Communications

From the Great Smokies to the Mountains of the Moon: U.S. and Ugandan Librarians Collaborate in a Digital World

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Scholarship and learning are truly global endeavors, and rightly so given the challenges of the twenty-first century. Higher education is increasingly at the forefront of these endeavors, pursuing international initiatives in support of teaching, research, and learning. Academic libraries throughout the world embrace this imperative for international understanding in today's turbulent environment. The University of Tennessee Libraries acted on the imperative through a very personal and direct collaboration with the Makerere University Libraries in Kampala, Uganda. This article describes how two different universities, seemingly worlds apart, forged an enduring, exceptional, and mutually beneficial partnership through a focus on information technology.

In the summer of 2001, the Makerere University Libraries (MUL) contacted the University of Tennessee Libraries (UTL) seeking a U.S. partner to join in a collaboration, advancing MUL within a university-wide initiative funded by major U.S. foundations.

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At first UTL was not convinced that it would be an appropriate partner for MUL. UTL does not have a strong Africana collection, and its emerging African studies department is modest. However, when UTL discovered that the project focused on applying technology to access and deliver information resources, it determined that UTL, an early adopter of and innovator in technology applications was an ideal partner. In particular, UTL's interlibrary loan and document delivery operations proved attractive to MUL. In addition, UTL had recently received a major grant to launch the Digital Library Center (DLC). This variety of expertise and services was just what librarians at MUL were seeking, and so the libraries decided to pursue the collaboration.

Underpinning the collaboration is support from the Carnegie Corporation of New York's International Development Program (IDP) and the corporation's activity related to the Partnership to Strengthen African Universities program. In 2000, four foundations, the Carnegie Corporation, the John D. and Catherine T. MacArthur Foundation, the Ford Foundation, and the Rockefeller Foundation launched the partnership as a $100 million initiative supporting higher education in Africa. These organizations see higher education as key to advancing economic and social development. The organizations based decisions to provide support on two trends: (1) a large number of African countries are implementing democratic and economic reforms, and (2) universities are responding to these reforms in creative ways. Carnegie's IDP provides institutional support to selected universities and libraries in sub-Saharan Africa to improve and sustain services, augment women's educational opportunities, and contribute to overall socioeconomic development. IDP also emphasizes the importance of involvement with innovative peers in the United States through participation in networks and information sharing.[1] Carnegie provided funding directly to MU and, in turn, MU funded the majority of UTL's participation described here.

MU, located in Uganda's capital, Kampala, is the oldest university in sub-Saharan Africa. The university went into a deep decline during the Idi Amin era which continued after the National Resistance Movement assumed power in 1986. It wasn't until the early 1990s that the Ugandan government increased emphasis on rebuilding education. A major shift towards expanding student enrollment and increasing reliance on student-paid fees and tuition rather than total government support provided the basis for the positive changes in the last dozen years.[2]

Formatting a strategy to guide the partnership

As one initiative propelled by these waves of change, MU and UT embarked on this new, cooperative venture. The first step in the collaboration was to formulate a workable memo of understanding (MOU) between the two institutions, outlining in general terms the conditions of the collaboration. Once drafted, the MU university librarian, James Mugasha, traveled to Knoxville for final negotiations and program initiation. Because the MOU involved the two universities as well as the two libraries, both the respective chief academic officers and the library directors, Mugasha and Dean Barbara Dewey, signed the agreement. The MOU also served as an enduring symbol of the collaboration and provided momentum for the activities that followed.[3]

As the first exchange, Mugasha visited UT for a whirlwind week in February 2002. Mugasha toured the libraries, the campus, and negotiated the finer points of the MOU. He and David Atkins, UT librarian and exchange coordinator, planned UTL's first exchange visit to MUL.

More importantly, Mugasha's visit transformed the exchange from a speculative venture with a distant partner into a real, tangible, and human endeavor with like-minded colleagues wrestling with their many shared information service issues, such as staff training, library automation, electronic resources management, and resource sharing.

At this point, the cooperative-based discussions progressed into substantial enterprises. These enterprises fell into two categories: exchanges and projects. In the exchanges, librarians from both institutions alternate visits focused on training, knowledge sharing, and fellowship. From the visits, librarians create the projects—ongoing service efforts that span exchanges and integrate into the daily operations of both libraries.

Putting strategy into practice

Following Mugasha, Atkins traveled to MU as UTL's first exchange librarian (figure 1). He provided two weeks of training for MUL librarians and staff on a variety of topics. Using MUL's state-of-the-art computer lab, Atkins led programs on UTL; international interlibrary loan; Web site searching, selection, and creation; and modern online catalogs. Atkins then evaluated MUL's resource-sharing services and advised on the creation of the UTL/MUL Electronic Document Delivery Service (EDDS), establishing an interlibrary services link between the two libraries. Finally, Atkins and MUL librarians negotiated future projects and planned the exchange visit of his counterpart, Robert Kakembo, for May 2002.

Kakembo's exchange, like Mugasha's, provided orientation to the breadth of technical and public services provided by UTL as well as UT's School of Information Sciences. UTL departments managing technical services, reference, systems, and

Figure 1. UTL's David Atkins (front row, second from left) and MUL colleagues at the conclusion of his two-week seminar in May 2002

the DLC hosted Kakembo. In turn, he worked in-depth with Atkins and the interlibrary services staff, devising the final test models and procedures for the EDDS.

After much trial and error and e-mail communication, the partners devised operational EDDS architecture and the first cooperative project was underway. MUL uses a UT-hosted ILLiad lenders account managed by Tracy Luna, UT's lending coordinator. MUL logs into their account to place and track interlibrary lending orders. MUL opted to receive lending orders via standard e-mail.

MUL officially opened EDDS to faculty and students in summer 2003. To date, UTL has filled more than 80 percent or 260 MUL article requests. In spring 2004, Atkins began negotiations with MUL to establish a referral system to route unfilled EDDS requests to other U.S. lenders. The project includes assisting with MUL's use of Ariel, the de facto standard for interlibrary electronic document delivery. Once MUL implements Ariel to both send and receive copies, MUL will close on the goal of reciprocal resource sharing, serving as both borrower and lender—a major goal

for the next phase of the EDDS project. MUL cleared a major obstacle to ILL participation in spring 2004 with the launch of MakLIBIS, their VTLS-based library Web catalog.

To reciprocate Mugasha's visit as library director, Dean Barbara Dewey traveled to Uganda in September 2003. Dewey produced and lead seminars in a number of areas related to leadership and organizational structure. These seminars provided support for a strategic and focused approach to library and information, communication, and technology (ICT) developments at MUL. Seminars presented included the following issues:

- digital libraries and portals—new models for collaboration;
- organization of libraries and IT in the campus context;
- strategic planning for universities and libraries;
- IT and libraries—content and context; and
- leadership and university libraries

The seminars provided for extensive discussion about current and future projects and underscored a sustainable and long-term approach

in all activities related to the collaboration, including an overall development plan.

During Dewey's visit, UTL hosted its third MUL exchange librarian, Miriam Kakai. Kakai, head of MUL's periodicals and digital projects units, worked with her UTL DLC colleagues Anthony Smith and Arwen Hutt on digital project management, metadata, and production. Kakai's visit set the groundwork for the second project and third exchange—the Digital Library Initiative.

In April 2004, Smith, UTL's DLC coordinator, traveled as UTL's third exchange. Smith trained and advised MUL librarians on digital collection building and tested models for expanding EDDS. Each day, approximately thirty MUL staff attended Smith's seminars and expressed a high level of interest in the topics. The first two days focused on introductory training, offering MUL staff an understanding of the many digital library issues. Smith's presentations covered collection development, intellectual property rights, preservation, and marketing in relation to digital library building. He exhibited a number of digital collections, illustrating the usefulness and benefits of digitizing. Smith worked with Kakai and Dorcas Kigozi, head of Africana and special collections, in identifying photographs from MUL's special collection of Africana for digitizing and testing MU's network infrastructure for digital production, access, and delivery. A sample set of photographs were digitized following the standards established at UTL for digital images. With any online image collection, both scan quality and the dimensions of Web images are important factors for usability within an electronic environment. The question UTL sought to answer is whether the patron will be able to effectively browse an online photograph album using the network's throughput capabilities?

Smith also tested electronic document delivery options for EDDS.

Smith and MUL colleagues successfully installed Ariel document delivery software and tested procedures developed at UTL for MUL. A working Ariel installation offers MUL the ability to participate in interlibrary services with academic libraries across the globe.

Today, Smith and Kakai continue their collaboration, identifying digitization projects for the immediate future that offer the greatest benefit to MU faculty and students. A number of items within the Africana collection would be useful not only to MU scholars but to those from other institutions and the general public. MUL's newspaper collection includes the only known copies of many unique materials. Preservation is a serious problem with MUL newspapers. Digitization may well provide a viable solution. Of more immediate concern is developing services with the new technologies that will benefit MU students and faculty. For example, an electronic reserves service offers immediate benefit by providing students with digital copies of heavily used course materials currently available only in paper formats.

Technological hurdles

A larger concern for any academic library increasing its reliance on electronic access and delivery is the actual robustness and stability of the network infrastructure. UT librarians quickly learned from their efforts to implement Web-based services at MUL that they take the reliability and performance of UTL's networks for granted. For MUL, Internet and power outages are commonplace even though the university has one of the best network infrastructures among the higher education institutions (HEIs) in Uganda. The backbone of the network is a single-mode fiber optic system. In order to meet its Internet service needs, the university opted against its own very small aperture

terminal (VSAT) satellite communication system as a method to provide Internet service to the MUL community. Instead, a decision was made to lease a line through a commercial Internet service provider in Kampala. At the time, it was determined that leasing would be much more cost-effective than purchasing its own VSAT system. In spite of the savings gained from its decision, bandwidth remains an exorbitant expense for the scholarly community at MU. A 2004 study conducted by The Partnership for Higher Education in Africa found bandwidth cost in Africa to be very expensive in comparison to prices in the United States.[4] MU is paying more than US$20,000 each month for a T1 (1544 kbps) connection through its Kampala service provider. The same T1 bandwidth can typically be leased in the United States for four to five hundred dollars per month. In MU's Information and Communication Technology (ICT) master plan, there is a budgeted total of US$480,000 in expenditures for bandwidth in 2006. This amount is expected to increase in 2007 and coincide with the adoption of a student technology fee.[5] This will provide MU with better funding for bandwidth, although the institution is still dependent on its ISP for Internet availability and connectivity to the rest of the world. The 2004 study conducted by The Partnership for Higher Education in Africa recommended establishing a VSAT system in Europe or the United States in order to service a consortium of HEIs throughout the continent of Africa. The study concluded that the coordinated effort will provide more bandwidth at a lower cost. Improvements in MU's broadband service will become increasingly critical as its reliance on Internet information resources and services continues to increase.

A second issue for MUL's consideration is how it might change the current campus policy restricting Web service to the university's centralized IT department. For a twenty-first-century academic library, the

ability to administer its Web-based services, as well as the delivery of its constantly changing collections of electronic information, becomes as crucial as a library's ability to shelve its books in accordance with its own set of rules. Unfortunately, it is very likely that this will continue to be the policy at MU for some time until bandwidth improvements are made and the availability of technical expertise increases around campus.

An enduring partnership

All exchange visits and projects proved invaluable. The opportunity for UT librarians to see in person the central library facilities and branch libraries throughout the MU campus proved a fascinating and extremely valuable experience. The integration of technology at MUL has been largely successful. MUL's implementation of a new library system continues. Climate control and security of print collections are new priorities for MUL and the Carnegie Corporation of New York-funded project. Plans for staff and user training, particularly in accessing databases and full-text journals, are also underway.

UT librarians and staff gained much from the experience, including exposure to other cultures and the practical issues of international librarianship. The opportunity to work with librarians from Uganda both in the United States and overseas is an exceptional professional development opportunity. All concur that they share more in common with each other than previously thought. All hope that the collaboration will expand to involve others within the UT community. Currently, UT's School of Information Sciences is negotiating a cooperative exchange program with counterparts at MU's East African School of Library and Information Sciences. Both universities are comprised of

similar colleges and schools representing many of same disciplines. Both boast large student bodies and are public in nature. The prospect of an enduring collaboration between the two universities is bright given the commitment and excitement generated by Ugandans and Tennesseans alike. For more detailed information on this project, visit the exchange project Web site (figure 2) at www.lib.utk.edu/africa.

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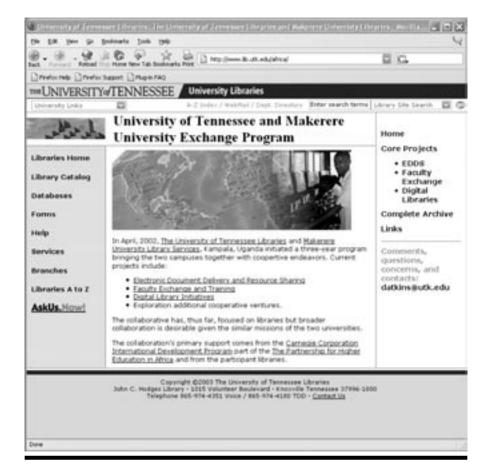
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Use of GIS for Presentation of the Map and Pictorial Collection of the National and University Library of Slovenia

Renata Solar and Dalibor Radovan

The Map and Pictorial Collection of the National and University Library of Slovenia encompasses map and pictorial documents that are part of the national collection. New technologies such as geographic information systems (GIS) provide a novel way to display, access, and research the valuable, interdisciplinary holdings of an institution. This paper discusses a pilot, Web-based application that explores the possibilities of GIS by creating a virtual collection of diverse materials. Spatial data are the basis for this digital archive on which other pictorial elements, such as views and portrait images, are connected by hyperlinks.

The Map and Pictorial Collection of the National and University Library

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of Slovenia (NUL) is responsible for the complete collection management of the maps and pictorial documents of the national production, covering acquisition, cataloging, preservation, and access. While this description of collection management implies the old, tried-and-tested methods, there have been significant modifications in the collection responsibilities.[1] Some new features can be considered. First, present day technologies enable new possibilities to promote library treasures, mostly those usually kept in special collections. In addition, such technologies have been introduced into mapmaking itself and into map collections. The evolution of modern cartographic techniques in different formats by mapmakers themselves can be seen everywhere.[2] Specifically, the NUL strategic plan for 2004–2008 placed a strong emphasis on access promotion, particularly through the extension of the virtual library. This paper describes a pilot, Web-based application that emphasizes the use of novel techniques, such as geographic information systems (GIS), for creating user-friendly access to diverse items within the collection. Experiences acquired by digitization projects of portrait photographs and historical maps of Slovenia, which have been created in the Map and Pictorial Collection, will be very useful for the further development of novel applications.

This article begins with a brief description of the Map and Pictorial Collection treasures, then describes the goals of the case study with an emphasis on GIS, then discusses method and contents before concluding with a consideration of results, problems, and possibilities of future development.

Items with great significance in the Map and Pictorial Collection

The map collection includes many rare items, including several older atlases and maps published before the mid-eighteenth century. Numerous items are not only of geographic and historic value but also of artistic value. The earliest cartographic treasure is a rare copy of Ptolemy's maps from the early sixteenth century. Twenty-six manuscripts are appended to the commentary by the Swiss humanist Joachim Vadian on the work of the Roman geographer Pomponius Mela titled "*Libri de situ orbis tres . . . ,*" which was printed in Vienna in 1518.[3] The oldest printed cartographic work in the National and University Library is *Isolario,* the third edition of the island maps by the Italian cartographer Benedetto Bordone from 1534. In addition, the map collection contains several maps of special importance to Slovenian cultural heritage. One such map is that of Styria dated in 1678 titled "*Styriae Ducatus Fertillissimi Nova Geographica Decriptio,*" the work of Austrian topographer Georg Matthaeus Vischer. Another original work of high cartographic quality is "*Ducatus Carnioliae Tabula Chorographica,*" executed in the mid-eighteenth century by the cartographer, astronomer, and mathematician Janez Dizma Florjančič de Grienfeld at an approximate scale of 1:110.000 on twelve sheets. The map collection also contains five editions of the map titled "*Zemljovid slovenske dežele in pokrajin*" published in Vienna in 1853 by Peter Kozler. This map depicts Slovenian ethnic territory with boundaries extending to where the Slovenian language was spoken and it uses the term "Slovenian country." As a consequence of the introduction of this term, "Slovenian country," use of the map was prohibited for eight years by the Austro-Hungarian government.

The pictorial collection contains comprehensive and varied material representing the past and present creativity of Slovenian artists and continues to contribute to the development of cultural heritage. Original works include watercolor paintings,

drawings, and graphics by Slovenian artists; old posters; calendars; a comprehensive collection of bookplates; thousands of old postcards; graphic sheets; lithographs; and a rich collection of portrait photographs of well-known Slovenians.[3]

Applicability of GIS

Developing information technology is enabling novel ways to interpret diverse collections within institutions. In the HIPPO (HIstoric-hyPer-PrOmenade: http://damon.nuk.uni-lj.si/gis/nuk.htm) case study, new possibilities provided by the use of GIS were explored. GIS provided a useful framework for organizing a digital archive, with the compilation and organization of information from diverse sources according to geographical location. Specifically, GIS enabled the integration of text, images, maps, and even sound recordings, in a single electronic space.[4] This provided a novel approach as well as research potential. The main theoretical model underlying this case study was the concept of exploring the possibilities of GIS across a diverse range of material, and it concentrated on the following objectives:

- to bring together the conservation and promotion of selected materials for education and research purposes by Internet users;
- to explore the possibilities of GIS as a tool for creating a virtual collection of diverse materials on a map-based access model, enabling users to access materials relative to a spatial locations;
- to provide users with an interactive, dynamic environment for exploring, manipulating, and transforming collection holdings, which was not possible with traditional print media; and
- to integrate and analyze historical maps with modern geographical data in digital form in terms of accuracy, cartographic

projection, cartographic presentation techniques, development of settlements, and changes of toponymy.[5]

Method

The goal of this case study was to bring together maps and pictorial items, which have been digitized in earlier projects within the Map and Pictorial Collection according to geographical location. The result was a dynamic Web page of valuable educational and research potential. It presented Slovenian cartography and toponymy from the mid-nineteenth century, including the appearance and importance of Ljubljana, the capital of Slovenia, during the same period, and portrait images of the poet France Prešeren (1800–1849), who took an active part in the city's social life.

The purpose was achieved by: (1) the geo-rectification and overlaying of historical maps of Slovenia and Ljubljana with contemporary maps; (2) the creation of a place-name point layer for historical and contemporary place names; and (3) the insertion of pictorial items (portrait images and views) at appropriate locations.

Data import

To convert print sources (including paper maps, views, and portrait images) into digital form, maps and images were scanned in 300 dots-per-inch resolution, raster format (TIFF images), with a flatbed scanner Saphir Ultra Linotype-hell, format A3.

Coordinate conversion and geo-rectification

The historical map "*Special—Karte des Herzogthums Krain*" as well as two city plans titled "*Croquis zur . . .*" from the mid-nineteenth century were integrated into the GIS and overlaid with contemporary digital maps.

Coordinate conversion was required to begin with, since the Austro-Hungarian cartographic tradition was to use "Ferro" (Ferro Island, Canary Islands) as the prime meridian and conversion to "Greenwich" (Greenwich, England) was necessary. Ten ground control points were defined for the "*Special—Karte des Herzogthums Krain.*" The resulting geo-rectified map was compatible with current longitude and latitude measurements. The ArcMap geo-referencing tool was used to perform an affine transformation from the (x,y) local grid coordinates of the map image to the (x,y) coordinates of the Universal Transverse Mercator (UTM) projection of the contemporary digital military map (1:100.000) for the same ten ground control points. The resulting image has been geo-rectified, enabling overlay operations. Geo-referencing of the two city maps of Ljubljana from the mid-nineteenth century was done by the same procedure.

Place-name point layer

In 1846, a brochure of German-Slovenian toponymy, the "*Gazetteer Alphabetisches Verzeichnitz aller Ortschafts und Schlösser Namen des Herzogthums Krain in deutch und krainischer Sprache,*" was published as a supplement to "*Special—Karte des Herzogthums Krain.*"[6] The gazetteer contains a very detailed and extensive list of historic Slovenian and German place names and incorporates some important information on tax counties and church hierarchy. Even distances to the nearest parish center were mentioned. It is a valuable source for historic Slovenian and German toponymy and was used as a prototype gazetteer for ten selected point places (settlements). As such it enabled users to query current and historic Slovenian and German names from the "*Special— Karte des Herzogthums Krain*" referencing the same geographic location,

linking the name of the place to the map image.

Hyperlinks, hot spots

Selected views, portraits, and one poem—the contemporary Slovenian anthem "Zdravljica"—were marked as hot spots on interactive maps. Hypertext describing the view, portrait, and author were added to images to provide additional educational information.

Software

Scalable Vector Graphics (SVG) were used as the application format. SVG is a standardized language for describing two-dimensional graphics and graphical applications.[7] It is based on XML and was confirmed as a Web standard by the World Wide Web Consortium in September 2001. In addition, use of SVG is promoted by many graphics and software companies and institutions, making it widely accessible. SVG is compatible with HTML, XML, Namespace, and Xlink, and therefore was used for all textual programs in this study.

Description of the contents

Diverse materials from the collection holdings, such as maps, portraits, views, and manuscripts were selected from the same historical period. The prototype Web site contains: (1) part of the map covering the central region of Slovenian territory from the mid-nineteenth century, the "Special—Karte des Herzogthums Krain"; (2) city maps of Ljubljana entitled "Croquis zur . . ."; (3) views of the city of Ljubljana dated from the same period; (4) portrait images of the famous Slovenian poet France Prešeren; and 5) the national anthem

"Zdravljica," written by Prešeren. Contemporary items such as a section of a modern digital topographic map of Slovenia at 1:100.000 and a digital city map of Ljubljana at 1:20.000 were also included to allow comparison with nineteenth century items.

"Special—Karte des Herzogthums Krain," von Heinrich Freyer, Wien, 1844–46, sixteen sections, five-colored lithography, composed map measuring 146 x 110 cm

One of the most important Slovenian cartographic works of the nineteenth century is "Special—Karte des Herzogthums Krain." The map was made by the famous curator, scientist, and cartographer Henrik Freyer (1802–1866) and it was published in sixteen sections at a scale of 1:113.500. The map was drawn by the cartographer Graf and engraved by H. F. Müller, a publisher in Vienna. The map was based on the 1834 Austrian military map, drawn on the Cassini-Soldner projection, with Ferro as a prime meridian. Shading was used for terrain interpretation while rivers and roads were drawn very precisely. The main advantage of the map is the extreme richness of Slovene-German toponymy and other geographical names. For the first time, Slovene names for small villages and even secluded hamlets were presented. Triangulation points and altitudes, as well as exhaustive geological data were novel features of the map.[8] For this study, section 6, Laibacher Kreist, was used, as it represents Ljubljana, the capital, and its surroundings. Coordinate conversion and geo-rectification enabled overlaying with a contemporary digital map. The map is zoomable, and, by clicking on the name of a selected area of the application, additional hypertext describing the author and the map is displayed.

"Croquis zur Beschreibung der Pomerialgränze der Provinzial-Hauptstadt Laibach und ihrer Vorstädte," Floder lith., A. Pappermann lith., Laibach, 1842, 1849

The mid-nineteenth century was highly dynamic for Ljubljana's economical growth. In 1849, a number of new industries developed in the town, the railroad arrived, and the city started to spread. Ljubljana was the Austrian provincial center for local government. At that time it had more than eighteen thousand inhabitants. Both city maps, "Croquis zur Beschreibung der Pomerialgränze der Provinzial-Hauptstadt Laibach und ihrer Vorstädte," editions 1842 and 1849, were executed in the land-registry drawing office as a joint initiative of the city hall and a committee for swamp colonization. Southern city provinces included areas of marsh, and local government strove hard to drain them in order to increase food supplies. The cadastral map was the basis for both "Croquies," which are important domestic cartographic pieces in their own right.

Both "Croquies" were geo-rectified to allow comparison with the contemporary digital city map. For detail searching, zoomability was included. By clicking on a selected area of the plan, a brief description of Ljubljana in the mid-nineteenth century can be displayed.

Contemporary digital maps

The map that represents Ljubljana is a part of the military topographic map at 1:100.000 in sixteen sections based on a UTM projection (ellipsoid WGS 84), and produced digitally in a hybrid vector and raster combination.[9] The digital city map of the Ljubljana city center, at 1:20.000, is in raster form only.

Views

Three views of Ljubljana from the mid-nineteenth century are included in the pilot Web site:

- black-and-white lithograph "*Laibach I*," engraved and printed by Jos. Wagner in Klagenfurt in 1843, 43 x 52 cm;
- black-and-white lithograph "*Laibach II*," engraved and printed by Jos. Wagner in Klagenfurt in 1843, 43 x 52 cm; and
- black-and-white lithograph "*Der Congress—Platz in Laibach*," engraved and printed by Jos. Wagner in Klagenfurt in 1844, 43 x 52 cm.[10]

By clicking on selected points on the maps, the views of Ljubljana from different locations, along with hypertext describing them and a brief biography of the author, can be displayed. Images are not zoomable at present, but this should be added in the new version of the application.

Portrait images of France Prešeren by famous Slovenian painters and the poem "Zdravljica," the national anthem

At the time when the "*Special—Karte des Herzogthums Krain, Crouquius der Laibach*" was executed, the most celebrated Slovenian poet, France Prešeren (1800–1849) was living. His poetic work, published in *Poezije* in 1846, represents the highest achievement of Slovenian poetry. Prešeren introduced a high Romantic lyric poetry that placed Slovenian literature on par with the acme of European literature at the time. His poem *Zdravljica* became the Slovenian national anthem in 1990. The original manuscript is held within the NUL Manuscript Collection. Several images of Prešeren made by famous Slovenian painters such as Božidar Jakac, Miha Maleš, Ivan Vavpoti , and Elko Justin were also included, as well as text describing Prešeren's life

and the artistic value of the portraits. These can be displayed by clicking on selected links.

Conclusion, problems, and possibilities for future development

This prototype Web site represents an initiative to present national library treasures in a novel way. It also highlights the possibilities for interdisciplinary presentation of material by using GIS. It explores one possibility of GIS by creating a virtual collection of diverse materials from the Map and Pictorial Collection of NUL. Spatial data are the basis for the digital archive in which other pictorial material is connected by hyperlinks. The GIS technology created new opportunities to display and link traditionally static prints. For example, GIS enables comparison of contemporary and historical data by their overlay, which creates new value for cartographic material.[11] It surpasses classical methods such as scanning and digitizing that allow only limited levels of survey and zooming.

The site presents only a very specific part of Slovenian history in the mid-nineteenth century, a time when Slovenian national perception was growing. This period is of special importance to contemporary national identity and is extensively studied in schools as part of history, geography, and art courses. Thus, the presented case study is expected to be a highly useful teaching tool. In addition, the Web page will hopefully highlight the value of the collection as well as promote the library to the general public.

While the material incorporated in this case study was highly selective, there is a potential to expand the contents of the existing application and to create a number of applications for other collections. One of the main questions regarding the extension of such applications is the amount of access time for loading

of the material. The loading time for maps is connected to the image sizes and formats. Currently, vector format is more suitable for map presentation while raster format is easier to access. Another question is whether to provide the user with just a picture image with basic bibliographic data or to create extensive descriptions that have educational and research potential but are time-consuming. Staffing is another area that is seriously affected by GIS and similar applications. The use of GIS requires a basic knowledge of programming, the use of databases as well as ArcGIS, a program that provides Web design for maps and geospatial indexing. Thus, libraries will have to either provide adequate training in GIS for their staff or hire GIS specialists, a solution that has become widely used in the map collections in the United States. Costs are also very important for the development of such technically demanding applications. A key financial question is whether money from state budgets (the most common way of funding the national libraries) intended for digitization projects will be sufficient for such applications or if projects will need extra funding. The need for additional funding for such projects is predicted to force libraries to search for new ways of income generation.

Importantly, access to old Slovenian, German, and contemporary Slovenian toponymy will be of interest to users outside Slovenia. It will be useful to extend the gazetteer to all place-names mentioned in the extensive, 145-page *Alphabetisches Verzeichnitz*, and link them to the contemporary digital register of geographical names. The major drawback is that the creation of such a toponymy database might be very time-consuming. The main ongoing plans are aimed at developing search tools and improving the dynamics of the Web page in general, thereby enabling more active user participation.

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