

Preface

Digital libraries are part of the global infrastructure being envisioned to interconnect many computer networks and various forms of information technologies around the world, a partial fulfillment of Bush's 1945 dream "memex" of a personal microfiche-based system to tackle the problem of information overload. Digital libraries, more organized and structured than the Web, an overwhelming example of a shared worldwide collection of information. Educational institutions, governments and corporations are spending millions of dollars on researching, developing and implementing digital libraries around the world.

Research done on the Web has shown that many Web sites are plagued with problems of usability and effectiveness. We can expect a similar situation in digital libraries since they are much more than just Web sites. In fact, they are complex and advanced forms of information systems that can be endowed with a multiplicity of functions and features. These can include collaboration support, distributed database management, hypertext, multimedia information services, information retrieval, information filtering, selective dissemination of information, intellectual property rights management, question answering and reference services, and resource discovery, among many others. Digital libraries can serve very large user populations that are composed of different stakeholder groups with different information needs. Improvements in design, development and evaluation can have a major organizational, national and international impact.

We need better theories, tools and techniques to support designers in designing, developing and evaluating digital libraries in ways that will improve usability and effectiveness to enhance users' experience of digital library collections and services.

This book was inspired by the very successful gathering and exchange of ideas among international and local participants of the Fourth International Confer-

ence on Asian Digital Libraries at Singapore (2002), where the need to highlight and share the best practices on digital library research and development in the Asia Pacific region emerged. The Asia Pacific focus is opportune to the increasing global effort to encourage and promote the sharing of research and development around the world that are largely limited, at the moment, to America and Europe.

To provide a global perspective, this book contains invited chapters from major key players and eminent researchers in digital library research and development to draw parallels of issues and challenges faced not only in the Asia Pacific region, but across the world. Special emphasis is placed on the design, use and usability of digital libraries, which include work surrounding digital libraries and related technologies, the management of knowledge in digital libraries, and the associated usability and social issues.

Organization

The book is written for academics, practitioners and undergraduate/postgraduate students interested in digital library design and development, with particular focus in the Asia Pacific region. It is organised around six sections into chapters with the following major themes:

- (1) Digital Library Development History and Landscape
- (2) Design Architecture and Systems
- (3) Implementation Issues and Challenges
- (4) Use and Impact
- (5) Users and Usability
- (6) Future Trends of Digital Libraries

Although all these areas are likely to be covered as part of the design, development and use of digital libraries at varying levels of detail, the chapter authors were requested to focus more on the specific area of the respective section in which their chapters were featured, thereby providing a more congruent approach for the reader to follow. References in each chapter, as well as an Appendix containing further sources of information at the end of the book, provide additional resources to the reader to pursue a more detailed study of a particular aspect of digital library research and development.

Overview

Section I is concerned with **Digital Library Development History and Landscape** in the Asia Pacific region. Through a meta-analysis of the publications and content within the International Conference on Asian Digital Libraries (ICADL) conference series and other major regional digital library conferences over the past few years, Hsinchun Chen and Yilu Zhou, in Chapter I, “*Survey and History of Digital Library Development in the Asia Pacific*,” noted an increase in the level of activity in Asian digital library research over the past decade. They posit that Asia Pacific is uniquely positioned to contribute significantly in the areas of cultural heritage and indigenous knowledge, and hence advance cross-cultural and cross-lingual digital library research.

Section II focuses on **Design Architecture and Systems**, encompassing the overall structure of a digital library system and the way in which the structure provides conceptual integrity for the whole system, examining input processing, process and control function, output processing, process and control functions, and user interface processing. Section II consists of four chapters.

Chapter II, “*Design Architecture: An Introduction and Overview*” by Edward Fox, Hussein Suleman, Ramesh Gaur & Devika Madalli, looks at current research and emerging best practices adopted in designing digital libraries, and discusses various interoperability standards and practices providing users with seamless access to highly distributed information sources in distributed/networked digital libraries. It also provides an overview of the rest of the chapters in Section II.

In Chapter III, Ismail Fahmi discusses the “*Development of Indonesia’s National Digital Library Network (IndonesiaDLN)*,” shares technical and social issues, and challenges communities to develop their own digital library networks for integration into IndonesiaDLN.

Chapter IV, by Shien-chiang Yu, Hsueh-hua Chen & Chao-chen Chen on “*Dynamic Metadata Management System for Digital Archives: Design and Construction*,” describes Metalogy, an XML/metadata framework that can handle several different metadata formats. Metalogy was developed under the Digital Museum Project funded by the National Science Council of Taiwan.

Chapter V, “*Information Filtering and Personalization Services*” by Chunxiao Xing, Chun Zeng, Zhiqiang Zhang & Lizhu Zhou, analyzes several key technologies and the related works in information filtering and personalized services, and then presents their research in building a prototype TH-PASS to provide personalized searching and recommending services.

Section III examines **Implementation Issues and Challenges** focusing on the “how” aspects of digital libraries with regard to algorithms, techniques, and/or methods. Discussions on pertinent implementation issues and results for comparisons serve as useful lessons learnt and provide a gauge of the efficiency and effectiveness of the implementation. Section III consists of three chapters.

Chapter VI, “*Implementation of Next Generation Digital Libraries*” by Ee-Peng Lim & San-Yih Hwang, outlines major implementation issues of next generation digital libraries and reviews existing standards, tools and related research topics. The authors discuss advanced digital library services and highlight new challenges in metadata harvesting, search and retrieval that require standardized protocols to be adopted across different digital libraries. It also provides an overview of the remaining chapters in Section III.

Chapter VII, “*Using Multi-Document Summarization to Facilitate Semi-Structured Literature Retrieval: A Case Study in Consumer Healthcare*” by Min-Yen Kan, describes a framework used in a consumer healthcare digital library that incorporates techniques used by librarians to discover common and unique topics among its input from a combination of structural and lexical cues. The framework brings together commonalities between documents and highlights their salient differences to target the needs of users when using the browsing and searching modes of information seeking.

Chapter VIII, “*KEA: Practical Automatic Keyphrase Extraction*” by Ian Witten, Gordon Paynter, Eibe Frank, Carl Gutwin & Craig Nevill-Manning, describes KEA, an algorithm for automatically extracting keyphrases from text. KEA identifies candidate keyphrases using lexical methods, calculates feature values for each candidate, and uses a machine-learning algorithm to predict which candidates are good keyphrases. KEA is available under the GNU General Public License and this chapter provides instructions for use of KEA.

Chapter IX, “*Cross-Lingual Information Retrieval: The Challenge in Multilingual Libraries*” by Christopher Yang & Kar Wing Li, reviews challenges in addressing structural and semantic interoperability, searching and retrieving objects across variations in protocols, formats, disciplines and languages. In particular, the chapter focuses on cross-lingual semantic interoperability to build the bridge between the representations of user queries and documents when they are based on different languages.

Chapter X, “*Evolving Tool Support for Digital Librarians*” by David Nichols, David Bainbridge, Gary Marsden, Dynal Patel, Sally Jo Cunningham, John Thompson, Stefan Boddie & Ian Witten, describes usability issues that face the digital librarian in creating and maintaining a digital library. The Greenstone digital library software suite is used as an example to examine how to support digital librarians in their work.

Section IV examines **Use and Impact**, delving on the applicability, use and impact on the targeted users of the digital library systems. The importance of these various forms of digital libraries, and their roles, key success factors, problems, issues, and contribution to the society at large, are important aspects that are typically expounded on in this section. Section IV consists of four chapters.

Ian Witten in Chapter XI, “*Digital Libraries and Society: New Perspectives on Information and Dissemination*,” reviews trends in today’s information environment, introduces digital library technology and explores the use of digital libraries for disseminating humanitarian information in developing countries, a context that is both innovative and socially motivated. The author demonstrates how currently available technology empowers users to build and publish information collections, but similar to conventional public libraries, the author highlights that open access in digital libraries presents a challenge to interface design. It also provides an overview of the rest of the chapters in Section IV.

In Chapter XII, “*Sharing Digital Knowledge with End-Users: Case Study of the International Rice Research Institute Library and Documentation Service in the Philippines*,” Mila Ramos portrays how resources of the International Rice Research Institute Library and Documentation Service are harnessed to develop its collection of technical rice literature and other information sources by searching, selecting and organizing print and electronic resources for inclusion in its Web page or online catalog. The author also highlights problems and recommends possible ways of dealing with them.

Chapter XIII, “*Multimedia Digital Library as Intellectual Property*” by Hideyasu Sasaki & Yasushi Kiyoki, discusses issues in intellectual property rights and copyrights regarding multimedia digital libraries with content-based retrieval mechanisms. Recognising the importance of protecting intellectual property rights in digital libraries, the authors present schemes for protecting multimedia digital libraries with keyword-based retrieval and content-based image retrieval mechanisms.

Chapter XIV, “*Digital Libraries as Learning Environments for Youth*” by Natalie Lee-San Pang, looks specifically at the process of learning between peers in a group and how digital libraries can lend themselves as a learning environment towards this purpose. Using a participatory process involving two groups of youths, a pilot study was conducted in which observations were made to suggest design features for digital libraries used for electronic learning.

Section V examines **Users and Usability**, focusing on usability evaluation techniques employed in the design and development of digital library systems, addressing users, requirements and context of use. Section V consists of five chapters.

In Chapter XV, “*Usability of Digital Libraries in a Multicultural Environment*,” Christine Borgman & Edie Rasmussen explain that besides understanding users in terms of their knowledge and expertise, they advocate that usability is further complicated by multicultural issues, as digital library users may come from many cultures and nations. Hence, it may be necessary to orient a digital library toward the needs of users from one or more specific localities or cultures. The chapter provides an overview of the remaining chapters in Section V and their projects employing different forms of evaluation – formative, summative, iterative – to improve usability of their systems.

Chapter XVI, “*Cross-Cultural Design and Usability of a Digital Library Supporting Access to Maori Cultural Heritage Resources*” by Chern Li Liew, looks specifically at issues supporting access to Maori heritage materials available in New Zealand through digital library technologies. This chapter examines the Māori culture, nature and forms of Māori heritage resources and their specific requirements for representation, organisation and retrieval. It concludes with identifying a set of critical research issues that need to be addressed for the success of such DLs.

Chapter XVII, “*From GeogDL to PAPER: The Evolution of an Educational Digital Library*” by Dion Hoe-Lian Goh, Yin-Leng Theng & Ee-Peng Lim, traces the evolution of GeogDL, a geospatial digital library of geography examination resources into PAPER (**P**ersonalized **A**daptive **P**athways for **E**xamination **R**esources) that provides mock examinations and personalized recommendations of examination questions. This chapter describes two initial studies involving student and teacher design partners, and discusses implications for the future development of PAPER.

In Chapter XVIII, “*Designing a Music Digital Library: Discovering What People Really Want*,” David Bainbridge, Sally Jo Cunningham, John McPherson, Stephen Downie & Nina Reeves review a set of techniques that have been successfully employed in eliciting user needs for a music digital library. This chapter concentrates on studying authentic music information needs in terms of the information seeking behavior of real people engaged in attempting to satisfy real music-related questions, outside of a lab, and discusses the lessons learned in designing contents, interface, and search interactions for a music digital library.

In Chapter XIX, “*Quantitative and Qualitative Evaluations of the Singapore National Library Board’s Digital Library*” by Yin-Leng Theng, Mei-Yee Chan, Ai-Ling Khoo & Raju Buddharaju, reports on two empirical studies – a quantitative and a qualitative study – conducted on the *eLibraryHub*, the Singapore National Library Board’s Digital Library. Findings from the two studies show users’ satisfaction of the effectiveness of the *eLibraryHub*, and that most usability problems occurred during the interpretation and evaluation stages of navigational actions. The chapter illustrates the rich interplay of quantitative and

qualitative data crucial in helping designers/developers to better understand users, uses and usability of deployed systems like the *eLibraryHub*, to address the dilemma of Carroll's task-artifact cycle of changing user needs and design possibilities.

Section VI examines **Future Trends of Digital Libraries**. In Chapter XX, "*A Snapshot of Digital Library Development: The Way Forward in the Asia Pacific*," Schubert Foo & Yin-Leng Theng highlight various key issues and assess the current situation of digital library development in the Asia Pacific. Although emphasis on cross-cultural and cross-lingual research would especially be beneficial to address the diversity and richness of the heritage, cultures and languages of this region, a fundamental digital divide problem poses the greatest challenge that needs to be resolved. This final chapter proposes that a concerted international collaborative effort is needed not only to push ahead the various aspects of the digital library research agenda, but to derive novel solutions to eliminate or close the gap of digital divide across various parts of the world, if the vision of a global digital library is to be realized in the near future.