The Way to Innovation:
Collaborative Research and Development at the Taiwan e-Learning and Digital Archives Program
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Introduction

The twenty-first century dawned on a world undergoing an extraordinary transformation, brought about by an explosion in information technology; since then, the great challenge of libraries, archives, and museums (LAM) has been to harness new means of gathering and sharing knowledge in order to help citizens and organizations understand and build upon the legacy of human civilization.

For more than a decade, the Taiwan e-Learning and Digital Archives Program (TELDAP) has sought to unite the strengths of Taiwan's academic research in various disciplines through innovative information technology, and extend it toward research and public education by building a national digital archive and e-learning infrastructure on an unprecedented scale. The program's goal has been to showcase Taiwan's cultural, socio- and bio-diversity, to promote digital archives and e-learning in cultural, academic, socio-economic and educational applications, and to disseminate Taiwan's important cultural assets over the Internet. Through this information technology enabled program, it has moved beyond digital archives toward a new concept of “digital humanities”. Led by humanities scholars and information technologists, TELDAP is the first long-term national effort devoted to combining forces of professionals from the humanities, information technology and other disciplinary domains, to facilitate the collective preservation of our cultural heritage by LAM institutions. By comprehensively archiving and integrating Taiwan's cultural heritage, it is TELDAP's mission to develop and creatively promote national digital archives and e-learning applications; facilitate the development of Taiwan's culture, society, industry, and economy; disseminate Taiwan's experience in the global community to expand its visibility on the international stage; and sustainably manage national cultural assets. Fulfilling this mission has taken long and dedicated work from many individuals and organizations working across institutional and disciplinary lines, committed to overcoming the many challenges posed by this monumental project.

The mechanism and contributions of this ambitious program are a wholly unique development in digital libraries. As a national-scale digital research library, TELDAP provides a immense and rich data store for both amateur and professional researchers, with sources spanning 5,000 years of Chinese history into the present. By providing researchers with this wealth of interlinked knowledge in an accessible way, TELDAP allows researchers to understand their subjects in greater depth, and with a greater understanding of context, than ever before. Seeing clearly within the present, and finding
direction as we move into the future, depends heavily upon our understanding of the past; in providing researchers with a powerful and innovative tool for discovering and interpreting humanity’s history, TELDAP has helped lay strong groundwork for a continuing cultural legacy in the Chinese-speaking world and beyond.

The Development History

The TELDAP project lasted 11 years, under the sponsorship of the National Science Council. The project’s earliest roots were in a short-term pilot study conducted from 1998 to 2001. In 2002 and 2003, two separate initiatives were launched on a 5-year plan with continuous government funding. The National Digital Archives Program was initiated to digitize various kinds of archives kept at public and private cultural institutions in Taiwan. Concurrently, the National Science and Technology Program for e-Learning began to integrate various disciplines of science, technology, the humanities, and commerce to develop e-learning applications for academic research, education, and industry. These two programs were officially merged together on January 1, 2008 to form TELDAP, which organized eight key divisional projects – focused on content, technology, platform, applications, industries, education, language learning, and international collaboration - to develop a core infrastructure for the national digital archives. Since 2010, TELDAP has been under historian Dr. Fan-Sen Wang, Vice President of Academia Sinica as its Program Director. Through this program, Dr. Wang encourages collaborations and innovations among domestic and international research and cultural institutions, facilitating cooperation among distinguished scholars, cultural institutions in Taiwan and abroad.

Main Achievement

Through the combined efforts of experts from a wide array of fields to create, organize, and disseminate digitized knowledge, TELDAP has succeeded in providing a vehicle for scholars and the general public to transcend barriers of time and space in appreciating and utilizing knowledge of the nation's rich ecology and cultural heritage, as detailed in the documentary film The Treasure in the Clouds.¹ Twenty major content holders and more than one hundred libraries, archives, museums, academic institutions,

¹ Portions of The Treasure in the Clouds can be seen on YouTube at http://www.youtube.com/watch?v=qYooXgf6eCg
and government agencies have worked to provide content for TELDAP. In the past
decade, TELDAP has created over 700 websites and databases for use by researchers
and the general public, and has digitized and archived almost 5 million objects\(^2\) of
interest in the fields of archeology, biology, ethnology, history, religion, visual arts,
performance arts, social science, and more. Digitized objects include nearly 93,000 rare
books - amounting to more than 15,900,000 pages - and 320,000 artifacts, paintings,
calligraphy of vital importance to Sinology research.

**Scripta Sinica Database**

In addition to their academic interest, these precious treasures contain the
wisdom of our ancestors and a wide range of knowledge, which can be freely accessed
by the public after digitization; the Scripta Sinica database, developed by Academia
Sinica as part of TELDAP, is but one example. Scripta Sinica is currently the largest
Chinese full text database in public use that encompasses such an enormous breadth of
historical materials. The database includes *jing* (Confucian classics), *shi* (historiography),
*zi* (masters and philosophers) and *ji* (anthologies and collections). The content can also
be roughly divided into religious documents, medical documents, literature and
anthology, writings on politics and policy, encyclopedias, and collections of historical
materials. More than 670 varieties of Chinese classical texts with a total of 444,800,000
characters have been gathered in the database, which provides both amateur and
professional researchers with a convenient and robust search tool.

**Taiwan Temporal-Spatial Database**

Besides Scripta Sinica, efforts on building repository of historical maps and
spatial information is also an important contribution to the Sinology research community
worldwide. For example, the Taiwan Temporal-Spatial Database integrates temporal and
spatial data of different periods of Taiwan, allowing researchers to easily access the
geographic information and research resources pertaining to humanities and social
sciences via the Internet.

**Union Catalogue**

Objects included in TELDAP have been made available in multiple formats, each
containing standardized metadata and relevant attachments. The development of a
publicly accessible Union Catalog and single application interface\(^3\) provides the efforts
and holdings of disparate institutions with excellent cohesion, for users and developers
alike. All the item pages contain object descriptions, links to related objects, licensing

\(^2\) There are 4,950,764 digitized materials in Union Catalogue ready for public and research use.

\(^3\) The English-language portal for the union catalog can be accessed at [http://culture.teldap.tw/culture/index.php](http://culture.teldap.tw/culture/index.php)
information, and links to the original databases for further information and high-resolution images. The Union Catalog of TELDAP has more contributors, a wider variety of themes, and a larger amount of collected material than any other digital library in the Chinese-speaking world. The integration of LAM resources via TELDAP provides users of research libraries across the country with a more extensive perspective on their topics. Visitor traffic of the Web portal was 6,092,506 from 2008 to 2012.

In addition, over 200 industry partners have joined TELDAP in a national initiative to build an advanced infrastructure for e-learning, developing standards for classroom applications as well as resources to allow educators comprehensive access to digitized assets.

By developing standard operating procedures for digital archiving on a national level and employing international standards in data packaging, TELDAP has helped to ensure that the archives are accessible to the widest possible audience, both within and outside the nation's borders. More than 100 titles of guidelines for digitization procedures, metadata design, video enhancement, audio processing and retrieval, and language technology were developed as part of TELDAP. The project saw the creation of new and innovative information technology solutions to resolve issues with un-encoded ancient Chinese characters, working with broken archives, handling and processing big data, video streaming of multimedia, and providing remote backup mechanisms to ensure the data is protected. TELDAP’s innovations in language processing technologies, of fundamental importance to Sinology research, have laid an important part of the foundation for digital humanities.

**Future Plan and Sustainability**

Although TELDAP officially came to an end in 2012, the digital archives will live on. Continuing support and development is carried out by projects through public and private participation, and encouraged through open calls for proposals and competitions to utilize TELDAP digital assets in industrial and creative applications. TELDAP has been participating actively in the global collaboration projects over the years, contributing information to the Global Biodiversity Information Facility (GBIF), Encyclopedia of Life (EOL) and Getty Research Institute (GRI)’s Art & Architecture Thesaurus, and TELDAP project members will continue making contributions despite the closure of this program. For the integrated platforms and websites developed by the program, Academia Sinica will take charge of the long term maintenance and sustained development. In addition, funding provided by Academia Sinica and the National Science Council directed to the
TELDAP digital archives will allow us to continue work on open data, open access, sustainability, and digital humanities projects into the future.

Principal Players

More than 300 LAM institutions and 5,000 researchers specialized in different fields have participated in the project. Among them, the two most important persons are the Program Director, and Deputy Program Director, who are responsible to the smooth operation of TELDAP. Their names and short biographies are listed below.

Dr. Fan-sen Wang, Program Director of TELDAP

Dr. Fan-Sen Wang was appointed as one of Academia Sinica's Vice Presidents on January 1, 2010 by President Chi-huey Wong. He joined Academia Sinica in 1985. He is a Distinguished Research Fellow (2005) of the Institute of History and Philology and served as Director of the Institute from 2003-2009. He became an Academician in 2004 and was also the Director of the Tsai Yuan-pei Research Center for Humanities and Social Sciences from 2003 to 2004. Academician Wang graduated from National Taiwan University with a Master's degree in History in 1983, and received his PhD in East Asian Studies from Princeton University in 1993. His research interests include the history of intellectual thought, culture and academic scholarship from the Ming and Qing Dynasty to modern China. He was elected Fellow of UK's Royal Historical Society in 2005. Among his other honors he was awarded the Outstanding Scholar Award from the Foundation for the Advancement of Outstanding Scholarship from 1999 to 2004.

Vice President Wang was the Director-General of the Department of Humanities and Social Sciences, National Science Council from 2000 to 2002, and since 2003 has been a Member of the Council of Academic Review & Evaluation, Ministry of Education and the Advisory Committee on Humanities and Social Science Development, National Science Council. He is also currently a member of the Steering Committee at the Center for Chinese Studies and a board member of the Foundation for Scholarly Exchange (Fulbright Taiwan). In addition to his administrative posts, Academician Wang is also a faculty member of National Taiwan University, National Tsing Hua University and National Chung Hsing University.

4 For a complete listing of program members, see http://teldap.tw/en/Members.php
Dr. Der-Tsai Lee, Deputy Program Director of TELDAP

Dr. Lee received his PhD in computer science from University of Illinois at Urbana-Champaign. He is a Distinguished Research Fellow at the Institute of Information Science (IIS), Academia Sinica. Currently he is on leave from Academia Sinica and serves as the President of National Chung Hsing University. He was in charge of information technology aspect of the national digital archives program (NDAP) (1998-03), coordinating the cooperation of IT professionals and content experts of social sciences and humanities in various institutions participating in the program. He was the CEO of NDAP (2003-06) and Deputy Program Director of TELDAP (2007-12), devoting to the integration of technology research in content development and in the promotion and outreach of TELDAP through international collaboration. He gave keynote speeches about TELDAP at various international conferences, e.g., PNC, ICADL and notably at the award ceremony in Bamberg, Germany in April 2008, when receiving the Humboldt Research Award from the Alexander von Humboldt Foundation, Germany. Dr. Lee was with the Dept. of EECS, Northwestern University (1978-98), Program Director in the Division of Computer and Computation Research, National Science Foundation (1989-90) and Director of IIS, Academia Sinica (1998-08). He was elected Fellow of IEEE (1992), Fellow of ACM (1997), Academician of Academia Sinica (2004) and Member of TWAS (2008). He is on the Executive Committee of CODATA, ICSU, the Humboldt Ambassador Scientist in Taiwan, AvH, Germany and Chair Professor of Computer Science at National Taiwan University, Chiao-Tung University and Chung-Hsing University.
Supporting Documents

1. Websites:

- Program Website  http://teldap.tw/en/
- Chinese Digital Archives Portal (Union Catalog)  http://digitalarchives.tw
- English Digital Archives Portal  http://culture.teldap.tw

2. Organizational Chart:
3. **User Traffic of “Digitalarchives.tw” (Chinese Digital Archives Portal Site)**

   according to Google Analytics (2007.10.01-2012.9.30)

![User Traffic Graph]

4. **Publications - Digitization Workflow Guidebooks (English Version)**


   Underwater Video / Chinese Classics Full Text Database / Maps and GIS / Vascular Plants / Seal and Imprint / Archaeological Data / Painting and Calligraphy / Integrated Operational Procedures / Ceramics / String-Bound Book
5. Newsletter -


6. Documentary Film I - The Treasure in the Clouds

25 minutes version: http://www.youtube.com/watch?v=JkAiy6mo9eM
trailers (60 seconds) I. http://www.youtube.com/watch?v=P3iT4iCvyc4
II, http://www.youtube.com/watch?v=ZYrhhTAlTyI
7. **Documentary Film II** - The collaboration between US National Science Foundation (NSF) and TELDAP

A collaboration between TELDAP and US NSF was initiated during the 2008 TELDAP International Conference. This project aims to restore the damaged ancient artifacts digitally and to extract valuable information through the restoration. By achieving this goal, texts that were thought lost were able to be revealed and sole extant copies of manuscripts that cannot be safely analyzed by any other known means can be revived. The US team from the University of Kentucky came to Taiwan to work on the project and shot a video to document the whole process and results. Program Director Dr. Fan-Sen Wang was interviewed in this documentary as well.

![Program Director Dr. Fan-Sen Wang](image)

8. **Press Coverage** - Intelligent Times Magazine (2008.06)

The Full-text article: [http://teldap.tw/Program/ITMagazine.pdf](http://teldap.tw/Program/ITMagazine.pdf)

In this article, Deputy Director of TELDAP Der-Tsai Lee was interviewed by Intelligent Times Magazine. He introduced the achievements and technology innovations of the TELDAP which have been accumulated for years. He also described TELDAP’s success in promoting Taiwanese culture and intellectual economy to every part of the world, and makes the competitiveness of Taiwan be seen worldwide.

![Deputy Director Der-Tsai Lee](image)
9. Announcement of the Chinese AAT - a listserv message from the Getty Research Institute

via - http://lsv.arlisna.org/scripts/wa.exe?A2=ARLIS-L:c3a9c713.1202


from Ms. Hsin-Ning Liu, Research Assistant, Institute of History and Philology, Academia Sinica

The database collects varied information related to more than 10,000 Han wooden slips, such as explanations of meaning of the words, photos, measurement sizes as well as excavation places, and the information of the slips could be retrieved by the serial number of the slips and explanation of meaning of the words, which is a continent function for researchers. In addition, the most valuable part of the database is that it preserves color and infrared photography of those Han Wooden Slips, which are re-shot by the Institute of History and Philology, Academia Sinica and have not been in print yet. Compared with earlier photos, re-shot photos provide new bases for research, and bring new advantages to the researchers. The retrieved results can display earlier photos, color photos and infrared photos at the same time, which help researchers choose the clearest version for identifying, and providing explanations of, the meaning and status of words on slips.
11. User Feedback II - Experience of using “Tamsui-Hsinchu Municipal Archives” and others

from Dr. Peng-Sheng Chiu, Professor, Department of History, The Chinese University of Hong Kong

TELDAP gives me the idea of “interdisciplinary” research, which helps me discover the interesting part of the history and broaden the horizon of thoughts. Take “Tamsui-Hsinchu Municipal Archives” for example. “Tamsui-Hsinchu Municipal Archives” is a local official documentary of Tamsui and Hsinchu area in the middle as well as late period of Qing Dynasty in Taiwan, which records detailed information related to fighting over woodland ownership. When only reading these files, readers can see no more than lawsuit cases; however, through the integration of digitized information by TELDAP, the Program inspires my interdisciplinary thoughts. I start to think about the fact that those woodlands were used to grow Taiwan acacia as cash crop, and wonder how I can acquire specimens of those Taiwan acacia. When I came out with this relational thinking, it is clear that history is not only linking to Sociology, but also Botany or even Zoology. As a result, I begin to do interdisciplinary research. I no longer limit my research in humanity subjects, but develop an approach to communicate with natural science subjects.

Take a traditional Chinese folklore holiday – Duanwu Festival for another instance. With a history-oriented perspective, I can do research on the historical stories of Duanwu Festival and related art works such as paintings and calligraphies in Sung, Ming as well as Qing Dynasty. Nevertheless, with an interdisciplinary research approach, I access “The Exhibition of Cyber Island, Taiwan” (http://cyberisland.teldap.tw/), which is a website using multimedia and a theme-oriented approach to display various aspects of Taiwan, and find the images of dragon boat competitions as well as short films describing how denizen spouses learn to make rice dumplings (Zongzi). Those collections combined with stories make the image Duanwu Festival and its meaning in the latest era even more concrete and vivid. Through integration, a simple holiday can gather complex and relative information, which lead to creative thinking in various aspects.

12. Nominator’s Statement

from Dr. Lewis Lancaster, Department of East Asian Languages and Cultures, University of California, Berkeley

The statement is enclosed in the end of this document.
January 14, 2013

I am pleased to add my support to the nomination of Professor Fan-sen Wang for the Stanford Prize for Innovation in Research Libraries. He has been a major figure in the programs described below and the extraordinary size and success of them. I can think of no other figure who has contributed so much to our use of digital material for research.

The National Archive Project of Taiwan and the follow up program of TELDAP are two of the outstanding efforts ever made to digitize and make use of information. The terabytes of data in a multitude of fields provides users around the world with unprecedented resources for research. From its very inception, the National Archive Project set out a strategy of recording, indexing, displaying, and integrating the human record found in the museums, libraries, archives, and research centers of Taiwan. The work was done with great care and close attention to the “best practices” for computer aided collection and use of information within the confines of the new technologies. It was a major decision to continue with the national effort by making the material available and useful to the citizens of Taiwan and to those beyond the borders. This secondary activity has been done with the same care as the original digitization process. Educational institutions have become partners in the development of appropriate lesson plans and student participation directed toward effective use of the massive databases.

Sincerely,

Lewis Lancaster
Professor (Emeritus)
Department of East Asian Languages and Cultures
University of California, Berkeley