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# MAPPING KNOWLEDGE CREATION AND RESEARCH LIBRARIES

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## ABSTRACT

*States that Research libraries have always supported knowledge creation primarily as a resource supplier based on traditional disciplinary schemas. Collections, considered comprehensive, were and still are based largely on “western-style” scholarship and its publishing avenues through books and journals. This paper will explore knowledge creation and the evolving role of research libraries to expand the universe of scholarship using mapping concepts. These concepts reveal alternative ways of supporting knowledge creation in a highly transformative, networked, and global environment underscoring the imperative to leverage and identify the full array of the world's knowledge.*

**KEYWORDS:** Knowledge Creation, Mapping; Research Libraries, Indigenous Knowledge

## Introduction

Knowledge is the basis for solving the world's problems and improving the human condition. Teerajetgul and Charoenngam (2006) assert that knowledge is the most important resource contributing to and enhancing competitive advantage and good decision making. Knowledge creation is core to the purpose and mission of research libraries and their universities. What types of knowledge exist? What are its components? What does it look like? What or who does it impact? What is the relationship between knowledge creation and research libraries? How do disciplinary and multidisciplinary approaches factor into knowledge creation, innovation, and discovery? Can mapping techniques reveal deeper levels of understanding knowledge creation? Exploration of these questions provides an alternative way of looking at the research library's contribution to knowledge creation and discovery in a rapidly changing global networked environment.

### **Components of Knowledge Creation**

Knowledge creation has been defined in a number of ways. Nonaka and Takeuchi's (1995) work is the best known. They argued that knowledge is the interaction and intersection between tacit and explicit knowledge through four different methods of conversion: socialization, externalization, combination, and internalization known as the SECI processes. Chou and Tsai (2004) contend that the composite effect of user involvement, knowledge cognition, and organizational mechanisms inform knowledge creation. Hawryskiewicz (2001) proposes a way to create places that bring explicit and tacit knowledge together conducive to knowledge creation. The famous anthropologist, Gregory Bateson (2000) considered knowledge to be the propagation of difference in a complex network or, to put it another way, he believed that categorizing differences in differences produces a hierarchy of knowledge. Malloy and Jensen (2006) argued that "it is from the relationships among these multiple flows of difference that what we call knowledge arises." These definitions and conceptualizations of knowledge creation as a process and a thing are complex. The complexities form a strong motivation for researchers to consider techniques such as mapping to gain greater insight into known and neglected sources of knowledge.

### **Concepts of Mapping**

Maps, themselves, have a metaphorical underpinning uniquely related to concepts of knowledge creation. Bateson (2000) noted the distinction between map and territory. A map used to navigate around a place is not the place, itself. Concept mapping, for example, can be used both to present ideas and their interconnections but also to visually link different generations of knowledge to provide a catalyst for brainstorming resulting in new knowledge. According to Ross and Dzurec (2010) these maps can be a "reflection of history and projected directions for the concepts identified." A rapidly evolving interdisciplinary area of research is mapping knowledge domains. It involves charting, mining, analyzing, sorting, navigating, and displaying knowledge. Its purpose is to ease information access, clarify the structure of knowledge, and support success of knowledge seekers (Shiffrin, 2004). This sounds strikingly similar to the purpose and activities of research libraries.

### **Mapping Knowledge Domains**

One of the most ambitious examples of mapping knowledge domains is Borner's (2010) *Atlas of Science: Visualizing What We Know*. The section called "Conceptualizing Science" provides the reader with an initial visual conceptualization of the global structure and evolution of science using seven major concepts accompanied by maps and text. They include: first scientific concept from which future science radiates; cumulative structure or building on knowledge; research specialty tubes or growth/new areas of exploration; research frontier epidermis which is all current research;

scholars movement and contributions; linkages between the many layers of science; and clustering in time, geography and topic space. This is one of the most comprehensive domain mapping works but others exist as well for individual disciplinary areas. Visualizing knowledge adds a powerful dimension to understanding past scholarship and for creating new knowledge.

Mapping digital networks is equally important in the 21<sup>st</sup> century. Gordon (2007) talks about the rise of networks which were separate and distinct from reality as described in movies such as *Tron* and *The Matrix*, to networks becoming completely indistinguishable from our social media-rich lives. “The everyday (the stuff of social and cultural life) is inching towards visibility.” Mapping is a way of making sense of infinite connections as well as determining and addressing knowledge gaps.

### **Libraries and Mapping Knowledge**

Giannoni (2010) takes yet another approach in her work *Mapping Academic Values in the Disciplines*. She asserts that values are central to the development of Western thought and are discoverable through analysis of scholarly discourse. Mapping knowledge, at least part of it, has been the traditional domain of libraries. Part of her analysis brings up an important reality about library classification systems in the section on library science (as a discipline). The systems are inherently flawed because they are dependent on mapping to fields at a particular time in history and the fields' acceptance by a critical mass of researchers. Many areas of global knowledge are missing from these schemas.

Zins and Santos (2011) explored how comprehensively libraries' three main classification systems (Library of Congress, Dewey Decimal, and Universal Decimal) map to knowledge. The researchers used *The 10 Pillars of Knowledge* tree to evaluate the systems (Zins, 2002-2012). They are foundations, supernatural, matter and energy, space and earth, organisms, body and mind, society, thought and art, technology, and history. Not surprisingly the conclusion, after a detailed analysis, was that none of the historically great classification systems adequately and systematically present contemporary human knowledge. In fact the researchers concluded that the systems are biased beyond repair. The Zins and Santos research underscore how library classification systems are largely discipline-based as defined by the academy. However, another conclusion is that mapping knowledge is not the same as mapping knowledge creation. Therefore, even if the classification systems mapped precisely to knowledge, they do nothing to map libraries in their totality.

From a practical point of view library classification schemas are primarily based on printed books and, therefore, fall perilously short of knowledge representation. As Dane (2003) points out in *The Myth of Print Culture* the books themselves are “products of what we call the printing press”....and not, in and of themselves, “print culture.” Even book scholars think about what “books” would look

like before books were created (Kelly and Thompson, 2005). The systems also ignore the array of services and expertise found in libraries, individually or collectively which directly supports knowledge creation.

Sanford Berman tackled the misrepresentation of knowledge in his 1971 seminal work, *Prejudices and Antipathies: A Tract on the LC Subject Headings Concerning People*. Librarians schooled in the 1970s, a period of great World unrest, will vividly recall his contributions. Unfortunately his work is largely forgotten today. He focused on the bias, bigotry, and sheer ignorance of the Library of Congress subject headings, a large part of the library mapping schema. He writes:

*Knowledge and scholarship are, after all, universal. And a subject-schema should, ideally, manage to encompass all the facets of what has been printed and subsequently collected in libraries to the satisfaction of the worldwide reading community...But in the realm of headings that deal with people and cultures—in short, with humanity—the LC list can only “satisfy” parochial, jingoistic Europeans and North Americans, white-hued, at least nominally Christian (and preferably Protestant) in faith, comfortably situated in the middle-and higher-income brackets, largely domiciled in suburbia, fundamentally loyal to the Established Order, and heavily imbued with the transcendent, incomparable glory of Western civilization.*

His work, thought by some to be overly strident and radical at the time, eventually moved the Library of Congress and the library profession to change, albeit slowly, the most obvious of the biased LC subject headings and acknowledge the flawed nature of the schema. This schema is still based on published works held in libraries and does not adequately address knowledge found in many other forms. Today we rely less on the supposedly improved LC subject headings and more on the power of key work searching and the like. At least the rest of the world operates this way opening up more resources for rich knowledge creation

Research libraries have traditionally collected and curated scholarship located in books and journals. These collected works are vetted in a variety of ways and emanate from the disciplines or emerging interdisciplinary fields supported by colleges and universities around the world. Additionally, research libraries collect original sources such as photographs, manuscripts, letters, records, and unique items in a variety of formats. In the 21<sup>st</sup> century there has been a shift to collect and steward content of different types. Data management and curation is a fast growing area in the research library domain. And, data of all types is of interest and certainly a huge building block for knowledge creation. Libraries provide inspirational physical and virtual spaces for knowledge creation increasingly with sophisticated discovery tools to transport the scholar into the vast networks of knowledge. However, a global map of even the most comprehensive resource types will reveal many blank spaces in the context of the world's actual knowledge.

The most comprehensive attempt related to actually mapping libraries is Lankes' (2011) *The Atlas of New Librarianship*. Lankes approach is completely different than a disciplinary or knowledge-based mapping or a library classification schema. His goal is to promote “a worldwide view of librarianship not founded on materials, but outcomes, and learning.” He believes that (2011) “the mission of librarians is to improve society through facilitating knowledge creation in their communities.” Thus, Lankes is actually mapping librarians' roles and responsibilities rather than the institution itself. Ideally his approach combined with disciplinary, multidisciplinary, and indigenous knowledge strategies could result in a map that acknowledges the critical nature of library support for knowledge creation.

Lanke's work inspires reflection on the role of services in mapping knowledge since knowledge is based on some kind of interaction, not on the book or object by itself. Sampson (2012), a management professor, studied the visualization of service operations apart from the traditional operations management approaches which look at manufacturing management. He uses the Process-Chain-Network (PNC) framework to help visualize services with an eye towards depicting complex service environments, identifying value propositions and cost drivers, and considering strategic alternative processes. Libraries are increasingly focused on the “suite of services” approach. The concept of the embedded librarian (Dewey, 2004) essentially blurs the lines of the map and organizational charts because the services are deeply embedded within campus offices, research centers, cultural venues and academic departments and no longer solely located in a physical or digital library. The embedded librarian brings a proactive approach to supporting knowledge creation through deep integration into a unit, a department, or a research institute. Smith and Sutton (in Zabel, 2011) have developed a map of embedded librarian models including by presence, client type, services, role, level of embeddedness, and organizational structure.

### **Global and Diverse Scholarship**

A recent presentation by Chris Bourg (2013) confirmed the knowledge gaps sparking the audience's realization that research libraries, even the largest, are shockingly lacking in depth when it comes to actually representing the world's knowledge. This is because of the way we choose and build our collections. Books and journals from many parts of the world are not collected, are not part of the interlibrary loan world, are not digitized, and are not embedded or a part of the “western” scholarly record. Likewise scholarship coming from diverse voices is not always collected and is slow to become part of the canon and, therefore, available to researchers for knowledge creation. Societal issues related to power, discrimination, and disenfranchisement stem, in part from the distortion in the historical record upon which knowledge is created.

Judy Chicago's *The Dinner Party* was conceived as a way to expose famous women throughout history using techniques that were traditionally not considered true art, such as ceramics painting and needlework. In her words (1979), "I had been trying to establish a respect for women and women's art; to forge a new kind of art expressing women's experience; and to find a way to make that art accessible to a large audience." This alternative way of knowing about women's culture through the ages also needs to be preserved and curated. Judy Chicago found a way, a schema, and a mapping strategy with *The Dinner Party* to present knowledge and ethos in a new way.

Sister Joan Chittister, the renowned Benedictine nun, saw *The Dinner Party* when it was on display in Cleveland, Ohio in 1981. She noted that many of the women in the installation were religious figures such as Sophia from the Old Testament, Judith from Saint Bridget, and Hildegard of Bingen to name a few. Chicago's work had a profound impact on her, so much so, that she subsequently arranged for three buses to take all of the Erie, Pennsylvania Benedictine nuns to Cleveland to see *The Dinner Party*. She next worked with a committee to encourage each chapter of the Federation of Saint Scholastica to create a version of *The Dinner Party* symbolizing women in their religious communities. In 1982 at the federation's meeting the sisters set up their installation and discussed the failure of the Church to recognize women's contributions through time (Bonavoglia, 2005). Another gap in the map of knowledge was filled that day through alternative ways of viewing and creating knowledge.

### **Indigenous Knowledge**

Knowledge and knowledge creation exists, not only from diverse voices, but in a multitude of formats worldwide. The indigenous knowledge movement underscores the reality that knowledge exists and has always existed in the intersection of people's unique understanding of their environment expressed and passed on orally and in other non-traditional ways. Proactively referencing indigenous knowledge requires collecting, stewarding, preserving, and making available this "other" world knowledge for the future. Research libraries are embracing 21<sup>st</sup> century approaches to support indigenous knowledge stewardship and creation. For example, at Penn State the University Libraries collaborates with the Interinstitutional Consortium for Indigenous Knowledge (ICIK) which is a global network of more than 20 indigenous knowledge resource centers across the world. ICIK is a network that promotes communication between those who share an interest in diverse local knowledge systems. These local knowledge systems are an integral part of current and future knowledge creation.

Indigenous people, themselves, are mapping their knowledge for cultural survival and as a way of communicating and managing their lives. The need to document and package this knowledge, much of it intertwined with the natural and cosmic world, in a meaningful way, has given rise to the use of

maps and mapping. “Mapping indigenous knowledge thus allows this information to be disseminated more widely than is possible by traditional oral means or even through written languages” (Chambers, et.al., 2004). These maps surface what Muehrcke and Muehrcke describe as the missing essence of what might look like vast, empty space on traditional western maps (1998).

Libraries and archives are more complex than an objective storehouse and preserver of the raw materials for knowledge. They are fundamental to people's cultural identity over time. Archives are deeply affected by their historical context and, therefore, the stories they tell is not necessarily accurate or complete. The documentation trail of pre and post-apartheid South Africa is an example of how the preservation of “history” and the storytelling that goes along with it changed dramatically leading to a much more inclusive representation of the country through archival means. The 2002 book *Refiguring the Archive* delves into aspects of reconceptualizing the archives in South Africa. Hamilton, Harris, and Reid assert that (in Harris, Taylor, Pickover, Reid, and Saleh, 2002) “the archive is porous to societal processes and discourses.” The contents of a so-called archive over time can be subject to purposeful editing or omission of important material out of ignorance leaving even more blank spaces on the knowledge map.

Increasingly scholars are focusing on how knowledge is produced, shaped, and then preserved. The inclusion of oral history, artifacts, and a myriad of other forms of knowledge transmission should be part of the total picture of human accomplishment and knowledge. Furthermore culture and knowledge are not flat but multidimensional and richly layered systems of thought. The study of memory provides another way of examining the full range of historical knowledge representations. In their groundbreaking book on memory Kuchler and Melion (1991) surface the notion that memory is not just a place where data are stored to be retrieved later but that “memory is a dynamic process informed by the cognitive experiences through which images are fashioned.” The process of expressing memory surfaces its many manifestations. The Luba of central Africa map memory through the creation of stools, staffs, and other visual devices. Roberts and Roberts (1996), in their award winning book *Memory: Luba Art and the Making of History*, detail the rich knowledge preserved in Luba art. The lukasa memory board is a prime example of explicit mapping and referencing of geography, architecture, and the cosmos. The memory boards “links place, memory, and body on a plane that allows different readers to roam through its 'landscape' along trajectories of their own choosing.” There are numerous examples throughout the world of textiles, artifacts, and other creative methods of presenting narratives and preserving knowledge for future generations.

The digital age is providing new ways of “collecting” and innovative partnering which cross country, political, and societal boundaries addressing major gaps in the knowledge map as well as strategies to curate materials at high risk. The Human Rights Documentation Initiative at the University of Texas

Libraries preserves human rights documentation and “exemplifies how research libraries may continue to prove their relevance only for the advancement of human knowledge, but also for the promotion of social justice” (Heath, et.al., 2010). The HRDI is committed to the long-term preservation of fragile and vulnerable records of human rights archival materials, and the advancement of human rights research and advocacy around the world. It also archives websites, reports, audio, and video, photographs on human rights struggles that are produced by individuals or small organizations who lack resources for widespread distribution of their work. Examples of this growing collection include:

- Free Burma Rangers
- Genocide Archive of Rwanda
- Museo de la Palabra y la Imagen (El Salvador)
- Texas After Violence Project

Other human rights libraries with similar missions are found at Columbia University, Duke University, the University of Minnesota, the University of Connecticut, University of California, San Diego, and the Center for Research Libraries (Global Resources Network Human Rights Archives and Documentation Project). These efforts are made possible by sensitive and creative partnerships combined with the application of innovative technologies. These materials are critical for an accurate understanding of political and cultural struggles over time.

Hidden resources are not just from other countries. Wachsberger reminded us of the many hidden resources and underground publications at risk in the United States in *Voices from the Underground* during the Vietnam Era. His book serves as a map, at the time, to forward thinking libraries that collected the material before it disappeared. A prime example is Northwestern University Library's *The Women's Collection* begun in 1968 (Wachsberger, 1993). This robust collection of periodicals, leaflets, and pamphlets was put together before the women's movement and other alternative movements of the time faded. Ironically Joseph W. Grant, the books publisher, had to start his own press in order to publish underground literature important to the history of the era, including this book, because no established press would do so.

#### **An “Old” Map Becomes New**

The evolution of digital humanities scholarship and accompanying services literally makes doing textual analysis, an ancient scholarly methodology, new through powerful digital-based tools and searching strategies. Treharne notes that “textual culture is not simply about manuscript or print or digital text” but spans all technologies from the past into the future (Da Rold and Treharne, 2010).

Scholars no longer have a singular focus on the moment in time when it was produced. They literally use maps and mapping tools to visualize the cultural context of the texts and a myriad of other technologies to gain new insight into the historic texts and their environmental context. At the 2013 Digital Humanities Conference, University of Nebraska-Lincoln, Evans and Jasnow (2013) presented “Mapping Homer's Catalogue of Ships” which won the conference's Paul Fortier Prize. This work is a wonderful example of how application of mapping tools (GIS) enabling spatially informed linguistic analysis has already led to important new insights on Homer's narrative structure. The University of Virginia Library provided a suite of services to support their work, an example of the emerging digital humanities service infrastructure provided by research libraries in addition to relevant scholarly resources.

### **Mapping and Building New Knowledge at the Interfaces of Cultures**

Michael Harris Bond (1997) writes about the interfaces of cultures and challenges people to seek out alternative ways of thinking and living. He says “reaching such questions requires that one travel in atypical ways; one must first expose oneself to the unfamiliar.” A relevant and vibrant future requires that research libraries navigate at the interface of a hugely diverse set of campus and academic cultures that approach learning and scholarship in very different ways. Librarians, throughout the world, need to learn from cross-cultural research in building collections and services based on how these different cultures work and what they require rather than on what we think they require. Mapping at the edges is an important strategy for these new ways of collecting worldwide knowledge and the services required to harness it as a basis for new knowledge.

### **Conclusion**

Research libraries must map to scale when working at the interfaces of cultures to advance collections, programs, services, and physical/virtual spaces to meet the requirements of comprehensive global knowledge creation. Successfully mapping to scale means ramping up services to meet the needs of large numbers of students, faculty, and global scholars; and identifying the vast treasure trove of scholarly resources found in all forms around the world. The knowledge creation map must be filled in with alternative ways of knowing and expressing knowledge. Research libraries not only play a crucial role in acquiring, providing access to, and preserving the enormous diversity of knowledge, but also in actively supporting knowledge creation which leverages this rich landscape finally made whole.

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