
LIS Education in the Digital Age for an African Agenda

JAYA RAJU

ABSTRACT

To provide an exposé of digital-age library and information science (LIS) education for an African agenda, this paper adopts an emergent qualitative research design by drawing on the literature on LIS education in Africa. It also draws on data gleaned from a survey of heads of schools of LIS in South Africa, and from content analyses of LIS school websites in South Africa and selected parts of the continent. The paper locates its narrative within Abbott's chaos of disciplines theory and concludes that the LIS discipline's "interstitial nature," its "fractal distinctions in time," and the resulting chaos of disciplines should not be seen as a crisis for LIS education in Africa and globally, but as an opportunity for a paradigm shift to broaden the LIS disciplinary domain and to stake an intellectual claim on this extended domain—and so contribute to the growth and development of LIS services in Africa within the context of an African development agenda.

RESEARCH DESIGN

An emergent qualitative research design is appropriate for examining African library and information science (LIS) education in the digital age because it allows the researcher "to learn about the problem or issue . . . after the researcher enters the field and begins to collect data" (Creswell, 2014, p. 186). This is different from a positivist approach, which requires the "research design to be decided on before data are collected" (Welman, Kruger, & Mitchell, 2005, p. 192). Bless, Higson-Smith, and Sithole (2013, p. 242) posit that in qualitative research, the researcher is an active role-player: "The researcher is the instrument," contributing to the "depth

and quality of the findings.” For this paper I draw on the literature on LIS education in the digital age, and the literature on LIS education in Africa; I also draw on data from a survey of heads of LIS education programs in South Africa, and from content analyses of the websites of LIS schools in South Africa and other selected parts of the continent. I have selected the LIS schools and their websites to be examined on the basis of my knowledge of them. Many of the bigger ones in Africa are located in South Africa, where I live. Following Bless, Higson-Smith, and Sithole (2013, p. 242), I have taken this vantage position in the hope of being able to contribute to the depth of my findings. I am, at the same time, cognizant of my obligation to be as inclusive and unbiased in my research as possible.

THEORETICAL FRAMING

The disciplinary identity of LIS has been extensively debated in the literature since the inception of librarianship as a professionalized occupation more than a century ago. Jurisdictional disputes are not uncommon in many professions, and in LIS such disputes have arisen in the past between *library science* and *information science*, and more recently between *LIS* and *computer science* and computer science subdisciplines, such as information technology, information systems, and software engineering (Bonnici, Subramaniam, & Burnett, 2009, p. 263; Burnett & Bonnici, 2006, p. 216). As Bonnici et al. point out, “over the past few decades, shifts in the professional market place, globalization and a rapidly changing technological landscape have further complicated the disciplinary identity formation process” (p. 263). Burnett and Bonnici, in their turn, have observed that “competition . . . is intensifying across higher education institutions offering preparation for the information professions” (p. 193). I have pointed out that disciplines like business information systems and knowledge management have also added to the disciplinary complications faced by LIS, and suggest that today, we have no alternative but to accept that “no single profession has a monopoly over the education and training of information professionals” (Raju, 2013, p. 251).

This is particularly evident with the emergence of the most recent contender to enter the contested information terrain, the iSchool. The iSchool “movement” originated in early 2000 with a number of LIS schools seeking to find ways to explain more effectively and in a coordinated way what information science actually was. The iSchools website (2014b) identifies their fundamental motivations in this way:

The iSchools are interested in the relationship between information, technology and people. This is characterized by a commitment to learning and understanding the role of information in human endeavors. The iSchools take it as given that expertise in all forms of information is required for progress in science, business, education and culture. This expertise must include understanding of the uses and users of information, as well as information technologies and their applications.

The iSchools organization consists of a range of schools, originally in the United States though now international, involved with information, computing, and information technology (IT): “Studying at an iSchool immerses students in . . . [the] dynamic and emerging iField where they confront the issues, opportunities and challenges of an information society in the 21st century in all their richness, controversy and ambiguity” (iSchools, 2014a). The “iField,” as an academic field of study, is considered to represent a paradigm shift, to be distinctively different from the “contemporary construction of the discipline of LIS” (Bonnici et al., 2009, p. 264; King, 2006; Mezick & Koenig, 2008, p. 595). The difference has been expressed by some schools dropping the “L” word from their names and highlighting the “I” word in different ways in their teaching, learning, and research agendas (Bonnici et al., 2009, p. 268; Chu, 2010, p. 93).

Bonnici et al. have used Abbott’s (2001) chaos of disciplines theory (originally developed for the discipline of sociology) to analyze the relationship between the iSchool movement and traditional LIS education in North America. Africa also is confronted in LIS by what might be described as a chaos of disciplines. For this paper I draw on Bonnici et al.’s 2009 study; I also use the chaos of disciplines theory as an epistemological lens through which to understand how LIS schools in Africa are dealing with the problem of disciplinary fragmentation in their attempts to stimulate and shape the growth and development of library and information services in Africa. Abbott’s framework for the analysis of the development of social science disciplines consists of a set of core principles, of which I single out two as particularly relevant here:

- *The interstitial character of a discipline:* a discipline that is “not very good at excluding things from itself . . . a discipline of many topics.”
- *Fractal distinctions in time:* refers to social science disciplines “rediscovering the wheel”—that is, “a generation triumphs over its elders, then calmly resurrects their ideas, pretending all the while to advance the cause of knowledge.” In other words, over time, a good idea resurfaces but is presented in a new guise to make it appear different from the old idea (Abbott, 2001, pp. 5, 10, 15).

I begin by providing a context of developments in LIS education in the digital age.

LIS EDUCATION AND THE DIGITAL AGE

LIS graduates are entering a world of work transformed by “the revolution in scholarly communication,” changes that have dramatically affected all aspects of library operations (Davis & Moran, 2005), particularly in the higher education sector. Barthorpe (2012) (among others) stresses that it is important for LIS schools to “understand the increasingly complex library environment and the needs of [for example] academic libraries,

particularly in the areas of information technology and data management . . . in the digital environment and scholarly communications areas” (n.p.). A commonly noted concern among employers is that new LIS graduates “are not adequately equipped for the jobs they are applying for,” and that modern academic libraries “need to be looking more broadly for specialist skills in areas such as . . . web development and computer science” (n.p.). Erdman (2007) posits that LIS graduates should receive an education that will allow them effectively to enter “a field where the line between librarian and computer tech is blurred more and more,” where a reference librarian, for example, should have not only disciplinary knowledge but also a knowledge of relevant technologies (pp. 93, 94). It is now “recognized and documented” that LIS has become technology-driven (Riley-Huff & Rholes, 2011, p. 129). Referring to the “complex [digital] environment” that LIS services and LIS education now need to mediate, De Bruyn (2007) points out that while on the one hand technology has “diffused the character of the LIS domain” (hence the chaos of disciplines referred to above), it has also democratized access to information. This has led to the “emancipation of the user of information,” which has opened the way to increasing jurisdiction contestation not only *within* LIS but also *beyond* its disciplinary boundaries (pp. 108, 109, 111).

LIS curricula now need to take cognizance of a range of diverse trends redefining the LIS sector and the delivery of information and information-related services in it. Among these trends are the following:

- Creating and providing access to digital documents and data
- Metadata handling
- Managing institutional repositories
- Digital curation
- Research data management

Most of these activities are technology-driven. In effect, the LIS environment, particularly in the higher education sector, has been transformed by technology into what may be called a “digital space” (Choi & Rasmussen, 2009; O’Connor & Au, 2008). As a result, there has been a trend in the sector toward the creation of new or redesigned job profiles as library administrators seek to make appointments of staff members with the necessary information and communication technologies (ICTs) skills (Riley-Huff & Rholes, 2011, p. 129). LIS curricula now have to be designed to prepare practitioners to respond to the needs of students, academics, researchers, and scientists in these new eScience and eResearch contexts (Luce, 2008).

Advances in ICTs have evolved the concept of *information* from “practice in specific locales (libraries) to practice in general (location independent)” (Bonnici et al., 2009, p. 273). Now, information professionals no longer deal essentially with information stored in a physical format (for example, printed books and journals) as in the past; they must increas-

ingly deal with digital content and retrieval using natural language-based searching techniques. This opens the way for entry into the digital-content realm and the LIS disciplinary space of disciplines like semantics, linguistics, and even mathematics (De Bruyn, 2007, p. 113), in addition to the encroachment of other disciplinary areas mentioned above like IT, information systems, and software engineering. It is clear that the new generations of LIS professionals to be competitive are increasingly having to acquire skills in the creation, management, and use of digital content (Ameen & Erdelez, 2011, p. 2). Given these trends, ICTs are shaping a major part of LIS curricula (Dillon & Norris, 2005, p. 294).

According to De Bruyn (2007), it has become critical for the LIS curriculum to establish a core of LIS and related competencies in order to be able to pin down a distinctive LIS identity in a highly diffused digital environment. He points out the urgent need “to reposition LIS and [that] we need to do it fast, because other domains are eager to take it on” (pp. 109, 114). A debate has raged in the literature (Dillon & Norris, 2005; Estabrook, 2005; Gorman, 2004—among others). Some take a traditionalist view of protecting the LIS disciplinary space from an “assault” by other disciplines (for example, Gorman, 2004); others see the so-called crisis in LIS education as a “moment of change” to be welcomed in providing an opportunity to stake an intellectual claim to an extended and broadened LIS disciplinary and professional domain (for example, Dillon & Norris, 2005). While supporting the increasing inclusion of more technology into the LIS curriculum, Estabrook (2005) cogently points out that LIS without a “strong linkage to technology (and its capacities to extend our work) will become a mastodon,” but technology without reference to core LIS “principles of information organization and access is deracinated” (p. 299). Instances of these core principles are those related, for example, to cataloging and classification, which have been fundamental to information organization since the inception of librarianship. Now, in the form of metadata management, they are critical to the growth of digital libraries and the retrieval of digital content.

LIS EDUCATION IN THE DIGITAL AGE AND THE AFRICAN AGENDA

The extensive literature on LIS education in Africa has tended to focus on specific parts of the continent, for obvious practical reasons. The largest number of LIS schools is to be found in South Africa (12), followed by Nigeria (8) and Kenya (7) (Ocholla, 2008, p. 467). African countries without LIS schools tend either to send individuals to other countries in Africa or else abroad for their LIS education. While the better-resourced South African LIS schools have, on the whole, comfortably integrated ICTs into their teaching, learning, and research processes (Minishi-Majanja, 2009, p. 153), in other parts of Africa, this is still problematic due to the lack

of resources and IT infrastructure support (Ocholla & Bothma, 2007, p. 166). Nevertheless, Ocholla and Bothma observe that LIS schools in Africa, initially providing education and training for librarians for employment primarily in libraries, have subsequently diversified their curricula to target the “broader information and emerging markets.” Libraries alone, particularly in the African context of developing economies—fewer new libraries being built, insufficient funds, shortage of positions, and so on—are not able to provide enough job opportunities for LIS graduates. Curriculum diversification has involved the integration into curricula of new information- and IT-related courses: for example, in knowledge management, information literacy, computer literacy, multimedia, media and publishing studies, records management, IT, computer technology, database hardware and software, information systems, and systems development (pp. 166, 154). These courses have sometimes been structured into new degree programs.

Onyancha and Minishi-Majanja (2009) have noted department name changes from “library science,” to “library and information science” (or studies), to “information science” (or studies); they have also identified LIS programs that have merged with other disciplines in order to tap into a wider professional information market and attract more students in the face of viability challenges in a competitive higher education sector (p. 111). I have interrogated this latter theme in a study of South African LIS schools, which concludes that “LIS schools in South Africa or elsewhere need to dig deeply and creatively into their epistemological resources and use the interdisciplinary nature of the LIS discipline to sustain their academic projects in a highly competitive and arduous environment” (Raju, 2013, p. 257).

In 2000, the UN-sponsored “Millennium Summit” developed eight goals for participating countries:

The Millennium Development Goals (MDGs) are the world’s time-bound and quantified targets for addressing extreme poverty in its many dimensions—income poverty, hunger, disease, lack of adequate shelter, and exclusion—while promoting gender equality, education, and environmental sustainability. They are also basic human rights—the rights of each person on the planet to health, education, shelter, and security. (UN Millennium Project, 2006)

Specifically, the goals are to

- eradicate extreme hunger and poverty;
- achieve universal primary education;
- promote gender equality and empower women;
- reduce child mortality;
- improve maternal health;
- combat HIV/AIDS, malaria, and other diseases;

- ensure environmental sustainability; and
- develop a global partnership for development.

These goals have a deadline of 2015.

Reflecting on LIS education in the context of the MDGs for Africa, I have suggested that “Africa’s challenges are numerous and often daunting and more so in a globalized context of unequal participants” (Raju, 2008, p. 126). I believe that every sector of African society, including LIS, needs to make an effort toward addressing these challenges. In the case of the LIS sector, this could include

- stressing literacy development;
- the provision of information necessary for daily survival in poverty-stricken communities;
- supporting research and knowledge creation aimed at responding to African social and economic problems; and
- “developing strategies to manage technology and information to help bridge the information access divide so that Africa can make meaningful contributions to a real knowledge society” (p. 126).

Albright and Kawooya (2007) have also examined how African LIS education might contribute to achieving such MDGs as the eradication of poverty, reduction in child mortality, and improvement in maternal health. They also argue that information provision and knowledge sharing in various available formats are critical to building the capacity necessary to achieve the MDGs in Africa. Albright and Kawooya use the example of the provision in LIS education of information about HIV/AIDs to demonstrate how this can “increase the effectiveness of African efforts to achieve the MDGs” (p. 118).

Raju, Smith, and Gibson (2013, pp. 45–46) point out that despite the desperate need for “trusted and relevant information for African development,” Africa has contributed only about 0.07 percent to the world’s research output, with much of this coming from one country—South Africa. Yet, as Ocholla (2008, p. 473) notes, “Africa presents unique opportunities for research that may not necessarily be available in the developed world,” such as research into indigenous knowledge and knowledge systems. Nevertheless, it is suggested that limited access to scholarly research materials has had a negative effect on the output of research from the African continent more generally, such that Africa has been relegated “to the periphery of world knowledge production” (Raju, Raju, & Smith, 2015, p. 161). In an article in the *South African Journal of Science* on the value of open access to the scholarly literature, Czerniewicz and Goodier (2014, p. 3) suggest that “in the African . . . context, the limited availability of research is a serious problem, one even worse for researchers not affiliated to universities and research institutions.”

One way of addressing aspects of the problem is for programs of education and training of information professionals to include the development of expertise in dealing with new, innovative methods of scholarly communication, such as publishing in institutional repositories and open access journals. Better exploitation of open access information resources, we suggest, will promote “the distribution of scholarly literature for the growth and development of research and society” (Raju et al., 2015, p. 160).

LIS education in Africa also needs to be cognizant of the *digital divide*—that is, the gap that exists between those who can access and effectively use ICTs and those who cannot. Minishi-Majanja (2009) observes that African LIS schools have the “responsibility of providing qualified staff” for LIS. This involves education and training programs that ensure that graduates acquire competencies that are aligned with the current digital environment. But it is also important that these programs are “relevant to the economic and social realities of the continent’s inhabitants.” She notes that recent educational delivery modes, such as *collaborative learning* (interaction among learners to share experiences, knowledge, information, and so on), *self-directed learning* (allowing learners to plan their own learning, access content themselves, and respond to critical issues), and *virtual classrooms* (that transcend time and space), all “pre-suppose the availability of relevant ICTs and ICT support services.” While Minishi-Majanja supports the integration of new technologies in teaching and learning, she also appeals for a “balance between incorporating modern teaching methods and marginalizing some students.” In the many African contexts where access to ICTs is problematic, participation in modern ICT-driven teaching methods will be a challenge, in that “many students have not yet developed efficient ICT-based learning skills” (pp. 153–154). Unfortunately, poverty and hunger, ethnic conflicts, the HIV/AIDS pandemic, high debt burdens, weak governance structures often plagued by corruption, large populations, and a host of other issues mean that many African countries have been unable to develop a secure and widely available ICT infrastructure (Raju, 2008, p. 117). At the same time, “some [African] countries have made greater strides than others” (Onyancha & Minishi-Majanja, 2009, p. 115). South Africa and Uganda are examples of African countries with strong ICT capacities.

The preceding section on LIS education in the digital age and Africa reveals

- an increasingly broad information focus (not a focus on libraries per se);
- an increased curricula integration of technology;
- an adoption of strategies to address viability issues in a competitive higher education terrain;
- possible contributions by LIS education to African development challenges (for example, achieving MDGs, increasing African knowledge production); and

- a need to be cognizant of the digital divide in the delivery of LIS education in Africa.

While some of these trends are particular to the African and other developing countries' contexts, many themes are similar to those that characterize LIS education in the global arena.

EMPIRICAL EVIDENCE FROM THE AFRICAN CONTINENT

It is evident from the literature that LIS education in Africa, like that within the global context, is being confronted by the chaos of disciplines discussed above and the blurring of disciplinary boundaries that this involves. In order to move beyond the literature to a more empirical approach toward examining LIS education in the African context, with a view toward strengthening its contribution to Africa's development agenda, this paper invokes two principles from Abbott's chaos of disciplines framework: the *interstitial character of a discipline* and *fractal distinctions in time*.

A discipline has *interstitial character* when it has an inherent tendency to "acquire" topics and when it has no "intellectually effective way" of denying them (Abbott, 2001, pp. 5–6). In other words, a discipline like LIS has a natural interstitial nature, in that, like sociology, gender studies, and other disciplines, it occupies *spaces* (hence *interstitial*) between other disciplines that places it in perpetual conflict with these other disciplines but also with aspects of itself. This latter point is reflected in changing disciplinary nomenclatures or designations, such as librarianship, library science or library studies, and information science or information studies, to say nothing of conflicts with other disciplines like information systems or IT.

Abbott's principle of *fractal distinctions in time* extends the mathematical term *fractal* to the concept of *disciplines* (2001, p. 17). A fractal is a mathematical figure whereby each part has the same statistical character as the whole (Soanes & Stevenson, 2004, p. 562). In the context of disciplines, a new context (for example, a digital library) repackages an "old" idea (cataloging and classification) in new language (metadata standards).

This paper presents relevant empirical data from a short questionnaire survey in 2013 and another in 2014 of heads of departments of the now nine LIS schools currently active in South Africa (rather than the twelve referred to by Ocholla [2008, p. 467]). These surveys are part of my ongoing research into LIS education in South Africa. The questionnaire data were triangulated against content analyses data from the websites of the nine South African LIS schools. As mentioned at the outset, I am South African, but my aim is to be as inclusive as possible in my research. Africa, however, is a huge continent, with not-always-reliable communication among the LIS schools in some of the states—unlike in South Africa where such communication is relatively easy. Hence, systematic data collection from some of the LIS schools is problematic. To overcome possible bias, I

asked Dennis Ocholla, a respected African LIS scholar, to independently identify six geographically dispersed though significant LIS schools in Africa, but not those in South Africa, whose websites could be used for the purposes of this paper. He identified these schools: the University of Botswana, University of Namibia, Makerere University in Uganda, Moi University in Kenya, University of Ibadan in Nigeria, and Univeristé Cheik Anta Diop in Senegal (D. N. Ocholla, personal communication, June 24, 2014). I analyzed the websites of the first five and left out the last because its website was in French, a language with which I am unfamiliar.

Table 1 presents data relevant to Abbott's (2001) notion of the interstitial character of the LIS discipline. These data are derived from this paper's literature review; from the 2013 and 2014 surveys of the heads of departments of the nine South African LIS schools; and from the combination of data from these schools, plus the five other African schools identified by Ocholla. Table 2 presents the LIS data relevant to Abbott's fractal distinctions in time aspect of his chaos of disciplines theory for analyzing the development and evolution of disciplines.

SUMMARY OF FINDINGS

The Interstitial Nature of LIS

In table 1, all three data sources show evidence of the interstitial nature of the LIS discipline. As mentioned above, there are frequent observations in the literature that technology, while democratizing access to information, has diffused the character of LIS by causing an overlap in the boundaries between it and other disciplinary areas, such as computer science, information systems, and software engineering. In Africa as well as elsewhere, IT has been increasingly included in LIS curricula. In table 1, we see that in the literature, LIS curricula in Africa have shifted from a narrow focus on librarianship to a broader information focus, resulting in the integration into the curricula of courses like knowledge management, information literacy, multimedia, media and publishing studies, records management, IT, and computer technology.

The interstitial character of LIS as seen in the literature is also evident in table 1 in the survey data from the department heads of LIS schools. All nine South African schools surveyed have incorporated the word "information" into their names; more than half have dropped the word "library" to demonstrate the diversification of their curricula to embrace the broader professional information market. Further, during the past five years, many of these schools have made staff appointments in specialist disciplinary areas like computer science, IT, knowledge management, information systems, publishing, archives and records management, digital curation, and enterprise content management. This indicates both the variety of information-related topics being embraced by LIS schools and the

Table 1. Abbott's chaos of disciplines theory: The interstitial character of LIS

Literature	Survey of LIS department heads	Websites of LIS schools
Technology has diffused the character of the LIS domain; that is, it has blurred its disciplinary boundaries.	All nine LIS schools surveyed have "information" incorporated into their names, with only four of the schools still retaining the word "library" together with "information"—indicating diversification of curricula.	"Integration of a wide variety of software programs . . . creative innovation abilities by fully utilizing all the advanced functions of computer software programs . . . highly technical computer [skills]"—such claims on one of the websites points to the blurring of disciplinary boundaries between LIS and disciplines like computer science and IT.
Technology has democratized access to information.	A LIS department head commented that a challenge is "catering for the broad spectrum of what should/ could be included within the field of information science"—an indication of LIS attempting to embrace the broader professional information market.	One of the LIS school's websites advertises a BA (information science) that is "aimed at jobs in the broad information field both within public and corporate organizations"—demonstrating the shift in focus from libraries per se to a broader information focus. This program focuses on "Software, Hardware, Networking, Internet, Practical Information Services Environment"—again pointing to the blurring of boundaries between LIS and disciplines like IT.
Technology has emancipated the end-user of information, leading to jurisdiction contestation with other disciplines.	Three of the nine LIS schools surveyed indicated that among new appointments made in the last five years, an LIS academic with specialist IT expertise had been appointed—an indication of the increasing infusion of IT into LIS curricula.	The biggest information science department in South Africa (SA) offers degree specializations in information science, multimedia, and publishing, with students being given the option to take courses in related departments (e.g., informatics)—demonstrating the diffuse nature of LIS.
The LIS discipline has been encroached on by the information technology discipline.	Other specialist areas in which appointments have been made in the last five years include knowledge management, information systems, publishing, and archives and records management—an indication of a variety of information-related topics being embraced by LIS.	
The LIS discipline has been encroached on by the computer science discipline.		
Advancements in ICTs have evolved information from being location dependent (for example, libraries) to being location independent.		
The focus of the information professional has shifted from physical storage to digital content and retrieval. Hence, free-text searching dominates over use of controlled vocabulary. This allows entry into this digital-content realm of disciplines like semantics, linguistics, and so on. Hence, the encroachment of these and other disciplines (information systems, software engineering, and so on) into the LIS disciplinary space.		

Table 1 (continued)

Literature	Survey of LIS department heads	Websites of LIS schools
<p>IT becomes increasingly infused into LIS curricula in Africa and globally. LIS curricula in Africa also have moved from a focus on librarianship to a broader information focus. This diversification has involved the integration of information-related courses like knowledge management, information literacy, multimedia, media and publishing studies, records management, IT, computer technology, and so on.</p>	<p>Two LIS schools have, during the past five years, made specialist appointments from outside the LIS discipline: one from computer science, the other from the area of digital curation/enterprise content management—an indication of the blurring of disciplinary boundaries between LIS and related disciplines.</p>	<p>The website of a big southern African LIS school outside of SA mentions “the infusion of ICTs in virtually all . . . [of its] programs,” and, significantly, emphasizes “information and knowledge management as a key resource . . . in national, economic, social and political development.”</p>
<p>LIS curricula in Africa also have seen an increased integration of technology.</p>	<p>In Africa also, LIS academic department names have changed from “Library Science” to “Library and Information Science/Studies” and “Information Science/Studies,” with LIS even merging with other disciplines, to embrace the wider professional information market.</p>	<p>While only a few SA LIS schools offer records and archives management, this specialization seems to be very common among African LIS schools outside of SA.</p>
<p>In Africa also, LIS academic department names have changed from “Library Science” to “Library and Information Science/Studies” and “Information Science/Studies,” with LIS even merging with other disciplines, to embrace the wider professional information market.</p>	<p>LIS curricula in Africa also have seen an increased integration of technology.</p>	<p>A large East African LIS school offers specializations in LIS-related areas, such as informatics, media science, and information science—again demonstrating the diffuse nature of LIS.</p>
<p>In Africa also, LIS academic department names have changed from “Library Science” to “Library and Information Science/Studies” and “Information Science/Studies,” with LIS even merging with other disciplines, to embrace the wider professional information market.</p>	<p>LIS curricula in Africa also have seen an increased integration of technology.</p>	<p>The oldest LIS school in West Africa interprets LIS to include librarianship, archival science, publishing, and information science—epitomizing Abbott’s description of a “discipline of many topics.”</p>
<p>In Africa also, LIS academic department names have changed from “Library Science” to “Library and Information Science/Studies” and “Information Science/Studies,” with LIS even merging with other disciplines, to embrace the wider professional information market.</p>	<p>LIS curricula in Africa also have seen an increased integration of technology.</p>	<p>Among the five African LIS schools outside of SA, their websites reveal some retaining the word “library” together with “information” in their names, others carrying only “information,” and yet others adding terms like “communication” or “archives”—an indication of the diversification of LIS curricula.</p>

Source: Adapted from A. Abbott, *Chaos of Disciplines* (2001).

blurring of disciplinary boundaries between LIS and related disciplines.

In table 1, the website data from the fourteen LIS schools (in South Africa and the other regions of Africa) show to what extent African LIS is a “discipline of many topics.” The websites, for example, refer to “advanced functions of computer software programs,” qualifications “aimed at jobs

Table 2. Abbott's chaos of disciplines theory: Fractal distinctions in time in LIS

Literature	Survey of LIS department heads	Websites of LIS schools
<p>The LIS work environment is transformed by technology/revolution in scholarly communication. Higher education LIS environments/academic libraries are particularly affected.</p> <p>The LIS environment has become highly digitized and very technology-driven.</p> <p>The use of technology in LIS has to be with reference to principles of information organization and access. For example, the principles of cataloging and classification, which have been at the core of information organization since the inception of librarianship, are now (in the form of metadata management) critical to the growth of digital libraries and the retrieval of digital content.</p>	<p>The head of the largest information science department in South Africa (SA) claims that "We don't teach most of the 'traditional' Library Science topics anymore"; this department's website does show a small specialization option via a library science elective, perhaps an indication of the large school being careful not to entirely abandon the "traditional" while focusing on "courses relevant to the trends of the information and knowledge age and economy."</p>	<p>One LIS school website comments that LIS students need to "develop new skills to remain abreast of the changing world of information and technology"; one needs to ask how much of this is really new or is, at least some part of it, traditional and longstanding LIS principles "wrapped up" in new technology.</p> <p>"Skills are needed to manage the valuable assets of data and knowledge"; note the use of the new concepts of "data and knowledge," which essentially refer to the traditional management of information (the same principles apply).</p> <p>Note the use, by one of the LIS schools, of the course title "Resource Description and Communication," which in essence refers to "cataloging and classification" among other information-organization-skills education.</p> <p>The website of a large southern African LIS school outside of SA, which remarks on the role of LIS in African development, shows a pronounced presence of traditional LIS courses (e.g., the theory and practice of cataloging and classification; information retrieval; and so on) in its core courses, with courses relating to the broader information market offered as electives.</p>

Source: Adapted from A. Abbott, *Chaos of Disciplines* (2001).

in the broad information field," and degree specializations in information science, multimedia, and publishing. Interestingly, the website of a large LIS school in southern Africa (but outside South Africa) makes reference to information and knowledge management as a key resource in national economic, social, and political development, thus foregrounding

the important role of LIS in Africa's development agenda. Like the South African LIS schools, the schools in the other parts of Africa have added the word "information," "communication," or "archives" to "library" in their names.

Fractal Distinctions in Time in LIS

In table 2, all three data sources show evidence in the LIS discipline of fractal distinctions in time. The literature repeatedly recognizes that the LIS work environment has been transformed by technology. The revolution in scholarly communication, driven by advances in technology, has particularly affected the higher education environment in Africa, where academic libraries have become highly digitized. However, the literature also recognizes that the use of technology in the LIS work environment has to be in support of the fundamental LIS principles of information organization and access. In table 2, we see old ideas, such as cataloging and classification, occurring in a new guise as "metadata management," which is central to the development of digital libraries and the retrieval of digital content. This is clear from the surveys of heads of departments in LIS schools, as well as in the content analyses of their websites. While the department head of the biggest LIS school in South Africa claims that they "don't teach most of the traditional Library Science topics anymore," the website of this school indicates that it still retains a small specialization option in the form of a library science elective. Perhaps this is an indication that the school recognizes that the basic principles of library science as a discipline still have a role to play, despite the school's focus on "courses relevant to the trends of the information and knowledge age and economy." Reference in one site to skills "needed to manage the valuable assets of data and knowledge" uses, in effect, a new language to refer to the traditional management of information, where the same library science principles apply. The website of another school refers to a course titled "Resource Description and Management," which upon examination reveals that it is basically a course devoted to cataloging and classification and other information organization skills but is buttressed by new technology and presented as involving new methods of scholarly communication. The website of the large southern African school (outside South Africa) mentioned above that emphasizes the role of LIS in African development also includes a marked presence of traditional LIS courses (such as the theory and practice of cataloging and classification and information retrieval) in its core offerings; courses related to the broader information market are offered as electives. This could, perhaps, be an indication of the technology challenges in developing African countries, where traditional libraries still play a significant role in the dissemination of information.

Viewed through Abbott's (2001) theoretical chaos of disciplines, it would appear that there is evidence to support the assertions that the LIS

discipline in Africa, as well as globally, is a discipline of many topics due to its natural interstitial character, and that it experiences fractal distinctions in time, in that fundamental principles of the discipline have, in the current technology-driven age, been repackaged in new language.

THE WAY FORWARD AND CONCLUSION

It seems clear that rather than viewing the chaos-of-disciplines phenomenon as a “crisis,” we should view it as an opportunity for paradigm shifts that contribute to growth and development of LIS for an African development agenda. Thus, in a highly diffused digital environment in which other disciplines are taking an interest in LIS disciplinary space, but also one in which LIS has been encroaching on the disciplinary jurisdiction of other fields (a result of its interstitial nature), LIS education should view this blurring of boundaries as an opportunity to extend and broaden the LIS disciplinary domain, as Dillon and Norris (2005) suggest. In this new domain, the skills set of LIS graduates would include not only important traditional skills, such as collection development, information organization, informational retrieval, and so on, but also the new skills required of graduates to be able to function effectively in new, complex digital environments. Here, according to Abbott’s (2001) fractal distinctions in time, the good ideas of past generations of LIS practices have not only been resurrected but also presented in new guises. The new generations of LIS professionals will then be able to create, manage, and use digital content in a variety of information contexts, including modern libraries, museums, virtual archives, and other real- or virtual-information contexts (Ameen & Erdelez, 2011). The literature reviewed, as well as the empirical evidence in this study, indicates that already there is an increasing integration of IT of this kind into LIS curricula. Mathews and Pardue’s (2009) study of job advertisements concludes that library administrators are seeking librarians with an increasingly wide range of IT skills. Estabrook (2005) points out that a significant percentage of full professors in LIS schools in the United States hold PhDs in fields other than LIS, such as IT and computer science. There is empirical evidence in this present study also of LIS schools in South Africa making academic staff appointments from outside the LIS discipline.

To repeat earlier observations in this paper, LIS education, both in Africa and elsewhere, in reflecting trends related to the interstitial nature of the discipline and its fractal distinctions in time, should move quickly to stake an intellectual claim to the broadened disciplinary space discussed here (De Bruyn, 2007). If it does so, as Dillon and Norris suggest (2005), it can make a valuable contribution to LIS both as a profession and a discipline. If LIS does not reposition itself and make this claim, we will see other and often better-resourced disciplines move into the space traditionally occupied by LIS. IT infrastructure and other resource challenges

should not be allowed to prevent African LIS education from making the broad disciplinary developments that will enable LIS to enhance the effectiveness of its contribution to the betterment of the economy and society of Africa.

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Jaya Raju is associate professor and head of the Library and Information Studies Centre at the University of Cape Town. She holds a PhD in information studies from the former University of Natal (now the University of KwaZulu-Natal) and has written extensively about LIS education and training in different types of higher education institutions and the implications of this for African development. Her current research focuses on the development of a national statement that can provide a framework for employers and employees in the higher education sector to measure existing LIS knowledge and skills as well as to identify areas for further knowledge and skills acquisition. She is currently the editor-in-chief of the *South African Journal of Library and Information Science* and is a National Research Foundation (NRF)–rated researcher.