in the views of manufacturers, of which only 42% are satisfied with customers' reaction to their electronic product communications.

This report shows that there are major opportunities to meet decision-makers' expressed needs when the full potential of electronic media is exploited creatively and effectively.

### 3. RESEARCH SOURCES

The programme of research for the '97 Barbour Report was carried out by Lychgate and consisted of several stages, designed to provide feedback from both specifying and buying professionals and building product manufacturers. The results in this report draw on a major programme of desk and original research, supplemented by other sources where appropriate. These include:

#### Telephone interviews with product decision-makers

- 401 in-depth telephone interviews, lasting on average 20 minutes, with a sample of large and medium sized organisations were conducted. These included 49 of the top 'repeat' clients with the greatest expenditure on construction projects, 220 specifiers from the largest multi-disciplinary, architectural practices and the main engineering consultancies, as well as 102 contractors and 30 housebuilders. In each organisation, those responsible for making or influencing product decisions were interviewed. These included Property Managers and Directors in client organisations, Architects, Engineers, Quantity Surveyors and Partners in private practices, Contracts Managers, Buyers and Estimators in construction firms, and Technical Managers and Directors in housebuilding organisations.

#### Barbour Compendium User Survey

- A questionnaire is distributed to 22,000 users of the Barbour Compendium each year. Within 6 weeks of the 1997 Compendium being released, over 5,000 completed questionnaires had been returned. These were analysed and some of the results are included in the report. 45% of the respondents to the survey were Architects and Technicians. The remainder were a representative cross-section of the Compendium's users and include: Engineers, Quantity Surveyors, Buyers, Estimators, Building Surveyors, Contractors and Project Managers.

#### Panel review of manufacturers' electronic information

- 10 Architects, with experience of using electronic product information, took part in a panel in order to review examples of electronic information published by manufacturers. Following a "hands-on" session to look at each service, they were asked for their views and opinions.

#### Telephone interviews with major manufacturers

- In order to assess the attitudes of manufacturers towards electronic communication tools, 100 major companies were interviewed by telephone for 20-25 minutes each about their marketing communication plans, including existing and anticipated investment in electronic media.

#### Manufacturers' postal questionnaire

- Product manufacturers were selected at random and sent a questionnaire seeking their views on electronic media. The first 108 responses were analysed and the results are included in this report.

#### Case studies

- Five of the manufacturers whose electronic information was reviewed in the panel were approached for background information, including their reasons for publishing information in electronic formats, the development timescales, target audience, distribution methods and budgets. These have been summarised as a table of case studies.

#### Web site

- The '97 Barbour Report Web site was set up to gain experience and an understanding of the processes involved.

#### Discussions with suppliers of information services and electronic publishers of information

- In order to develop an understanding of the services available and the issues which are relevant to manufacturers considering these forms of communication, discussions were held with third party suppliers and organisations publishing manufacturers' information in electronic formats.

#### Expert papers

- A number of contributors have provided papers relevant to their specialist fields. These are:

Pat Ware, Barbour Index  
Niall Lawless, Quantum Solutions

Paul Stefan, Autodesk  
Ronald Marsh, TRADA

#### 4. METHODS OF ELECTRONIC DELIVERY

Electronically published data is conveyed to the user via a delivery medium. There are three main modes of delivery; it is worth remembering that the 'electronic file' consists of software of various capabilities and complexities, but the electronic file is basically the same for each. However, there are benefits, limitations and consequent applications associated with each of the different delivery methods.

Which one to choose? This is unlikely to be based solely upon the benefits or limitations of the medium. It will also be influenced by the needs of the recipients, the challenges of distribution and promotion, and the organisation's degree of commitment to electronic publishing in the long term.

##### Three modes of delivery

###### Disk

- The 3.5" High Density Disk is the most common, but now perhaps one of the most limited, forms of data storage and distribution. Typical Disks hold 1.4 MB to 2MB of data. This tends to restrict them to predominantly text-based information which, for practical usability, would need to be transferred to an internal computer hard Disk. Their main advantages are the high levels of available hardware and the familiarity of users.

###### CD-ROM

- CD-ROM (Compact Disk - Read Only Memory) is a developing technology with the density of data and consequent storage capacity increasing significantly in recent years. Typically, a CD-ROM will hold around 400 times as much data as a Disk (680MB and increasing) and provides a robust, portable, user friendly method with which to deliver electronic data. The main disadvantage is that, for the majority of CDs, data can only be recorded on them once.

###### On-line

- On-line delivery requires the recipient to make a direct connection with another computer holding the source information. This can be achieved in one of two ways, either by a single direct link (often known as direct dial or dial-up connection) or via the Internet (the worldwide interconnecting network of computer communications). The route of the link between the two computers which need to share information, defines which form of connection is being used.

##### The benefits and constraints today

###### Disk

- The capacity of a Disk is a major constraint. Software tools which compress ('zip') computer files to reduce their size, are commonly used in conjunction with Disks. However, for information and programmes of even modest size, use will almost certainly involve multiple Disks with sets of 4, 6 and even 20 not being uncommon.
- Transferring software to Disk is a straightforward process, allowing low cost duplication. Files can be transferred using any computer to generate individual copies for distribution as and when required. These cost little more than the price of a typical Disk. At the other end of the scale, commercial specialists will 'publish' files on Disk in large numbers and will arrange packaging and distribution. The benefits of duplication are reflected in unit costs falling significantly.
- The badging and packaging of Disks tends to be simpler than CD-ROMs, using methods which will be familiar to most companies and their existing suppliers. Distribution also uses more traditional routes i.e. mail or direct delivery.



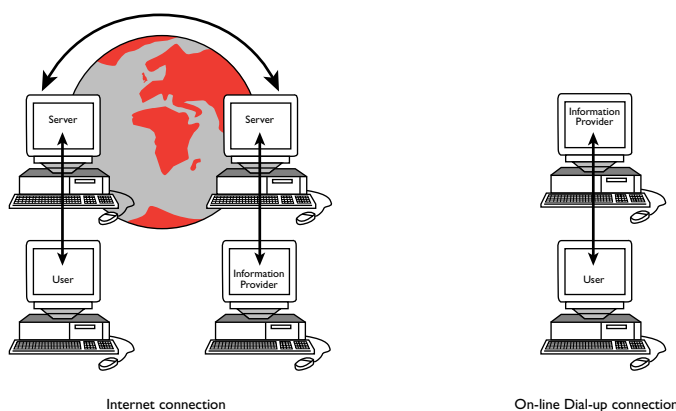
### CD-ROM

- Speed of access, portability and familiarity are the main benefits of CD-ROM. It provides quick access to large quantities of data, making it ideal for information publishing and data distribution. CD-ROMs can be easily carried and stored and are not reliant upon any external connections. There is also a degree of familiarity passing over to users from the well established audio CD market.
- Although initially relatively expensive to design and set-up, subsequent costs for duplication and distribution of the finished product become more competitive with volume. Unlike Disk, the presentation of CD-ROM utilises screen printing techniques direct onto the Disk surface. Although packaging is usually paper based, possibly with inserts into purpose-designed plastic cases, the direct printing onto the CD is a specialist process. Expert assistance is almost certainly required for publication using this medium.
- Without the need to start the whole process again, the subsequent modification of the data and re-issue is more cost effective. It is a relatively easy process to alter the original electronic file and have it re-published for duplication and distribution. The costs for packaging and mailing etc however still remain. As with Disks, the distribution of CD relies upon mail or direct delivery.

### On-Line delivery

- The main benefits of on-line delivery lie in the ease with which information can be designed, amended and distributed to a large audience, theoretically without limitations of file sizes and geographic location. However, in practice, the speed with which data can be downloaded across the standard telephone system or higher performance ISDN digital lines, is a major constraint to full utilisation of the potential of this medium. Over £4 billion has already been invested by UK cable companies in a connection network which is capable of data delivery up to 26 times faster than a standard modem. It is estimated that 2.5 million residences and 200,000 businesses are already making use of cable telephony and this will continue to increase.
- In the case of direct dial or a dial-up connection, the link is made from the user's computer directly, via the public telephone network, to the information provider's computer. The two exchange information on a one-to-one basis, without the involvement of other computer systems or services. This makes the efficiency of the connection reliant upon the performance of the information provider's server and the capacity of the link between them.
- An Internet connection still links the two computers but via a more complex series of connections over which the local user has no specific control. Because this route relies upon a series of connections, the user is dependent upon establishing access to their own service supplier and subsequently to that of the information provider. The overall performance will be governed by the performance of all the hardware and the capacity of all the links in the connection.

### What is the Internet?



- The Internet is a loose amalgamation of private and public networks joining computers together. In simple terms, the Internet allows computers to communicate quickly and effectively on a global basis.

Some of the more common terms applied to the Internet are explained below:

#### Electronic mail (Email)

- A method of sending text and multi-media messages to other computers which have Internet access. Attachments or files of information such as CAD drawings can be transported around the world quickly, for the cost of a local phone call. This is rapidly becoming the most efficient way of communicating in the electronic age and is increasingly used for electronic trading.

#### World Wide Web

- The global system of sites containing information which can be accessed by the information seeker using the Internet. A Web browser is used to locate information using hypertext mark up language (HTML) which creates live electronic links, through the Internet, to documents located anywhere in the world. The WWW is doubling in size every three months. The success of the Web has, in part, been responsible for the rapid growth of the Internet in recent years.

#### Hypertext

- The technique by which users can link information. Highlighted text provides links (also known as hyperlinks) to other Web sites which, when selected, will take the user through to another part of the Internet. This technique allows the relationship between separate sets of information (ie Web sites) to be explored by the user. Navigation around the Web is easy with a variety of different 'Search Engines' or 'Browsers'.

#### File Transfer Protocol

- The language which allows a computer user to copy a file or a program from one computer, over the Internet, to their own computer.

#### USENET

- A network of electronic meeting places or 'newsgroups' where electronic conversations take place amongst users with like minded interest. The user has the ability to read what other people have said, make their own comments and create new directions or topics for discussion.

#### TELNET

- A network which allows the user to take control of a public access computer, located in the next room or on a different continent, from their own terminal.

### Developments in the future

#### Disk

- Data compression ('zip') drives have been introduced which can store between 100MB and 120MB of data on a 3.5" Disk. The main manufacturers have now started to integrate these into desktop computers. At present, it is likely that 'zip' drives will remain a storage utility rather than becoming a common delivery medium.

#### CD-ROM

- Read/write CD technology is becoming more widely available but this is focussed upon data archiving functions. The price of writeable CD-ROM drives has fallen from thousands to hundreds of pounds and is likely to continue to fall. In the future, users will widely adopt CD-ROMs for data storage at the workstation. Capacity and data density will continue to increase, further releasing the capabilities for video. The integration of CD-ROM based information, together with external links through on-line connection, will reduce the frequency of up-dates.

#### On-line

- 10 years ago there were 5,000 Internet users worldwide. Estimates of the current number of users vary between 16 and 50 million. The Internet Society (ISOC) predict that, based on current trends, the Internet will be used by 180 million hosts by the year 2000. A survey in 1995 found that there were 0.7 million non-academic UK users. By early 1997 this figure had risen to 2.4 million, an annual growth rate of 125%. It is predicted that the corporate market will continue to expand rapidly as the use of the Internet as a business tool becomes fully recognised.

## 5. PRODUCT DECISION-MAKERS' USE OF TECHNOLOGY

As a first step, the research set out to identify whether product decision-makers have access to, and are using, computers.

### Access to the basic tools

- Access to PCs

|  |     |
|--|-----|
| No access to PC                          | 17% |
| Have access to PC but not at workstation | 19% |
| Have a PC at workstation                 | 64% |

Source: Compendium User survey 1997 (Base: 5,038)

- Access to PCs by profession

|                            | % with PC at workstation | % with access to PC either at workstation or elsewhere |
|----------------------------|--------------------------|--|
| OVERALL                    | 64%                      | 83%  |
| Architect                  | 60%                      | 79%  |
| Architectural Technician   | 62%                      | 82%  |
| Civil/Structural Engineer  | 70%                      | 90%  |
| Building Services Engineer | 67%                      | 86%  |
| Quantity Surveyor          | 68%                      | 87%  |
| Project Manager            | 73%                      | 89%  |
| Buyer/Estimator            | 60%                      | 78%  |
| Contracts Manager          | 64%                      | 82%  |
| Building Surveyor          | 64%                      | 85%  |
| Interior Designer          | 62%                      | 79%  |

Source: Compendium User survey 1997 (Base: 5,038)

- Almost two-thirds of product decision-makers in the industry have a PC at their workstation. A further 19% have access to one. Adding these together, 83% have access to personal computers and therefore to the platforms for electronically delivered information. Compared to other professions, a higher proportion of Project Managers, Engineers and Quantity Surveyors have a PC at their desks. A slightly lower proportion of Architects have a computer at their workstation or access to one.
- 92% of these computer users have a PC with a 486 or pentium processor, giving them the ability to utilise the latest software and communication devices.

### Use of CAD, CD-ROM and the Internet

- CAD is a popular facility, which has 'introduced' many designers to working with electronic tools. Nearly half of product decision-makers use it. The Barbour Compendium survey has tracked use of CAD, CD-ROM and the Internet over the last few years.

- Use of CAD, CD-ROM, Internet

|   |     |     |     |
|---|-----|-----|-----|
| % using CAD                                 | 42% | 47% | 47% |
| % using CD-ROM                              | 20% | 38% | 50% |
| % with access to Internet (1)               | 12% | 25% |     |
| % intending to open an Internet account (1) | 9%  | 11% |     |

Source: Compendium User surveys '95, '96, '97 (over 5,000 respondents in each annual survey)

(1) question about use of the Internet was included for the first time in the 1996 questionnaire

1995 1996 1997

● % Using CAD by profession

|                            |     |
|----------------------------|-----|
| OVERALL                    | 47% |
| Architect                  | 59% |
| Architectural Technician   | 65% |
| Civil/Structural Engineer  | 75% |
| Building Services Engineer | 71% |
| Quantity Surveyor          | 13% |
| Project Manager            | 49% |
| Buyer/Estimator            | 14% |
| Contracts Manager          | 29% |
| Building Surveyor          | 44% |
| Interior Designer          | 56% |

Source: Compendium User survey 1997 (Base: 5,038)

● % Using CD-ROM by profession

|                            |     |
|----------------------------|-----|
| OVERALL                    | 50% |
| Architect                  | 51% |
| Architectural Technician   | 54% |
| Civil/Structural Engineer  | 64% |
| Building Services Engineer | 68% |
| Quantity Surveyor          | 41% |
| Project Manager            | 56% |
| Buyer/Estimator            | 36% |
| Contracts Manager          | 43% |
| Building Surveyor          | 49% |
| Interior Designer          | 53% |

Source: Compendium User survey 1997 (Base: 5,038)

● Access to the Internet by profession

|                            | % with access to the Internet | % intending to open an Internet account |
|----------------------------|-------------------------------|---|
| OVERALL                    | 25%                           | 11%                                     |
| Architect                  | 23%                           | 13%                                     |
| Architectural Technician   | 18%                           | 10%                                     |
| Civil/Structural Engineer  | 32%                           | 12%                                     |
| Building Services Engineer | 38%                           | 7%                                      |
| Quantity Surveyor          | 22%                           | 11%                                     |
| Project Manager            | 36%                           | 11%                                     |
| Buyer/Estimator            | 16%                           | 8%                                      |
| Contracts Manager          | 21%                           | 14%                                     |
| Building Surveyor          | 22%                           | 10%                                     |
| Interior Designer          | 33%                           | 17%                                     |

Source: Compendium User survey 1997 (Base: 5,038)

- Engineers are using the new communications technology to a greater extent than other professions, with over 60% using CD-ROM and over 30% having an Internet account. The professions where use is lowest include Buyers/Estimators and Contracts Managers, as their need tends to be for information on prices and availability rather than technical detail.

- **Use of tools by size of organisation**

| Number of professional/technical staff | Using CAD | Using CD-ROM | With access to Internet | Intending to open Internet account |
|--|-----------|--------------|-------------------------|------------------------------------|
| OVERALL                                | 47%       | 50%          | 25%                     | 11%                                |
| Sole practitioner                      | 32%       | 36%          | 13%                     | 12%                                |
| 2-5                                    | 48%       | 51%          | 21%                     | 14%                                |
| 6-20                                   | 57%       | 57%          | 29%                     | 11%                                |
| 21-50                                  | 51%       | 58%          | 37%                     | 7%                                 |
| over 50                                | 47%       | 52%          | 43%                     | 8%                                 |

Source: Compendium User survey 1997 (Base: 5,038)

Whilst these figures from the Compendium User survey provided data on the use of electronic tools amongst a random selection of product decision-makers, the telephone interview programme focused on 401 of the larger organisations in the industry, covering a mix of repeat Clients, large multi-disciplinary practices, Architects, Engineers, Quantity Surveyors, Contractors and Housebuilders. The results therefore represent use of technology amongst some of the leading product decision-makers in the industry.

- **% using PCs, CD-ROM, Email and the Internet at least 2-3 times per week**

|                                    | Using PC with at least 486 processor | Using PC with CD-ROM | Using Internet | Using Email |
|------------------------------------|--------------------------------------|----------------------|----------------|-------------|
| OVERALL                            | 89%                                  | 40%                  | 14%            | 34%         |
| CLIENTS                            | 86%                                  | 37%                  | 4%             | 41%         |
| Top Clients                        | 50%                                  | 33%                  | 0%             | 50%         |
| Other Public Clients               | 88%                                  | 44%                  | 0%             | 28%         |
| Other Private Clients              | 94%                                  | 28%                  | 11%            | 56%         |
| SPECIFIERS                         | 89%                                  | 45%                  | 19%            | 40%         |
| Large Multi-Disciplinary Practices | 95%                                  | 33%                  | 21%            | 67%         |
| Large Architectural Practices      | 86%                                  | 54%                  | 21%            | 32%         |
| Other Architectural Practices      | 85%                                  | 58%                  | 17%            | 25%         |
| M&E Consultants                    | 93%                                  | 39%                  | 11%            | 36%         |
| Structural Engineers               | 93%                                  | 36%                  | 29%            | 46%         |
| Quantity Surveyors                 | 87%                                  | 35%                  | 17%            | 39%         |
| CONTRACTORS                        | 88%                                  | 32%                  | 8%             | 22%         |
| General Contractors                | 88%                                  | 33%                  | 7%             | 19%         |
| M&E Contractors                    | 92%                                  | 31%                  | 15%            | 38%         |
| HOUSEBUILDERS                      | 90%                                  | 40%                  | 13%            | 23%         |

Source: Telephone programme (Base: 401 respondents)

- A higher proportion of Specifiers are using these tools, particularly CD-ROM, Email and the Internet. In this category, the Architects have the highest use of CD-ROM, and Structural Engineers are using the Internet to a greater extent than others. Contractors are least likely to be working with the communication devices. However a high proportion of these plan to invest in the next 12 months.

### **Adoption of electronic culture**

Product decision-makers have access to the basic electronic tools, but to what extent are senior management committed to fostering an environment where use of computer technology is a fundamental aspect of business processes? Questions were included in the telephone survey to allow assessment of the extent to which organisations have accepted technology as part of the company culture. These included questions about the proportion of staff using computers on a regular basis, whether IT training is provided, and the extent to which they are encouraged to use IT.

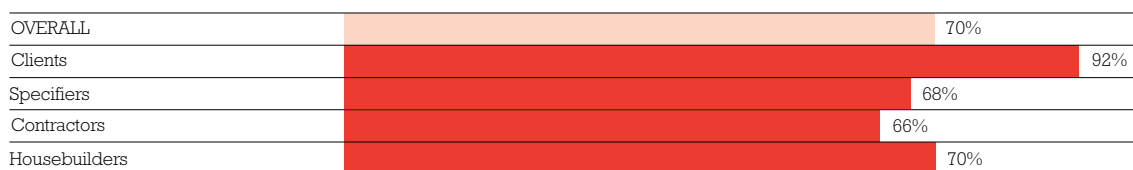
• What % of technical staff at your site use a computer at least 2-3 times per week?



Source: Telephone programme (Base: 401 respondents)

- Regular use of computers by technical staff is lowest amongst Contractors and highest amongst Clients and Specifiers, where about 8 out of 10 technical staff use a computer at least 2-3 times per week.

• % offered IT training by their own organisation



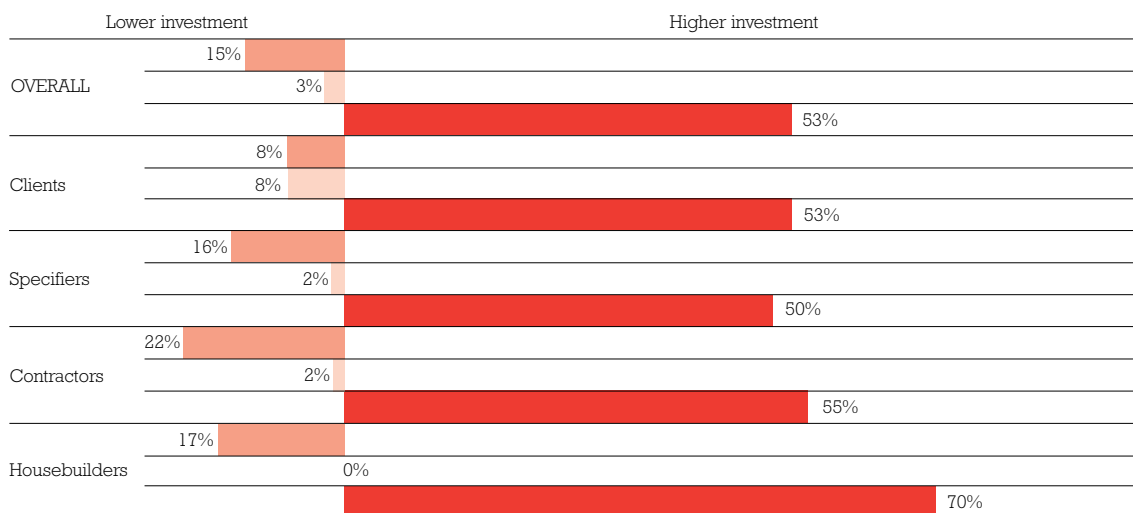
Source: Telephone programme (Base: 401 respondents)

- Although their use of some of the electronic tools, such as CD-ROM and the Internet, is lower than the average for the sample as a whole, Clients are more likely to have attended an IT training course.
- Overall, in just over half of organisations, responsibility for IT policy rests with a Director or Senior Partner. 28% have an IT Manager, rising to 43% of Housebuilders and 37% of Clients.
- 88% feel that they are encouraged by their organisations to use IT, ranging from 80% of Housebuilders to 100% of Clients.

**IT investment plans**

Respondents were asked to comment on their IT expenditure plans for 1997 compared with 1996.

• Expenditure on IT in 1997 compared with 1996



Source: Telephone programme (Base: 401 respondents)

Less, have just made investment    Less, other reason    More

- This graph shows the proportion who expect their company's IT expenditure to increase or decrease, with over half anticipating growth. In addition, 15% overall expect their expenditure to remain the same and 13% were unable to comment on their company's plans.

- What do you plan to invest in over the next 12 months?

|                                | OVERALL | Clients | Specifiers | Contractors | Housebuilders |
|--------------------------------|---------|---------|------------|-------------|---------------|
| PC with at least 486 processor | 50%     | 49%     | 53%        | 44%         | 53%           |
| PC with modem                  | 40%     | 45%     | 37%        | 41%         | 53%           |
| PC with CD-ROM drive           | 44%     | 51%     | 44%        | 42%         | 43%           |
| Email                          | 39%     | 41%     | 35%        | 42%         | 50%           |
| Internet                       | 33%     | 37%     | 36%        | 29%         | 20%           |

*Source: Telephone programme (Base: 401 respondents)*

- Housebuilders' expenditure on technology is likely to show a greater increase than other categories, with funds allocated for PCs with modems and Email networks. Specifiers appear to have already made the investment and are now using some of these tools. More Clients and Specifiers are anticipating investment in the Internet than Housebuilders and Contractors.

## 6. USE OF PRODUCT INFORMATION DELIVERED ELECTRONICALLY

### Availability and use of electronic forms of product information

The results of this study show that a significant proportion of product decision-makers are using computer technology. But to what extent are they using product information delivered electronically, as well as other construction-specific software?

- Availability of software and other tools (% with the following available in their organisations)

|  | OVERALL | Clients | Specifiers | Contractors | Housebuilders |
|--|---------|---------|------------|-------------|---------------|
| CAD  | 75%     | 71%     | 86%        | 55%         | 60%           |
| Product information on Disk, CD-ROM, On-line or Internet   | 68%     | 63%     | 75%        | 59%         | 60%           |
| Project management software                                | 66%     | 67%     | 62%        | 77%         | 50%           |
| Technical information on Disk, CD-ROM, On-line or Internet | 52%     | 55%     | 57%        | 43%         | 43%           |
| Quantity surveying/cost software                           | 49%     | 47%     | 35%        | 72%         | 77%           |
| Central project files on computer                          | 49%     | 47%     | 52%        | 46%         | 40%           |
| Estimating software  | 44%     | 33%     | 29%        | 75%         | 67%           |
| Engineering analysis software                              | 40%     | 47%     | 44%        | 33%         | 20%           |
| Purchasing or ordering software                            | 39%     | 45%     | 25%        | 58%         | 70%           |
| Electronic specification tools                             | 33%     | 33%     | 45%        | 12%         | 13%           |
| Site management software                                   | 20%     | 16%     | 17%        | 29%         | 13%           |

Source: Telephone programme (Base: 401 respondents)

- The telephone research identified that 68% have product information available to them in electronic formats, although a lower figure, 59%, (as shown on the next graph) are actually using it.
- % Using the available electronic product information (as % of all)

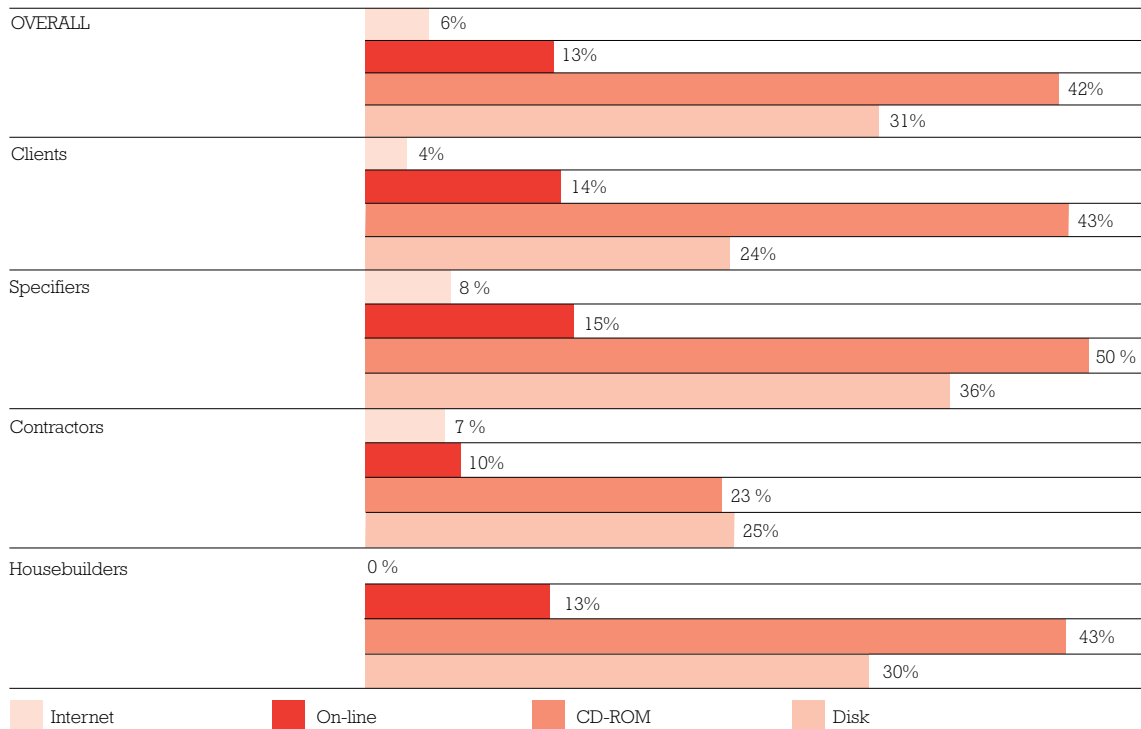
|                                    |     |
|------------------------------------|-----|
| OVERALL                            | 59% |
| CLIENTS                            | 59% |
| Top Clients                        | 33% |
| Other Public Clients               | 80% |
| Other Private Clients              | 39% |
| SPECIFIERS                         | 67% |
| Large Multi-Disciplinary Practices | 76% |
| Large Architectural Practices      | 71% |
| Other Architectural Practices      | 75% |
| M&E Consultants                    | 71% |
| Structural Engineers               | 50% |
| Quantity Surveyors                 | 39% |
| CONTRACTORS                        | 44% |
| General Contractors                | 39% |
| M&E Contractors                    | 77% |
| HOUSEBUILDERS                      | 53% |

Source: Telephone programme (Base: 401 respondents)

- Specifiers are most likely to access product information electronically and Housebuilders and Contractors are least likely to do so. This may be explained by their involvement in the process:
- Housebuilders develop standard specifications and house types and their need for product information is therefore not as frequent as Specifiers'.
- Contractors work with specifications developed by others. Although they may change specifications or choose from a range of options against performance criteria, they tend to use manufacturers' products with which they are more familiar, basing decisions on price and availability. Hence they may have a lower requirement for detailed product information.



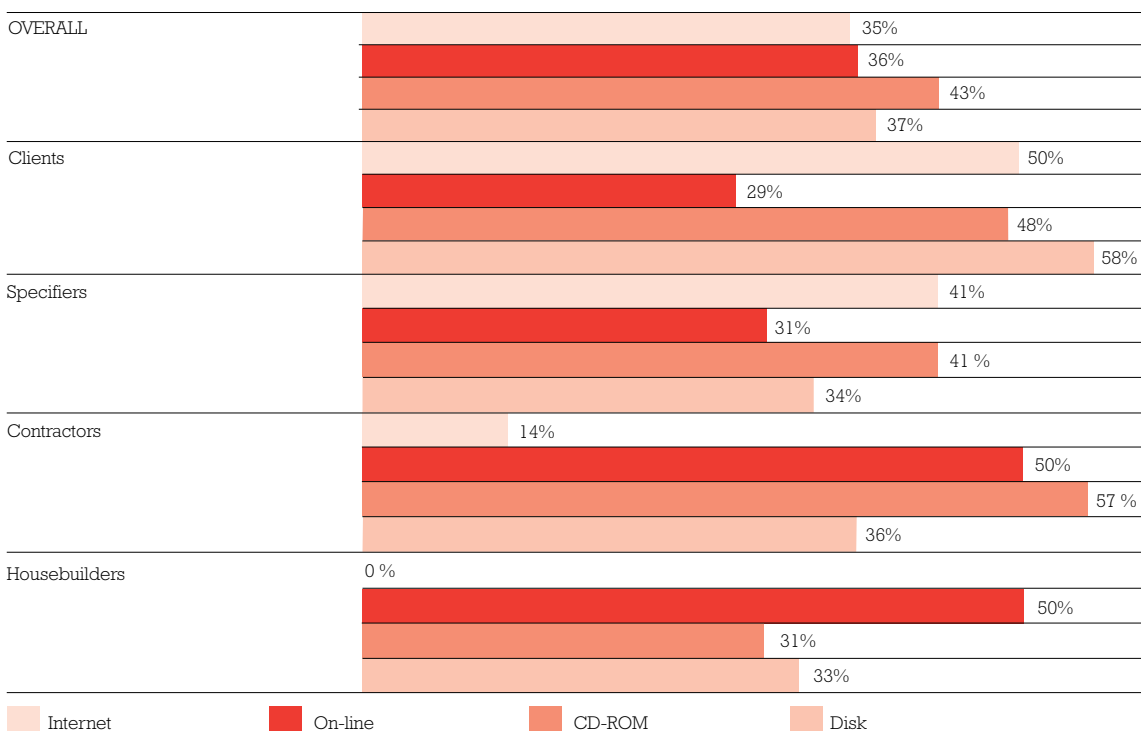
- Amongst Specifiers, it is the large multi-disciplinary and architectural practices which have the highest use of electronic product information, with over 70% actively using one of the formats.
- **Electronic formats used for product information (as % of all)**



Source: Telephone programme (Base: 401 respondents)

- Figures given earlier in this report show access to and use of hardware (including CD-ROM and the Internet), and those using these basic tools to access product information. CD-ROM and Disk are the most used formats amongst the larger organisations in the industry, and a higher proportion of Specifiers are using these formats than other product decision-makers. On-line is defined as direct dial connection to a single point.

- **% using electronic product information at least once a week (as % of those using each format)**



Source: Telephone programme (Base: 401 respondents)

- The figures on the previous page show, for example, that of the 42% who are using CD-ROM for product information 43% are using it at least once a week.

### Extent of satisfaction with delivery methods

The study also sought to identify the extent of satisfaction with the electronic methods of delivery.

- Satisfaction with Disk, CD-ROM, On-line and Internet

|          |     |
|----------|-----|
| CD-ROM   | 6.5 |
| Disk     | 6.0 |
| Internet | 5.8 |
| On-line  | 5.5 |

(average score where 10 = very satisfied and 1 = very dissatisfied)

Source: Telephone programme (Base: 401 respondents)

Based on users of each form of electronic product information: CD-ROM=168, Disk=125, Internet=26, On-line=53

- Scores given are generally around the mid-point on the scale. The moderate level of satisfaction with electronic product information shows that "it has not quite got there yet". Satisfaction is greatest with CD-ROM, and lowest with on-line product information.

### Receipt and storage of electronic product information

It is useful for manufacturers to be aware of the methods by which users have received Disks and CD-ROMs.

- Receipt of information on Disk and CD-ROM (as % of users of these formats)

|                               |     |
|-------------------------------|-----|
| Salesman brought in           | 47% |
| Received in post, unrequested | 42% |
| Requested from advertisement  | 39% |
| Requested by other means      | 32% |
| Picked up at exhibition       | 7%  |

Source: Telephone programme (Base: 401 respondents)

- The most common methods are via the salesman and by mailshot. About four in ten have received Disks/CD-ROMs by responding to an advertisement.
- The breakdown by type of respondent shows that manufacturers are, in the main, targeting Specifiers for more direct promotion.

- Receipt of information on Disk and CD-ROM (as % of users of these formats) by respondent type

|                               | OVERALL | Clients | Specifiers | Contractors | Housebuilders |
|-------------------------------|---------|---------|------------|-------------|---------------|
| Salesman brought in           | 47%     | 45%     | 52%        | 35%         | 31%           |
| Received in post, unrequested | 42%     | 25%     | 49%        | 35%         | 31%           |
| Requested from advertisement  | 39%     | 60%     | 34%        | 54%         | 23%           |
| Requested by other means      | 32%     | 15%     | 32%        | 35%         | 54%           |
| Picked up at exhibition       | 7%      | 10%     | 6%         | 12%         | 0%            |

Source: Telephone programme (Base: 401 respondents)

Having received the information, the research sought to identify where Disks and CD-ROMs are stored.

- Storage of Disks and CD-ROMs (as % of users of these formats)

|                                |     |     |
|--------------------------------|-----|-----|
| In department's general office |     | 44% |
| In the library                 |     | 30% |
| On my desk                     |     | 23% |
| Other                          | 9 % |     |

Source: Telephone programme (Base: 401 respondents)

Adds to over 100% as information kept in more than one place.

- According to about three-quarters of respondents, Disks and CD-ROMs tend to be kept in a central place allowing access by many users. Only one-quarter keep them on their desks.

### Use of product information supplied electronically by individual manufacturers

Previous results show use of all forms of electronic product information, including that provided by third party suppliers. In the Barbour Compendium User Survey, the following question was asked: "Do you use any product information supplied to you by individual manufacturers on Disk or CD-ROM?"

- Use of product information supplied electronically by individual manufacturers

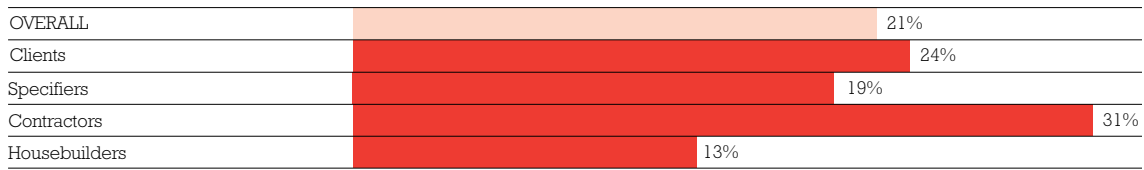
|                            | Using Disk | Using CD-ROM | Total using Disk and/or CD-ROM (1) |
|----------------------------|------------|--------------|------------------------------------|
| OVERALL                    | 25%        | 19%          | 32%                                |
| Architect                  | 31%        | 23%          | 38%                                |
| Architectural Technician   | 35%        | 27%          | 43%                                |
| Civil/Structural Engineer  | 48%        | 17%          | 53%                                |
| Building Services Engineer | 46%        | 40%          | 59%                                |
| Quantity Surveyor          | 12%        | 10%          | 18%                                |
| Project Manager            | 23%        | 17%          | 29%                                |
| Buyer/Estimator            | 11%        | 10%          | 17%                                |
| Contracts Manager          | 17%        | 11%          | 22%                                |
| Building Surveyor          | 22%        | 18%          | 30%                                |
| Interior Designer          | 19%        | 21%          | 29%                                |

Source: Compendium User survey 1997 (Base: 5,038)

Note: (1) Columns 1 & 2 are not mutually exclusive. Those using Disk may also be using CD-ROM, and vice versa. The 3rd column eliminates any double-counting and gives the % using an electronic format.

- These figures show wider use of Disk than CD-ROM, with about one-third of product decision-makers using product information in at least one of these formats.
- The main users are the design professionals, particularly the Engineers: 40% of Building Services Engineers are using product information on CD-ROM, compared with 23% of Architects. A manufacturer targeting Building Services Engineers and not having product information available on CD-ROM may be at a competitive disadvantage. Over half of all types of Engineer, including Civil/Structural, use product information on Disk or CD-ROM and about four in ten Architects and Technicians do so.
- Under 20% of Quantity Surveyors and Buyers are using product information in these forms. These work to the specifications of others, and may not have the same requirements for technical detailing and specification clauses.

- % of times manufacturers' electronic information is used when specifying (as % of users)



Source: Telephone programme (Base: 401 respondents)

- Amongst those using electronic product information, it is used on an average of 21% of occasions when a specification is made.
- If those not using product information are included in this average, it falls to 9% of all specifications made.

- Trends in use of manufacturers' electronically delivered product information (as % of users)



Source: Telephone programme (Base: 401 respondents)

- About three-quarters are seeing their use of electronic product information increasing, with only 2% experiencing declining use. The balance, amounting to 22% overall, consider that their usage levels will not change.

- Most used manufacturers' information on Disk or CD-ROM

In the questionnaire sent out with the '97 Compendium, users were asked which manufacturers' information they use on Disk or CD-ROM. Armitage Shanks, Redland Roofing Systems, Catnic, Dow Insulation and Metsec received the most mentions.

## 7. APPLICATION AND PREFERRED FEATURES

In this section, the contribution which electronic tools make in the design and specification process is examined, and an analysis is given of the features which are required.

### Application

- Where is electronic product information used in the construction process? (as % of users)

|                              |     |
|------------------------------|-----|
| Technical detailing          | 58% |
| Product selection            | 38% |
| General information purposes | 38% |
| Ordering                     | 8%  |
| Installation instructions    | 7%  |
| Design                       | 1%  |
| Other                        | 5%  |

Source: Telephone programme (Base: 401 respondents)

- Over half the users of electronic product information are using it for technical detailing, followed by four in ten using it for product selection and a further four in ten for general information.

### Preferred features

The research process included a review of some examples of manufacturers' electronic product information. During this process, 10 Architects were asked to rate a number of features of electronic information for their usefulness. The average scores are given below:

- Usefulness of features of electronic product information

|   |     |
|---|-----|
| Technical drawing and detailing                     | 9.9 |
| Specification clauses                               | 9.3 |
| Copy and paste facilities for drawings and graphics | 9.2 |
| CAD link  | 9.1 |
| Sizes and dimensions                                | 9.1 |
| Product match against performance criteria          | 8.9 |
| Product range information                           | 8.1 |
| Copy and paste facilities for text                  | 8.1 |
| Testing and certification                           | 7.2 |
| Approved lists of suppliers or installers           | 6.6 |
| Colour and appearance examples                      | 6.4 |
| Images of products/finishes in use                  | 6.2 |
| Facility to select and view different finishes      | 6.2 |

(average score out of 10, where 10 = very useful and 1 = not at all useful)

Source: Panel of 10 Architects

- In the discussion that took place during the panel session, the Architects made it clear that they do not want electronic product information to be just advertisements full of superlatives. They require interactive facilities and tools that will help them to select and specify, in ways which are better than the existing brochures.
- If they are just browsing, or if electronic information gives them no additional benefits compared with brochures, they would prefer to turn to hard copy.
- The scores indicate the features and facilities they require, particularly technical drawing and detailing, specification clauses, copy and paste facilities, CAD link, sizes and dimensions and product match against performance criteria.
- Images and colour examples come low on the list. In part because they can obtain these more reliably from brochures and, as some said, it is part of their function to be able to visualise the finished article in the appropriate situation.

- A CAD link would be useful, particularly where information provided can be used in day-to-day tasks.

The telephone survey also asked respondents what features they would like to see on manufacturers' Disks, CD-ROMs or Internet sites. The answers again show that technical information to assist in the specification preparation is very important.

- **Required information in manufacturers' electronic formats (prompted)**

|                                  | OVERALL | Clients | Specifiers | Contractors | Housebuilders |
|----------------------------------|---------|---------|------------|-------------|---------------|
| Range of products available      | 95%     | 96%     | 95%        | 93%         | 97%           |
| Sizes and dimensions             | 90%     | 90%     | 94%        | 82%         | 93%           |
| Technical drawings and detailing | 87%     | 90%     | 92%        | 75%         | 83%           |
| Specification clauses            | 85%     | 94%     | 90%        | 77%         | 60%           |
| Testing and certification        | 79%     | 86%     | 79%        | 74%         | 87%           |
| Images of products in use        | 71%     | 71%     | 73%        | 61%         | 90%           |
| Colour and appearance examples   | 65%     | 57%     | 65%        | 60%         | 90%           |
| Prices (unprompted)              | 11%     | 6%      | 8%         | 21%         | 10%           |

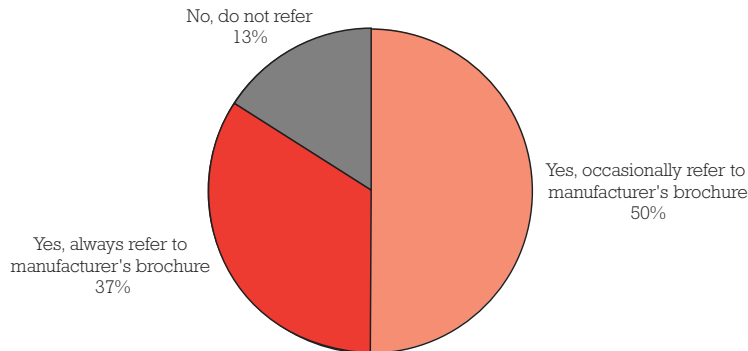
Source: Telephone programme (Base: 401 respondents)

**Impact on hard copy brochures**

Manufacturers investing in new electronic publications will face the dilemma of how they will interact with existing modes of communication, particularly hard copy product brochures.

To assess the value of product brochures, the telephone interviews asked if respondents still refer to the hard copy brochure when using electronic information.

- **Referral to hard copy brochure when using a manufacturer's electronic information**



Source: Telephone programme (Base: 401 respondents)

- Almost nine out of ten also refer to the hard copy brochure for that product, having viewed the information electronically.

- **Reasons for referring to hard copy brochure (as % of those using hard copy)**

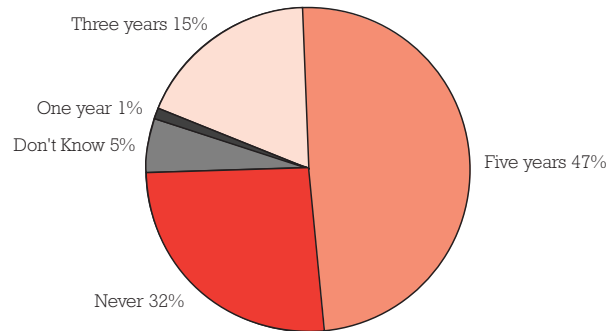
|   |     |
|---|-----|
| Easier to work with                     | 39% |
| For more detailed information           | 37% |
| Better representation of colours/photos | 16% |
| Always request latest brochure          | 10% |
| To take copies for file                 | 9%  |
| Other                                   | 35% |

Source: Telephone programme (Base: 401 respondents)

- "Other" reasons include a preference for hard copy, a lack of trust in electronic information being up-to-date, and the ability to easily show paper to others, to copy it and to have it to hand.

- There is a view even amongst those currently using electronic product information, that hard copy is easier to work with. This was given as the main reason for referring to it, together with the need for more detailed information which may not appear in an electronic format, or may be harder to locate. Interestingly, the need for better colours and photos was mentioned by only 16% as a reason for referring to hard copy.

- **When will electronic information replace manufacturers' literature?**



Source: Telephone programme (Base: 401 respondents)

- 47% agreed with the statement that "electronic product information is of interest but not really usable yet". Given this belief, it is hardly surprising that 47% feel that it will take five years for electronic delivery to replace hard copy brochures and 32% believe that this will never happen.
- The reasons given by those stating that this will never happen include a preference for hard copy, and that not everyone will have access to computer equipment or be computer literate. The greater transportability of paper and the lack of electronic product information available from all manufacturers were also given as secondary reasons.

## 8. PERCEIVED BENEFITS AND DRAWBACKS OF THE ELECTRONIC MEDIA

- Users - perceived benefits - unprompted (based on users of any form of electronic media)

|  | Disk | CD-ROM | On-Line | Internet |
|--|------|--------|---------|----------|
| Speed of use                                 | 24%  | 38%    | 11%     | 13%      |
| Ease of use                                  | 25%  | 29%    | 5%      | 9%       |
| Convenient                                   | 20%  | 29%    | 2%      | 7%       |
| Saves keeping library                        | 13%  | 17%    | 2%      | 7%       |
| Comprehensive                                | 10%  | 30%    | 2%      | 16%      |
| Up-to-date                                   | 8%   | 15%    | 16%     | 27%      |
| Helps with technical detailing               | 5%   | 4%     | 1%      | 1%       |
| Flexible, can incorporate into spec/drawings | 9%   | 11%    | 2%      | 3%       |
| Can network                                  | 2%   | 2%     | 2%      | 5%       |
| Other  | 16%  | 20%    | 2%      | 10%      |
| Don't know/no answer                         | 25%  | 14%    | 69%     | 47%      |

Source: Telephone programme (Base: 401 respondents)

"Other" includes: Disk – saves storage space, universal technology. CD-ROM – compact/capacity, better standard of presentation. Internet – large volume of information.

- The various electronic delivery methods are perceived to have different benefits. The highest number of comments were made about Disk and CD-ROM.
- CD-ROM is considered to be fast and easy to use, providing a convenient and comprehensive information tool.
- Disk has similar benefits, but these are not considered to be as great as CD-ROM.
- About half of the sample were unable to comment on the benefits of the Internet, but those able to do so believe its main advantage is that the information can be kept up-to-date more easily and is comprehensive. However, at present, it is not considered to be easy or convenient to use, nor is it fast to access.
- Using information on-line (direct dial) is an unfamiliar process to two-thirds of the sample. Those able to comment believe that its main benefit is that it can be kept up-to-date.
- The ability to network information was barely mentioned, a particular advantage of electronic information over hard copy. However, the benefits were sought without any prompting, so this facility is not uppermost in users' minds.
- Surprisingly only 5% or less mentioned the help these tools provide with technical detailing as a benefit, yet this is a feature which is particularly required. It appears that, whilst this is an essential requirement, users do not currently perceive it to be a particular benefit over hard-copy brochures.



• Users - perceived drawbacks - unprompted (based on users of any form of electronic media)

|  | Disk | CD-ROM | On-Line | Internet |
|--|------|--------|---------|----------|
| May not be up-to-date                                | 19%  | 14%    | 3%      | 0%       |
| Insufficient information in this format              | 19%  | 8%     | 5%      | 8%       |
| Not user-friendly                                    | 15%  | 10%    | 3%      | 11%      |
| Slow to access                                       | 9%   | 9%     | 6%      | 16%      |
| Lack of consistency in style                         | 6%   | 5%     | 1%      | 1%       |
| Ability to integrate into other documents is limited | 4%   | 5%     | 0%      | 0%       |
| May be in use elsewhere                              | 3%   | 7%     | 1%      | 0%       |
| Poor representation of colours                       | 1%   | 1%     | 1%      | 1%       |
| Other  | 34%  | 22%    | 3%      | 15%      |
| Don't know/no answer                                 | 26%  | 36%    | 75%     | 49%      |

Source: Telephone programme (Base: 401 respondents)

"Other" includes: Disk – viruses, corruption, limited capacity. CD-ROM – susceptible to damage and getting lost, printing out, readability on screen. Internet – finding information, time consuming.

- A higher proportion believe that Disk has more drawbacks compared to CD-ROM, including that the information may not be up-to-date, and it is not user-friendly, although similar criticisms were also made of CD-ROM. Few were able to comment about the drawbacks of on-line delivery of information and the Internet. The perceived problems with the latter are the slow speed of access and that it is not user-friendly.

9. REASONS FOR NON-USE OF ELECTRONIC PRODUCT INFORMATION

Although using electronic tools generally, 41% of respondents in the telephone research were not using electronic product information. Their reasons for not doing so were identified.

• Reasons for non-use

|                                    | OVERALL | Clients | Specifiers | Contractors | Housebuilders |
|------------------------------------|---------|---------|------------|-------------|---------------|
| Cost                               | 31%     | 40%     | 38%        | 21%         | 29%           |
| Not had the need                   | 28%     | 50%     | 22%        | 30%         | 14%           |
| Prefer hard copy/brochure          | 20%     | 15%     | 24%        | 18%         | 14%           |
| Not aware of information available | 8%      | 5%      | 1%         | 14%         | 21%           |
| Other                              | 46%     | 40%     | 49%        | 54%         | 14%           |

Source: Telephone programme (Base: 401 respondents)

"Other" includes not user-friendly, do not like using, do not know it is up-to-date, poor representation of colours, not enough information available in consistent form, slow to access, each mentioned by a maximum of 4%.

- Cost, a lack of need, (which may be interpreted as a lack of understanding of the benefits) and a preference for hard copy, are the main reasons given for non-use of electronic information. There are differences by profession, with Housebuilders showing a lack of awareness of what information is available, and having poor access to hardware, while Specifiers and Clients are more concerned about the cost implications, probably associated with subscribing to an information service.

Non-users were asked what they consider to be the benefits of electronic information.

Non-users – perceived benefits of electronic delivery media in general - unprompted

|  |     |
|--|-----|
| Speed of use                                 | 50% |
| Up-to-date                                   | 38% |
| Ease of use                                  | 36% |
| Convenient                                   | 20% |
| Saves keeping library                        | 18% |
| Comprehensive                                | 11% |
| Helps with technical detailing               | 7%  |
| Flexible, can incorporate into spec/drawings | 3%  |
| Other  | 15% |
| None   | 7%  |
| Don't know                                   | 6%  |

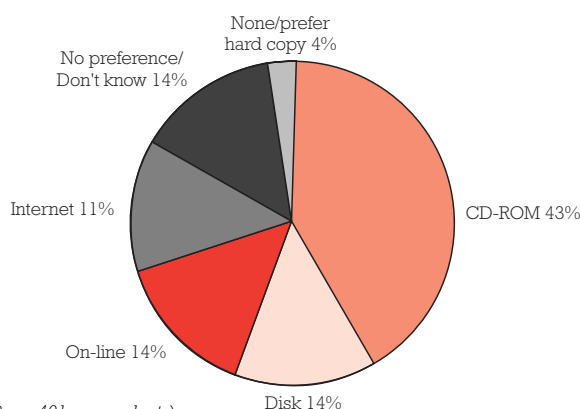
Source: Telephone programme (Base: 401 respondents)

"Other" includes more accessible to all, more professional standard of presentation.

- Speed of use was mentioned as the main benefit, followed by up-to-date information and ease of use. Given the recognition of these benefits, it is surprising that more are not using electronic product information. Their perception of the benefits does not outweigh concerns, such as cost and a preference for hard copy.
- More non-users than users consider electronic tools to be fast to access and use. The conclusion may be drawn that, in reality, these tools do not provide as fast a route to the data as is imagined. Non-users also perceive that these new tools can keep them more up-to-date than brochures, yet this was only recognised by users to be a significant benefit of the Internet, and not the other media.

**10. PREFERENCES FOR FUTURE DELIVERY OF PRODUCT INFORMATION**

- Electronic format preferred - % ranking first



Source: Telephone programme (Base: 401 respondents)

- Preferences by type of organisation (% ranking each media 1st and 2nd)

|                          | OVERALL | Clients | Specifiers | Contractors | Housebuilders |
|--------------------------|---------|---------|------------|-------------|---------------|
| CD-ROM 1st               | 43%     | 39%     | 46%        | 40%         | 43%           |
| CD-ROM 2nd               | 21%     | 14%     | 23%        | 20%         | 23%           |
| Disk 1st                 | 14%     | 12%     | 13%        | 21%         | 3%            |
| Disk 2nd                 | 25%     | 31%     | 25%        | 25%         | 20%           |
| On-line 1st              | 14%     | 14%     | 15%        | 10%         | 23%           |
| On-line 2nd              | 10%     | 16%     | 12%        | 8%          | 0%            |
| Internet 1st             | 11%     | 20%     | 11%        | 8%          | 7%            |
| Internet 2nd             | 16%     | 14%     | 16%        | 17%         | 20%           |
| No preference/don't know | 14%     | 14%     | 11%        | 17%         | 20%           |
| Prefer hard copy         | 4%      | 0%      | 5%         | 5%          | 3%            |

Source: Telephone programme (Base: 401 respondents)

- Based on current experience and awareness, there is a strong preference for delivery of product information on CD-ROM. Almost two-thirds ranked CD-ROM in first or second place. This view is consistent across all respondent groups, with some differences in attitude towards other formats. For example, almost one-quarter of Housebuilders ranked on-line services (other than the Internet) in first place, and about one-third of Clients placed the Internet in first or second place. The reasons for preferences are summarised in the next graph:

● Main reasons given for stated preference (as % of those ranking each first)

|                             |     |
|-----------------------------|-----|
| CD-ROM                      |     |
| Easier to access/use        | 44% |
| Holds a lot of information  | 40% |
| Faster to access            | 29% |
| DISK                        |     |
| Easier to access/use        | 55% |
| Compact                     | 11% |
| ON-LINE                     |     |
| Up-to-date                  | 41% |
| Easier to access/use        | 30% |
| Faster to access            | 18% |
| INTERNET                    |     |
| Up-to-date                  | 33% |
| Easier to access            | 27% |
| Has more information        | 24% |
| The most developed/advanced | 18% |

Source: Telephone programme (Base: 401 respondents)

- A preference for a medium which is easy to use is the main reason for placing CD-ROM or Disk in first place, whereas those preferring on-line services, including the Internet, welcome them because they perceive the information to be up-to-date.

11. **MANUFACTURERS' ATTITUDES TOWARDS ELECTRONIC PRODUCT INFORMATION**

The increase in use of product information will be partly driven by the extent to which manufacturers make it available in these formats. To understand the level of manufacturers' investment in electronic forms of communication, and their future plans for doing so, 100 product manufacturers were interviewed by telephone and a further 108 completed postal questionnaires.

Communication tools used (% of respondents)

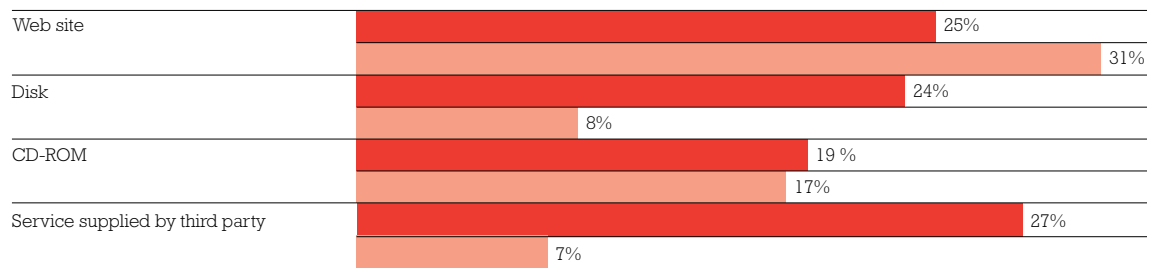
|               | Used in 1996 | Expect to use in 1997* | Change 1997 v 1996 | % anticipating increase in expenditure in next 2-3 years |
|---------------|--------------|------------------------|--------------------|--|
| Disk/CD-ROM   | 31%          | 55%                    | +24%               | 43%  |
| Web site      | 18%          | 54%                    | +36%               | 49%  |
| Advertising   | 91%          | 90%                    | -1%                | 14%  |
| Direct mail   | 67%          | 71%                    | +4%                | 28%  |
| Exhibitions   | 65%          | 60%                    | -5%                | 14%  |
| Telemarketing | 35%          | 34%                    | -1%                | 13%  |
| Video         | 24%          | 31%                    | +7%                | 11%  |

Source: Manufacturer telephone survey (Base: 100)

\*Includes those already using

- Based on the sample of 100 product manufacturers, electronic tools are the fastest growing communications media. By the end of 1997, if plans become reality, just over half will have made an investment in Disk/CD-ROM and a similar figure in Internet sites (second column above). Over the next two to three years, 43% expect to increase their spend on Disks/CD-ROMs and 49% in Web sites (last column above).

● Investment in electronic tools by type in 1996 and planned for 1997

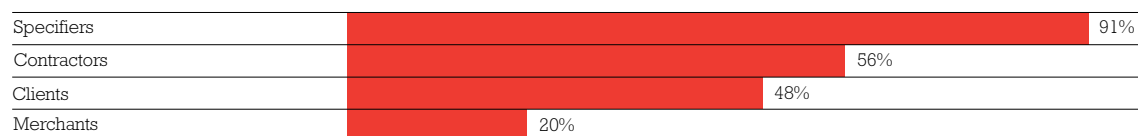


Source: Manufacturer postal survey (Base 108)

■ Investment made by end 1996 ■ Budgeted to invest in for first time in 1997

- Again, these figures show that the tool which many plan to include for the first time in their 1997 marketing plans is a Web site, followed by CD-ROM. It tends to be the larger companies who have already published on Disk or set up a Web site, and a higher proportion of these large companies plan to bring out a CD-ROM this year. The potential for CD-ROM as a technical aid for specifiers was given as the main reason for including Disk/CD-ROM in their 1996 plans.
- Half of those who have developed a Web site are just testing this medium out, suggesting that its value for product decision-makers is not yet clear. Only 6% are using the Internet as a communication tool because it may be kept up-to-date, and 17% gave the direct contact it allows with decision-makers as their reason.
- When asked "Which do you think offers greatest potential to your business for communication of product information?", 52% answered the Internet, 39% CD-ROM, 17% third party suppliers and 10% Disk; figures which reinforce the anticipated investment trends.
- The manufacturer postal survey included questions about the customer groups targeted and the promotional or distribution methods used for Disks and CD-ROMs.

● Target customers for electronic tools (as % of those with electronically held information)



Source: Manufacturer postal survey (Base 108)

- Nearly all companies with electronic information tools are targeting Specifiers, and over half are targeting Contractors.

● Promotion/distribution methods for Disks and CD-ROMs (as % of those with electronically held information)



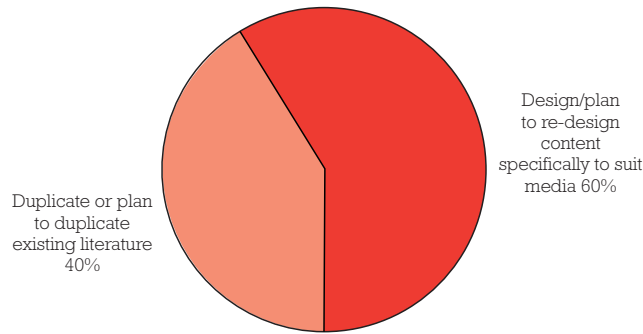
Source: Manufacturer postal survey (Base 108)

- Manufacturers tend to send out electronic product information on request, or it is taken in to decision-makers offices by the salesforce.

Manufacturers were asked for their views on the benefits and drawbacks of each of the electronic delivery media.

- Disk is considered to be cheap, but limited in capacity. CD-ROM overcomes this problem and allows a better standard of graphics, but the main concerns are that CD-ROM drives are not available to all, and publishing to CD is expensive.

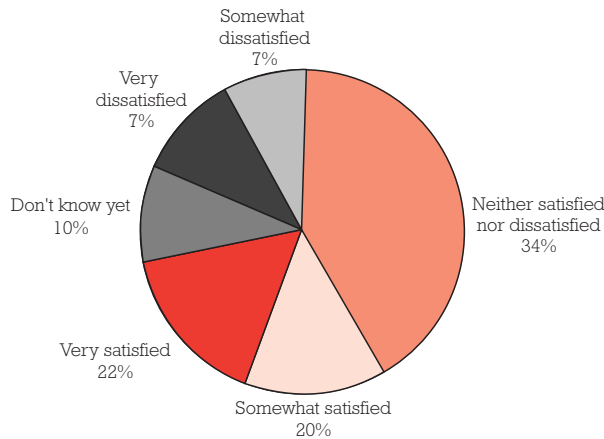
- Manufacturers regard the potential to make information available to a wide audience as a main benefit of the Internet, together with the ability to keep the site up-to-date. However, limited usage, slow access and downloading time are concerns. Unprompted, 8% raised the fact that customers and potential customers cannot be targeted for a marketing campaign, as a drawback of the Internet.
- Research with users has shown that simply scanning-in brochures, with no additional features, is not sufficiently attractive to warrant using the electronic version. Manufacturers who have developed an electronic version were asked in the postal survey whether they took a completely new approach or followed the design of their literature.
- **Design of new electronic product communications**



Source: Manufacturer postal survey (Base 108)

- The 40% who duplicate their literature in an electronic form, may find that users prefer to turn to the hard copy if there are no additional features. The new tools are used in a different way to brochures, and this needs to be taken into account in designing for the new media. Manufacturers' satisfaction with the reaction from customers was sought:

- **Satisfaction with customer reaction**



Source: Manufacturer postal survey (Base 108)

- Only 42% of manufacturers are satisfied with customers' reaction to what is probably their first attempt at producing product information electronically; 14% are dissatisfied, giving the lack of feedback from customers, or the lack of a system to monitor feedback, as their reason. For 10% it is too soon to judge as services may still be under development.

The research also examined the investment manufacturers have made in other electronic forms of contact with customers, such as ordering systems for merchants.

- **Other systems developed**

|   |     |
|---|-----|
| Have not developed other electronic systems         | 66% |
| Considering developing electronic merchant ordering | 14% |
| Have developed electronic merchant ordering         | 8%  |
| Have other system                                   | 7%  |
| Don't know  | 5%  |

Source: Manufacturer postal survey (Base 108)

## 12. Electronic tools – some manufacturer case studies

### Background

Five manufacturers who have published product information electronically agreed to provide information for these “case studies”, with the aim of giving other manufacturers examples of what they set out to achieve, the features and benefits, main target groups, and an indication of the development costs. Their product information was included in the panel where 10 Architects were asked to take a look at each service. While their comments are based on a review of up to 10 minutes, we feel that this is a realistic reflection of the time a Specifier may spend initially in looking at a new piece of information in order to judge its value to them, and, importantly, whether it will be of use in the future.

### Conclusions of panel review

Discussions during the panel session with Architects, and the scores given to the services reviewed, demonstrate that Specifiers are looking to electronic formats to provide additional tools and benefits, and not simply an electronic reproduction of manufacturers' brochures. A number of conclusions may be drawn from the generally average scores; that Specifiers have not grasped how to find their way around electronic tools, (but without a commonality of approach, this may not be surprising), or that these tools are not yet fully meeting their requirements. The Architects selected for the panel were conversant with the use of electronic product information, and may therefore be regarded as more likely than many to grasp the features and benefits.

| Product sector:   | Manufacturer 1<br>Interior fittings   | Manufacturer 2<br>Thermal protection  |
|---|---|---|
| Electronic format reviewed:                                       | CD-ROM (1996)   | CD-ROM (1996)   |
| Other formats available or under development by manufacturer:     | Disk (1990), Web site (1997)  | Web site to be developed  |
| Objective(s):   | To meet market demand   | To provide information in a format which is easier for specifier to use than literature |
| Main targets in order of importance:                              | Architects, other specifiers, contractors, clients, merchants, sub-contractors                          | Architects, other specifiers, contractors, sub-contractors                              |
| Promotional method:   | Advertisements in trade journals, via sales force, in literature and by direct mail                     | Via sales force, direct mail and PR   |
| Main features:  |   |   |
| Product match against performance criteria                        | ✓   |   |
| Technical drawings and detailing                                  | ✓   | ✓   |
| Sizes and dimensions  | ✓   | ✓   |
| Testing and certification   | ✓   | ✓   |
| Product range   | ✓   | ✓   |
| Colour and appearance examples                                    | ✓   | ✓   |
| Images of products/finishes in use                                | ✓   | ✓   |
| Approved list of suppliers/installers                             |   | ✓   |
| Selection of different finishes and effect shown in examples      |   | ✓   |
| CAD link  |   |   |
| Provides rendering software for those without true CAD facilities |   |   |
| Specification clauses   |   |   |
| Selection of different finishes                                   |   |   |
| Copy and paste for text   | ✓   | ✓   |
| Copy and paste for drawings/graphics                              | ✓   | ✓   |
| Telephone software support  | Dedicated Software Support  | Through Technical Helpline  |
| Plans for development of this format:                             | CAD link, drawings file   | Change to landscape format  |
| Development time:   | 12 months   | 18 months   |
| Number printed:   | 10,000  | 3,000   |
| Re-designed format or brochures duplicated:                       | Used existing brochure approach and style, as this is familiar to specifiers, but not simply scanned in | Some pages scanned in, others developed based on current literature                     |
| Budget for electronic media:                                      | £70,000   | £20,000   |
| Ease of understanding what service offers                         | 4.88  | 6.60  |
| Ease of use and generally finding way round                       | 4.50  | 5.80  |
| General design of service   | 4.50  | 5.00  |
| Contribution as a design tool                                     | 2.62  | 3.60  |
| Contribution as a product selection tool                          | 3.50  | 5.00  |
| Contribution to making a detailed specification                   | 4.00  | 3.80  |

(average scores out of 10)

A common failing of electronic tools is a lack of explanation of the benefits. One of the first screens viewed on entering the service should inform the "reader" how to use it, and what it can do for them. The manufacturer developing electronic tools for their target market is faced with the new challenge of not only marketing their products, but also "selling" a new communication tool which is less familiar. As with their products, a manufacturer needs to give the specifier very good reasons for using this new tool. If the features and benefits are not grasped within the first 5 minutes, it is possible that the information in an electronic format may be filed away and not referred to again.

Of the services reviewed, the panel's general preference was for the product information provided via the least advanced electronic method - the Disk. But this was a reflection on the content rather than the delivery medium. The reasons given included ease of use, that it offered a fast route to identifying the most appropriate product, and provided specification clauses for a given set of circumstances.

Interest in visual tools was surprisingly low. Architects see these new formats assisting them at the detailed specification stage rather than making a significant contribution to the design process.

| Manufacturer 3<br>Interior finishes   | Manufacturer 4<br>Envelope   | Manufacturer 5<br>Interior fit-out  |
|---|--|---|
| CD-ROM  | Web site   | Disk (1996)   |
| Disk and Web site under development   | CD-ROM under development   | CD-ROM, Web site (1998)   |
| To communicate with decision-makers in a contemporary fashion. To gain competitive advantage by setting a benchmark that will be difficult for others to follow | Considered as a result of the '96 Barbour Report (Communicating with Construction Customers) and market demand | To make specification of this product more straightforward, to support technical assistance provided by the company and to gain competitive advantage |
| Architects, other specifiers, clients, contractors, sub-contractors   | Architects, sub-contractors, other specifiers, contractors, clients  | Architects, other specifiers, contractors, sub-contractors  |
| Adverts in trade journals, via the sales force and in product literature  | Adverts in trade journals, via the sales force and in product brochures  | Adverts in trade journals, via the sales force and in product brochures   |
| ✓   |  | ✓   |
| ✓   |  |   |
| ✓   | ✓  |   |
| ✓   | ✓  |   |
| ✓   | ✓  |   |
| ✓   |  |   |
| ✓   |  |   |
| ✓   |  |   |
|   |  | ✓   |
|   |  | ✓   |
|   |  | ✓   |
| Dedicated Software Support  | By Email   | Through Technical Helpline  |
| Improved access, expansion of technical content and component information   | Further development of Web site planned but details not available  | Developments will be incorporated into interactive CD-ROM   |
| 14 months   | 3 months   | 12 months   |
| 25,000 including distribution to Europe   |  | 1,000   |
| Re-designed   | Re-designed  | Re-designed   |
| £250,000  | £1,000   | Not available   |

|      |      |      |
|------|------|------|
| 5.78 | 4.40 | 6.57 |
| 5.56 | 4.60 | 6.29 |
| 6.44 | 4.60 | 4.57 |
| 4.44 | 2.80 | 5.29 |
| 4.44 | 3.00 | 6.86 |
| 3.12 | 2.80 | 6.43 |

### 13. **ELECTRONIC PUBLICATIONS – ISSUES FOR CONSIDERATION**

During conversations with professionals in this field, with those who have already published electronically and with users who have utilised the end products, a considerable amount of information has been gathered on the issues that surround the electronic publication process. The following list is intended as an approach structure for manufacturers' starting along this route.

#### ✓ **The starting point**

Clear definition of the objectives behind the decision to publish electronically is essential. Will this be a tool for selling, for aiding specification, for providing technical support, to simplify the ordering and distribution process or a method for raising customer awareness and corporate visibility?

#### ✓ **Defining the user and their needs**

Understand why a user would want information in this format, what information will they use and how will they use it. Answer the questions:

- Who are the recipients of the information, what are their business profiles and roles in the construction processes?
- What is the geographic location of the audience: UK, Europe or world-wide? How can they be identified and targeted?
- What information do these recipients need as they complete their role? Do they have a need to use this information in any specific way in order to satisfy their professional obligations?
- How will electronic delivery of information integrate with their day-to-day working patterns? What will it deliver over and above existing paper-based sources?
- How often does it need updating?

#### ✓ **Available content**

Information may already be held in electronic formats by either the company or its suppliers. Brochures produced by external printers or designers, technical bulletins and specifications in word processing formats, company logos, photographs and illustrations as bitmaps; any such files will save considerable time and money in the conversion and modification for electronic delivery.

#### ✓ **Initial design and set-up**

Publications can range from the most simple electronic copy of existing material to highly interactive tools bringing new approaches to specification and design. Text, illustrations, and photographic images can now be supplemented with sound, video and the ability to move seamlessly between the different media. Except for anything other than the most basic programme or within large organisations with an advanced electronic business culture, it is unlikely that the expertise to design and set-up electronic publications will exist in-house. External expertise will therefore need to be 'bought-in' from one or more of the many specialist companies established in this rapidly growing service sector. The specialities have tended to split between Disk/CD-ROM and On-line/Internet.

#### ✓ **Educating the User**

Electronic construction product media should be designed to provide interactive specification tools, technical manuals or customer support facilities rather than acting as a sales exhibition. The user will only access a site if it provides them with information they can directly use in their professional role. Browsing product images for entertainment or general interest is unlikely to be a business pursuit.



There is a school of thought which believes that electronic information should have a familiarity of appearance with paper-based information. This removes a degree of fear, encouraging the less confident users to be more adventurous. However it is important to remember that the simple reproduction of existing brochures makes no use of the true capabilities of an electronic format, provides few, if any, benefits to the user and is hard to differentiate from the original hard copy.

All electronic publications must inform the user of the operation, content and abilities of the programme at the point of first contact. In many instances, this has been achieved by including written instructions in hard copy, on the surface of the Disk/CD-ROM, in the case, or in a separate booklet. Opinions suggest that this information process should also be included in the electronic document if it is to be fully effective. The user needs to be shown, automatically in the first few minutes, the full capabilities of the information tool in their possession. On the Internet, greater reliance must be placed upon user-friendly interfaces and obvious routes for access. Users are less likely to wait for an explanatory file to download and run; at best they will read a text or diagrammatical explanation of what lies beyond the opening screen.

Failure to educate and achieve utilisation may condemn an electronic offering for a lengthy period. If immediately useful, it will be filed as a favourite, easily accessible and available for day-to-day use. If the full potential is not immediately recognised, revisiting at a later date is unlikely and a considerable investment will remain unused.

### ✓ Setting the budget

The budget will significantly influence the delivery medium and capabilities of the publication. It must provide for proficient design and set-up at the outset, together with effective packaging, distribution and promotion. A false start, with user rejection, may mean that future attempts will have to remove existing negative perceptions before rebuilding positive acceptance.

### ● Disk

The capacity limitations of Disks will limit the complexity of design and format of content. This need not compromise the quality and capabilities of simple publications to effectively help the user with their information needs. Creative use of text, rigorous commitment to relevance and avoidance of memory hungry devices can still result in a programme which is comprehensive, applicable, user friendly and capable of delivery by Disk. For smaller volume distribution to a known targeted audience by traditional means ie mail, this is the lowest cost method.

### ● CD-ROM

The art of interactive, user friendly CD-ROM design is a complex, rapidly developing speciality with world leading expertise available from a number of companies within the UK. Provided with clear objectives and a target audience, a specialist designer will provide a full service from concept design through detailed content and interactive categorisation. They will arrange publication, Disk pressing, screen printing and packaging design.

The considerable storage capacity of CD-ROMs presents the opportunity for using the more memory hungry features which cannot be incorporated on a Disk or would take an unacceptable time to download across the Internet. Video, high resolution colour photographs, sound, CAD files (.dxf files etc), can be easily incorporated to provide interactive components which the user can directly transfer to other tools or documents.

The initial design and set-up costs for a quality CD-ROM will be measured in tens of thousands of pounds. If this is for publication in small numbers, the cost per CD-ROM will be prohibitive. The benefits come with the ability to press large volumes and to update and amend easily for subsequent lower cost re-issues.

### ● Internet

Publishing your own Web site on the Internet is possible but the likelihood of failing to deliver what users want is high. Poor connections, slow speed of downloading and user-unfriendly design are commonplace amongst the 'DIY' sites. A dedicated 'server' will require management and maintenance 24 hours a day.

Internet Service Providers (ISPs) provide a full service for Internet connection, Web site design, monitoring, management and support. Many offer deals that include server space as part of a corporate connection package. The main service providers have 'resellers' who offer these services on a more local basis. Most have the necessary skills and experience to help set up a professional looking, user-friendly site. As with any field of design, there are 'experts' who have highly developed capabilities for designing and publishing on the Internet. The leading car manufacturers, magazines and the entertainment industry currently provide some good, leading edge examples of this art.

The keys to good Web site design are speed of access to information, user-friendliness and quality of content. Speed of access to information is probably the most critical issue. If the user gains access to a site but then needs to spend ten minutes waiting for a large, high resolution image to download, they will not wait.

Once at a site, the user must be offered understandable choices which allow them to tailor offerings to match their needs. Information explaining the content, capabilities, tools and facilities, together with the routes to access them, should appear immediately. Images and memory hungry facilities may be offered, but downloading should be left to the users' discretion. Explanations of how the information can be used, integrated with other software tools or working practices, will encourage exploitation of the full potential and help develop the electronic relationship.

The Internet allows two-way communication between the user and information provider. Questionnaires or feedback devices can be incorporated and easy routes to send Email are commonplace. These will only work if the mechanisms to use the information and to respond are well established and practised. Users expect a response to Email in hours not days. Equally, feedback will not be offered if actions resulting from it are not visible.

#### ✓ **Mixing media**

A CD-ROM may include software to lead a user directly to a specific site on the World Wide Web. This capability binds the best of both media together; the storage capacity, user-friendliness and speed of the CD-ROM, with the up-to-date immediacy and two-way interaction of the Internet.

#### ✓ **Packaging (Disk and CD-ROM)**

Applicable only to Disk and CD-ROM, packaging the delivery medium is an important element of electronic delivery. The Disk will require a label, the CD face will require screen printing, and endless options range from the most simple and cheap to the highly complex and expensive. However these surfaces must carry the necessary information to identify and access the information when it is separated from any other surrounding material.

Such material, Disk boxes and folders, CD cases etc. have to protect the contents during the distribution process and the subsequent useful life of the information. Broken Disks and scratched CDs are unreadable, denying the user access to your information thereafter. Ineffective packaging is capable of devaluing the investment in electronic media even before the user has seen it.

#### ✓ **Distribution**

Distribution of Disks and CD-ROMs will utilise mail, courier services or be delivered in person by representatives in the field. Weights and consequent costs are similar to smaller brochures, but in the case of some of the more expansive technical manuals which manufacturers have produced, the CD-ROM equivalent will be considerably cheaper to deliver. Distribution of Internet based material will rely either on the resources of an ISP (Internet Service Provider) or will involve the purchase of your own 'server' with the appropriate connection, monitoring and maintenance resources to ensure effective 'distribution', 24 hours a day, 365 days a year. 'Outsourcing' the distribution to an ISP is an attractive alternative. Costs are charged on a monthly or annual basis and are being driven downwards by aggressive competition in the current market. This will continue in the near future, as more providers enter with their rapidly expanding services. Some are now offering server space as part of an inclusive connection package although these are mainly aimed at the smaller business user. Internet 'distribution' or server costs are unlikely to consume significant percentages of the overall budget, but they are on-going.

✓ Promotion

The challenge, applicable across all the delivery media, is to promote the existence of the information source to users, and to arrange for them to have access to it. In the case of Disk and CD-ROM, these methods may be very similar to those in existing use for paper-based information ie via targeted mailshots and requests generated through traditional advertising. However for Internet and dial-up based information, the user has to be given the details necessary to locate the information and provided with the incentive to do so. Ironically, electronic media experts accept that the traditional paper based forms of promotion are still necessary to ensure the success of most electronic publications.

✓ Support

It is a fact of life that some Disks will be damaged or unreadable, CD-ROMs may fail to load or run and Internet files can disappear into un-locatable directories on the user's hard Disk. Electronic information directly interfaces with a user's hardware and software and manufacturers' data will be blamed for 'bugs' 'crashes' and 'viruses'. The market leaders in software production have learnt, through experience, that any changes in operational performance are often blamed on the latest software addition.

A support mechanism is needed to deal with user questions and problems. Telephone based software support is a highly developed process spearheaded by the leading computer industry players. Users have experience of this and have high expectations, no matter whom the provider. To ensure the information is accessible when the users want it, a minimum commitment during normal office hours will be necessary. Unless the development team is wholly 'in-house', this support service should be 'out-sourced'. Most specialists who have helped in the set-up and design will provide the necessary support infrastructure. Manufacturers' should remember that this is an on-going commitment and cost.

✓ Development

Publishing information electronically is a rapidly developing process with experience, skills, tools and resources changing almost weekly. What is issued today could well be superseded in months, and once recognised as being 'out-of-date' will be discarded by the user. Any commitment to electronic media must be matched by a commitment to update and develop as the information and technology change. The well understood pitfalls of out-dated brochures are also directly applicable to these new formats. The consequences of them, with users able to access outdated CAD details or specifications for example, could be far greater.

## 14. VISION FOR THE FUTURE

Current investment in hardware and software by construction businesses is continuing to increase. As the attention of the IT sector moves to the further expansion of the home and smaller business market, familiarity and adoption levels in other industry sectors will increase.

Communication infrastructure investment and innovation are rapidly removing the main barriers to usability of on-line information in day-to-day working practices. Access to the Internet by product decision-makers is projected to be around 70% by the year 2,000. Use of CD-ROM based information will be between 80% and 90% by that time. These two delivery media will interact to provide users with access combining the benefits of both formats.

Powerful PCs will make more tools available to wider business audiences accessing information company-wide, nationwide, and worldwide through networks, intranets and the Internet. The advent of the 'Net computer', a low cost slimmed down processor reliant upon Internet servers for its performance capabilities, will bring even greater adoption of the technologies onto the business desk.

The abilities of electronic media designers will grow through experience and expanding resource capabilities, leading to more user-friendly interfaces which will encourage more frequent usage. As increasing numbers of product manufacturers deliver their information electronically, users will become more confident and familiar with the time and cost benefits of easy integration with other design and specification tools. Demand for greater sophistication and wider availability will increase, manufacturers will be able to differentiate themselves through the quality and capabilities of their electronic support media.

The growth and development of highly focussed construction information gateways and intelligent specification and information tools will lead active, on-line specifiers directly to manufacturers who have prepared themselves for the direct one-to-one electronic relationship. Communication will take place by Email, voice and video conferencing, live, at the moment when information is needed.

Construction project information will take the form of centrally held electronic files which will be simultaneously accessible by all involved. It will cease to be used in isolation but will be combined into virtual models that develop during the design and specification process, expand in the construction process and are interrogated and utilised throughout the life of the building. The occupier will have detailed management and control information which will be supplemented by tagged components able to communicate with the central data source. The process industries and retail sector are well advanced with developments in this area and the construction industry will adopt these techniques. A number of initiatives are now taking place to drive forward the industry's specific requirements and use of technology (for more information see appendix 1).

Details in the design documentation will be generated by the manufacturer not the designer, who will simply copy them from the delivery media straight into CAD files. Product manufacturers will have to provide not only descriptive and dimensional information but also full performance and operational criteria. Maintenance and monitoring data, in fully active electronic formats, will simulate every operational attribute of products in reality.

Electronic product information will develop using different media that link to create a virtual library for all construction users. Limitations on storage space and the risks of accessing outdated information will cease to be issues as constant availability of usable information at the workstation becomes commonplace.

Nothing in this vision is futuristic. All the technologies exist and are being used in such ways, to some degree, in other business sectors. Adoption by the construction industry, as followers, should be rapid, particularly as users become accustomed to the benefits and capabilities being demonstrated elsewhere in everyday experiences. Children have already replaced Encyclopaedia Britannica with Microsoft Encarta and the World Wide Web is challenging the municipal Library. When electronic banking, shopping and user directed entertainment is commonplace in the home, business users will not accept lower levels of technology in the workplace. All parties from all aspects of the construction industry must now prepare to drive these fundamentally different ways of delivering information into day-to-day working practices in user friendly and efficient ways.

## 15. **SPECIALIST PAPERS**

### Introduction

The research for this report includes interviews with many individuals involved in various aspects of the delivery of electronic information. They have considerable expertise and experience of their own fields, opinions on developments to date and visions of the future development of communication tools. Four have been invited to share their views which are set out in the following papers:

Pat Ware of Barbour Index plc explores the relationship between the information provider and user and shares some of the guiding principles behind the development of Construction Expert.

Niall Lawless, General Manager of Quantum Solutions Limited gives the benefit of his wealth of 'hands on' Internet design experience and sets out some essential steps and business implications of developing a Web site.

Paul Stefan of Autodesk explains the company's commitment to the integration of CAD tools with Web technologies and shows how manufacturers' can support the designer using these resources.

Ronald F Marsh, a Consultant with TRADA Technology Limited, argues the case for product identification systems which will provide the data for better control, management and accountability throughout the construction process.

## **INFORMATION AND TECHNOLOGY**

by Pat Ware, Barbour Index plc

During 1993/94 Barbour Index started the development work for what was to become Construction Expert. It was not our intention to simply 'computerise' existing paper-based systems, but rather to reappraise what was required by the user, and to assume that modern information technology could deliver these requirements. Throughout the development process we concentrated on the information needs of the user. The computer was simply the means of delivering this information.

Three years on, we believe that Construction Expert is unique in its coverage of both the 'technical' and 'product' sides of the industry, as well as the structured approach which it takes to finding information. We remain convinced that this is the correct emphasis, and that the information must always come before the computer system.

Even before the advent of the Internet and the World Wide Web, it was an increasingly commonly-held view that electronic information systems were the way forward. There was much talk of the 'paperless office' and the declining future of the printed word.

While there is no doubt that there is a grain of truth in this - currently it is no more than that - for the future of information lies, as it always has, with the information itself. The medium by which it is delivered only becomes significant when it has a bearing on the means of access, the medium does not have the ability to improve the quality of the information.

In the early days of computing, we used to hear the acronym 'GIGO' - garbage in, garbage out. It's not said as often these days but is surely still as true, and with the advent of cheap processing power and mass storage, it has become so much easier to present the user with huge amounts of seemingly inaccessible 'garbage'. The throw-away product card which falls from a magazine has been replaced by the throw-away CD.

Too often it seems that these products are developed with little thought for the user.

The first rule of computer-based systems must be to ensure that the information is accurate, structured, clear and worthwhile before it is allowed anywhere near any system which presents it to the end user. In the development of Construction Expert, we spent a considerable amount of time discussing the information and the ways in which it should be structured, before we even began to consider the computer system - for without structure and clarity there is simply chaos.

Regardless of the delivery medium, the designer of any information system must think about what the user wants. How will they use the information? How do they expect to access it? What are their expectations? What will they do next? It is as well to remember that it is the information, not the medium, which the user is seeking, and that even the most useful 'nuggets' are useless if they cannot be located.

Early on in the development phase of Construction Expert, we decided that we were not producing a library system and, although this may seem contradictory, nor were we selling a computer system. The computer was simply the means to the end. We wanted to avoid putting 'old wine into new bottles', and resolved that, whatever our approach, we would present the users with exactly the information they were seeking and not with lengthy lists of documents or manufacturers unless, of course, that was what they required.

What Construction Expert provides is access to a wide range of technical documents and product information via a CD-ROM based search engine and database. It has a unique, structured fast search mechanism which prompts questions and leads the user to answers, giving them precisely the information they require.

## **THE INTERNET – A STRATEGY FOR BUSINESS**

by Niall Lawless, Quantum Solutions Limited

### **Introduction**

The way in which all companies involved in property and construction do business has the capacity to be changed by the Internet. Those that are able to successfully exploit the opportunities offered by the Internet will have a clear advantage over their competitors: for example, the Internet can increase efficiency, help serve existing and new customers better, develop new markets and assist in research and development.

The attractiveness of the Internet as a communications medium encourages many companies to connect without planning. This often leads to disappointing results and a loss of faith in the technology as a business tool.

### **The Internet strategy in context**

Strategy should be driven by the competitive direction a company wishes to take. This begins with an analysis of business objectives and a plan which identifies the basis for short and long term competitiveness. Companies that are able to visualise the potential use of the Internet in all facets of their business will be able to gain maximum advantage from it. The Internet is not just about marketing and sales, it can affect all departments including technical support, manufacturing and human resources. The most successful Internet strategy will be an inclusive one. However, although it is important to establish objectives and to plan for implementation, companies should not take the process of formulating a strategy to extremes. It is possible to argue that by experimenting with the Internet now, a company can make mistakes whilst the target audience is relatively small.

### **Uses of a Web site in property and construction**

A Web site can provide customers anywhere in the world with access to your company all day and every day. Manufacturers and service suppliers are currently using Web sites to provide:

#### **Corporate information**

It is possible to generate new content or re-purpose existing marketing information contained in brochures to position your company on the Internet. Visitors will be interested in different aspects of your company and they should be able to choose that which interests them. Because of this, you should consider what additional support information might usefully be made available. The Internet provides a low cost and fast means of keeping all stakeholders in your business such as customers, suppliers and staff up-to-date (see [www.arup.com](http://www.arup.com));

#### **Additional support information**

Many companies use the Internet to make their organisation more customer facing. They identify key support people who can be contacted for different products and queries. Data capture forms and Email are used to encourage feedback and interaction. Current news and project successes keep existing stakeholders up-to-date and may enhance your credibility with new customers. Other information sets such as quality assurance objectives and accreditation can be displayed. The Internet provides a low cost and fast means of distributing this information to a wide range of people ([www.acenet.co.uk](http://www.acenet.co.uk));

#### **Catalogue product information**

This can be made available in HTML and also Adobe Acrobat® which allows the user to print information locally to the exact format and layout as your paper-based catalogue information. The Internet provides a low cost and fast means of distributing current product information (see [www.liebert.com](http://www.liebert.com));

### Technical information

This can be offered for all your products. It can be made available in HTML, Adobe Acrobat® and simple text which allows the user to capture information to their local computer and easily incorporate your product information into their designs. The technical information can also be printed locally to the exact format and layout as your paper-based information. The Internet provides a low cost and fast means of distributing current technical information on your products (see [www.compaq.com](http://www.compaq.com));

### CAD drawings

These can be offered for all your products. They can be made available in any format although AutoCAD .dxf and .dxb is currently the most widely used. To incorporate your products into their designs, the user can access two and three dimensional drawings for specific products and download these to their local computer. The Internet provides a low cost and fast means of distributing CAD drawings of your products (see [www.wilo.co.uk](http://www.wilo.co.uk));

### Installation and maintenance information

This can be made be available in HTML, Adobe Acrobat®, and simple text which allows the user to capture information to their local computer and create installation plans and operating and maintenance manuals quickly. The installation and maintenance information can also be printed locally to the exact format and layout as your paper-based information. The Internet provides a low cost and fast means of distributing installation and maintenance information on your products ([www.netscape.com](http://www.netscape.com));

### Problem solving

Many good Web sites have a 'frequently asked questions' section which allows visitors to access information to help solve problems. This provides a low cost and responsive means of dealing with your most common queries (see [www.metainfo.com](http://www.metainfo.com));

### Electronic commerce

The Internet can be used for electronic commerce at low cost. Use of on-line authenticated and encrypted Internet technology allows customers to place secure orders for your products quickly and with convenience ([www.virtualvin.com](http://www.virtualvin.com));

### Manufacturing scheduling and progress

By assigning each customer with a unique identity and an order number, you can allow them to review progress for particular projects, on-line. This can be used for the specialist manufacture of high value long lead items but it can also add value in businesses where each transaction is low cost and takes just a few days to complete (see [www.fedex.com/track\\_it.html](http://www.fedex.com/track_it.html));

### Ease of interaction

This can be achieved by deploying tools which allow visitors to search for information using a specific word or combination of words. The tool will return a weighted list of matching information, with better matches shown first. This makes your Web site more usable and visitors are more likely to return (see [www.masons.com](http://www.masons.com)).

In considering the above, you might choose to build an Internet Web site which has both private and public parts. This will allow you to build relationships with your customers providing them with instant access to support information, but excluding your competitors. You might also choose to build an Internet Web site for internal use which will make company confidential information available only to employees. Typically human resource policies, health and safety policies, management briefing notices and the like are presented in this way.



## What are the essential steps?

There are a number of essential steps required to move forward to use the Internet as a business tool. Even if an organisation does not feel that the Internet has anything to offer them at the moment, they need to act now to provide maximum potential for use at a later date. Having defined the strategic objectives for the Web site, there are a number of other essential steps which are:

### Obtain your preferred domain name

An organisation's Internet Web site address is known as its domain name and is usually chosen to closely reflect the name of the company. However, as domain names are unique, they are limited and it is most advisable for you to register yours immediately;

### Determine your service requirements

To connect to the Internet, you use an Internet access provider. This is similar to using BT to connect your phone at home to the phone systems in other countries around the world. The choice of Internet connectivity for a company requires balancing. The most appropriate connection for a business depends upon the anticipated volumes of traffic, the number of people who will have access, the speed of access you require and cost. An important criteria is whether your company is to be an information provider to the Internet or an Internet information consumer. This decision may affect both the type and speed of connection required;

### Undertaking Web site development

The process of establishing a Web site can be divided into three separate phases. These are:

- Web site content design and production, which includes considering who will be using the site and for what purpose, which information has to be included in the site, how best to lay out and move between the pages, and designing the site so that it can be easily maintained.
- Web site server infrastructure and location, which includes ensuring that there is adequate hardware and software to host the Web site, and that issues such as security are addressed.
- Web site monitoring, upgrading and maintenance, which includes making sure that usage is monitored and that changes are made with the necessary frequency. Each phase may be undertaken either in-house or by outsourcing;

### Advertising and measuring success

Your strategy must include for advertising your Web site to both existing and new customers. Your Web site address should be as accessible as your telephone and facsimile numbers on all corporate information, including letterheads and compliments slips. Register with Internet search engines to make context specific enquiries return your Web site address;

### Web server tracking

Use Web server tracking, management and analysis tools to manipulate statistical information such as the number of times visitors were referred from other Web sites;

### Managing your investment

Successful deployment of your Internet Web site is a process and not an event. Use customer focus groups to help you decide on how the Web site could be improved in terms of ease of navigation, content and the services it provides.

## **Moving forward**

To move forward, you need to develop an implementation plan which addresses the essential steps required to establish your business on the Internet. This may comprise:

- Prepare an action plan identifying the tasks needed to achieve the objectives;
- Identify the costs involved, these may include salaries, hardware, software, upgrades, publicity material, Web site design, maintenance, updating and improvement, training, research and development, Internet access and communications charges;
- Implement the action plan against an agreed timescale, milestone events such as 'register domain name' or 'get everyone an Email address' will be useful;
- New initiatives often generate internal resistance, identify champions within the organisation to help overcome this. Champions will usually be people who have used the Internet and appreciate its potential for the business;
- Allocate responsibility for the management and implementation of tasks to achieve objectives;
- Identify potential obstacles. This is best carried out at an early stage and plan to eliminate them during implementation.

## **Conclusion**

The Internet is changing the ways that the property and construction industry accesses and delivers the information used to make decisions. The Internet and the World Wide Web has emerged as the enabling technology to deliver this information quickly and on a global basis. Most organisations begin by consuming information and then move swiftly on to become information producers. They use the Internet to deliver new benefits and develop new relationships.

Developing and hosting a compelling World Wide Web Internet site requires a mix of skills and these can be developed internally or outsourced to others who offer expertise and a bespoke Internet development service.

The pace of research and development is rapid and current work will enable the Internet to deliver:

- Professional and technical conferences with associated virtual exhibition halls. These act as a showplace for product and service suppliers and provide an Internet gateway for referring customers ([www.virtual-conference.com](http://www.virtual-conference.com));
- Virtual Reality (VR) models of products, plant and equipment, which will allow the easy creation of virtual building and services infrastructures. The pharmaceutical, fine chemical and petro-chemical industries have already embraced this development using VR models to support CAD drawings;
- Common object model cataloguing products and delivering these over the Internet using a distributed object model;
- Intelligent design tools from your Internet Web site to perform selection from your product portfolio;
- Access to expert systems for remote problem diagnosis and work flow management tools for problem resolution.

The Internet is not the business tool of the future – low cost and ease of use have made it today's tool for many in our industry.

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## **COLLABORATIVE DESIGN AND THE INTERNET**

by Paul Stefan, Autodesk

The Internet is a vast collection of world-wide network computers on which information on almost any subject can be found. The power at a 'surfer's' fingertips is unquestionably immense. This power, however, needs harnessing. It needs a methodology to ensure that it is both productive and integrates with the way that construction project teams work today and in the future.

The construction industry has historically struggled to collaborate. Passing contract, drawing and specification information, for example, has always taken time and often been inefficient. The industry therefore needs to find a way of collaborating in a much more efficient manner to reduce time and project costs.

The main economic benefits of Web technology are that, firstly, it enables data to be kept current and up-to-date, therefore allowing the project team to retrieve that information simply and efficiently without the need to search in many locations. Secondly, it reduces the amount of documentation that needs distributing throughout a project, as all relevant project information is available on-line. Additionally, it enables those without CAD stations to view AutoCAD files very quickly and without the overhead of a full workstation. It therefore becomes a 'front-end' to a project.

There are two distinct ways to use Web technologies - an intranet or the Internet:

Intranets are company confidential networks that are secure to employees. They can be very specific to a construction project with confidential project information available only to internal personnel.

The Internet allows users to browse the World Wide Web and therefore have access to all Web servers and information on a global scale.

The technology used for both is almost identical in that all that is required is a Web browser (such as Microsoft Internet Explorer or Netscape Navigator) and a TCP/IP protocol. More construction companies are now seeing intranets as the way forward for distributing information on specific projects. Their local area networks (LANs) are already in place and they can easily construct an internal Web site to be the 'front end' of the project.

Autodesk recognised this when researching into how the Internet can be made to be productive for the construction project team. Scenarios such as an architect immediately wanting to know what designs of window a manufacturer produces, a technician urgently requiring a project approved detail for his drawing, or a site engineer wanting to have a close look at the latest foundation detailing on a drawing, have all shown us that the Internet and Web technologies can help these scenarios as well as many others, thus allowing project teams to collaborate much more efficiently.

What Autodesk has created is a Web file format of AutoCAD drawings that allow all the above scenarios to happen far more easily. This new AutoCAD file format is called .dwf (drawing Web format) and allows a full AutoCAD Release 13 or 14 drawing to be compressed to about 10% of its original size, allowing quick and efficient transfer of information. This means that full AutoCAD drawings in .dwf format can be viewed on the project Web site and distributed to any project team member, whether they are on site in Liverpool; in a Client's office in Hong Kong or back in the design office. With the Web browser, the user is able to look at one or a series of AutoCAD drawings, and is able to zoom, pan and print/plot the file without the use of AutoCAD.

This has many implications for the distribution of data on a project and also for building product manufacturers. For the design team it means quick and efficient distribution of drawings for approval, construction etc. Designers have access to 'project approved' details and components that can be dragged and dropped from the Web site directly into an AutoCAD session, to be used as part of the design process. For building manufacturers it means a whole new, but very productive, way of distributing product information and data. Product manufacturers are now able to create Web sites where users may view product literature and, with Autodesk technology, be able to post their products and details in AutoCAD .dwf format for users to download or drag and drop into their AutoCAD session, enabling the designer and the supplier to work much more closely.

## **TRACE AND TRACEABILITY**

by Ronald F Marsh, Consultant with TRADA Technology Limited

(This paper is based on a jointly funded DOE-TRADA research project on Marketing and Labelling systems for Construction Products and the author gratefully acknowledges their support).

### **The case for traceability**

The United Kingdom's construction industry has, in general, been slow in exploring the advantages that the application of Information Technology would bring to increase both the efficiency and quality of the building process, whilst at the same time reducing real costs and increasing profit margins. This situation was highlighted in the Latham Report on the Construction Industry which set, as one of its main targets, a 30% reduction in real construction costs by the year 2000.

A number of factors, detailed in that report, contribute towards the relatively high construction costs in the UK compared with the USA - a key one is the construction industry's poor record in material management. Research by Harris and Olomolaiye (SERC Research in Building No. 8 Spring 1992) identified that 40% of the time lost on sites, ie. non-productive time, could be attributed to bad management, lack of materials, poor identification of materials or inadequate site storage. Since that study, an increasing number of companies in the construction process have been certified under ISO 9000 Quality Assurance schemes and this, together with the introduction of the Construction, Design and Management Regulations 1994, has had the effect of sharpening the construction management process and, in particular, has improved the quality of site management. Together, these have also put pressure on clients, designers, specifiers and product manufacturers to examine how their instruction can be structured such that there is no ambiguity in their intent, thus ensuring that construction materials and products are fit for purpose and retain in use their "fit for purpose" attributes.

Further improvements in construction productivity could accrue if construction products could be identified in such a way that end users, at any stage of the construction process, could use that identification to undertake a number of tasks including:

- verify that the product conforms to regulatory requirements
- confirm that the product complies with the contract specification
- production control
- stock control
- ordering and purchasing
- storage and sequencing
- location and fixing
- troubleshooting and remedial works
- maintenance
- refurbishment and change of use
- recycling and disposal.

For such an identification system to be accepted by the Construction Industry it will be necessary to demonstrate that it:

- is applicable to all construction products
- has a level of compatibility with existing procedures
- is robust in both factory and site conditions
- has the potential to reduce costs.

The key factor is traceability.

In this context, traceability is defined as the mechanism by which it is possible to positively identify the previous history of the product, its ownership, its constituent materials and its performance attributes at any point within the construction chain.

The mechanism requires that there is data capture at each change of ownership such that in consequence of processes to the product any visible marks or labels are removed then by reference to the data capture mechanism, full traceability is maintained.

## Achieving traceability

If traceability is to be achieved, each product will have to carry with it an "identifier" which uniquely separates it from any other construction product. It is the very large diversity of products and the significant number of changes in the "ownership" chain from specification through to manufacture, stocking, construction, maintenance and disposal, which sets the challenge. It is perhaps by reference to other industries which faced similar problems that the Construction Industry could draw examples.

The retail, automotive and, perhaps most significantly, the health care industry all face a similar set of programs as the Construction Industry, though none of them have to address the added complication of site works. The key factor that has brought order and control to all of those industries has been the adoption of Auto ID as the mechanism to identify a product without the need to rely on human intervention with its consequential error possibilities and slowness of application.

The most common form of Auto ID, with which we are all familiar, is the one dimensional bar code used on virtually every retail product we purchase. Though a very simple system, it is exceptionally robust because it is under the control of a central, non-industry sector organisation, the Article Numbering Association. The most important factor in its success has been that the bar code symbology used is an "open" system. That is, it is not a proprietary product for which payment is required but is freely available to all those who wish to use it. These one dimensional bar codes carry two pieces of information – the producer's name and a reference number indicating the type of product. These reference numbers are issued by the ANA and in fact are random and do not have an inbuilt relationship either to the product manufacturer's own reference numbers or to an industry wide identification system. It is the software at the read-out which enables the interpretation of the bar code into product specific information, thus providing the retailer or wholesaler with a tool by which to implement stock control and pricing mechanisms.

The limitation of one dimensional bar codes is that they have a relatively low density of information carrying capability. In industries such as automotive manufacture, where an Auto ID system is required not only to identify specific components but also to control the production sequence, a higher density of information is required, which is comparable to that needed in the construction process.

These Auto ID needs are being met by two computer systems, two dimensional bar codes and radio frequency (RF) tagging. Both of these systems are capable of carrying large volumes of information though the RF tags have the significant advantage of being programmable. This means that data can be added at any stage of the production and manufacturing process, giving full traceability at any specific instant.

So what are the limitations on the use of these various Auto ID systems? Bar coding, though very cost efficient, has the following fundamental deficiencies:

- it provides only fixed data sets
  - it can be read only
- Retrieving the stored data is limited by:
- line of site access
  - sequential data access
  - one dimensional bar codes rely on central databases
  - two dimensional bar codes are at present "proprietary" systems
  - they demand high precision geometry, durability in service and freedom from usual corruption.

Although RF tagging provides a high flexibility in use and has the distinct advantage of being programmable and providing a very high security level on the encoded information, there are important disadvantages:

- there are no open systems currently on the market with suppliers building their own technical and proprietary systems
- the current cost of tags is very high relative to bar codes though dramatic reductions are predicted in the immediate future.

The linking factor, independent of the Auto ID system used, is that they all depend on a numerical code system. This provides the opportunity to define an industry wide code fixation system by which products can be uniquely identified by material, type and performance without reference to a specific manufacturer. The Construction Industry did have such a system, SFB, which was internationally recognised though it has proven to be computer unfriendly. This has now been totally re-cast as the "Uniclass" system which is computer based and thus provides a window of opportunity to develop an industry wide system, specific to the Construction Industry, with the ANA system to provide the basis for full traceability.

### **What is the future?**

On behalf of the Construction Industry, there has been significant university based research on Auto ID systems and electronic data interchange (EDT), with the work at the University of Reading by Dr Ed Finch being most notable. This research, both by simulation and field trials, has demonstrated that considerable time can be saved, with a very high level of reliability, in the information transfer required in the construction process. Subsequently, a more substantial field trial was undertaken by the University of Loughborough and a pre-cast concrete floor manufacturer, Richard Lees, which not only demonstrated production savings but proved the reliability of the system in factory and site conditions.

In addition to theoretical research, some sectors of the Construction Industry, for example the Builders Merchants Federation, have invested in developing EDI. The latter, which relies on the ANA system used in the retail industry, provides for a paperless system for the sale, stocking and transfer of construction products.

Thus, to return to the subject of trace and traceability, the Construction Industry now has the tools to provide this essential control mechanism. Each player in the construction team, be he the specifier, manufacturer, stockholder or contractor, if he is certified under ISO 9000, will, as part of his QA system, maintain a full database of all his activities. Under the CDM regulations, the critical contractual arrangements again are retained on a database. Thus, if the industry would grasp the value of a common product classification system, together with the application of the ANA system, we will be provided with the ability which, in an extreme case, could enable the Building Inspector to trace the history of a fire door back from its component materials, the manufacturing process, the test regime, the supplier and the fixing requirements to give him total assurance that the product has met the required specification and regulatory requirements. Total trace and traceability but, even more important, accountability.

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## **APPENDIX: CONSTRUCTION IT RESEARCH & DEVELOPMENT PROJECTS**

### **BAA Construction Road Map**

Published by British Airports Authority for their construction projects. Sets out the information flow on a major construction project and points of interchange of information and nature of information need and form in which it must be delivered.

### **CICC – Collaborative Integrated Communication for Construction**

A Europe wide extension of BRICC project. CICC is designed to demonstrate and evaluate Telepresence, Intranet, Augmented Reality, Mobile and Multi media services on real construction projects. BICC, ARUPS, BT and Bovis are UK participants.

### **CITE Initiative**

Construction Industry Trading Electronically through assistance in system development and advice from CITE Community Manager via Interlock Limited. A project with 20 partners putting electronic trading into practice.

### **Commit**

A Salford University IT Centre project developing a sophisticated project information system in association with OSCON. Designed to ensure all project decisions are recorded and advised to all participants.

### **Construct IT**

Benchmarking report on Best Practice on Briefing and Design. UNISYS and others undertook the exercise and are working on a series of benchmarking projects with Salford Construction IT Centre as publishers.

### **Construct IT Research Database**

An Internet site maintained by Dr Ed Finch at the University of Reading for the Construction IT Centre of Excellence. Ref: <http://www.construct.rdg.ac.uk/IT.html>.

### **Construction Industry Gateway**

Proposals for an industry wide accepted standard for access to construction information via the Internet. A DOE funded PE study and proposal available now being discussed with the industry with a view to a feasibility study being undertaken by CIRIA.

### **Construction IT Bridging the Gap**

A DOE policy document setting out strategy for sharing information through the use of integrated project databases.

### **IAI – International Alliance for Interoperability**

Initiated by CAD software providers particularly Autodesk in USA and Europe to ensure interoperability between systems and to provide data/attribution properties to 'objects' as defined by CAD systems. Purpose is to ensure free flow of standard data throughout the project life cycle.

### **IT 2005 Report**

Published at the end of 1995, this report contains 38 separate papers on specific IT subjects and deals with 'now' and the next 5-10 years, it also has some overall comments on the future. Copies of the full report are available on disc or on paper from CRC (EMAP Construct).

### **Mernet**

The Builders Merchants Federation system for electronic trading.

### **OSCON – Open Systems for Construction**

A 2 year DOE funded project at Salford University uses case studies from construction projects to demonstrate the usefulness of integrating project information in a central project database. This project is a development of the ICON project – full report available shortly. Strong in theory, lacks resources and knowledge to generate full supporting product information.

### PIPPIN – Pilot Implementation of a Process Plant Information System

This is a fully developed example with application to oil industry process engineering from design through operation, management and maintenance to demolition. This is the ultimate objective for construction industry systems. It is an ESPRIT (EU), Shell and ICI funded project.

### SCENIC – Support Centres Network for IT in Construction

Project operating in France, UK and Sweden designed to create a best practice Network of Construction IT initiatives in different European countries. Theoretical and evangelical, practical benefits more in ideas than application.

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Plus the manufacturers who provided electronic product information and background for the case studies and allowed them to be scrutinised by the panel.



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