



Methodologies for Multilingual Information Integration in the Domain of Chinese Art

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Abstract:

In this paper, we report on methodologies through the two multilingualized research projects. We discuss a proposed methodological framework for Chinese-English interoperability between the respective thesauri, including four main modules: Translation, Mapping, Localization, and Creation. We also discuss four steps involved in building English metadata: Mapping, Selection, Translation, and Control Vocabulary. In addition, the paper also looks into key issues faced by the two projects, including the varying degrees of semantic equivalence between Chinese and English terms, metadata translation, and metadata quality.

1. Introduction

Since the launch of The Digital Library Initiative (DLI) projects by the National Science Foundation (NSF) in the U.S. in 1994, the focus on multilingualization has been one of the most important issues of digital library research. (Borgman, 1997; Fox & Marchionini, 1998; Oard & Diekema, 1998; Zeng, & Chan, 2004; Clough, & Eleta, 2010) In this paper we propose methodological frameworks of multilinguality in the context of digital libraries, through two multilingualized research projects participated in by Academia Sinica and Taiwan e-Learning and Digital Archives Program (TELDAP), for allowing Chinese-based digital collections of Chinese fine arts to become more accessible to users of different languages. The TELDAP is aimed to sustainably maintain important cultural assets of Taiwan and to promote e-learning applications in industry, academic research, and education. Since its initiation, TELDAP has successfully accumulated more than 3 million digitized items. It has been a big challenge to overcome the language barrier and share its abundant collections with the world. First, the paper presents the collaborative project with the Getty Research Institute (GRI) in the US – a Chinese version of Art & Architecture Thesaurus (AAT) - as an example, showing that on the basis of the existing multilingual thesaurus, the Chinese translation of 35,000 English terms and the link with digital images allows all English, Spanish and Dutch users and parts of French and Italian users to use their local languages to access Chinese art collections. Second, the paper takes another example – our collaborative project with the ARTstor Digital Archive Collection of The Andrew W. Mellon Foundation - to analyze how to build English metadata for the Chinese-based digital collections.

2. Methodological Framework for Multilinguality

TELDAP provides multilingual service for digital collections through three approaches. The first approach is to collaborate with the Getty Research Institute on the Chinese AAT project, linking the multilingual terms in AAT with the metadata of 3 million digital collections in the TELDAP Union Catalog to facilitate the multilingual indexing and browsing of item-level metadata. The second is the pilot collaboration project with ARTstor, which selects 500 digital collections and translates the item-level metadata into English. The third approach is to develop the portal (<http://culture.teldap.tw/culture/>) multilingually (including English and Spanish at present) in addition to the local language (Chinese), and to provide multilingual collection-level metadata. (Chen & Chen, 2008) The article will look into the methodological framework of the first and second approach.

2.1 The TELDAP and Getty Research Institute Collaboration Project (AAT-Taiwan)

The collaboration between the TELDAP and GRI was first initiated in late 2008 to build the Chinese version of the Art & Architecture Thesaurus (AAT). The Getty began building the thesaurus back in the late 1970s; since then the AAT has accumulated around 131,000 terms, 34,000 concepts (Harpring, 2009). The AAT-Taiwan is a hierarchical database. In addition to

the hierarchical relationships, it also has equivalence and associative relationships, making it a thesaurus in compliance with ISO standards. By incorporating Chinese concepts of art, architecture, installations, material culture, and materials into the AAT-Taiwan, it is able to provide catalogers, researchers and general public in the Chinese-speaking societies worldwide with a well-developed and authoritative information database.

Before developing procedures of multilingual thesaurus, one may face practical issues in terms of translating source vocabulary (SV) into target vocabulary (TV), raising questions such as: Should we translate only preferred terms of SV? If yes, then should all or partial vocabularies be translated? What kind of methods should we use? What kind of qualifications or backgrounds are we looking for in translators? Are we using any principles to do such mapping/linking? If we find synonyms in TV, what rule should we follow to decide upon one as a descriptor.

TELDAP and GRI had four Multilingual Vocabulary Project Workshops from 2008 to 2010. During these Workshops all the issues related to multilingual vocabularies were fully explored and discussed. Selected topics included "Issues and Challenges in Multilingual Equivalency Work: Lessons Learned on the Spanish AAT Translation Project", and "Bilingual Equivalence Mapping Methods and Issues". A methodological framework has been developed especially for Chinese version of AAT as follows (Figure 1) with four modules which are translation, mapping, localization and creation.

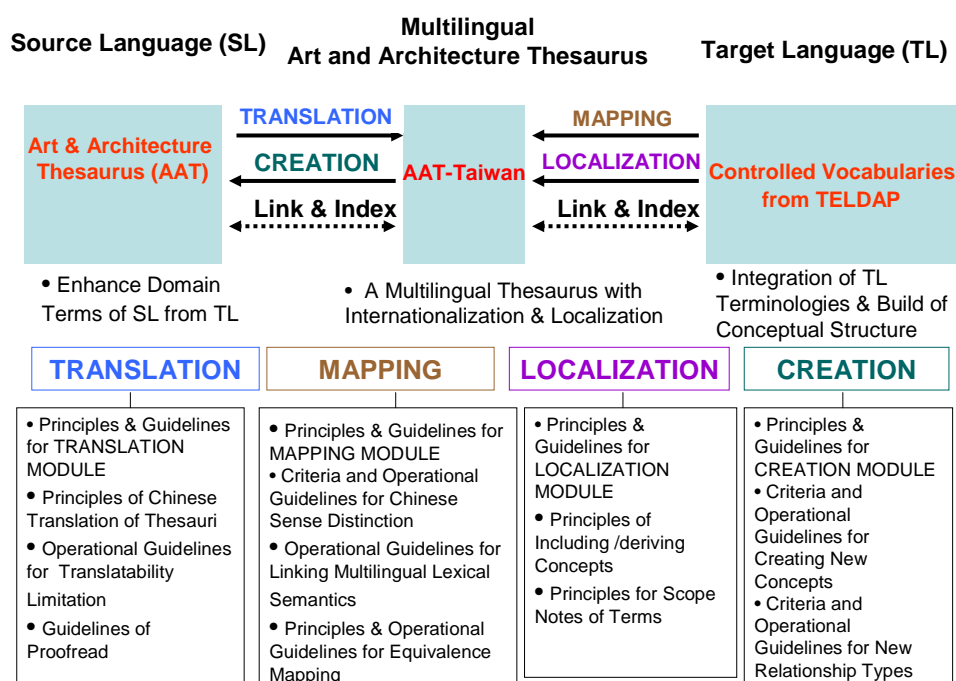


Figure 1. Methodological Framework of Multilingual Thesaurus

2.1.1 Translation

From the management perspective we focus on 3 things to ensure maximum results from the translation team: recruitment, training and quality management. The translation team members, including translators and proofreaders, are recruited from various fields. 46% of the translators major in Translation Studies, followed by 31% in Foreign languages and Literature, and only 15% with an Art and Architecture background. The proofreaders tend to come from different fields, however, with 43% majoring in Art and Architecture fields, 29% in Foreign Languages and Literature, and only 14% in Translation Studies. The first step of training involves unifying terms and file format, to ensure that the entire process runs smoothly. There are several documents that we provide to the translator for their weekly translation. For example, the Chinese-English glossary provides the translator a standard as how to translate guide terms and common words. We have also set up an online translation forum to answer translators' questions, and post solutions that can help improve their translation skill. In this way, the translators can learn from each other's mistakes or problems, and the team can spend less time answering the same question twice. The following is selected procedures for the translation.

T1_R : Recruit professional translators, maintain a minimum of ten translators at all time.

T3_U2 : Establish a set of formats for the reference list, translation sheet and word-count sheet for the translators to follow.

T3_QC2 : Examine the fluency and accuracy of the translations of scope notes. The most frequently encountered problem types include Chinese sentences that are redundant or awkward, misunderstandings of the English text, parts of the scope note that are not translated, and terms representing western concepts being mistaken for incompatible terms in the Oriental concept.

T3_R2 : Train proofreaders and test their abilities before employing them.

2.1.2 Mapping

Three sources are used for identifying Chinese terms. Terms may be taken from the controlled vocabularies of institutes or organizations, selected by experts from authoritative references, or may be high-frequency words from the TEDLAP Union Catalogue. The equivalence mapping team consults authoritative references to identify English terms, then locates the term in AAT. There are five most commonly identified types of equivalence between SV and TV including exact equivalence, inexact equivalence, partial equivalence, single to multiple equivalence, and no equivalence. In the first phase of the project, thousands of controlled vocabularies from National Palace Museum (NPM), one of participating institutions of TELDAP, are selected as sources to map into AAT. The main task of mapping is to identify the types of equivalence based on mapping analysis. The procedure includes

verifying SV translation of TV for each term (Table 1), finding the possible equivalent term in SV (Table 2), and then determining the type of term equivalence (Table 3) (Chen & Chen, 2011).

Table 1. The process of verification for TL “孔雀藍”

TV	SV translation	References	Source of TV
孔雀藍	Peacock blue	Ralph Mayer, Dictionary of Art Terms and Techniques (2002) [Chinese version]	Digital Archives Sub-Project of Antiquities in the National Palace Museum – Metadata Specification version 1.2), p. 20

Table 2. The process of mapping for TV “繡花”

TV	Context representing concept	Equivalent concept in SV
繡花	technique > embroidery	Term : embroidering Hierarchy : Processes and Techniques Facet : Activities Facet Note : embroidering (needleworking (process), <needleworking and needleworking techniques>, ... Processes and Techniques)

Table 3. The type of equivalence for TV “仰韶文化”

Equivalence type	Meaning	Example	
		TV	SV
Exact Equivalence	Different terms in TELDAP and AAT represent exactly the same concept.	仰韶文化(<考古學文化) Yangshao Culture (<archaeological period)	Yangshao (<Chinese Neolithic periods>, <Chinese prehistoric periods>, ... Styles and Periods) ID: 300173481

2.1.3 Localization

Here “localization” has two meanings; the first refers to the localization process from SV to TV, such as finding at least three authoritative published sources for TV in order to comply with the principle of literary warrant, to collect the synonyms of TV and choose one to be the descriptor, and to add the digital images that can stand for the term. The second meaning refers to the localization process from TV to SV, including all the localization needed when TV and SV are not exactly matched, such as: describing the equivalence type with the SV that is closest in meaning, complementing the scope note of the original SV to cover the conceptual scope of TV, or adjusting the current conceptual structure based on SV in order to match the structure of TV.

2.1.4 Creation

In the process of mapping from TV to SV, the resulting relationships between terms may be partial equivalence or non-equivalence; therefore, the importance of these TV and their compatibility with the scope of SV needs to be evaluated. If we decide to incorporate these terms, we have to enter the Creation module, building a complete term record for TV first, then translating these terms into SV and adding new conceptual structures in SV if needed, finally contributing them to the SV system. Take “中國書體”(Chinese scripts) for example; TV such as “隸書”(clerical scripts), “楷書”(standard scripts) and “篆書”(seal scripts) also describe important forms of Chinese characters, often used in Chinese paintings, but they are not included in SV. However, there are 12 kinds of scripts under <Arabic scripts> in SV, the structure of which is similar to Chinese scripts (e.g. oracle bone scripts, bronze inscriptions, seal scripts, clerical scripts, standard scripts, running scripts, and cursive scripts). It is decided to add a set of <Chinese scripts> with a similar hierarchy under “scripts (writing)- <scripts by form>” in SL (here AAT). As shown below (Figure 2):

Example : Chinese Scripts

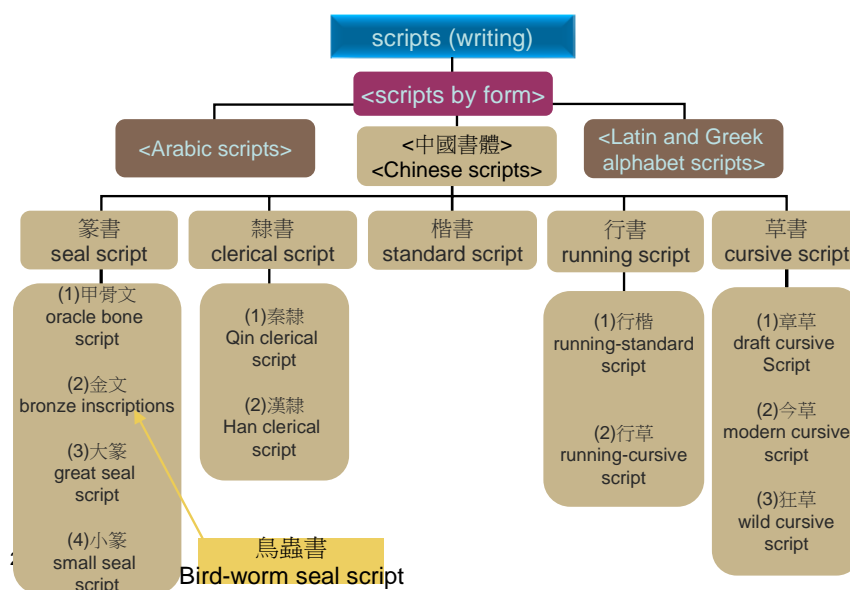


Figure 2. Creation of New Terms

2.2 The TELDAP and ARTSstor Collaboration Project (TACP)

The TACP has adopted Dublin Core-based metadata as its metadata format. This metadata format includes: identifier, title, creator, date, description, subject, right, material, measurements, work type, and repository. Among of these, five elements - title, date, work type, right, and repository - are mandatory elements. From February to August of 2010, 14

digital collections with nearly 500 metadata records have been selected for inclusion in the TACP. These collections have focus on art, history, archeology, anthropology, and culture. In order to reduce pressure on contributors, TACP only ask contributors provide two tasks. One is the repository identifier of objects, and the other is digital images of the items. TACP has developed a team, called TACP Team, to build English metadata for the Chinese-based digital collections. This paper will discuss how the TACP Team builds Dublin Core-based metadata through four procedures, including mapping, selection, translation and control vocabulary.

2.2.1 Mapping

Each of the 14 digital collections has its own metadata design, and some collections have a complicated metadata format with over 100 fields. Therefore, determining how to correctly map rich metadata to simple DC base metadata is a big challenge for TACP Team. The most important guideline for the mapping procedure is the ‘Dublin Core One-to-One Principle’, which means DC metadata only describes one manifestation or version of a resource.(Hillmann, 2005) The TACP Team looks for collections that follow this principle. For example, the metadata of ‘Bronze Rubbings collection database’¹ contains full description of bronze information as well as rubbings information. In this case, The TACP Team has selected only rubbings metadata for mapping.

2.2.2 Selection

The second procedure is selection. Development of English metadata for the Chinese-based digital collections faces obstacles resulting from natural language differences between Chinese and English. Chinese collections sometimes include words and stamps that are applied to the object during or after creation. These texts were usually written in classical Chinese without punctuation, such as calligraphy in a Chinese painting (Figure 3, on the top); understanding this form of writing may difficult for modern Chinese-speaking people, not to mention foreigners. In this case, the TACP Team has to decide whether to skip translation of these texts.

¹ Digital Archive of Bronze Rubbings <http://rub.ihp.sinica.edu.tw/~bronze/> (2011-05-09)



Figure 3. Landscape, Zhang Xing-quan (In Hwa Kang Museum, Taiwan)

2.2.3 Translation

The third procedure is translation, which includes four steps : preliminary translation, editing by Chinese-speaking editors, proofreading by native-speakers, and finalization by project members. In these four steps, all translations are processed using the same online translation platform (Figure 4), and each translator has his/her account to login. In addition, when encountering difficulties during translation, such as errors in the original Chinese text, wrong image, or multiple translation options, translators can use this online platform to note outstanding issues for the TACP Team to confirm and check later on.

數位典藏與學習聯合目錄翻譯平台
TELDAP Union Catalog Translation Platform

國合分項子計畫一
典藏目錄與內容多語化計畫

ID :

Password :



ARTSTOR(ARTSTOR)	
ARTSTOR(ARTSTOR)	ARTSTOR-合作案
artStor_E(artStor_E)	ARTSTOR-合作案
華岡博物館(Hwa_kang)	ARTSTOR-合作案
史語所西南(ARTSTOR_5)	ARTSTOR-合作案
史語所善本(ARTSTOR_6)	ARTSTOR-合作案
史語所甲骨(史語所甲骨)	ARTSTOR-合作案
史語所甲骨拓(史語所甲骨拓)	ARTSTOR-合作案
史語所考古遺物(史語所考古遺物)	ARTSTOR-合作案
史語所佛拓(史語所佛拓)	ARTSTOR-合作案
史語所漢畫拓(史語所漢畫拓)	ARTSTOR-合作案
青銅拓(青銅拓)	ARTSTOR-合作案
華岡博物館(華岡博物館)	ARTSTOR-合作案
臺灣古碑拓本(Rubbings of Taiwan's Ancient Tablets)	ARTSTOR-合作案
明清(Ming and Qing Dynasty)	ARTSTOR-合作案
華岡博物館(華岡博物館)	ARTSTOR-合作案
史博館玉器(史博館玉器)	國立歷史博物館(National Museum of History)
故宮選件30件(故宮選件30件)	國立故宮博物院(National Palace Museum)

古籍文獻(Ancient documents)	
日治時期臺灣研究古籍(Old books on Taiwanese studies from the Japanese colonial period)	中央研究院臺灣史研究所 (Institute of Taiwan History, Academia Sinica)
善本、俗文學資料、類善本書、古籍線裝書、檔案(Rare books, vernacular literature, quasi rare books, thread-bound old books, archives)	中央研究院歷史語言研究所 (Institute of History and Philology, Academia Sinica)
善本古籍(Rare and old books)	國立故宮博物院(National Palace Museum)
善本古籍(Rare and old books)	國家圖書館(National Central Library)

Figure 4. The online translation platform

2.2.4 Control Vocabulary

The final procedure is the adoption of controlled vocabularies, which include both the Getty AAT (The Art & Architecture Thesaurus) and TGN (The Getty Thesaurus of Geographic Names) (figure 5). The TACP has adopted AAT descriptors in the field of Work Type, such as photographs, oil paintings, watercolors, and rubbings. If geographic information is important for understanding collections, for example, a place of excavation for archeological artifacts, the TACP Team would try to adopt descriptors in TGN to enhance data discoverability for collections.




Image Information	
Title	A group photo of chairman of the National Government, Chiang Kai-shek, the American ambassador, Patrick Hurley, and Mao Zedong after a conference. 國民政府主席蔣中正與美國駐華大使赫爾利及毛澤東等人會談後合影
Work Type	photographs 照片
Date	1945/9/25
Measurements	4x5
Description	Acting under orders to facilitate cooperation between the National and Communist parties, the American Ambassador Patrick Jay Hurley poses with Chiang Kai-shek and Mao Zedong for a group photo during a conference in Chongqing prior to his return home to report his progress. 華會促成國共合作的美國駐華大使赫爾利(Patrick Jay Hurley)於返國進職前，在重慶與進行會談的蔣中正、毛澤東等人合影。
Subject	The President of the National Government America Ambassador Name: Chiang Ching-kuo Name: Zhang Qun Location information: Chongqing (China) 國民政府主席 美國 駐華大使 姓名: 蔣經國 姓名: 張群 地點資訊: 重慶(中國)
Source	TELDAP Union Catalogs: http://catalog.digitalarchives.tw/?URN=3790552 Academia Historica http://linxu201.dmh.gov.tw/textdb/dmhBrowse/advGry.inc.php?_op=?collectionNum:002050102001007
ID	典藏號002050102001007

photographs 照片
AAT ID : 300046300

Chongqing 重慶
TGN ID: 7024355

Figure 5. The photograph collection adopts Getty AAT and TGN terms. (In Academia Historica, Taiwan)

3. Discussion and Conclusion

In this paper we present methodological frameworks of multilinguality in the context of digital libraries, through two international collaboration projects for allowing Chinese-based digital collections of Chinese fine arts to become more accessible to users of different languages. There are two key issues faced by the two projects as follows.

3.1 Varying Degrees of Semantic Equivalence Between Chinese and English Terms

According to the mapping study of descriptors from National Palace Museum (in Chinese) and AAT (in English), the findings show six types of term equivalence to varying degrees, which are: exact equivalence, exact equivalence (cross ref.), inexact equivalence, partial equivalence (species – genus relationship), non-equivalence (culture uniqueness), and non-equivalence (beyond the scope).(Chen & Chen, 2011) We need to examine carefully for each mapping beyond exact equivalence. For example, in a case of inexact equivalence occurs if, in SV, the scope note (Getty Research Institute, 2011) of "censers" refers to "containers with perforated covers used for burning incense in a ritual context, especially ecclesiastical" which does not completely fit the concept of "香爐" (Xiang Lu) in TV.. We have concluded that Xiang Lu refers to the “container used for burning incense in a religious or ritual context”, and is placed in front of the temple or no the altar table depending on its size. So in reality, Xiang Lu and Censers are inexact equivalence because the previous one actually might refers to container without cover and is not used in ecclesiastical rituals. (Figure 6) In this case, we may need to add additional scope notes for the term.

A typical censer in the West



Typical censers in Chinese culture

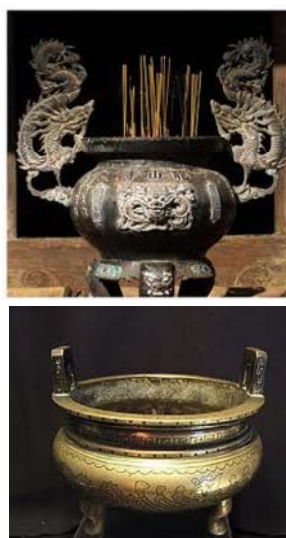


Figure 6. Censers in the Context of Western and Chinese Culture

When a term is partially equivalent, it could mean it is either mapped to a narrower term or a broader term. This study shows that most terms in TELDAP are more specific than terms in AAT, so it can only be mapped to broader terms in AAT. For example, in the aspect of geometric motifs, there is “dots” under “geometric motifs” in AAT, but this is the bottom of the hierarchy. In TELDAP there is "dots" under "geometric pattern" and below "dots" are "乳丁紋" (nipple nail pattern), "穀紋" (grain pattern), and so on. These terms need to be further discussed to see if they represent important concepts. If they do, then it is necessary to add new concepts for these terms under “dots” in AAT.

3.2 Metadata Quality vs. Cost

During the implementation of TACP, we use the four aforementioned procedures to construct 14 digital collections with nearly 500 metadata records in the seven-month pilot period. However, though the aforementioned procedures can achieve high quality in the multilingualization of metadata, they are regarded as time consuming and labor-intensive for the project, and also costly. On average, it takes about \$90 USD² for one object metadata. The after-action review points out two major reasons; one is that the mapping of metadata is time consuming, and the other is that the translation of metadata is time consuming.

In metadata mapping, in order to encourage the archiving institutions to participate, TACP initially asked only for the institutions to provide object IDs and digital files, and the mapping of object metadata was assigned to the TACP Team. After being put into practice, it was found that the metadata quality of participating institutions showed great discrepancy, such as errors in the original Chinese text, and failure to follow the “Dublin Core One-to-One Principle,” so it took a lot of time to select from the original object metadata and conduct correct mapping. For instance, it is necessary to ensure that the creation time of the “bronze rubbings” (Figure 7) (around 19th Century) is not mistaken for the creation time of the “bronze ware” (1046–256 BCE), and the work type of the “bronze rubbings” is not mistaken for the work type of the “bronze ware” (cooking utensil), which makes the cost of time and labor increase greatly.

² 1 U.S. dollar = 29 N.T. dollars (Exchange rate in May 2011)



Figure 7. Wei Ding (Ancient Vessel) (In Academia Sinica, Taiwan)

In metadata translation, the “description” fields in the object metadata of this project are often written in an academic fashion, containing a large number of Chinese art terms with no English equivalents; these are sometimes rare vocabularies that are difficult to look up, resulting in the slower progress of translation. Additionally, the terminology cannot be translated clearly in a couple of words, because the original text is already difficult to understand for Chinese native speakers. Whether to translate the whole text completely (such as translation 1) or the selected important parts (such as translation 2) is an issue that needs to be faced with in the translation process. For instance, the original text: “王羲之精於章草、隸、八分、飛白、真、行諸體，亦能繪事，後世更尊為書聖”.

1. Wang Xizhi was skilled in almost all of the calligraphic script types: Zhangcao (one style of cursive scripts), Lishu (clerical script), Bafen, Feibai, Zhengshu, Xingshu (semi-cursive script), etc. He was so influential that later generations elevated him to the supreme position as the “Sage of Calligraphy.”
2. Wang Xizhi was skilled in almost all of the calligraphic script types, and he was already highly regarded in his own time. He was so influential that later generations elevated him to the supreme position as the “Sage of Calligraphy.”

For TACP the biggest challenge is how to achieve high quality metadata in spite of the limited human resources, budget, and time to complete the project. Reviewing the four steps performed during the pilot period, we found that the first step (mapping) and the third step (translation) require the greatest commitment of human resources, budget, and time; this can be attributed to the large number of metadata elements at present and the abstruse wording in Description that makes translation difficult. To accelerate the multilingualization process of metadata in order to showcase the digital collections more quickly, TACP might adopt the following strategies as feasible solutions in the future: (1) reducing the number of metadata elements, only translating the six basic fields of Title, Creator, Date, Work Type, Repository, and Right into English; (2) multilingualizing the content of collection-level metadata first, and allowing the elements in Description remain in Chinese, to be returned to later for multilingualization ; (3) using the controlled vocabularies in AAT as “work type” elements to maintain the quality of metadata.

The methodological frameworks of multilinguality in the context of digital libraries, through two multilingualized research projects, have been proposed. The paper is expected to provide controlled vocabularies and metadata as two different ways for the multilingualization strategies of digital libraries in the art domain, which is particularly meaningful for digital humanities in that it contributes to information sharing among artists and scholars of different language and cultural backgrounds by enhancing multilingual search in digital collections.

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Brief Biography

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Ms Chen is the Assistant Research Engineer at Research Center for Information Technology Innovation, Academia Sinica. She is a PhD candidate in the Department of Library and Information Science at the National Taiwan University. She is also the Chair of the MCN Taiwan (Museum Computer Network, Taiwan Chapter) Special Interest Group on Standards. Recently, she initiated the research project of Chinese-language AAT (Art & Architecture Thesaurus) with Getty Research Institute, the pilot study on bilingual metadata with the ARTstor Digital Archive Collection.

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Ms. Cheng received her M.A. degrees in Museum Studies from University of Leicester, U.K. She has been with the Metadata Architecture and Application Team, Academia Sinica, Taiwan, where she is a research assistant since 2002. Besides, Ms. Cheng is also the co-chair of the MCN Taiwan (Museum Computer Network, Taiwan Chapter) Special Interest Group on Standards.

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Dr. Chen is professor of Library and Information Science at the National Taiwan University (NTU) and had served as the department head from 1995 to 2001. She is currently University Librarian of the NTU Library and also President of the Library Association of the ROC (Taiwan).