iResearch Series

Series Editor: G. G. Chowdhury, Professor of Information Science and Head of the Department of Mathematics and Information Sciences at Northumbria University in Newcastle, UK.

This peer-reviewed monograph series supports the vision of the iSchools and creates authoritative sources of information for research and scholarly activities in Information Science. Each book in the series focuses on a specific aspect or emerging topic of information studies, provides a state-of-the-art review of research in the chosen field and addresses the issues, challenges and progress of research and practice.

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Information Systems
Process and practice

Edited by
Christine Urquhart, Faten Hamad,
Dina Tbaishat, Alison Yeoman

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Contents

List of tables and figures vii
Series editor’s foreword ix
Gobinda Chowdhury
About the authors xi

1 Introduction 1
Christine Urquhart

2 Approaches to information architecture 9
Faten Hamad

3 Taxonomy testing for information architecture 33
Christine Urquhart

4 The enterprise website and its information structures 49
Sally Burford

5 Analysing activities, roles and processes 71
Christine Urquhart and Dina Tbaishat

6 Libraries and the organisation of library processes – a history of 85
operational research, and the use of process modelling
Dina Tbaishat

7 Using Riva process modelling to study book acquisition in 107
academic libraries
Dina Tbaishat

8 Workflow analysis and process mapping in US academic libraries 127
Christine Urquhart

9 A theoretical framework for designing and evaluating 145
semi-structured document triage interfaces
Fernando Loizides and Aekaterini Mavri
### VI INFORMATION SYSTEMS: PROCESS AND PRACTICE

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Resource discovery case studies</td>
<td>171</td>
</tr>
<tr>
<td></td>
<td><em>Karen Colbron and Christine Urquhart</em></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Increasing social connection through a community-of-practice-inspired design</td>
<td>185</td>
</tr>
<tr>
<td></td>
<td><em>Catherine M. Burns and Adam Euerby</em></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Methods for studying information provision, networking and communication in patient support groups</td>
<td>205</td>
</tr>
<tr>
<td></td>
<td><em>Cristina Vasilica and Paula Ormandy</em></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Health information systems: clinical data capture and document architecture</td>
<td>233</td>
</tr>
<tr>
<td></td>
<td><em>Faten Hamad</em></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Producing systematic reviews and getting evidence to the clinician</td>
<td>255</td>
</tr>
<tr>
<td></td>
<td><em>Faten Hamad</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Index</strong></td>
<td>269</td>
</tr>
</tbody>
</table>
List of tables and figures

**Tables**

4.1 Comparison of Burford’s construct on the grounded theory of practising web information architecture and other information architecture advice or research 50

8.1 Framework for comparing the process mapping and workflow analysis of Mumford (1995) and Checkland (1981) 133

11.1 View of a community-of-practice-inspired work domain analysis 191

11.2 Key design changes made to a website after a work domain analysis 192

12.1 Levels of engagement when creating and distributing content on the GMKIN 217

**Figures**

2.1 Elements of information architecture 15

2.2 Components of information interaction 16

2.3 Faceted classification on the Web of Science website 21

2.4 The labelling scheme on the University of Jordan website 22

2.5 The labelling scheme and taxonomy on the University of Jordan website 22

4.1 Burford’s grounded theory of the situated practice of web information architecture in large organisations 55

5.1 A use case diagram for a Copac Collection Management Tools Project 74

5.2 FRBR Group 1 entities of intellectual and artistic endeavour 77

5.3 Process relationships 82

7.1 A role activity diagram for the book acquisitions process at UK Library A 117

7.2 A role activity diagram for the book acquisitions process at UK Library B 118

7.3 The ideal workflow for an electronic patron driven acquisition process 121
VIII INFORMATION SYSTEMS: PROCESS AND PRACTICE

7.4 A role activity diagram for the patron driven acquisition process 122
9.1 A visual framework for designing and evaluating semi-structured
document triage interfaces 151
9.2 A TriDoc academic document triage application 152
9.3 An EBSCOhost online research directory table of contents
with top-to-bottom and left-to-right navigation flow and
a dedicated scrollable full-text reading window 155
9.4 Example of a Safari Books Online Digital Library item with book
title and table of contents positioned on the left of the
dedicated full-text reading pane 155
9.5 A patent from the US Patent and Trademark Office online
repository showing the spatial and visual proximity of relevant
items such as the left menu links 156
9.6 Example of Science Direct Digital Library body text and
table-of-contents text in Arial, in 16px and 13px sizes respectively
9.7 The Microsoft Amalga Unified Intelligence System facilitating
independent image viewing and manipulation functionality for
detailed inspection 157
11.1 Survey response time average and distribution, 1 Dec 2010 to
29 Jun 2011 194
11.2 Social network analysis results at the times of surveys 1, 2 and 3
11.3 Mean weekly site visits during each period for all users and
returning users 198
11.4 Mean weekly page views per visit during each period for all users
and returning users 198
11.5 Mean weekly average time on site during each period for all users
and returning users 199
11.6 Content statistics based on post type on the UCP-SARnet web portal
during each period 200
12.1 Social media GMKIN CKD application of activity theory
(adapted from Engeström, 1987, 78) 220
Series editor’s foreword

Facet’s iResearch series began its journey in 2015 with the aim of publishing unique titles blending theory and research on a specific aspect or an emerging topic in information science. Design and evaluation of information systems and services has remained an area of study and research in many cognate disciplines ranging from computing and information systems, information and library studies, to business management, and so on. Each discipline aims to address a set of unique challenges as they are seen from their disciplinary background and perspectives. This results in research that often fails to take a holistic view of information systems including technologies, people and context. This second title in the iResearch series – edited by Urquhart, Hamad, Tbaishat and Yeoman – aims to address this challenge by bringing together different viewpoints and perspectives of information systems design and evaluation from the contributors’ own diverse and yet complimentary areas of teaching and research interests. Quite rightly, in her introduction to the book, Urquhart points out that this title sits within the design and architecture theme of the iResearch series and it aims to encourage information researchers to think critically about the possible connections that can be made between different topics of study in information in order to design, develop and evaluate the most effective and efficient information systems and services. Hence this is not just another book on information architecture that focuses on content architecture alone; the research and development activities reported in this book also cover the other end of the spectrum concerned with service evaluation, performance management and library assessment.

This book, containing 14 chapters written by academics and researchers from different research backgrounds and viewpoints, offers a significant contribution to research and practices in the architecture, design and evaluation of online information systems and services.

Professor Gobinda Chowdhury
Series editor
About the authors

Editors

Christine Urquhart was a full-time member of staff in the Department of Information Studies, Aberystwyth University, UK (1993–2009). Since retiring from full-time teaching she has continued to pursue her research interests. These include information behaviour and information systems research, and the value and impact of information services. She is the lead author for two Cochrane systematic reviews (including one on nursing record systems) and has worked with SaraDunn Associates on several social care information projects. For five years she was Director of Research in the Department at Aberystwyth and devised the research training programmes for doctoral research. She was a member of the 2014 QAA subject benchmark panel for the library, archives, records and information management group.

Dr Faten Hamad is an assistant professor in the Library and Information Science Department, University of Jordan, with a specialisation in computer science and information science. She obtained her PhD degree in information science from Aberystwyth University in 2013. She is currently a member of a committee responsible for preparing one of the new mandatory university courses – learning and scientific research skills – one course among the new university proposed course bundle. She is responsible for teaching modules related to information retrieval, digital libraries and web design. Her current research interests include information retrieval, database performance evaluation and systematic reviews, social media, health informatics and e-services.

Dr Dina Tbaishat is an Assistant Professor at the University of Jordan, Library and Information Science Department. She teaches information technology courses as she has a computer information systems background. She completed a Masters degree in software engineering, where systems analysis and
requirements engineering courses sparked her interests in business process modelling. Therefore her PhD in information studies at Aberystwyth University investigated business process modelling in academic libraries. Her research efforts focus on modelling processes using different methods such as Riva and Architecture of Integrated Information Systems (ARIS), in an attempt to streamline processes and possibly improve them. She is also interested in the use of social networks in the educational environment.

**Alison Yeoman** was awarded her PhD while working as a research officer in the Department of Information Studies, Aberystwyth University, UK. She worked on a range of projects relating to information behaviour (particularly in the context of health), use of electronic resources (including user evaluations of website accessibility), communities of practice, and virtual learning environments. Since leaving Aberystwyth, she has expanded her research interests into social care and the third sector while also working as a senior learning development advisor for Bath Spa University.

**Contributors**

**Dr Sally Burford** is an associate professor in knowledge and information studies in the Faculty of Arts and Design at the University of Canberra, Australia, and teaches postgraduate coursework and research students. She is the Associate Dean Education within the Faculty. Sally’s research is in the area of knowledge and information practice – specifically, the practice of web information architecture and how social media is incorporated into existing information practices. She is also researching in digital mobility, in particular mobile health. Sally is a member of the News and Media Research Centre at the University of Canberra. Alongside her research, Sally has considerable industry experience in managing online environments, especially online education and large enterprise websites.

**Catherine M. Burns** is Professor in Systems Design Engineering at the University of Waterloo, Canada, where she directs the Advanced Interface Design Lab and the Centre for Bioengineering and Biotechnology. Catherine’s research is in human factors engineering where she is well known for her work in cognitive work analysis, ecological interface design and developing decision support systems. She has contributed over 250 publications and is the co-
author of seven books in this area. She is a fellow of the Human Factors and Ergonomics Society.

Karen Colbron is digital content manager at Jisc, working with libraries and archives to make their digital collections visible and discoverable on the web for learning, teaching and research. Following a postgraduate diploma in information studies at Northumbria University, UK, she has worked extensively in public broadcasting in the UK and USA for over 25 years. She is an Emmy Award-nominated archivist who specialises in preserving and creating web access to digitised collections, including the only extant copy of the public radio coverage of the 1963 March on Washington for jobs and freedom, famous for Martin Luther King Jr’s speech ‘I have a dream’. Her research interests focus on training and guidance on online resource discovery. Additionally, she is interested in digital access issues relating to monographs.

Adam Euerby is Senior Product Designer at FairVentures Lab, an innovation research and development initiative of Fairfax Financial Holdings Ltd, Canada. In his current position he explores future applications of emerging technologies and works with Fairfax companies to further develop their internal innovation practices. Previously, he worked as a product design manager and product designer at D2L Inc., an education-based start-up out of the Waterloo Region in Canada. Adam graduated from the University of Waterloo with a Masters of Applied Science in Systems Design Engineering focused in human factors, where he explored how social networking technologies could support active and productive communities of practice in a range of contexts.

Dr Fernando Loizides is Lecturer of Computer Science and Informatics at Cardiff University, UK. His research lies in information interaction, human–computer interaction and digital libraries, focusing on information seeking, information architecture and user experience, with a special interest in user interfaces and emerging interactive technologies. He has applied development experience and is involved in several research and industrial projects with companies including the European Patent Office, Microsoft, Nokia, Department for Education UK, Cyprus Broadcasting Channel and the Federal Department of Antiquities.
Aekaterini Mavri is a researcher at the Cyprus Interaction Lab and a full-time member of the special teaching staff at the Department of Multimedia and Graphic Arts at Cyprus University of Technology. She has worked as a digital designer in the industry for several years and she is currently teaching modules related to digital design, user experience design and web design and development. Her research interests focus on instructional models and methods that can encourage collaboration and active learning through technological interventions, particularly in web design and development. She is also interested in information architecture, visual presentation and interactive behaviour relating to the design, development and evaluation of semi-structured document triage interfaces for text-heavy environments, such as digital libraries.

Paula Ormandy holds the Chair in Long Term Conditions Research at the University of Salford. She has many years of experience in executing and leading on research funded projects and service evaluations across various healthcare settings. Her research interests focus on patient experience, information needs research and information provision to facilitate self-management in clinical practice for people managing a long-term condition. She is the British Renal Society Vice President for Research and chair of the Research Committee. She is currently examining digital skills training to re-engage people with chronic kidney disease back into the labour market and the use of social media for patient and public involvement in research.

Cristina Vasilica is a Post-Doctoral Research Fellow in Digital and Social Media in Healthcare. Her background is in IT service development working in the industry before embarking on her PhD, which evaluated the impact of social media on patients’ information provision, networking and communication. Her research interests focus on creating digital tools, which embed sustainable engagement strategies in the healthcare and educational context. She explores the expansion of digital/social media and emerging technologies across different contexts, combining technical understanding with theoretical constructs to impact on real life information provision, individual engagement in health and social care. For example: a social media approach to respond to the needs of patients with IgA nephropathy or digital marketing to promote health messages.
1.1 Introduction

This book attempts to bridge some of the gaps between discrete areas of research that information professionals could use to design helpful and effective information systems and services. We know the problem of silo thinking, and it can be hard to make the connections, to see patterns and the big picture across different research cultures, or even within one broad discipline. An editorial in MIS Quarterly (Goes, 2013) points out that information systems research has many streams, many different ways of thinking and doing research. This variety is healthy and probably unavoidable if the broad discipline is to grow and flourish. We are not alone in library and information science and information systems research in facing challenges in deciding how to do research or evaluate practice. It helps to have different perspectives on a problem. Different viewpoints can help to formulate a research question that can be answered, help decide on appropriate methods to use and help to discuss the findings in relation to the existing evidence.

As a group of editors, we have diverse areas of research and teaching interests, covering information retrieval, health information research, knowledge translation and evidence-based practice, information behaviour research, systems analysis and business process analysis. Our teaching and research experience has helped us realise that there are problems with
communication across different silos. For example, information architecture within the library and information science field has often been the study of content management. Information seeking may be accommodated for navigation tools, but the activities, processes and workflows that might accompany an information systems architecture may be less obvious. Information behaviour research often seems separate from research on the design of information systems. The context that is so important in information behaviour research may come into personal support and services to support the information systems (hence much of the work on information literacy) but information behaviour research may not contribute directly to information systems design as much as it could. Information behaviour research often focuses on information seeking, and less attention is given to the use of information, and the processes involved in this. Within library and information services themselves, the library assessment literature discusses performance measurement and change management strategies, but there is little published on ways of looking at the process architecture of a library service, and how this may or may not relate to the business aims of the organisation.

This book belongs with the design and architecture theme of the iResearch series. We are trying to encourage students and practitioners to think about the possible connections that can be made. Information professionals graduating from information or knowledge management, or information studies degree schemes may find themselves working at that point where technology, people and information meet. It is interesting – but also challenging and requires integration of much that may have been learnt on different modules during a degree scheme. Our aim is to provide a critical analysis, with supporting case studies of library and information service and systems architecture – in a very broad interpretation of the term architecture. As the book belongs with the iResearch series, we have emphasised methods of enquiry wherever possible, to help students and practitioners choose suitable ones to use for their own investigations.

After this introduction, Section 1.2 outlines an approach to blending science, engineering and design for effective systems, and Section 1.3 explains the function of the commentaries in the book. Section 1.4 argues that the multidisciplinary approach taken in this book may help recent graduates to find employment in the future. Section 1.5 outlines the structure of the book.
1.2 Blending science, engineering and design

While working on this book I read *The New ABCs of Research* by Shneiderman (2016), which comforted me that the approach we were trying to take was a good way to go. In the book Shneiderman discusses the need for different disciplines to collaborate and, perhaps more importantly, the need to combine applied and basic research. He takes this further than the usual problems of the academic perspective of what is important to research and the practitioner perspective of not finding that type of research immediately useful. Shneiderman suggests that there are three streams to blend: science, engineering and design. Science, the basic research, helps us understand the world. We have a considerable body of research on information behaviour research, for example. Engineering, the second strand, is about using technologies, developing new technologies to make things, systems and services that work safely and effectively. Library management systems need to be secure, we want them to cope with the load placed on them, and we want to upgrade them without too many problems. We need health information systems to improve individual interactions with the health services, and to make the work of health professionals more effective. Design, the third strand, is about fresh thinking. Designers need to be open-minded, to entertain a range of possibilities. Human–computer interaction research exemplifies the design approach, integrating ideas from a range of disciplines to produce beautiful and functional interfaces that people will want to use. Large collaborative projects need those three strands of science, engineering and design in order to do research to produce effective solutions to problems.

Large collaborative projects may be the ideal approach, but many practitioners and academics may not have the resources or the time to set up projects on this scale. This book aims to demonstrate a variety of ways of thinking and research approaches that can be applied in large collaborative research, but also in smaller projects. Goes (2013) points out that in the information systems field, different programmes are offered by faculties across the USA. The same could be said for library and information science programmes in the UK. As part of the initial market research for the book, I looked at the outline content of many undergraduate and postgraduate programmes in librarianship, information science, information management, information studies and information systems. The results were confusing, as the same module title, e.g. Information Architecture, may offer completely different content in different institutions. Sometimes it seemed that the
technology component of a programme was boxed within one particular module or two, with little apparent impact on other modules. There might be modules that stress the importance of working with users, the human aspects of service delivery, but few modules that really deal with design, and methods to make the lives of users easier through better information systems and services. We often focus on what information should be provided, but sometimes forget how the information work gets done – the workflows and the business processes.

1.3 Function of the commentaries

We were aware that this book required some stitching together of the chapters, to help readers appreciate some of the connections. That is why the chapters have commentaries to provide some cross referencing to other material in the book and further information on the approaches described in the chapters. For example, we do not aim to be another book on information architecture, but we refer to some of the advice given by leading practitioners. We cannot discuss in detail how to undertake object-oriented analysis and design, but we consider some of the methods, such as use cases, that designers and users can employ to help in discussions about system design. Similarly, we show how business process analysis methods operate, but for further advice there are other textbooks and websites that should be used as well.

The introductions to each chapter help readers appreciate how a particular chapter fits into the structure of the book.

1.4 Future proofing your degree studies

In a book examining the future of the professions, Susskind and Susskind (2015, 264) consider future roles for people who now class themselves as ‘professionals’, arguing that there will be a decline in the demand for the traditional professions and the conventional professional worker. Some of the future roles that they suggest fit neatly (and quite coincidentally) into the content of this book. For example, one future role suggested is that of process analyst (discussed in chapters 5–8), another is the moderator in virtual communities (Chapter 12), and another is the R&D worker, who keeps up to date with specialist areas of knowledge, and appropriate technologies to provide practical expertise in new ways (see chapters 13 and 14 for ways of collecting...
clinical data, and working with the evidence, using and developing tools for systematic review support for better policy decisions). Other future roles include the designers who will provide online services that are intuitive, simple to use, and designed for people with varying degrees of knowledge (chapters 2–4, 9 and 10).

We cannot make recommendations on how you should try to steer your career, but we hope that the book gives you some ideas on what might be possible, and some of the methods and techniques that you might need to learn to get you where you want to go.

1.5 The structure of the book

The book aims to take a holistic interpretation of information architecture, but to move beyond the view of information architecture that focuses on content architecture alone. We aim to be relevant to the other end of the spectrum, those concerned with service evaluation, performance management and library assessment. To do that we need to look at methods, research approaches and research evidence that consider the workflow and the processes going on in library and information services, and other organisations.

Chapter 2 provides an overview of information architecture, the various approaches and emphases of information architecture, the development of pervasive information architecture, information and knowledge organisation, and information behaviour and how they may influence design of navigation and visualisation. Chapter 3 takes the information and knowledge organisation one step further, and looks at methods of taxonomy testing for information architecture, with an overview of taxonomy development, and discussions of case studies from the literature on taxonomy testing in library and information services. We move from the detail of taxonomy to thinking about the big picture of organisational website design in Chapter 4. Sally Burford discusses her research using grounded theory on practising web information architecture in large organisations. She describes the components of owning information architecture (the governance), negotiating information architecture (the human exchanges in design and changes), enacting information architecture (those implementing, improvising and acting on the website), and the knowing of information architecture (where and how learning takes place).

Chapter 5 introduces some of the methods and techniques for process analysis that are discussed in more detail in chapters 6–8. Chapter 5 explains
how to describe the functionality from the user perspective using use case diagrams, and how use case descriptions consider the steps of the interaction between system users and the high-level functions, the use cases. The chapter goes on to describe the principles of process analysis and how to derive a process architecture for an organisation or part of an organisation. Chapter 6 provides more guidance on process modelling with the Riva technique. Chapter 7 illustrates how these techniques may be used to help redesign internal processes within library services. Chapter 8 compares two case studies of business process modelling for process improvement. The framework used to compare the studies considers how far each study examined job fit, job satisfaction and the viewpoints of the stakeholders.

Chapter 9 examines the design of online semi-structured documents, such as academic articles, and how to design interfaces that help users to evaluate quickly the information in those semi-structured documents. Design for this type of document triage requires combining research in information behaviour and human–computer interaction. The chapter covers aspects of the information architecture required, how designers can accommodate the likely ways that users may assess information quality, and the tools that can improve information seekers’ experience. Chapter 9 presents some evidence-based guidelines for interfaces, but Chapter 10, in contrast, provides examples of work in progress from practice. Three Jisc resource discovery projects are discussed, all different, but each emphasises user experience, or information behaviour (or both). The case studies cover the use of Flickr to promote a photograph collection at Queen’s University Belfast; Middlesex University’s Museum of Domestic Design and Architecture’s use of the balanced value impact model to help analyse the possible purposes of the collection for various stakeholders, and how to choose appropriate social media; and how a better content management system has been built at the Museum of English Rural Life and Special Collections at the University of Reading, to try to meet the challenge of how to work with and for different audiences, and their different reasons for using the website. Chapter 11 takes the idea of the audience deeper, and discusses design for a community, a global community of practice for those with shared interests, in this case for the University-Community Partnership for Social Action Research (UCPSARnet), an organisation based at Arizona State University. The longitudinal design and evaluation of UCP-SARNet combined a human factors approach and cognitive work analysis with the design principles for supporting a community of practice.

Much of information behaviour research has been interested in getting
information to the user, but the rise of social media has emphasised the importance of co-creation of information and knowledge. Chapter 12 discusses the design and development of an online patient support group for renal patients, where co-creation of information was vital. The chapter covers the identification of information needs for this group, how users might engage with the website, an evaluation of the website that demonstrated levels of engagement, and how activity theory contributed to an understanding of the way the information might lead to better patient outcomes. Chapter 13 continues the health theme for these final chapters by examining the research evidence on design of systems for clinical data capture and how these might integrate with electronic health records. Chapter 13 also revisits the idea of document architecture but this time for clinical document architecture and information exchange. Chapter 14 examines aspects of systematic review production and providing easy access to that evidence for clinicians. The chapter describes how to provide easy access to the evidence within clinical workflows, methods for searching for the evidence, management of the systematic review process, and the tools and techniques, such as text mining, that may help to streamline the process of producing a systematic review.

Returning to Shneiderman’s plea for combining science, engineering and design, how do we rate on providing a holistic view of information architecture?

First, on the science side, we cover methods for taxonomy testing in Chapter 3. We have an understanding of the operation of large organisational websites in Chapter 4, the use of a theoretical framework for comparing approaches to business process modelling in Chapter 8, and Chapter 9 presents guidelines based on the evidence from human–computer interaction research. Chapter 11 looks at how human factors can be combined with principles of communities of practice. Chapter 12 discusses some of the research on human information behaviour and use of social media that helped in design of the website. Chapter 13 examines ‘what works’ in design of systems for clinical data capture, and Chapter 14 is concerned with production of the evidence.

Second, on the engineering side and use of innovative technologies, we mention some software tools to help in taxonomy testing (Chapter 3), chapters 6 and 7 discuss the use of Riva and some software tools for business process modelling. The case studies described in Chapter 10 examine different social media tools and techniques for design and evaluation of websites. Chapters 13 and 14 make extensive reference to technologies, such as the design of
information systems for electronic clinical data capture, and tools to assist systematic reviewing teams.

Third, on the design aspect of information architecture and the need for fresh thinking to create useful and effective solutions, Chapter 9 presents a framework for thinking about designing interfaces for document triage - fresh thinking about a solution to a problem that most of us simply tolerate. Business process analysis and business process modelling (chapters 5–8) are ways of enquiry that should help people rethink ways of working, workflows, how the organisational processes fit together, whether some processes could be outsourced, whether some activities and roles can be eliminated, and whether some roles should be enhanced. Chapters 13 and 14 emphasise how workflows for some time-intensive activities in health care research can be improved.

Some of the chapters, as you may have noted, fall into more than one category of Shneiderman’s framework. That was our aim, when trying to provide our holistic view of information architecture. We have covered content management and taxonomy development, information behaviour research, theoretical and methodological approaches appropriate for design and evaluation of particular types of websites, and the idea of process architecture and process modelling to support improved workflows and how people can effectively manage information in an organisation. There is much more that can be written on some of these topics and techniques, and we have tried to give pointers to other research, and some other background.

References