

**The pattern of Internet use for information management by
architectural practices in the UK**

A thesis submitted to the University of Wales, Cardiff
in fulfilment of the requirement for the degree of
Doctor of Philosophy

BY

Bhzad Sidawi
B.Sc., M.Phil. (Uni. of Bath)

Welsh School of Architecture

Part A
Main Text

July 2003

APPENDIX 3: Specimen Layout for Declaration/Statements page to be included in Higher Degree Theses

DECLARATION

This work has not previously been accepted in substance for any degree and is not being concurrently submitted in candidature for any degree.

Signed.....(candidate)

Date.....

STATEMENT 1

This thesis is the result of my own investigations, except where otherwise stated.

Other sources are acknowledged by footnotes giving explicit references. A bibliography is appended.

Signed.....(candidate)

Date.....

STATEMENT 2

I hereby give consent for my thesis, if accepted, to be available for photocopying and inter-library loan, and for the title and summary to be made available to outside organizations.

Signed (candidate)

Date.....

Abstract

In recent history, architects have experienced problems related to the use and management of new innovations. The Internet presents one such challenge. It offers considerable expansion in types of communication and sources of business information and connects people and businesses around the globe. As is argued in this research, these services could play a positive role in architectural practice.

This research examines the use of the Internet by architectural practices in UK in order to reveal how aware they are of the opportunities it presents, the extent to which they are taking advantage of them, and the problems they are experiencing.

A field study was conducted of two types of practices: RIBA private practices and local authority practices. A number of research tools were used to inspect how these practices are using the Internet to manage various types of information that used and produced in the practice, namely: the acquisition of web information, the exchange of the practice's information through the web and the presentation of the practice's information on the web. Explanations for the results were sought by correlating variables from the questionnaire study, using simple statistical tests.

The field study shows that many Internet services are unpopular among architects, and that practices have problems in adopting and using the technology. The pace at which the Internet is being absorbed and accepted by practices is slow. The study suggests that possible causes are: the little knowledge of users' about IT, the poor resources of the practice, and old or imperfect Internet installations and the absence of the Internet support to the architect's activities. The research argues that there are a number of links between these negative factors which make the practice unable to utilize the Internet and to manage the practice's information through the Internet.

To break these links, the research suggests that practices should adopt a specific management strategy to promote more utilization of Internet services in the office and to manage information. Practices need to make certain changes to the way they manage the Internet and work with it, if they plan to integrate the Internet more successfully into their practice. The research discusses techniques for improving practice management which would help practices to digest Internet technology and to use it more effectively in the practice.

Acknowledgement

This research is an attempt to record how the UK architects react towards the new communication and information technology i.e. the Internet. And to address some potential problems in the way that architects deals with this medium.

Such research needs a careful guide-ness, an endless patience, and a deep awareness of what would really benefit and enrich the research and this what Dr Mike Fedeski provided throughout the long and uncertain periods of this research. He continuously encouraged and motivated the author to think hardly about how to develop the research ideas. He was quite enthusiasm with the ideas that have been presented to him. He took them further and implemented his time and effort to add and to improve them. During the research period, the meetings were recorded. Each meeting notes describes the discussion of the meeting, links the results to the previous research stage outcome and set a conclusion of what has been done and which route is the best to follow in the next stage. These notes link the research stages and were very useful to be used in the subsequent research stages particularly during the writing-up stage. I would like to express my deep appreciation to his invaluable contribution to the research and his continuous motivation to the author to produce meaningful results.

My special thanks also to Professor Bryan Lawson, Dean of the Faculty of Architectural Studies, the University of Sheffield for his advice on how to provide a further focus in dealing with the research problem.

During the research there were technical problems related to the programming of the on-line research tools, and the statistical analysis of the survey results, but thanks to the staff at computer help desk, school of Mathematics at Cardiff university and also to professor Gamble at University of surrey for their advices of how to sort out these problems. Staff at Welsh School of Architecture were brilliant at supporting the research with views and research materials. I would like to thank all of them for this marvelous support especially the former CAD laboratory manager Dr Jeff Jones and the senior librarian Mrs. Sylvia Harris.

The field study benefit from the information that UK architects have provided to the author. They generously contributed their own time to provide the author with a feedback which enriches the research data. My gratitude should go to Local Authorities and private practices that accepted to participate in research activities, in Cardiff and south Glamorgan, and in the other regions and counties of the UK.

A number of practices and organizations which provide training and help to the author during this research. I would like to thank all these practices and organizations and in particular Westlea Housing Association *WHA*. Without this practical knowledge, I would not be able to understand the rich and unique culture of practicing architecture in the UK.

Contents table

	Page
Section A	
The background to the research	
Chapter One	
1.1 Introduction	1
1.2 The need for the research	2
1.3 Research aim and objectives	3
1.4 The scope of the study	4
1.5 Research methodology	4
1.6 Description of thesis chapters	5
Chapter two	
The architectural profession's response to historical change	
2.1 Introduction	7
2.2 The architect's management of the practice	7
2.3 The features and types of architectural information	12
2.4 The pattern of use of information by architects	13
2.5 Discussion	14
2.6 Conclusion	17
Chapter three	
Internet services	
3.1 Introduction: Internet history and evolution	19
3.2 The Internet infrastructure	20
3.2.1 Internet service providers	21
3.2.2 Access to the Internet	21
3.2.2.1 Wired connections	21
3.2.2.2 Wireless access	22
3.3 Acquiring information services	23
3.3.1 Information retrieval services	23
3.3.1.1 Information Search services	24
3.3.1.2 Gateways & databases	24
3.3.1.3 Useful Building and construction Sites	26
3.3.2 E-procurement and e-commerce sites	29
3.4 Exchange of information or communication services	30
3.4.1 Asynchronous services	30
3.4.2 Synchronous services	33
3.5 Presentation of information on the web	35
3.6. Software applications on the Internet	35
3.6.1 General office management applications	36
3.6.2 Computer Aided Design (CAD) applications	37
3.6.3 Project management applications	38
3.7 E-Business applications	41
3.8 Benefits of the Internet	42
3.9 Problems & limitation of use	43
3.9.1 Security problems	43
3.9.2 The Internet limitations	47
3.10 Discussion and Summery	48

Chapter Four

The use of the Internet by architects

4.1 Introduction	54
4.2 The use of the Internet by architectural practices	55
4.2.1 IT use in other countries	55
4.2.1.1 The use of the Internet by US practices	55
4.2.1.2 The impact of information technology on Canadian AEC industry	58
4.2.1.3 CMCD use in Australian practices	60
4.2.1.4 The use of IT in Scandinavia	62
4.2.1.5 The use of computers by design practices worldwide	63
4.2.2 IT use in the United Kingdom	65
4.2.2.1 The adoption of information systems (IS) by small practices	65
4.2.2.2 The use of on-line mailing lists and forums by the building industry	66
4.2.2.3 The adoption of Information Systems (IS) by small practices	68
4.2.2.4 The use of information systems	71
4.2.2.5 The use of computers and Internet services by architects in the UK	71
4.2.2.6 The exchange of information in construction industry	73
4.2.2.8 The use of The Internet for presentation	74
4.3 Summary	75

Section B

The research methodology

Chapter five

The research design

5.1 Introduction	78
5.2 Understanding the problem	79
5.3 The use of the Internet for information	80
5.4 The choice of research method	81
5.5 The research techniques	83
5.6 The practices' population	84
5.7 Sampling	85
5.8 Panel and trend studies	86
5.9 The survey on Internet use by practices	87
5.10 Statistical tests of the data	92
5.11 Conclusion	94

Chapter Six

The pilot study

The Internet use by Welsh practices

6.1. Introduction	96
6.2 The preliminary survey of some Internet influences	97
6.3. The pilot survey	98
6.4. Discussion of the interviews' results	100
6.4.1 The influence of practice environment on Internet use	104
6.4.2 The influence of outside world on practices use of the Internet	105
6.4.3 The influence of the Internet on practices	106
6.5 Conclusion	106

Chapter Seven

The field survey	
7.1 Introduction	110
7.2 The reconsideration of the sampling method	110
7.3 The reconsideration of the influences on Internet use	113
7.4 The questionnaire design	114
7.5 The quizzes design	116
7.6 The design of discussion forum on line	117
7.7 Contacting the practices & practitioners responses	117
7.8 The interview study	119
7.9 The observation & group meeting	120
7.10 Reconsideration of the use of statistical tests tools	121
7.11 Conclusion	123

Section C**Chapter Eight**

The practices' use of the Internet	
8.1 Introduction	126
8.2 Analysis of the individual questions results	127
8.2.1 The acquisition of web information	127
8.2.2 Exchange of information	131
8.2.3 The use of the web home site by the practice	136
8.2.4 The management of the practice tasks	137
8.2.5 Study of the influences	139
8.3 Discussion	142
8.4 Conclusion	144

Chapter Nine

Influences on the practices' use of the Internet	
9.1 Introduction	148
9.2 Analysis of paired questions	149
9.2.1 Users knowledge and attitude	149
9.2.2 Practice setting	162
9.2.3 Internet system Installations	173
9.2.4 Aspects of practice's use of the Internet	178
9.3 Analysis of interviews responses and observation notes	185
9.4 Summary	190
9.5 Conclusion	195

Chapter Ten

Trends in the practices' use of the Internet	
10.1 Introduction	198
10.2 Trends of Internet usage	198
10.3 Discussion	206

Chapter Eleven

The potential uses of the Internet in the practice	
11.1 Introduction	208
11.2 The follow up survey	208
11.3 Analysis of the results	211
11.4 Discussion & conclusion	216

Section D**Chapter twelve**

Discussion of section C conclusions	
12.1 Introduction	220
12.2 The influence of the Internet use on the practice	221
12.3 The influences on Internet use	222
12.3.1 Influences on the use of the Internet to manage information flow	222
12.3.2 Influences on the use of the Internet to manage office processes	223
12.4 Barriers and constraints of Internet use	225
12.5 Discussion	228
12.6 Conclusion	229

Chapter thirteen

Recommendations	
13.1 Introduction	231
13.2 Recommendations	231
13.2.1 Development of human resources	231
13.2.2 Management of the Internet system	233
13.2.3 Management of Internet use	233
13.2.3.1 Management of the decision to adopt the Internet services	233
13.2.3.2 Management of the practice use of the Internet	234
13.2.4 Controlling the change of the practice	238
13.3 Development of Internet system	239
13.4 The role of the universities, the UK government and RIBA	240
13.3 Further research	241
References	243

List of Figures

	Page
Figure 2.1: the RIBA plan of work map of the design process	10
Figure 2.2: Type of use of information at each stage of the building project	15
Figure 2.3: The managerial tasks that should be carried out at each stage of the project by the practice	16
Figure 4.1: Types of Internet usage and access policy in US practices	56
Figure 4.2: The use of Computer Mediated Communication tools in US practices	56
Figure 4.3: Types of architect's access to the Internet	58
Figure 4.4: Comparison of the use and access to the Internet by construction industry firms in Scandinavian countries	62
Figure 4.5: Number of messages that sent to each discussion topic on Build Talk forum site	66
Figure 4.6: Percentage of architectural practices with access to the WWW	68
Figure 4.7: frequency of architect's access to the Internet	70
Figure 4.8: Internet tools that are used by respondents	70
Figure 4.9: Which route is preferred by architects to find specifications	72
Figure 4.10: Types of Internet services that are used by architects	73
Figure 5.1: Influences on use of the Internet services and influences of the Internet on the practice	79
Figure 5.2: Panel and trend studies and suggested samples for the proposed study purposes	88
Figure 7.1: The components of practice environment: the users' knowledge and attitude, the Internet system, and the practice setting	112
Figure 7.2: The office processes through the Internet and the influences on these processes	113
Figure 8.1: The present and intended use of the Internet for the listed purposes in private practices	138
Figure 8.2: The present and intended use of the Internet for the listed purposes in local authority practices	139
Figure 8.3 How strongly the listed factors influence the smooth running of the Internet in private practices	140
Figure 8.4 How strongly the listed factors influence the smooth running of the Internet in local	140
Figure 8.5: The influence of the Internet on the practice as seen by private practices	141
Figure 8.6: The influence of the Internet on some aspects of practice as seen by local authority practices	142
Figure 8.7 Types of project information that used by private practices through the Internet	146
Figure 9.1: Staff knowledge of IT in practices crosstabulated with the proportion of respondents who use these Internet services	152
Figure 9.2: The exchange of information format types by practices which have short and long Internet history	167
Figure 9.3: The use of Internet services by CAD & computer & IT technicians in more and less networked practices	174

Figure 12.1: The influences on use of the Internet to manage information	223
Figure 12.2: The influence of the practice environment (the headings) on Internet usage for project purpose variables	224
Figure 12.3: Negative feedback loop. How several barriers to Internet use found in the research could combine if found in one practice to reduce future use	227

List of Tables

Table 2.1 Architectural-product-management	11
Table 2.2 Architectural-process-management	11
Table 3.1 The theoretical pattern of Internet use by architectural practices	50
Table 4.1: Percentage of specialist staff who have e-mail addresses and access to the Internet	59
Table 4.2: Number of messages that sent to each discussion topic on Build Talk forum site	66
Table 4.3: Comparison of the use of mailing lists	67
Table 4.4: Summary of the interviews' findings with senior partners and an associate	70
Table 4.5: Reviewed use of the Internet by architectural practices in the UK	76
Table 5.1: The research method types, characteristics and prospective outcomes	82
Table 6.1 Observed approach for Internet use by architectural practices that participated in the pilot study	108
Table 7.1: The stratified random sampling that was used to extract private practices sample	111
Table 7.2: The number of valid and invalid responses from local authority and private practices	119
Table 8.1: The Internet information services that are used by the architectural practices	127
Table 8.2: The frequency of using external information services and other services in local authority and private practices	128
Table 8.3: The use of Internet information services by staff in Private & Local Authority practices	129
Table 8.3.1: The use of external information services and other services by each specialist section in private and Local Authority practices	129
Table 8.4: Type of Internet sites that visited by staff at the observed practice	130
Table 8.5: The Internet communication services that are used by the architectural practices	131
Table 8.6: The frequency of using Internet services in local authority and private practices	132
Table 8.7: Types of file formats that are exchanged by private and Local Authority practices	133
Table 8.8: The use of Internet communication services by staff in Private & Local Authority practices	134
Table 8.8.1: The use of external communication services by each specialist section in private and Local Authority practices	135
Table 8.8.2: The use of asynchronous and synchronous services by each specialist section in private and Local Authority practices	136
Table 8.9 Phases of the use of the web site by private practices who has web sites	137
Table 9.1: Summary of tests No. 1,2 & 3 results	150
Table 9.1.1: Breakdown of the test 1; the correlation between IT Staff Knowledge as evaluated by respondents and other variables	151
Table 9.2: Summary of the tests No. 4 results	155
Table 9.3: Summary of the tests No. 5 & 6 results	156
Table 9.4: Summary of the tests No. 7, 8& 9 results	157
Table 9.5: Summary of the tests No. 10 &11,12 results	159
Table 9.6: Summary of the tests No. 13&14 results	161
Table 9.7: Ease of use of the Internet services as seen by the interviewees (raw results)	162
Table 9.8: Summary of the tests No. 15, 16 results	162

Table 9.9: Summary of the tests No. 17, 18 &19 results	165
Table 9.10: Summary of the tests No. 19&20 results	166
Table 9.11: Test No. 21 results	168
Table 9.12: Test No. 22 results	168
Table 9.13: Summary of test No.23 results	170
Table 9.14: Summary of the tests No. 24 & 25 results	171
Table 9.15: Summary of the tests No. 26, 27 results	173
Table 9.16: Summary of the test No. 28 results	175
Table 9.16.1: Breakdown of test no. 25; cross tabulation between type of network in the practice at present variable and the influence of the Internet on design information quality & quantity variable	176
Table 9.17: Summary of the tests No. 29, 30 &31 results	176
Table 9.18: Summary of the tests No. 32 & 33 results	178
Table 9.19: Summary of the tests No. 34, 35 &36 results	180
Table 9.19.1: Breakdown of test 34, 35; cross tabulation between the frequency of use of a number of Internet services with other variables	182
Table 9.20: Summary of the tests No. 37, 38 &39 results	183
Table 9.21: Summary of the tests No. 40 results	185
Table 9.22: The influence of the practice environment (the headings) on Internet usage variables	191
Table 9.23: The level of support that the Internet could provide to the practice at present and in the near future as seen by the interviewees	196
Table 10.1: A comparison between the results of this present survey with other surveys' results	199
Table 10.2: Comparison between the trends of using Internet communication services in private and Local Authority practices	200
Table 10.3: Comparison between the trends of using Internet information services in private and Local Authority practices	201
Table 10.4: Comparison between trends of the exchange of information file format types with people outside the practice in private and Local Authority practices	202
Table 10.5: the frequency of Internet services usage in architectural practices	203
Table 10.6: Comparison between the trends of using security arrangements in private and Local Authority practices	204
Table 10.7: Comparison between the trends of access to the Internet policy adopted in private and Local Authority practices	205
Table 10.8: Comparison between problems experienced by private and Local Authority practices throughout the period of Internet use	205
Table 11.1: Reasons for conducting the follow-up survey	208
Table 11.2: the significant relationships between the options: usefulness of the Internet and the required cost saving for each potential Internet service	212
Table 11.3: the significant relationships between the options: usefulness of the Internet and the required cost saving for each potential Internet service	213
Table 11.4: the significant relationships between the options: project value and project distance for each potential Internet service	214
Table 11.5 Potential uses of the Internet as evaluated by the architectural practices	217