Handbook of Research on Digital Libraries: Design, Development and Impact
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#### Chapter I: OpenDLib: a Digital Library Service System
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This chapter describes OpenDLib, a Digital Library Service system developed at ISTI-CNR to support the creation and management of digital libraries. It addresses the characteristics of the contents that can be managed by the system, a corresponding set of supporting functions, system architecture paradigm and technologies utilised in the development of the system.

#### Chapter II: Information Security and Privacy in Digital Libraries
Esther O. A. Fatuyi, Elsie Whitlow Stokes Community Freedom Public Charter School, USA  
Mohammed Nasser Al-Suqri, Sultan Qaboos University, Oman  
This chapter examines how appropriate technologies and software must be ensured to enable digital library systems to provide accurate, secure, and timely information over a sustainable future. Specifically it addresses issues protection of the information infrastructure and access control; identification and authentication; standards and policies; and ethical considerations.

#### Chapter III: Digital Learning Objects and Metadata
Sarah-Jane Saravani, Waikato Institute of Technology, New Zealand  
This chapter describes a case study undertaken by the Waikato Institute of Technology, New Zealand on OSLOR, an open source learning object repository of digital resources that are contributed by various education communities. The key success hinges on the ability to develop a metadata application profile that is reducible and extensible to ensure searchability, durability and ultimate value of the repository.

#### Chapter IV: Extensible Digital Library Service Platform
Jian-hua Yeh, Aletheia University, Taiwan  
Shun-hong Sie, Fu-Jen Catholic University, Taiwan  
Chao-chen Chen, National Taiwan Normal University, Taiwan  
This chapter outlines a digital system architecture designed to support flexible content management and development of user services. A data model and storage with high portability and use of stackable service features are proposed as part of the requirements of the X-System, which is a general digital library platform that is capable of handling large-scale digital contents with flexible, extensible management features.

#### Chapter V: Personal Digital Libraries
Juan C. Lavariega, Tecnológico de Monterrey, Mexico  
Lorena G. Gomez, Tecnológico de Monterrey, Mexico  
Martha Sordia-Salinas, Tecnológico de Monterrey, Mexico  
David A. Garza-Salazar, Tecnológico de Monterrey, Mexico  
This chapter presents the services and functionality that a personal digital library system should provide, including a reference architecture to support such a design. A current system, PDLib, is used to demonstrate such a personal digital library that can be used to manage personal collections and its potential to become a commodity and means of social interaction.
Chapter VI: Comparing Open Source Digital Library Software
George Pyrounakis, University of Athens, Greece
Mara Nikolaidou, Harokopio University of Athens, Greece
This chapter does a comparative evaluation of the basic characteristics and system features of five well-known and extensively used open source digital library software, namely, DSpace, Fedora, Greenstone, Keystone and EPrints. The findings are summarized in a score table along with cases where each system is considered as most suitable are proposed.

Chapter VII: Greenstone Digital Library Software: Reconciling Production Values with a Research Framework
Ian H. Witten, University of Waikato, New Zealand
David Bainbridge, University of Waikato, New Zealand
This chapter provides a definitive and coherent account of the Greenstone open source digital library project developed at University of Waikato by its developers. In addition to its production system that is widely adopted globally, it also serves as a framework for digital library research. It outlines a strategy for reconciling this conflict of these two different dimensions of the project in the future.

Chapter VIII: Design and Development of a Taxonomy Generator: A Case Example for Greenstone
Yin-Leng Theng, Nanyang Technological University, Singapore
Nyein Chan Lwin Lwin, Nanyang Technological University, Singapore
Jin-Cheon Na, Nanyang Technological University, Singapore
Schubert Shou-Boon Foo, Nanyang Technological University, Singapore
Dion Hoe-Lian Goh, Nanyang Technological University, Singapore
This chapter addresses the issues of resource discovery and the importance of using knowledge organization tools to build digital libraries. A prototype Taxonomy Generation Tool, utilizing a hierarchical classification of contents by subjects, was designed and built to categorize contents in the Greenstone Digital Library software. The taxonomy template supports controlled vocabulary terms and allows users to select the labels for the taxonomy structure.

Chapter IX: From Digital Archives to Virtual Exhibitions
Schubert Foo, Nanyang Technological University, Singapore
Theng Yin Leng, Nanyang Technological University, Singapore
Dion Goh Hoe-Lian, Nanyang Technological University, Singapore
Na Jin-Cheon, Nanyang Technological University, Singapore
This chapter demonstrates how digital archives, and in particular, its derivative in the form of virtual exhibitions can be developed using the multimedia digital contents of the archives. It presents a number of concepts and design considerations and illustrates this with a proposed generic system architecture that encapsulates the important issues of metadata, system architecture design and developmental techniques for creating effective and usable virtual exhibitions.

Section II: Information Processing and Content Management

Chapter X: Standardization of Terms Applying Finite-State Transducers (FST)
Carmen Galvez, University of Granada, Spain
This chapter introduces the standardization methods of terms using the two basic approaches, computational and linguistic techniques, and justifies the application of processes based on Finite-State Transducers (FST). Standardization of terms is the procedure of matching and grouping together variants of the same term that are semantically equivalent.
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Fu Lee Wang, City University of Hong Kong, Hong Kong  
Christopher C. Yang, Chinese University of Hong Kong, Hong Kong  
This chapter presents a hierarchical summarization approach that generates a summary for a document based on the hierarchical structure and salient features of the document. User evaluations conducted by the authors indicate that the hierarchical summarization outperforms traditional summarization.

Chapter XII: Metadata Interoperability  
K S Chudamani, Indian Institute of Science, India  
H C Nagarathna, Indian Institute of Science, India  
This chapter describes the various Metadata standards for digital document description in the context of bibliographic databases. It also examines metadata interoperability and mapping issues among the various standards.

Chapter XIII: Semantic Association Analysis in Ontology-based Information Retrieval  
Payam M. Barnaghi, University of Nottingham, Malaysia  
Wei Wang, University of Nottingham, Malaysia  
Jayan C Kurian, University of Nottingham, Malaysia  
This chapter firstly introduces various approaches towards ontology development, ontology population from heterogeneous data sources, semantic association discovery, semantic association ranking and presentation, and social network analysis. Then the authors present their approach for an ontology-based information search and retrieval.

Chapter XIV: User Profiles for Personalizing Digital Libraries  
Giovanni Semeraro, University of Bari, Italy  
Pierpaolo Basile, University of Bari, Italy  
Marco de Gemmis, University of Bari, Italy  
Pasquale Lops, University of Bari, Italy  
This chapter introduces a machine learning-based approach which builds user profiles for intelligent document filtering in digital libraries. This study exploits knowledge stored in machine-readable dictionaries to obtain accurate user profiles that describe user interests by referring to concepts in those dictionaries.

Chapter XV: Automatic Text Summarization in Digital Libraries  
Shiyan Ou, University of Wolverhampton, UK  
Christopher S.G. Khoo, Nanyang Technological University, Singapore  
Dion H. Goh, Nanyang Technological University, Singapore  
This chapter provides the literature review of various text summarization and evaluation techniques, and discusses the application of text summarization in digital libraries. This chapter helps the reader to obtain a clear overview of the text summarization field and facilitate the application of text summarization in digital libraries.

Chapter XVI: Speechfind: Advances in Rich Content Based Spoken Document Retrieval  
John H. L. Hansen, University of Texas at Dallas, U.S.A  
Woool Kim, University of Texas at Dallas, U.S.A  
This chapter describes a number of advances in formulating spoken document retrieval for the National Gallery of the Spoken Word (NGSW) and the U.S.-based Collaborative Digitization Program (CDP). Their experimental online system called “SpeechFind” is presented which allows for audio retrieval from the NGSW and CDP corpus.
Chapter XVII: Using Topic-Specific Ranks to Personalize Web Search
Sofia Stamou, Patras University, Greece
This chapter introduces a personalized ranking function that encapsulates the user interests in the process of ordering retrieved results so as to meet the user needs. The ranking function relies on a lexical ontology that encodes a number of concepts and their inter-relations, and determines the semantics of both the query keywords and the query matching pages. Based on the correlation between the query and document semantics, it decides upon the ordering of search results so that these are personalized.

Chapter XVIII: Guidelines for Developing Digital Cultural Collections
Irene Lourdi, University of Athens, Greece
Mara Nikolaidou, University of Athens, Greece
This chapter introduces basic guidelines for developing and maintaining digital cultural collections in order to be interoperable and easily retrievable from users. The requirements of cultural material are discussed and it is shown how in combination with the adequate metadata schema policy, a digital cultural collection can cover the various needs for learning and retrieving information.

Chapter XIX: Digital Libraries and Ontology
Neide Santos, Universidade do Estado do Rio de Janeiro, Brazil
Fernanda C. A. Campos, Universidade Federal de Juiz de Fora, Brazil
Regina M. M. Braga Villela, Universidade Federal de Juiz de Fora, Brazil
This chapter describes a digital library for the e-learning domain which main service is a search engine that retrieves information by tracing the domain vocabulary met on ontology. The digital library extends Web portal’s functionalities, providing technical information and communication and collaboration spaces, and hosts a wide variety of information. It provides services for cataloging, storing, searching, and retrieving information, based on ontology-based semantic queries.

Chapter XX: A Suggestion for the Classification of Innovative Types in Scholarly Communication
Svenja Hagenhoff, Georg-August-Universität Göttingen, Austria
Modern information and communication technologies (ICT) introduce new publication forms and services in the area of scholarly communication which seem to enable a faster and more cost efficient distribution of research results. This chapter presents a classification scheme which aims to allow describing new forms of scholarly communication in a standardized way.

Chapter XXI: Improving Multimedia Digital Libraries Usability Applying NLP Sentence Similarity to Multimodal Sentences
Stefano Paolozzi, Istituto di Ricerca sulla Popolazione e le Politiche Sociali Consiglio Nazionale delle Ricerche, Italy
Fernando Ferri, Istituto di Ricerca sulla Popolazione e le Politiche Sociali Consiglio Nazionale delle Ricerche, Italy
Patrizia Grifoni, Istituto di Ricerca sulla Popolazione e le Politiche Sociali Consiglio Nazionale delle Ricerche, Italy
This chapter describes multimodality as a means of augmenting information retrieval activities in multimedia digital libraries. Multimodal interaction systems combine visual information with voice, gestures and other modalities to provide flexible and powerful dialogue approaches. The authors propose a new approach to match a multimodal sentence expressed by the user with a template stored in a knowledge base to interpret the multimodal sentence and define the multimodal templates similarity.
Chapter XXII: Duplicate Journal Title Detection in References
Ana Kovaèeviæ, University of Belgrade, Serbia
Vladan Devedžiæ, University of Belgrade, Serbia
This chapter explores text mining techniques for matching abbreviated journal titles from citations with journals in existing digital libraries. The main problem is that for one journal there is often a number of different abbreviated forms in the citation report, hence the matching depends on the detection of duplicate records. The author uses character-based and token-based metrics together with a generated thesaurus for detecting duplicate records.

Chapter XXIII: Word Segmentation in Indo-China Languages for Digital Libraries
Jin-Cheon Na, Nanyang Technological University, Singapore
Tun Thura Thet, Nanyang Technological University, Singapore
Dion Hoe-Lian Goh, Nanyang Technological University, Singapore
Yin-Leng Theng, Nanyang Technological University, Singapore
Schubert Foo, Nanyang Technological University, Singapore
Paul Horng-Jyh Wu, Nanyang Technological University, Singapore
This chapter introduces word segmentation methods for Indo-China languages. It describes six different word segmentation methods developed for the Thai, Vietnamese, and Myanmar languages, and compare different approaches in terms of their algorithms and results achieved. It provides underlying views about how word segmentation can be employed in Indo-China languages to support search functionality in digital libraries.

Chapter XXIV: On the Effectiveness of Social Tagging for Resource Discovery
Dion Hoe-Lian Goh, Nanyang Technological University, Singapore
Schubert Shou-Boon Foo, Nanyang Technological University, Singapore
Jin-Cheon Na, Nanyang Technological University, Singapore
Yin-Leng Theng, Nanyang Technological University, Singapore
This chapter explores the effectiveness of social tags as resource descriptors. Social tags are freely selected terms by users to resources, and shared among other users. Two text categorization experiments via Support Vector Machines (SVM) were done for this research. The first study concentrated on the use of terms as its features while the second used both terms and its tags as part of its feature set.

Chapter XXV: Semantic Annotation and Retrieval of Images in Digital Libraries
Taha Osman, Nottingham Trent University, U.K
Dhavalkumar Thakker, Nottingham Trent University, U.K
Gerald Schaefer, Aston University, U.K.
This chapter presents an ontology-based semantic annotation scheme for image retrieval in digital libraries. The authors show that the employment of a semantic framework for image annotation provides more accurate retrieval results than general search techniques typically relying on statistical analysis of keyword recurrences in image annotations.

Section III: Users, Interactions and Experiences

Chapter XXVI: Metadata and Metaphors in Visual Interfaces to Digital Libraries
Ali Shiri, University of Alberta, Canada
Drawing on earlier information retrieval visual interfaces that have made use of thesauri, this chapter explores metadata-enhanced visual interfaces. The chapter describes a study to explore the design of visual interfaces for digital libraries design ideas and discusses implications for digital library interface design in terms of metadata-based information search and retrieval features for visualization.
**Chapter XXVII: Usability Evaluation of Digital Library**
Judy Jeng, Rutgers University, USA
This chapter gives a critical review of common usability evaluation methods and describes empirical user studies employing a combination of usability methods to understand user interaction issues.

**Chapter XVIII: Digital Library Requirements: A Questionnaire-Based Study**
Stephen Kimani, Institute of Computer Science and Information Technology JLUAT, Kenya
Emanuele Panizzi, University of Rome "La Sapienza", Italy
Tiziana Catarci, University of Rome "La Sapienza", Italy
Margerita Antona, FORTH-ICS, Greece
This chapter describes a questionnaire-based study covering a wide range of issues pertinent to the design of user interfaces for DLs, including: user characteristics/profiles, current experience in DL usage, functional requirements, non-functional requirements, and contextual requirements.

**Chapter XXIX: Handhelds for Digital Libraries**
Spyros Veronikis, Ionian University, Greece
Giannis Tsakonas, Ionian University, Greece
Christos Papatheodorou, Ionian University, Greece
This chapter examines the services that can be accessed by means of portable devices and analyzes the main socio-technical issues that arise and influence user interaction. Factors that affect acceptance of these devices are discussed, and future trends are presented to outline the research landscape in the future.

**Chapter XXX: The CGIAR Virtual Library Bridging the Gap Between Agricultural Research and Worldwide Users**
Mila M. Ramos, International Rice Research Institute, Philippine
Luz Marina Alvaré, International Food Policy Research Institute, USA
Cecilia Ferreyra, International Potato Center, Peru; Peter Shelton, International Food Policy Research Institute, USA
This chapter introduces the Consultative Group on International Agricultural Research (CGIAR) Virtual Library as a tool linking researchers and agricultural research results. The CGIAR is a strategic alliance of countries, international and regional organizations, and private foundations supporting 15 international agricultural Centers that work in partnerships with national agricultural research institutions and societies. The chapter explains their work, and discusses implications to the design of virtual libraries.

**Chapter XXXI: Map-Based User Interfaces for Music Information Retrieval**
Robert Neumayer, Vienna University of Technology, Austria
Andreas Rauber, Vienna University of Technology, Austria
This chapter reviews alternative ways to access digital audio collections, and describes two applications, PlaySOM and PocketSOM, for accessing audio files that are based on the Self-Organising Map, an unsupervised neural network model. Alternative interfaces to large audio collections for both desktop computers and mobile devices are discussed, and presents a practical approach to pressing issues in accessing digital collections.

**Chapter XXXII: Patent and Trade Secrets in Digital Libraries**
Hideyasu Sasaki, Ritsumeikan University, Japan
This chapter reviews the patent and trade secret issues in digital libraries, especially, patentable parameter setting components implemented as computer-related inventions in digital libraries, restricted within the current standard of the U.S. laws and cases in transnational transaction and licensing of intellectual properties regarding digital libraries. The chapter then discusses the directions for
embedding and protecting numerical parametric information as trade secret in the patentable parameter setting components performing retrieval operations of digital libraries and the future of intellectual property protection in multimedia digital libraries.

Chapter XXXIII: User Adapted Information Services  
Thomas Mandl, University of Hildesheim, Germany  
This chapter describes personalization strategies adopted in digital libraries as a means to improve the usability of digital library services, and the modeling of these strategies based on users’ interests, search histories and documents accessed during the search process. Typical approaches and systems for individualizing the results of information retrieval systems are also presented.

Chapter XXXIV: An Empirical Analysis of the Utilization of University Digital Library Resources  
Hepu Deng, RMIT University, Australia  
This chapter presents a study based on an online survey in a university environment aimed to investigate the extent to which digital resources are utilized and to identify the critical factors for the effective use of digital resources. The study reveals that the usage of digital resources is significant in higher education and the utilization of digital resources is very much dependent on users and purposes. The awareness and the quality of information are critical for the use of digital resources. The findings of this study shed light on the use of digital resources and help libraries better understand users’ perceptions and experiences of using digital resources services in university libraries.

Chapter XXXV: Visualisation of large image databases  
Gerald Schaefer, Aston University, U.K  
Simon Ruszala, Aston University, U.K  
Following the ever-growing sizes of image databases, effective methods for visualising such databases and navigating through them are much sought after. These methods should provide an “overview” of a complete database together with the possibility to zoom into certain areas during a specific search. It is crucial that the user interacts in an intuitive way with such a system in order to effectively arrive at images of interest. In this chapter, several techniques are presented that allow for effective browsing and navigation of large image databases.

Section IV: Case Studies and Applications

Chapter XXXVI: Towards Multimedia Digital Libraries  
Cláudio de Souza Baptista, University of Campina Grande, Brazil  
Ulrich Schiel, University of Campina Grande, Brazil  
This chapter presents a multimedia digital library that copes with the storage and retrieval of resources of different media such as video, audio, maps, images and text documents. The main improvement with regard to textual digital libraries is the possibility of retrieving documents in different media combining metadata and content analysis. We discuss the problems and solutions associated each media.

Chapter XXXVII: BIVALDI the digital library of the Valencian Bibliographic Inheritance  
Nuria Lloret Romero, Polytechnic University of Valencia, Spain  
Margarita Cabrera Méndez, Polytechnic University of Valencia, Spain  
Alicia Sellés Carot, Masmedios Ltd, Spain  
Lilia Fernandez Aquino, Masmedios Ltd, Spain  
The Biblioteca Valenciana was created to meet, conserve and provide access to the Valencian bibliographic inheritance and all the printed, sound and visual production, about the Comunidad Valenciana. To support this work, the Biblioteca Valenciana has embarked on the design and implementation of a digital library project, the Biblioteca Valenciana Digital, BIVALDI. This chapter describes this endeavour as well as discusses the unique challenges associated with the project.
Chapter XXXVIII: Digital Libraries as a Foundation of Spatial Data Infrastructures
Ruben Béjar, University of Zaragoza, Spain
J. Nogueras-Iso, M.Á. Latre, University of Zaragoza, Spain
P.R. Muro-Medrano, University of Zaragoza, Spain
F.J. Zarazaga-Soria, University of Zaragoza, Spain
This chapter introduces Spatial Data Infrastructures (SDI) and establishes their strong conceptual and technical relationships with geographic digital libraries (geolibraries). The authors describe the origin of SDIs, and highlight their role as geographic resources providers. The chapter also discusses the key differences between SDIs and geolibraries, in order to provide a broader view of these infrastructures.

Chapter XXXIX: DL and GIS: Path to a new collaboration paradigm
Oscar Cantán, University of San Jorge, Spain
J.Nogueras-Iso, University of Zaragoza, Spain
F.J. Zarazaga-Soria, University of Zaragoza, Spain
Challenges remain in serving users of Digital Libraries (DL) and Geographic Information (GI) services. This is due to the proliferation of different representation formats, proprietary standards, protocols and platforms in which information is published. In this chapter, we share some of the lessons learned during architectural design and standardization activities carried out in the GI domain.

Chapter XL: Digital Libraries beyond Cultural Heritage Information
Piedad Garrido Picazo, University of Zaragoza, Spain
Jesús Tramullas Saz, University of Zaragoza, Spain
Manuel Coll Villalta, University of Zaragoza, Spain
This chapter introduces Digital Libraries as a means of cultural heritage access and diffusion. It argues that Digital Libraries, combined with superimposed information techniques, offer a potentially more substantive approach to understanding the historical documentation analysis problem. The chapter also discusses how techniques such as agents, information management and information visualization can be incorporated to implement a versatile digital library that meets the cultural heritage information needs of users need.

Chapter XLI: Reference Services in Digital Environment
Wan Ab. Kadir Wan Dollah, MARA University of Technology, Malaysia
Diljit Singh, University of Malaya, Malaysia
Rapid development in information and communication technologies have significantly influenced both the way libraries provide information services to their users and the way they choose to access information. Digital reference services are thus gaining popularity especially in academic and public libraries. This chapter discusses how such services can play a vital role in terms of providing personalized assistance to library users in accessing resources to meet their information needs.

Chapter XLII: USGS Digital Libraries for Coastal and Marine Science
Frances L. Lightsom, U.S. Geological Survey USGS Woods Hole Science Center, U.S.A
Alan O. Allwardt, USGS Pacific Science Center, U.S.A.
This chapter describes the design and implementation of three related digital libraries developed by the U.S. Geological Survey for topical and georeferenced information for coastal and marine science: the Marine Realms Information Bank (MRIB) and its two offshoots, the Monterey Bay Science Digital Library and Coastal Change Hazards Digital Library. The chapter also discusses important challenges facing digital library developers.
Chapter XLIII: Digital Preservation
Stephan Strodl, Vienna University of Technology, Austria
Christoph Becker, Vienna University of Technology, Austria
Andreas Rauber, Vienna University of Technology, Austria
Digital preservation is one of the most pressing challenges not only within the digital library community, but also in other areas such as archives and data centres. This chapter introduces the concepts and challenges in the field of digital preservation. We provide an overview of the projects and initiatives worldwide dealing with this challenge, and present preservation planning as a key concept at the heart of preservation endeavours.

Chapter XLIV: Music Information Retrieval
Thomas Lidy, Vienna University of Technology, Austria
Andreas Rauber, Vienna University of Technology, Austria
This chapter provides an overview of the increasingly important domain of Music Information Retrieval, which investigates efficient and intelligent methods to analyze, recognize, retrieve and organize music. The chapter describes the background and problems that are addressed by research, and introduces methods for the extraction of semantic descriptors from music. Next, music retrieval, music classification and music library visualization systems are described.

Chapter XLV: The Strategic Plan of Digital Libraries
Juha Kettunen, Turku University of Applied Sciences, Finland
This chapter describes the cooperation of academic libraries and the consortium of digital libraries of Finnish universities of applied sciences. It argues that it is necessary to adopt networking and cooperative strategies among libraries to provide electronic services of users. The findings of this chapter are useful to administrators of educational institutions aiming to plan a networked strategy and improve the cost-efficient cooperation of otherwise independent organizations.

Chapter XLVI: Software Process Asset Libraries using Knowledge Repositories
Leonardo Bermón-Angarita, Carlos III University of Madrid, Spain
Antonio Amescua-Seco, Carlos III University of Madrid, Spain
Maria Isabel Sánchez-Segura, Carlos III University of Madrid, Spain
Javier García-Guzmán, Carlos III University of Madrid, Spain
This paper establishes the incorporation of Knowledge Management techniques as a means to improve actual software process asset libraries. It presents how Knowledge Management contributes to the creation of a new generation of process libraries as repositories of knowledge as well as the mechanisms to allow the acquisition, storage, collaboration, sharing and distribution of knowledge related to the software development processes.

Chapter XLVII: The role and integration of digital libraries in e-learning
Han Lee Yen, Nanyang Technological University, Singapore
Educators and learners have long relied on libraries as their main sources of learning resources and libraries have in turn provided the infrastructure that promotes the creation, assimilation and leverage of knowledge. However, with the growth of e-learning in recent years, libraries are facing new challenges to the way they develop, manage and deliver their services and resources to their users. This chapter discusses how libraries can meet these challenges by providing electronic or partially electronic services.

Chapter XLVIII: Development of Digital Libraries in Pakistan
Kanwal Ameen, University of the Punjab, Pakistan
Muhammad Rafiq, University of the Punjab, Pakistan
This chapter aims to discuss the development of digital libraries in Pakistan. It gives an account of the digital transformation taking place in the country and reviews a few digital library initiatives. It discusses a number of issues associated with the development of digital libraries with specific reference to Pakistan. The major issues appear are as follows: Misconception about digital libraries; Lack of technological applications; Lack of human resources with needed skills; Copyright and Publishing; Cultural Divide; Digital Divide; and Insufficient financial support. The authors believe that understanding the underlying issues will not only accelerate the development of DL in Pakistan, but also in other developing countries with more or less common environment.

Section V: Digital Library Education and Future Trends

Chapter XLIX: Core Topics in Digital Library Education
Seungwon Yang, Virginia Tech, U.S.A
Barbara M. Wildemuth, University of North Carolina at Chapel Hill, U.S.A
Jeffrey P. Pomerantz, University of North Carolina at Chapel Hill, U.S.A
Sanghee Oh, University of North Carolina at Chapel Hill, U.S.A
Edward A. Fox, Virginia Tech, U.S.A.
This chapter presents the effort of developing a digital library (DL) curriculum by an interdisciplinary group from Virginia Tech and the University of North Carolina at Chapel Hill. It describes the foundations of the curriculum building, the DL curriculum framework, the DL educational module template, a list of draft modules that are currently developed and evaluated by multiple experts in the area, and more details about the resources used in the draft modules and DL-related workshop topics mapped to the DL curriculum framework.

Chapter L: Digital Libraries as Centres of Knowledge: Historical Perspectives from Ancient Libraries in European
Natalie Pang, Monash University, Australia
This chapter focuses on the core role of libraries as centres of knowledge using historical perspectives from ancient libraries in Europe. The ways technological and social contexts have been adapted in ancient libraries are discussed. This chapter contributes to a collective understanding of immediate and future directions of libraries, their challenges and promises, and how they have evolved as places for local communities.

Chapter LI: The European Approach towards Digital Library Education: Dead End or Recipe for Success?
Wolfgang Ratzek, Stuttgart Media University, Germany
With the rapid development of effective and efficient information and communication technology (ICT) and the vital change of patron behavior, a library cannot offer its services without qualified staff. Thus this chapter describes the LIS (library and information science) educational and training programs in Europe, especially in Germany, Great Britain and the Nordic Countries.

Chapter LII: New Roles of Digital Libraries
Faisal Ahmad, University of Colorado at Boulder, U.S.A
Tamara Sumner, University of Colorado at Boulder, U.S.A
Holly Devaul, University of Colorado at Boulder, U.S.A.
This chapter proposes the future of digital libraries (DLs) in terms of the support provided for the end users and distributed computer applications. The authors briefly present their methodology for systematically exploring the future of DLs and then highlight some of the roles a DL can play to support its diverse set of users. A new breed of consumer is introduced with discussion on how DLs can provide support to this consumer group.
Chapter LIII: A Review of Progress in Digital Library Education
Yongqing Ma, Victoria University of Wellington, New Zealand
Warwick Clegg, Victoria University of Wellington, New Zealand
Ann O’Brien, Loughborough University, U.K
This chapter reviews the history, development and current status of digital library (DL) courses and
programmes now being offered, mainly by universities/institutions with accredited programmes or
courses by CILIP (the Chartered Institute of Library and Information Professionals) and ALA
(American Library Association). Trends in digital library education (DLE) are also presented.

Chapter LIV: The future of learning with Digital Libraries
Chew-Hung Chang, Nanyang Technological University, Singapore
John G Hedberg, Macquarie University, Australia
This chapter discusses the issues of current digital libraries (DLs) for learning. Then it proposes that the
future of learning with DLs rests on integrating supportive tools into a seamless learning environment.

Chapter LV: Computational Sense for Digital Librarians
Michael B. Twidale, University of Illinois, USA
David M. Nichols, University of Waikato, New Zealand
This chapter presents the role of technology in digital library education. It investigates how elements of
computer science and library science can be merged to produce an appropriate ‘computational sense’
for future digital librarians. The discussion in this chapter aims to inform the development of digital
library software tools – particularly those used in educational contexts.

Chapter LVI: Digital Libraries Overview and Globalization
Soh Whee Kheng, Nanyang Technological University, Singapore
This chapter presents an overview of how national libraries of 14 countries in Asia-Pacific region are
involving in the digital library initiatives. Most libraries participate in the collaborative efforts to build
the digital libraries with the support from their government. With the understanding of the current
situation in Asia Pacific, the reader can understand the readiness of national libraries aiming for
globalization.