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Advanced Methodologies and Technologies in Library Science, Information Management, and Scholarly Inquiry

Mehdi Khosrow-Pour, D.B.A.

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Advanced Methodologies and Technologies in Library Science, Information Management, and Scholarly Inquiry

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Information Resources Management Association, USA

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List of Contributors

Table of Contents

Section 6
Research Methods and Scholarly Publishing

Preface

Advanced Methodologies and Technologies in Library Science, Information Management, and Scholarly Inquiry is a single-volume major reference work comprised of 46 unique chapters covering some of the most advanced and innovative technologies and methodologies available to scientists, researchers, and organizations worldwide.

As information intake, knowledge management, and research methods are continually advancing, this publication focuses on a wide range of subject matter – from digital literacy to research methodologies.

Attention is also given to emerging topics including but not limited to information systems, knowledge acquisition, scientometrics, ICT competency, and digital libraries. The chapters within this publication are sure to provide readers the tools necessary for further research and discovery in their respective industries and/or fields. Additionally, this publication could be extremely beneficial for use in coursework by instructors of various library science programs.

Advanced Methodologies and Technologies in Library Science, Information Management, and Scholarly Inquiry is organized into six sections that provide comprehensive coverage of important topics in library science, information management, and scholarly inquiry. These sections are 1) Digital Literacy, 2) Information Resources Management, 3) Information Retrieval, 4) Knowledge Management, 5) Library Science and Administration, and 6) Research Methods and Scholarly Publishing.

The following paragraphs provide a summary of what to expect from this invaluable reference source:

Section 1, "Digital Literacy," is comprised of 10 chapters and opens this extensive reference source by highlighting research detailing the latest architectures, frameworks, and methodologies on digital literacy. The first chapter in this section, "Digital Literacy," authored by Prof. Anirban Ray from UNC Wilmington, USA, provides a comprehensive overview of digital literacy, looking at the theoretical and ideological construct of the term from functional and critical perspectives. It also highlights contemporary issues associated with the spread of digital literacy, including challenges of cross-cultural digital literacy and digital divide.

Another chapter presented early in this section, "Digital Literacy for the 21st Century," authored by Profs. Hiller A. Spires, Casey Medlock Paul, and Shea N. Kerkhoff from North Carolina State University, USA, is designed to 1) define digital literacy from multiple theoretical viewpoints, 2) illustrate how the definition continues to evolve in light of emerging technologies, and 3) discuss the cognitive, social, and affective dimensions of digital literacy as it is a key requirement in contemporary K-12 education.

Following this chapter is "Digital Literacy in Theory and Practice," authored by Prof. Heidi Julien from the State University of New York at Buffalo, USA. It explores the concept of digital literacy from a theoretical perspective and the implementation of it. It also examines the need to focus on the development of digital literacy, however defined, as a policy priority for all sectors.

One of the closing chapters, "The Roles of Digital Literacy in Social Life of Youth," authored by Prof. Dragana Martinovic from the University of Windsor, Canada, Prof. Viktor Freiman from the Université de Moncton, Canada, Prof. Chrispina S. Lekule from St. Augustine University of Tanzania, Tanzania, and Prof. Yuqi Yang from the University of Windsor, Canada, contains findings related to social aspects of digital activities of youth. It also addresses the social prospects of information and communication technology (ICT) use among youth and describes the online behavior of young people through the paradoxical nature of the Internet that provides opportunities for social development but introduces risks.

The final chapter in this section, "Toward a Working Definition of Digital Literacy," authored by Prof. Margaret-Mary Sulentic Dowell from Louisiana State University, USA, presents a comprehensive definition of digital literacy and examines the dissonance between digital natives and digital immigrants, how and why some forms of digital literacy enjoy acceptance and legitimacy, and issues surrounding the digital divide.

Section 2, "Information Resources Management," is comprised of seven chapters and explores major issues, trends, and areas for advancement in information management research. The first chapter in this section, "Advanced Model of Complex Information System," authored by Prof. Miroslav Svitek from Czech Technical University in Prague, Czech Republic, presents original approaches to information representation, transmission, and processing.

Following this chapter is "Computer Information Library Clusters," authored by Prof. Fu Yuhua from CNOOC Research Institute, China. It discusses the concept of computer information library clusters (CILC) as well as other concepts of information library clusters.

Another noteworthy chapter in this section, "The Impact of the Impact of Meta-Data Mining From the SoReCom 'A.S. de Rosa' @-Library," authored by Profs. Annamaria Silvana de Rosa, Laura Dryjanska, and Elena Bocci from Sapienza University of Rome, Italy, addresses the following question: What is the value of the scientific networking, training, and documentation activities in the new academic scenario dominated by the bibliometric assessment culture and by the impact of the technology to the science production and sharing (data-driven science, big data, open data, open access, etc.)?

One of the closing chapters, "Open Data Repositories in Knowledge Society," authored by Prof. Nadim Akhtar Khan from the University of Kashmir, India, Prof. Sara Sohrabzadeh from Tehran University of Medical Science, Iran, and Prof. Garvita Jhamb from the University of Delhi, India, discusses the concept of open data and its importance in present times for supporting advanced research activities in different domains of human knowledge. It also provides a glimpse of open data repositories at the global level and attempts to showcase select open data repositories set by different organizations and institutions for making different datasets available in varied areas for facilitating specialized research and development activities.

The final chapter in this section, "Towards a General Theory of Information," authored by Prof. Laura L. Pană from Polytechnic University of Bucharest, Romania, shows the hierarchy of natural, social, and human information structures, processes, and activities, and integrates the various information levels, structures, and features in order to ensure a valid and suitable scientific and philosophical foundation of a general theory of information.

Section 3, "Information Retrieval," is comprised of seven chapters on the latest academic material in the field of information and communication technologies and explores how complex information systems interact with and affect one another. The first chapter in this section, "Analysis and Assess-

ment of Cross-Language Question Answering Systems," authored by Profs. Juncal Gutiérrez-Artacho and María-Dolores Olvera-Lobo from the University of Granada, Spain, presents question answering systems (QAS) as an alternative to the traditional information retrieval (IR) systems, seeking to offer precise and understandable answers to factual questions instead of showing the user a list of documents related to a given search.

Another chapter presented early in this section, "Cognitive and Psychological Factors in Cross-Language Information Retrieval," authored by Prof. Rowena Li from the Bayside High School Library, USA, explores the human and social aspects of cross-language information retrieval. It explores CLIR users' unique social and cultural contexts, their psychological and cognitive structures, and their distinctive relevance judgment. It also examines in depth the barriers embedded in cultural, linguistic, and cognitive dimensions, which might hinder further advancement in cross-language information retrieval.

Another chapter in this section, "Information Seeking Models in the Digital Age," authored by Profs. Mudasir Khazer Rather and Shabir Ahmad Ganaie from the University of Kashmir, India, explores, introduces, and discusses select information seeking models and explains various elements of each model. Various online resources like databases, research articles, and other web tools will be accessed to retrieve relevant information related to the select models. It also focuses on the diagrammatic or pictorial representation of each model.

One of the closing chapters, "An Insight Into Deep Learning Architectures," authored by Profs. Nishu Garg, Nikhitha P, and B. K. Tripathy from VIT University, India, aims to come up with a state-of-the-art approach for overcoming these problems by clubbing together widely recognized deep architecture along with natural language processing. This novel design methodology utilizes the latent query features, deep belief network, and restricted Boltzmann machine for learning tasks. This collaborative work can be used to reduce the epoch in the learning periods whereas the rest of the methods fail to achieve the constraints.

The final chapter in this section, "Online Information Retrieval Systems Trending From Evolutionary to Revolutionary Approach," authored by Profs. Zahid Ashraf Wani and Huma Shafiq from the University of Kashmir, India, highlights various trends in online information retrieval from primitive to modern ones. It also visualizes the future requirements and expectations keeping in view the ever-increasing dependence on diverse species of information retrieval tools.

Section 4, "Knowledge Management," is comprised of 10 chapters on emerging theories, concepts, and methodologies within the knowledge management (KM) discipline. The first chapter in this section, "Boosting the Social Development of the Majority Through the Creation of a Wireless Knowledge Society," authored by Dr. Danilo Piaggesi from Framericas, USA, presents some of the best ICT practices aimed at boosting the social development of the majority contributing to the creation of a wireless and inclusive knowledge society.

The chapter "Communities of Practice as a Source of Open Innovation," authored by Prof. Diane-Gabrielle Tremblay from the University of Quebec, Canada, defines a new form of learning and knowledge management that is communities of practice. It also highlights some results from a research on communities of practice in Canada, specifically the main conditions and challenges of such new modes of knowledge creation and management, which don't always work automatically.

Another noteworthy chapter in this section, "Intellectual Capital Measurement," authored by Prof. Lukasz Bryl from Poznan University of Economics and Business, Poland, presents the current state of knowledge concerning intellectual capital (IC) and its measurement methods. It also analyzes the controversies and usability of chosen methods.

One of the closing chapters in this section, "Theory and Practice of Online Knowledge Sharing," authored by Prof. Will W. K. Ma from Hong Kong Shue Yan University, Hong Kong, defines online knowledge sharing, discusses the effects of intrinsic and extrinsic motivational factors in explaining online knowledge behavior, explores the various forms of knowledge sharing in different online learning environments, and reviews the measurement of online knowledge sharing.

The final chapter in this section, "Visualization as a Knowledge Transfer," authored by Prof. Anna Ursyn from the University of Northern Colorado, USA, presents selected concepts, methods, and tools related to the visualization of data, information, and knowledge. It presents some approaches to the concept of visualization and the ways it mediates between the user and the physical world. It also overviews visualization tools and applications and discusses the importance of visualization methods for the current educational strategies.

Section 5, "Library Science and Administration," is comprised of seven chapters on the latest scholarly material on trends, techniques, and management of libraries and examines the benefits and challenges of library administration. The first chapter in this section, "Change Leadership Styles and Behaviors in Academic Libraries," authored by Prof. John Kennedy Lewis from Salve Regina University, USA, addresses the research on change leadership styles and behaviors employed by leaders in academic libraries today. Included in the chapter are reinforcement and transactional leadership, consultative and participatory leadership, participatory and transformational leadership, shared leadership, and self-leadership.

Another chapter presented early within this section, "Digital Archives for Preserving and Communicating Architectural Drawings," authored by Profs. Roberta Spallone and Francesca Paluan from Politecnico di Torino, Italy, investigates the phenomenon underlining the benefits and the risks connected to the digitization of the contemporary architectural archives, focusing on their communicative potentialities thanks to the tools of the digital representation, in relation to the necessities of fruition and preservation of the original archival materials.

Another noteworthy chapter within this section, "Massive Digital Libraries (MDLs)," authored by Prof. Andrew Philip Weiss from California State University – Northridge, USA, describes the characteristics of massive digital libraries (MDLs) and outlines their impact upon contemporary information science issues, especially with regard to digital collection metadata, copyright, and the diversity of the source collections.

One of the closing chapters, "Social Media Applications as Effective Service Delivery Tools for Librarians," authored by Prof. Ihuoma Sandra Babatope from Delta State College of Physical Education, Nigeria, provides an overview of social media applications and identifies those that are commonly used in libraries in Nigeria as well as explores the reasons for using social media applications in libraries and how they are employed in performing sundry library routines. It also examines the future role of librarians with respect to the current realities as presented by these social media applications as well as the opportunities and the challenges of using social media applications in libraries.

The final chapter in this section, "Web 2.0 From Evolution to Revolutionary Impact in Library and Information Centers," authored by Profs. Zahid Ashraf Wani, Tazeem Zainab, and Shabir Hussain from the University of Kashmir, India, examines the genesis, development, and application of various Web 2.0 tools in library and information science.

Section 6, "Research Methods and Scholarly Publishing," is comprised of five chapters on research gathering, presentation, and publishing. The first chapter in this section, "Advancement and Application of Scientometric Indicators for Evaluation of Research Content," authored by Profs. Tazeem Zainab and Zahid Ashraf Wani from the University of Kashmir, India, examines the concept of Scientometrics and

its indicators that are employed to assess the quality of scholarly content. It also discusses the pros and cons of prominent scientometric indicators that are currently employed in assessing the performance of an individual researcher, institution, or a country.

The second chapter in this section, "Electronic Theses and Dissertations (ETDs)," authored by Profs. Ralph Hartsock and Daniel G. Alemneh from the University of North Texas, USA, traces the history of dissertations, from their printed form and issuance in microform by various agencies. It also examines the changes in textual content and its presentation from the pre-digital to digitized documents, and the relation to software developed for music and other fields.

The third chapter in this section, "The Nature of Research Methodologies," authored by Prof. Ben Tran from Alliant International University, USA, covers the three types (trends) of research methodologies: the traditional (quantitative, qualitative), the universal (mixed-methods), and the trends (blogs, webinars, virtual intercepts, and virtual reality).

The fourth chapter in this section, "Research Methodology," authored by Drs. Swati C. Jagdale, Rahul U. Hude, and Aniruddha R. Chabukswar from MAEER's Maharashtra Institute of Pharmacy, India, explores the two types of research: basic and applied. It also examines how research methods are the various procedures, schemes, and algorithms used in research and how research methodology is a systematic way to solve a problem.

The fifth and final chapter in this section, "Scholarly Identity in an Increasingly Open and Digitally Connected World," authored by Profs. Olga Belikov and Royce Kimmons from Brigham Young University, USA, explores emergent forms of technology-influenced scholarship, identifies broad categorizations of these practices (including digital scholarship, social scholarship, open scholarship, public scholarship, and networked participatory scholarship), and discusses common themes and implications within a larger framework of their effect on scholarly identity.

The comprehensive coverage this publication offers is sure to contribute to an enhanced understanding of all topics, research, and discoveries pertaining to library science, information management, and scholarly inquiry. Furthermore, the contributions included in this publication will be instrumental to the expansion of knowledge offerings in this area. This publication will inspire its readers to further contribute to recent discoveries, progressing future innovations.

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Section 1

Digital Literacy

Chapter 1
Digital Literacy

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ABSTRACT

The chapter provides a comprehensive overview of digital literacy, looking at the theoretical and ideological construct of the term from functional and critical perspectives. Digital literacy as a heterogeneous concept is claimed by diverse stakeholder disciplines such as education, communication studies, English, media studies, library information studies, and computing. The chapter underlines the complementary notions of digital literacy couched in both "conceptual" as well as "standardized operational" definitions and sheds light on the shifting implications of global digital literacy. From this perspective, it scans the global landscape to understand the diffusion of digital literacy and to show how the concept is tackled within disparate contexts of use. The chapter also highlights contemporary issues associated with the spread of digital literacy, including challenges of cross-cultural digital literacy and digital divide.

INTRODUCTION

Decoding digital literacy is a descriptive act of interpreting, reinterpreting, and understanding the relationship between the terms digital and literacy in the expanding space of information and communication technologies (ICTs). While the idea of literacy reveals a long evolutionary past associated with the term literate, the construct of digital, as we use it today, is shaped by the use of the digits, 0 and 1, in the 1930s and 1940s to represent computer data—a practice that eventually came to be known as digital . With the emergence of the Internet and the Web as the dominant systems of information organization and knowledge creation, the concept of literacy was broadened from its original notion of skills in reading and writing to developing cultural, historical, social, and technical awareness— a shared assumption critical to and closely associated with the understanding of ICTs and their use as well. The shift has influenced the definition of literacy as "primarily a technology of which records are the end products" (Clancy, 1993, p. 20). Although contemporary discourse in digital literacy assumes a much expanded scope of understanding than a product view of technology, the deterministic tendencies are evident in instances in which digital literacy is viewed as a set of benchmark skills. Broadly speaking, digital literacy is couched in both "conceptual" as well as "standardized operational" definitions (Lankshear &

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Knobel, 2008, p. 2), the key distinction being the former places digital literacy within the multiplicity of frameworks and models, while the latter measures and observes skills and performances that advance the "standards" of being digitally literate.

BACKGROUND

In 1981 *The Washington Post* first pioneered the concept that demanded "special skills" to use and manage computers (Warschauer 111) and invented the term "computer literacy." Later, extension of the term "literacy" included "information literacy," "digital literacy," and "media literacy" to broaden the idea of skills. Paul Gilster (1997) in his pioneering book, *Digital Literacy*, popularized digital literacy as a shorthand for understanding and using information in multiple formats "from a wide range of sources presented via computers" (p.33). He operationalized and extended the term throughout the book, postulating that "digital literacy is about mastering ideas, not keystrokes" (p.1)—a call to attention between a "special kind of mindset or thinking" and "limited technical skills" (Bawden, 2008, p.19) premised on tasks and performances on the other. According to Gilster, digital literacy is about developing a critical approach toward using digital sources and forming awareness about our "expanded ability" (p.31) to connect with people and information using these sources. Over the years, digital literacy has addressed the split through skill and knowledge perspectives. Evidently, the skill construct affirms the neutrality thesis of technologies in which technologies are understood as means or instruments that need to be learned; conversely, the knowledge model ascertains technologies as more complex systems, not free of social, cultural, and political biases.

Despite these prevalent articulations, the challenges of defining digital literacy stem from a lack of consensus building among stakeholder disciplines, including education, communication studies, English, media studies, library information studies and computing. The problem is further compounded by competing interpretive frameworks and theoretical models (Boechler et al., 2014) that stake claims on the scope and application of digital literacy. Considering the value of addressing the diverse views, the scholars have framed a discourse around digital literacy to accommodate dominant perspectives. These perspectives coalesce the domain-specific views into two broad categories that are identified as conservative, sometimes called traditional, and skeptical (Aviram & Eshet-Alkalai, 2006; Boechler et al., 2014). The former is uncritical of existing literature and accepts it in face value, privileging an instrumental view of digital literacy implicated in the notion of acquiring threshold or generic set of technical skills. This perpetuates the standardized paradigm of skill acquisition, a method common in educational institutions that aligns pedagogy through traditional conceptualizations of computer literacy (Ferrari, Punie & Redecker, 2012), information literacy (Mackey and Jacobson, 2011), and network literacy (McClure, 1994). Notwithstanding the widespread adoption of the view in curricular mapping and technology developments, the assumption is challenged as a didactic model that stabilizes teaching and learning as a set of prescriptive and durable practices that have fixed unities of time and place in which the role of technology is regarded as neutral.

The skeptical or functional approach, on the other hand, gained prevalence as a reaction to the conservative approach. The underlying thesis favors contextualization of digital literacy and by extension digital technologies, reframing digital literacy as a plural concept. As an alternative strategy, it recognizes that digital literacy cannot replace traditional learning but can enhance the learning environment. The thinking here is that the functional approach potentially erases the dichotomies between digital and

print literacies by emphasizing the hidden aspects of "learning styles, multiple intelligences, personality types," and capacities (Aviram & Eshet-Alkalai, 2006). The perspective coincides with the idea of meta-literacy and value adds a plural approach to digital literacy discourse, facilitating a strategic inclusion of multiple critical conditions such as cross-cultural contexts (Thatcher, 2010), privacy and surveillance (Reilly, 2016), and situated learning within the wider conceptual framework.

The skeptical formulation questions the skill paradigm but also situates literacy beyond cognitive processes of reading, writing, and information seeking. In that it underlines the social dimension of literacy, emphasizing critical exchange and application of thoughts and ideas between individuals. Re-framing literacy along these lines was done by a group of scholars in the 1980s and 1990s who called it "the New Literacy Studies" (NLS); there are still others who focus "on more recently developed literacy practices which are often (but not always) associated with 'new technologies' like computer and the Internet" (Jones & Hafner, 2012, p.13) and define it as "new literacies." Digital literacy functions as a type of new literacies among several others, like computer literacy, Internet literacy, network literacy or hyper-literacy, and media literacy; other analogs include, Web literacy and game literacy (Buckingham, 2008); library literacy and reproduction literacy (Koltay, 2011); ICT skills, e-Skills, and ICT literacy (Lee, 2014), which all share common conceptual assumptions.

Digital literacy incorporates a strong social component reimagined through concepts like user, access, practice, consumption, interpretation, and production that gain emphasis within the contemporary literacy discourse. Importantly, there are four basic assumptions of new literacies that help to conceptualize digital literacy within a larger framework of literacy: (a) innovations in ICTs require new skills, competencies, awareness, and strategies of use; (b) new literacies develop continually as their defining technologies change (c) literacy components empower individuals as global citizens; (d) new literacies are multi-dimensional and multi-modal and their understanding positively impact our social participation (Leu et al., 2007). These assumptions underscore the critical perspective articulated by Paul Gilster (1997) and later explained by David Bawden (2008). Similarly, others have emphasized the importance of approaching digital literacy and production from feminist perspectives (see Hawisher and Selfe, 1999; Wajcman, 2004), raising questions like online equity and subject positions, whether technological innovation equals advancement of literacy or how costs of digital technologies hinder or facilitate the learning process across social, cultural, or institutional spaces.

From a critical digital perspective, it is difficult to imagine digital literacy as a stand-alone term; the critical dimension includes the internal "faculties of analysis and judgement applied to the content, usage, and artefact of the technology" while the external critical element refers to the cultural and historical circumstances of the wider field of technology than computers (Hinrichsen and Coombs, 2013). Thus, the idea of literacy in digital literacy continues to be redefined by innovations of digital technologies and signals an opportunity to reconstruct a definition based on contextualized meaning and practices than checklist of skills.

Bawden (2008) offers an updated version of digital literacy by suggesting that "it is not sensible to reduce it to a finite number of linear stages" (p. 28). For him, the six-stage linear model for information literacy formulated by American Library Association in 1989, which had a considerable influence on the scholarship and conceptualization of digital literacy, does not adequately characterize contemporary understanding of digital literacy. Bawden formulates a digital literacy framework in the light of the changing circumstances and awareness for rapid technological innovation. It includes (a) underpinnings as literacy *per se* and computer/ICT literacy, (b) background knowledge as complex of information and nature of information resources, (c) central competencies as basic skills such as reading and understanding

digital and non-digital formats, knowledge assembly, evaluation of information, etc., and (d) attitudes and perspectives as underlying concept connecting modern idea of literacy with the values of older literacy through independent learning and moral/social responsibilities (p.29-30).

Similarly, Yoram Eshet-Alkalai (2004) encapsulates a framework with five types of digital literacy: (a) photo-visual literacy to interact with the visual-graphical interface (b) reproduction literacy to reproduce meanings by repurposing and recombining preexisting information elements; (c) information literacy to assess and evaluate the credibility of online information; (d) branching literacy to navigate the non-linear Web structure; (e) socio-emotional literacy to safeguard personal interests within the expanded scope of collaboration and networking offered by the ICTs. The framework was further updated with the real-time digital skill characterized by the ability of users to manage and respond to real-time, high-speed, and quick-response digital scenarios and genres (Eshet, 2012) such as gaming and simulation.

Both these models expand the scope of digital literacy from practice-orientated to (critical) knowledge-orientated conceptualizations. They index the idea of literacy as a discourse, embedding a complex understanding of the relationships between the tool, the environment, and the actor. The frameworks position digital literacy as a "survival skill" and explore the idea of social membership within the digital space. Most importantly, the shift from a tool-centered toward a critical knowledge orientated framework exemplifies learning as a social phenomenon external to tools or residing outside of tools and machines.

GLOBAL DIGITAL LITERACY PROGRAMMES AND POLICIES

From a policy standpoint, the emphasis placed on digital literacy training is enormous across the global societies. Initiatives by various national and international organizations, governments, and educational institutions support the continuing relevance of digital literacy. The content, strategies, and development of training programs and materials are often structured in conjunction with the demands and needs of the target populations. For example, a macro perspective on literacy was adopted by UNESCO to guide the digital literacy policy framework that defined literacy as "a continuum of learning in enabling individuals to achieve their goals, to develop their knowledge and potential, and to participate fully in their community and wider society" (UNESCO, 2004). Further, UNESCO's Information for All Programme3 (IFAP) recognizes digital literacy as "life skill," outlining objectives squarely related to the more critical idea of digital literacy— "ICT skills, civic skills, learning to learn skills, and participation of adults in lifelong learning" (UNESCO, 2011). The objectives, such as these, are aptly coordinated with the support from national governments and agencies through centralized polices. Evidently, these policies vary across the geographical boundaries both from conceptualization and implementation standpoints.

In the United States, the mainstreaming of digital literacy is guided by several plans of action formulated by governmental and non-governmental agencies. According to the *Fact Sheet: Digital Literacy* report 2011, "28 percent of Americans do not use the Internet at all" (commerce.gov). Toward that end, the transformative task of building discourse communities for participating in information economy is largely facilitated by strategic interventions at K-12 levels and adult community learning centers such as the Literacy Information and Communication Systems (LINCS), a national leadership initiative of the U. S. Department of Education, Office of Career, Technical Adult Education (OCTAE), Division of Adult Education and Literacy (DAEL) (lincs.ed.gov). The compelling idea behind digital literacy education is to ensure digital inclusion by raising the quality of general awareness and critical thinking among learners—a contention echoed by the Association of American Colleges and Universities (AAC&U) in

their publication, *Greater Expectations* that envisions college graduates in the role of "integrative thinkers who can see connections in seemingly disparate information and draw on a wide range of knowledge to make decisions" (aacu.org).

Other western nations also emphasize the importance of digital education as part of their broader educational goals. For instance, the United Kingdom has in place the Digital Inclusion Strategy with the aim to reduce digital exclusion. The main implications of the plan are outlined in terms of skill acquisition, ICT connectivity, and equal accessibility. The government has adopted the Action 15 document with the stated purpose to "'Collaborate with partners across public, private and voluntary sectors to help people go online'" (gov.uk). On a larger scale the European Union (EU) has under taken the Digital Literacy 2.0 funded in the "Lifelong Learning Programme" to bring Web2.0 affordances within the ambit of everyday life. The salience of digital literacy is recognized as "one of the key competences to ensure social cohesion, active citizenship and personal fulfillment" (digital-literacy2020.eu). The most comprehensive plan for enhancing citizens' digital knowledge was envisioned by the European Commission Institute for Prospective Technological Studies. The institute's goals are premised on the notion that "participation in the digital domain is no longer a question of 'haves' or 'have nots,' but rather an issue of competence" so much so that digital literacy is accepted as one of the eight key competencies for "Lifelong learning." Within this context, digital literacy is identified as a "transversal key competence" that enables acquisition of other key competences like language, mathematics, learning to learn, cultural awareness, etc. The European Digital Competence Framework, the primary

instrument of implementation, contains 21 competences structured according to 5 areas: information, communication, content-creation, problem solving, and safety. A lot of emphases are laid for utilizing digital literacy for job searching process and improving employable qualifications (openeducationeuropa.eu).

Digital literacy penetration in South America presents a very different picture altogether. According to a World Economic Forum global technology report, the social and economic impacts resulting from ICTs are still somewhat low. Despite the efforts made by the government agencies to digitally connect its population, problems with infrastructure, political instability, regulatory policies and above all low skill base pose serious challenges (Bilbao-Osorio et al., 2013, p. 15). The ICT Development Index (IDI) 2011 of the major economies shows Argentina ranked at 56, Brazil at 60, and Mexico at 79 respectively (www.itu.int). Argentina in 2006 made a longstanding and comprehensive commitment to introduce digital literacy in educational sector especially at the secondary level. The highlights of the policy include improving computer infrastructure in classroom, training teachers to encourage adoption of digital technologies in pedagogy, developing appropriate educational content to integrate technologies, and implementing One Laptop per Child (OLPC). The Digital Literacy National Campaign, started in 2006, promotes digital literacy in conjunction with Encuentro TV channel that regularly broadcasts quality educational content to schools. Further, the creation of the national portal, www.educ.ar, facilitates teacher training, connects schools to the information superhighway, and develops and delivers digital content for education purposes (Lujambio et al., 2008, p.80-81).

Compared to South American countries, Asian economies perform better when it comes to diffusion of digital literacy. A quick survey of the Association of Southeast Asian Nations (ASEAN) reveals that all eight member–nations have progressed in the direction of digitizing social and cultural life of their citizens (Bilbao-Osorio et al., 2013, p. 15). For instance, The Digital *Saksharta Abhiyan* (DISHA) or National Digital Literacy Mission (NDLM) envisaged by the government of India in 2015 aims to bring at least one member from the household to participate and train in digital literacy. Given the complex diversity and huge population of India, the program enables the participating families to nominate one

member to undergo the certificate training. In the Indian context, digital literacy is defined as "the ability of individuals and communities to understand and use digital technologies for meaningful actions within life situations." The introduction of the concept proceeds through two staggered levels, (a) appreciation of digital literacy which includes orientating with and operating digital devices like mobile phones and tablets, and (b) basic digital literacy which enables active citizenship through participating in e-governance (ndlm.in). In addition to government initiatives, there are numerous private agencies and organizations involved in the idea of digital literacy for the commons. The "Hole-in-The Wall Education Project (HiWEP) started by a private individual in the late 90s has over 300 learning stations for educating poor and disadvantaged children in India and Africa. Using a principle known as "Minimally Invasive Education," HiWEP installs networked computers or learning stations in public places like streets, market places, and playgrounds with the purpose to attract and encourage young children to learn ICTs in independent, self-organizing, and sometimes collaborative environments (Mitra & Dangwal, 2010). The project has received a lot of traction among underprivileged communities where technology access is a chronic problem. HiWEP has been praised by various international organizations including UNESCO and continues to remain a crucial instrument for spreading digital literacy.

Global diffusion of digital literacy is based on the idea of strategically exposing the populations to the practical and ever changing dynamics of digital technologies. Regardless of global economic status, the digital literacy policy discourse is dominated by three fundamental optics: reach, penetration, and applicability. Reach entails closing the digital gap, penetration involves targeting to specific needs, and applicability concerns transference of competence for performing activities within social contexts. In the case of the developed nations, the quantum of applicability is very diverse and complex and is thus central to policy implementation. For most developing nations, however, the challenges are capacity building and task prioritization and hence reach and penetration act as vital indicators. Interestingly, the global diffusion pattern reveals distinct strategies, varying across geographic, cultural, and political scales. For instance, while the EU focuses on employability aspects, the United States is more concerned with early exposures at institutional levels from K-12 upwards. Similarly in the case of South America, the emphasis lies on infrastructure while India, being a collectivist culture, attempts to create a large "family" of digital users by targeting individual households.

ISSUES AND CHALLENGES

Lack of consensus among researchers is a major hindrance to developing a theory of digital literacy that could be translated to educational contexts to serve the current generations of students. Eshet-Alkalai (2004) suggests that "indistinct use of the term causes ambiguity, and leads to misunderstanding, misconceptions, and poor communication." In the absence of a consolidated definition, educators are faced with the challenges of curricular development and identifying proper assessment techniques consistent with students' learning objectives; an allied problem is reorienting teachers toward embracing a philosophy of digital literacy that can ultimately address the practical and social needs of students. As the notion of literacy shifts from a text-based syntactic to a graphic and link based semantic conceptualization (Nielsen, 1993), digital literacy must be understood as a moving target because digital technologies evolve rapidly. This has led to question the assumptions whether the so called 'digital natives' are truly equipped to understand and use ICTs in their current iterations. The problem is more acute at the K-12 level where in absence of a unified digital literacy curriculum, the institutions are capitulating to what

is referred to as the "standards movement" (Trotter, 1997 in Boechler et al., 2014) conceived by the International Society for Technology in Education (ISTE)—an organization dedicated to "leveraging the use of technology in K-12 education" (Boechler et al., 2014). Thus, as 'screen becomes the dominant site of texts,' emphases are laid on measuring concepts of digital literacy through qualitative, quantitative, normative, and formative assessment structures such as, self-reported surveys, Software Recognition Test (SRT), Educational Activities Checklist (EAC), Recreational Experience Scale (RES) (see, Boechler et al., 2014); other formulations include code breaking, text-participating, text-using, and text-analyzing (see, Hinrichsen & Coombs, 2013) and operational digital literacy, usage digital literacy, communication and interaction digital literacy, and creation digital literacy (see Lee, 2014). The strategic integration of these techniques in curricular mapping remain vital as also properly training and upskilling teachers who ultimately impart classroom knowledge.

Another important aspect worth considering is digital literacy is not just an educational construct; it must also be fundamentally approached as a "social fairness issue" (Seale, 2009). The viewpoint generates awareness about digital divide and ethnocentric biases— two critical concepts surrounding the social aspect of digital literacy. In the prevailing circumstances social, political, and commercial activities are increasingly structured on ICTs and therefore for population with low digital literacy competence are at a risk of further marginalization. This divide or gap can potentially disengage individual from active citizenship, creating practical barriers for activities like accessing heath and government information, public service information, engaging through social media, learning in mediated environments such as Massive Open Online Courses (MOOCs). In this connection, digital literacy education or DLE has significant implications in addressing the issue of digital divide. The primary goal of DLE is to "support learners' knowledge and skill construction process through education and practices to enhance their digital literacy" (Lee, 2014). DLE aims to incorporate the social learning paradigm in life situations.

As indicated earlier, each society shapes and constructs definition of digital literacy according to its own social environment. However, many societies consider that other cultures must imitate their patterns of appropriation of digital technologies as "best practices" (Thatcher, 2010, p. 170)—a symptom of ethnocentric oversight. Digital literacy perceptions in global societies are influenced by numerous differentials including infrastructure, regulations, access, community participation, schools versus adult education, and individualism versus collectivism. It would therefore be a gross mistake to assume a universal approach. Consequently, effective measures can be developed to prevent ethnocentric biases in cross-cultural communications. According to Thatcher, one must be sensitized to the need to understand the rhetorical nature of the digital medium itself, to configure the characteristics of the medium to individual purpose, demands, and constraints, to assess the situation in the target culture, and finally to align to communication strategies to the expectations of target culture (p.169). This provides a functional framework that can negotiate the differences across disparate cultural configurations.

FUTURE RESEARCH DIRECTIONS

Current research in digital literacy reveals a solid direction toward developing a working definition of digital literacy and creating assessment tools for educational training. While establishing some type of functional metrics is important, it is equally important to build a corpus of scholarship addressing global discourse communities. Most research currently is confined to micro aspects of digital literacy, focusing mainly on theoretical constructs sometimes discounting the fact that in an information economy the scale

of operation is not just regional or national but is global as well. Therefore, given the digital literacy landscape of shared creativity and involvement in networked activities, it is time that conversations focused on exploring differences and trends between the west and the east, between the developed and the developing nations. Additionally, studies should refine the understanding of digital divide itself since most research on the digital divide tends to make a broad generalization using "multivariate analyses of several individual properties and aggregating them to produce properties of collectives" to support explanation (van Dijk 10). Generally, most approaches lack in conceptual clarity on one hand, and the idea of localization of use on the other. For example, in the west digital divide is defined in terms of use whereas in most other places it is still a matter of access to digital technologies. They also ignore or gloss over cultural factors and focus more on the overall use of technologies and their characteristics. Thus a repurposing of outcomes are warranted to take into consideration the more nuanced elements of digital literacy studies.

CONCLUSION

Digital literacy is multi-dimensional and no single context, culture or society has patent over its definition. Both conservative (skill) and skeptical (knowledge) orientations of digital literacy are still emerging, or at best tentative hypotheses and therefore extensive analyses are warranted before utilizing them as conclusive models. Knowledge paradigm enables individual agency by referencing one's situation unlike the skill model where the user adopts a top-down task orientated structure. Digital literacy is indeed a crucial "life skill" whose salience cannot be overestimated as society transitions from essentially a linear to a hyper-linear mode of information processing. The digital literacy arc has shifted from its original focus on computers to technologies and to finally the idea of human agency.

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