The Management of Internet Use, in UK Architectural Practices

M. Fedeski
Cardiff University, U.K.

Abstract

The architectural profession has been slow to adopt new innovations in such areas as building technology, management, and CAD, as earlier research has shown. The Internet presents a particular challenge. With even greater changes to the Internet expected in the near future, it is timely to ask how the profession is adapting.

Field research conducted by the author has found shortcomings in the way that architects use Internet technology in the U.K. These involve the decisions to adopt the Internet, the management of its daily use, and forward planning for future adaptation. U.K. architects under-use the services available, and experience problems with the services they do use. Their resultant dissatisfaction with what the Internet can offer leads to a reluctance to adopt and use further Internet services.

This paper discusses one aspect of that research, which is how architects are managing Internet resources in their practices. It argues that many of the difficulties that architects have are related to practice management. The paper presents these under the headings of the knowledge and attitude of the staff, and the decisions made by practice managers. The paper highlights features that need attention from practices and from the architects who guide them.

1   Introduction

The Internet is a connection between large numbers of computer networks. The capabilities of the Internet to provide information and low-cost communication have increased substantially in the last decade, and this has encouraged its use by businesses and the public. It provides information for research, business, banking, and commerce and also enables communication between individuals and groups at different levels ranging from text to video and audio communications.

In the U.K., architectural businesses started connecting to the Internet in the early 1990s. There have been a number of surveys showing a gradual increase in use (see Barbour 1997, Barbour 1999; RIBA 1989; RIBA 1996; RIBA 2000; Salvid 1999). A few practices seriously used the Internet for projects by 1995. Barbour (1997) showed that 23% of UK architectural practices were connected to the Internet in 1997, and Salvid quotes figures (from Kadence) showing that 46% were connected in 1998. The Barbour (1999) figures show, however, that the trend toward Internet use by U.K. practices is slow compared with U.S. or Swedish practices, 90% of which were connected to the Internet by 1998.

Cuff (1991), and Seidel et al. (1995) suggest that architects often have problems in adopting and managing new innovations. They state that architects are reluctant to use new technologies, and when they do, they often use them badly. This failure in managing new technologies has contributed to instability in the architect's role in the design team. The architect has suffered the loss of some of his work in managing the team and its projects to other businesses that have better absorbed and managed new technology (Stevens 2000).

The introduction of computer networking by architectural practices has not been trouble-free. Many practices, particularly small ones, made ill-advised decisions in adopting a system (Proudlock 1998, 2000). Once they had begun using the Internet, these practices discovered issues not taken into account, such as the compatibility of information exchanged with outside parties, the security of information being stored or exchanged, copyright issues, and protection from viruses. Such issues

caused the management serious problems and hindered the real utilization of Internet resources (Coyne et al 1996a, 1996b, 1996c; Schulz 1997).

Architects found that the efficient management of these technologies needed a level of IT skill and knowledge that they did not posses, and this led to some complicated problems that could not be resolved easily. They had problems in learning about computers and programs, in updating and maintaining their systems, and in the quality control necessary to make transitions between manual and computer systems. This increased their effort on projects, which required, for example, manual preparation as well as computer preparation (Westerman et al., 1998).

The research reported in this paper is taken from a wider project which explored the nature and cause of the slow uptake of Internet services by architectural practices in the U.K. This paper focuses on the way practices manage their Internet use. It identifies a number of shortcomings in the way the Internet is used, which the research shows is related to practice management.

2   Research Methodology

A survey was used to collect information about the use of the Internet by U.K. practices. The survey used two samples: a stratified random sample of RIBA private practices and a random sample of local authority practices. Questionnaires, observation, and interviews were used to collect information. The respondents initially addressed were the practice principals; some principals may have asked others to complete questionnaires on their behalf, but in what follows the responses are treated as if they were their own.

The questionnaire asked respondents for information about their practice, about their Internet installation, and about their reaction to using the Internet. The percentage of respondents who returned the questionnaire was around 22%, giving a sample of 60 private RIBA practices and 18 local authority practices. These numbers were too small (Plakett 1974; Everitt 1992) to allow any but simple statistical tests, such as Cramers' test of correlation to examine the strength of relationships, and the Chi-square Pearson test to measure their significance. Results with a significance level below 0.05 were accepted and only the significant are reported here. This part of the research is referred to below as the "survey"; its results refer to the period December 1999 to January 2000. Unfortunately, there were too few local authority practices in the sample to allow statistical inferences about local authority practices in general to be drawn with confidence. The results reported should therefore be interpreted with caution.

Interviews and observation were used to get more depth of information about problems of Internet use and practitioners' attitudes and views towards the Internet. The interviews were in two stages using a sub-sample of seven practices and a new sample of thirteen.

3   Results Concerning the Use of the Internet

The results showed that almost all architectural practices in the U.K. now use computers: 97% of the private practices and all the local authority practices. IBM operating systems are favored over MAC systems, with 67% of private practices having IBMs only, 18% MACs only, and 12% both. The equivalent figures for local authority practices are 73%, 16% and 11%. Most of those with IBM machines have Pentium processors rather than the older 486 processors: there is a 57:10% ratio in those private practices with IBMs only, and 68:5 % in the equivalent local authority practices. The local authorities thus showed a slight tendency to be more up-to-date.

There has been an appreciable rise in the proportion of practices connected to the Internet since the earlier surveys quoted above. Using connection dates recalled by the respondents in private practices, the numbers connected each year from 1994 to 1999 were 2%, 5%, 17%, 32%, 63%, and 85%. By the end of the survey, 86% of the private practices sampled were connected to the Internet. However, some practices were connected to other types of network as well. Thirty-five percent of practices had an intranet as a second network (which is an internal network connecting computers within the office), and 3% had both these networks together with an extranet (a private network that links them with other offices). Sixty-three percent of local authority practices had Internet, of which 53% had an intranet in

addition, and around 5% had all three types of network. In local authority practices, an intranet or extranet is more familiar. The 37% of them without Internet were all connected to an intranet, an extranet, or both. Reference to the Internet in this paper does not include extranet and intranet networks.

Most private practices (i.e. 68%) are limited to dial-up access and only 18% have the faster link available through ISDN. Five percent (included in the latter figure) have both. On the other hand, no local authority practices are limited to dial-up. Sixty-three percent have access to ISDN, 15% of which have dial-up or leased lines as well, while 21% have a leased line only. Five percent have other means of access, and 10% returned missing or puzzling data.

Seventy percent of private practices and 50% of local authority practices implement only a password to protect their information and data, and otherwise have no proper security arrangements.

Private practices do not use the Internet much to market themselves. Only nine private practices out of the sixty sampled have home pages on the Internet, whereas all the local authority practices have a Web presence through their city council or district council home page.

In using the Internet to exchange information with the outside world, most practices (65% of private practices, 57% of local authority practices) exchange informal file formats like plain text message using the e-mail service. Less than 50% said that they exchange formal and graphic file formats, such as text processed with the practice heading and logo, CAD files, and image files, and less than 20% exchange DTP (i.e. Data Transfer Protocol) and HTML (i.e. Hyper Text Markup Language) file formats.

Even the services for informal communication are not used to their full potential. Services providing instantaneous communication, such as discussion groups or video conferencing, are used less often than some providing more delayed communication, such as e-mail. Two-way or instant communication services like video conferencing and chat services are used by less than 20% of private and local authority practices. Few practices have plans for greater use of them in the future.

There is a high variation in Internet use among members of the practice. Some staff, for example architects and architectural staff, use the Internet more than others. Administrative staff, for example, hardly use or do not use any of the Internet services.

Around 70% of local authority practices apply some type of restriction to Internet use by staff. Some of them restrict Internet use to certain business matters, or certain hours, whereas others allow access only from certain machines. Twenty-one percent of them said that Internet use is unrestricted. Half of private practices said that they apply no restriction over Internet use by staff, and the other half apply different levels of restrictions to Internet use.

Half of the private practices said that they sometimes have problems related to Internet use, with a further 21% of practices reporting having problems occasionally. However, the interviews and observation revealed that practices are making inappropriate decisions in their use of Internet services, without much awareness of their importance or their future effects if they were left without resolution.

An obvious example is the use of non-standard formats in exchanging information over the Internet with outside parties. Staff were observed producing non-standard files and then exchanging these through the Internet, which created problems of compatibility with the systems run by outside parties. CAD files, for instance, being exchanged between the practice and clients or consultants, were not created according to ISO standards. Nonstandard layers, line types, fonts and scales were being used in 2D drawings. Also, various techniques were being used to build 3D models, that made it difficult for people outside the practice to extract and use these models. The staff appeared to have insufficient knowledge about how to create and exchange standard files in a standard way.

4   Explanations for Shortcomings in Usage

Several issues relating to the way the Internet is used in these practices can be highlighted:

- Internet access and use is unevenly distributed among different types of staff;

- practices make little use of the Internet for marketing themselves;

- practices do not make full use of the Internet services available for exchanging data and communicating with others;

- practices report some problems related to their use of the Internet; with inexpert use of Internet services possibly increasing problems if fuller use were made of them; and

- practices have inadequate security arrangements for files in storage and transmission.

These issues indicate shortcomings, or potential shortcomings, in the way the Internet is used in practices. To look further at how these shortcomings arise, the influence of various factors will be examined. They will be considered under two headings: the knowledge and attitude of staff, and decisions by practice managers.

4.1 Knowledge and Attitude of Staff

The level of a staff's IT knowledge is one of the factors that has a bearing on how the Internet is used. In private practices, most respondents say that their architects and administrative staff have only average knowledge of IT, whereas their CAD staff, architectural technicians, and some other professional staff are more knowledgeable. Other staff are considered to have a low level of knowledge of IT. In local authority practices, the pattern is similar, but architectural technicians now join architects in having average knowledge of IT, whereas other professional staff, and computer, CAD, and IT staff are more knowledgeable. The other staff are again considered to have a low level of knowledge of IT.

The survey has found significant links between a staff's knowledge of IT and both the frequency of Internet use and the number of Internet services that are used: greater knowledge corresponds with greater use. At the same time, there is a link between a staff's knowledge of IT and Internet-related problems. Practices whose staff have only a passing knowledge of IT report having more frequent problems than practices whose staff are more knowledgeable. This indicates that practices have not managed their staff's knowledge of IT well enough to bring it up to the level needed to use the Internet services proficiently.

The survey and interviews targeted principals, because they are the people most able to speak on behalf of the practices. Thus, questions about practitioners' attitudes to the Internet were limited to the principals. The attitudes of the principals are of particular significance. Ninety percent of the practices have fewer than 5 professional staff members. The management of a small practice is often in the hands of the principal, who indeed in many cases is a sole practitioner. In these practices, the principals' attitudes toward the Internet are likely to color their decisions about services that are available and in use in their practices.

Questions about their attitudes were put to principals in the interviews. Some of the principals who were interviewed resist using computers. One principal said that he prefers his practice to use traditional tools, like telephone and the fax, rather than Internet tools for the exchange of information and communication. He reasoned that: *"All Internet services are time consuming to learn and use, and inappropriate for my practice".* Other principals interviewed emphasized deficiencies they found when comparing computers with traditional media for doing certain tasks. For example, one explained that drawing on a computer is too slow for his thinking. Another principal had found that reviewing products on the Internet failed to give him as real an impression of quality as seeing them in exhibitions or handling samples.

Whether such reactions are justified depends on the knowledge and experience base from which the principal is speaking. During the interviews the principals' knowledge was tested. It was found that many of them were aware of only a limited range of Internet services, little more than the few that they use. Furthermore, the test revealed that the interviewees found difficulties in interacting with some Internet services such as search engines and professional guidance, which they considered to be non-friendly.

A good knowledge of IT helps principals examine the Internet system and identify where it could or could not best be employed in the practice. As an example, a principal in a practice well advanced in

using IT was able to point from experience to some problems with the service the Internet provides for architects. He has learned to avoid discussion forums and chat rooms for business because they cannot be considered as real business tools. He pointed out that to manage communication with clients effectively the architect needs audio devices that provide sound at an emotional rather than simply a factual level. He said that he cannot make business communication with clients using the Internet voice service and mobile communications because of their limited bandwidth. He explained: *"As you are getting farther away from facts into emotion, [then] the more of the voice you can hear, the more you can communicate at emotional level than at factual level, and that is why the phone is preferred and meetings are still important."* Another principal was concerned about dynamic communications, pointing out that the Internet does not provide efficient and low-cost mobile web communication. He also regretted that there are no specific areas for each specialist on the Internet where information relevant to architects' needs could be found easily.

These interviews offer an explanation of an unexpected correlation in the survey. The ratio of connected computers to staff is found to relate to satisfaction with the Internet's influence on the quality and quantity of design information. The lower the ratio of connected computers to staff, the higher the respondents' satisfaction. This runs contrary to other results which relate frequency of use positively with satisfaction.

The explanation could lie with the fact that the respondents were the principals, who had a strong influence on the ratio. By way of demonstration, some of the interviewees were among those who ran practices with few computers connected to the Internet. These were also among those principals not sure of the Internet's benefits. They explained they were afraid that the Internet could distract staff and waste their time, and were concerned about possible abuse of the Internet. The policy they believed met the needs of their practices best was to limit the distribution of connected computers.

This case serves to illustrate the importance of the principals' attitudes toward, and knowledge of, the Internet. It could be argued that by implementing such a policy, principals would limit utilization of the Internet by their staff, and so impair their staff's familiarity with available Internet services.

4.2   Decisions by Practice Managers

Practice managers make decisions about the adoption of the Internet, the upgrade of computer and networking systems, and procedures and policies for Internet use. Taking these decisions without being properly informed may give rise to problems in the practice's use of the Internet.

The decision about whether to adopt the Internet and what system to adopt was significant. In many practices this was made by the principal, who usually made it alone but sometimes made it in collaboration with other staff. There is, as would be expected, a significant relationship between the degree of involvement of other staff in this decision and the practice size, the one increasing with the other.

The degree of staff involvement in the adoption decision was found to be reflected in the type of security arrangements that the practice has in place to protect its on-line information. A lower level of security was accepted when the decision was taken by the principal alone than when the decision was taken by the principal together with other specialist staff. Thus there is more likely to be a problem in security arrangements in practices that did not involve their staff in the adoption decision. This was also found by Proudlock (1998) in a survey of architectural and other practices, although he recommended that it is better to share the IT adoption decision only with specialist staff than with all staff.

The use of inappropriate security arrangements itself relates to other shortcomings noted above. There is a significant relation between the type of security arrangement used in the practice and the number of instant communication services used (e.g. video conferencing, chat and whiteboard). These tools are used much more by practices that have a firewall than by practices using passwords or those that have no security arrangements at all. Of course, either of these shortcomings might be the cause of the other, but it is interesting to note that they both relate to the initial decision about adopting the Internet.

The degree of staff involvement in the adoption decision is also related to the likelihood that the practice

will use the Internet to assist in managing the practice. Office staff are hesitant about using the Internet for certain management purposes, particularly when the adoption decision was taken solely by the principal. But they are more likely to use the Internet for these same purposes when the principal shares the decision with staff. Thus involving other staff in drawing up plans about how to adopt Internet services would seem to facilitate drawing up plans for how to use them or extend their use in the future.

In the survey, most practices said that the factor influencing their adoption decisions the most was the prospective benefit the Internet could bring them. Among the principals interviewed were some who had made the adoption decision alone. They had only a very general idea of what advantages the Internet could bring the practice. The limitations of the system they adopted did not appear until it was actually in use. The principals who had involved other specialist staff in the adoption decision had a clearer idea of the advantages they expected.

The survey results show that practices with slow access to the Internet (i.e. those with dial-up) experience more Internet-related problems and utilize the Internet services less fully than practices with access through ISDN or a leased line. Also, more staff use more services in practices connected to more types of network (from between intranet, Internet, and extranet). For instance, the use of professional information by CAD and computer technicians is greater in practices that are more networked.

Also, practices with Macs use fewer Internet services less frequently than those with IBMs. During the interviews, Mac users complained that they have a problem finding information compatible with their system, and they highlighted a problem of compatibility when exchanging information with business partners using IBMs.

These results seam to indicate that some types of installation are more amenable to Internet use. Of course, there are other factors that must influence any decision about which type of computer to adopt, and what type of connection to make to the Internet. A good decision will be one that is appropriate to the practice; what is important is that a decision should be made using the best information available.

One of the criteria in making the decision will always be cost. Taking the practice workload and the value of their projects as indicators of the availability of financial resources, a relation is found between this and the frequency with which Internet services are used. Principals who said that their practices have higher value projects tend to be the ones whose practices are making more use of Internet services and vice versa. Proudlock et al (1998, 2000) found also that a lack of financial resources hinders practices from adopting and using IT.

The interviews support this view. Interviewees said that the use of any Internet service will be evaluated according to available funding. A principal talking about the expense of computer technology, and how to afford it, said: *"But people like me do not afford to buy it all the time. I am trying to upgrade what I have because it is a lot cheaper."* Another interviewee, when asked about the possibility of using the Internet to transfer remote video pictures, replied that it comes down to the budget. He commented: *"A lot of people here like to have new technology; because of budget, some of the Internet tools are unreachable to us."*

The integration of the Internet into practice is taking place only slowly. The interviews showed that many interviewees do not have any clear framework for their use of the Internet at present or in the future. This supports the survey findings, which show that many principals are not sure whether they are likely to use the Internet for certain design and management tasks in the foreseeable future.

In the offices observed, the services provided by the Internet are being used casually, in that they had not been integrated into office and design practice. For instance, practices do not have methods in place for integrating design information downloaded from the Internet into designs; they do not use hyper-linking to link drawing information to external information resources; they make only limited use of freeware available on the Internet, such as CAD viewers; and although many practices publish images of their projects on the Internet, these images do not hold information that would enable users to explore their projects further. Moreover, the interviewees did not have plans for increasing the integration among the Internet services, their office tools, and their design and management tools.

5   Explanations of Success in Internet Use

The interviews showed that some practices do manage the Internet's resources in a professional and appropriate way. These are among the practices making greater use of Internet services.

Practices that use more Internet services, particularly services for accessing professional information and downloading software, tend to be the ones that express their satisfaction with the effect of the Internet on the management of projects, business, and communications. They also tend to be the ones that have fewer problems using the Internet.

The interviews showed that practices that have success in using the Internet find that it brings them benefits. One benefit stated was that it reduces the need to generate paper. More and richer information can be produced and distributed electronically, as the Internet can facilitate communication and the exchange of information between offices. The interviews found that some practices are able to achieve some recovery of the money spent on the Internet system, getting extra and efficient communication channels with outside parties.

These perceived benefits generate a positive impression, and they encourage principals to plan how to extend Internet use in their practices. Some of these successful practices are using video conferencing to talk to other people, managing projects on line, hyper-linking their documents to on-line technical and manufacturers' information, producing virtual reality models and publishing them over the Internet, keeping in contact with clients electronically through newsletters, and maintaining their connections with clients by sending them a practice newsletter. Some of them are starting to look at how to integrate the Internet with their CAD models. These practices realize that the Internet provides the practice with a modern facade that advertises the talents of the practice at minimal cost and which can impress visitors to their web site and attract potential clients.

Some interviewees pointed out how important it is that the whole building industry reaches a similar level of adoption and use of Internet technology, as differences would hinder its use. One practitioner mentioned that some of his clients do not have access to the Internet. This prevents his practice from using the Internet effectively to communicate and exchange information with them.

6   Conclusion

The study found that the number of practices connected to the Internet is improving. However, the standard of connection is not high, in terms of the speed of access and the number of computers connected. Access to the Internet, the use of the services, and knowledge of IT, are unevenly distributed between staff; these issues are related. Security arrangements for protecting data are inadequate.

The services available are not being used to their full potential. Practices deviate little from standard e-mail text services, for external communication. Neither formal exchange of advanced document formats nor informal audio-visual communication are exploited adequately, yet they have great potential for architectural practice. The Internet is used for obtaining professional information, but it is used insufficiently for marketing the practice and keeping in touch with clients.

Most practices report some problems in using the Internet, though at a low scale. If the Internet were exploited as fully as it could be, the present level of unskillful use would probably giving rise to a higher scale of problems.

All these matters can be improved by forward-looking and positive practice management. Practices need strategies for how to bring more benefits to the business through the Internet, and clear policies for the future integration of Internet services into project and office management tasks. In this, there could be a role for RIBA to provide on-line support and CPD.

In the small practices, which make up the majority, practice management decisions affecting the Internet are taken by principals. Their attitudes to the Internet are important because ill-informed decisions will handicap progress. They need to acquire a management-oriented knowledge of how to employ and use the Internet.

The decisions involved when the Internet is adopted affect many aspects of later use. This demonstrates a broader issue. Decisions about the management of the Internet system need to be balanced decisions taken from an experienced and well-informed viewpoint. If there are staff with a high level of knowledge about the Internet, they should be involved in the decision-making process. Otherwise, specialists should be consulted.

Practices should raise their staff's level of understanding of the Internet sufficiently for them to utilize it effectively. In particular, staff must learn the protocols and rules of electronic communication. There is a relationship among staff knowledge, the extent of their use of the Internet, and their satisfaction with the Internet.

A shortage of financial resources is a constraint on utilizing the Internet fully. However, there are other constraints, such as a lack of awareness of the benefits that the Internet can bring. Those practices that have adopted the Internet enthusiastically have shown that these benefits are real, and should be balanced against the more obvious costs.

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