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## A Study of XML in the Library Science Curriculum in Taiwan and South East Asia

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### ABSTRACT

This paper aims to investigate the current XML-related courses available in 96 LIS schools in South East Asia and Taiwan's 9 LIS schools. Also, this study investigates the linkage of library school graduates in Taiwan who took different levels of XML-related education (that is XML arranged as an individual course or XML arranged as a section unit in courses) and their professional qualification. Research questions include what is the availability of XML-related courses in countries in Taiwan and South East Asia? What are Taiwan LIS graduates' views on degree of XML-related courses satisfaction, cognition of learning XML technology, and views of XML-related courses? What is the linkage of Taiwan LIS graduates who studied different levels of XML-related education and their professional qualifications? This study applies 3 research methodologies: information gathering from the internet; questionnaire surveys; in-depth interviews. Results of the analysis show that LIS schools should provide optional XML-related courses with practical sessions, and library associations should provide regular XML-related continuing education to enhance LIS students' professional qualifications.

**Keywords:** eXtensible Markup Language (XML); Library and Information Science (LIS) Education; library science curriculum; information-related positions; digital library.

### INTRODUCTION

With the digital library acting as an information depository, there are many challenges concerned with the description of objects and repositories, interoperability and collection management. The underlying value of digital resources to the users will depend upon the quality of the contents, the organization, the data management systems, and the presentation of the data. The staff at the Library of Congress saw that metadata was the key to resolving challenges in building digital libraries of the 21st century (Library of Congress, 1998). Anderson (1999) pointed out that interoperability and metadata are the main components for building global networked digital libraries. Metadata is important because it is used to provide access globally, and to find and describe the digital content. It would be also important that metadata is encoded in a universal, globally accessible format which can potentially promise longevity, flexibility, compatibility, and interoperability. These mainly depend on issues of metadata and interoperability. The challenges of metadata and interoperability are now being investigated in the context of the technology, the Extensible Markup Language (XML), and these initiatives are being developed in the infrastructure provided by the XML environment. Chang (2006) pointed out that the XML and the relevant infrastructure provided by the XML family environment play crucial roles in solving the challenges of digital library metadata and interoperability.

XML, like its ancestor SGML (Standard Generalized Markup Language), is a form of descriptive markup. It has been developed under the auspices of the World Wide Web Consortium (W3C). The first version of XML was originally published as a Recommendation in February 1998 (Bray et al., 1998). XML was needed because HTML is a fixed set of tags; SGML provides an extensible tag set but lacks web support for network delivery. For this reason, XML has been designed for ease of implementation and for interoperability with both SGML and HTML.

XML has rapidly gained popularity as a markup language for information, finding constituencies in both the document-centric and data-centric worlds. A variety of web applications and industry initiatives have announced their support for XML. The related standards in the LIS field such as MARCXML are also based on XML technology. The crucial role of XML in the Integrated Library Management Systems (ILMSs) has also been identified (Carvalho and Cordeiro, 2002; Felstead, 2004).

XML has grown rapidly as web technology and portable devices have evolved. Its variation XHTML is used as a language for content that is both XML-conforming and HTML. Developers who migrate their content to XHTML can benefit from this W3C effort. The Web Ontology Language (OWL) is used in the Semantic Web; mobileOK Basic Tests evaluates whether the content can be provided in a way that achieves basic usability, efficiency, and interoperability with mobile devices; Mobil SVG (Scalable Vector Graphics) Profiles creates a profile specification that addresses mobile devices for vector graphics display; XML Encryption specifies a process for encrypting data and representing the result in XML to use in validating a signature or decrypting encrypted data; XML Signatures provides integrity, message authentication and signer authentication services. XML Encryption and XML Signatures are particularly useful in electronic commerce. Simple Object Access Protocol (SOAP) uses XML as its message language; Security Assertion Markup Language (SAML) defines standardized mechanisms for the communication of security and identity information between business/academic partners; the Synchronized Multimedia Integration Language (SMIL) can describe the temporal behavior of the presentation, the layout of the presentation on a screen and the associate hyperlinks with media objects; the VoiceXML (VXML) brings advantages of web-based development and content delivery to interactive voice response applications. Other W3C's standards closely associated with VoiceXML include the Speech Recognition Grammar Specification (SRGS) which is used to tell the speech recognizer what sentence patterns it should expect to hear. The Speech Synthesis Markup Language (SSML) is used to populate textual prompts with information on how best to render them in synthetic speech. A Call Control eXtensible Markup Language (CCXML) interpreter is used on VoiceXML platforms to handle the initial call setup between the caller and the voice browser, and to provide telephony services such as call transfer. The Pronunciation Lexicon Specification (PLS) is used to define how words are pronounced. In the environment of applications of speech interface media server, it has the Media Server Markup Language (MSML) and Media Server Control Markup Language (MSCML).

The concept of XML has been brought into library related courses, such as electronic publishing, electronic document processing, network resource management, information technology tools and applications, information organization, digital archives, and so on. Chang (2006) found that in England, one of 8 LIS schools has XML related courses. In America, 2 out of 50 LIS schools have XML related courses. However, LIS schools in England and America arranged XML concept into teaching materials as a section unit in some courses, for example, courses such as "Electronic Publishing", "Technologies in Web Content Management", "Information Technology Tools and Applications", "Information Organization and Access", "Access Systems for Archival Materials", and "Taxonomy, Classification, and Metadata".

The Association of Research Libraries (ARL) explored the professional qualifications of LIS specialists and indicated that markup languages such as XML were one of the core professional abilities (Simmons-Welburn, 2000). The Association for Library Collections and Technical Services (ALCTS) (2003) conducted a survey and discovered that 73% of respondents thought that catalogers needed knowledge of XML. The Library & Information Technology Association (LITA) (2010) points out Top Technology Trends which LIS specialists need to monitor closely, and it is noteworthy that one third of these are technologies closely related to XML initiatives. The UK Chartered Institute of Library and Information Professionals (CILIP) (2010) has covered XML in their training courses called "Metadata Essentials" as one of the core skills.

Tennant (1999) claimed that a digital librarian requires knowledge of cataloging and metadata, and also requires knowledge of the markup language XML. Pinfield (2001) thought digital librarians should act as innovators and metadata producers in which XML is the ideal carrier of metadata. Researchers from Taiwan concurred with this view and thought that it was beneficial to provide courses on markup languages in LIS curricula (Wang, 2001; Wu et al., 2004).

This study will provide LIS schools and library associations in Taiwan and South East Asia with the necessary information to take into account the needs of LIS schools in their curricula and to plan future XML-related courses and provide directions for the planning for continuing education for LIS specialists.

## RESEARCH DESIGN

This study applies 3 research methodologies described below.

### *Information gathering from the internet by browsing websites*

From 20 August to 20 September 2010, the study investigated the current XML-related courses available in 96 LIS schools with English websites from 207 LIS schools in 10 countries in South East Asia. The selected 10 countries are countries which hosted the International Conference on Asian Digital Libraries (ICADL) from 1998 to 2008. They are: Hong Kong (1998), Shanghai (2004) in China; Taipei (1999) in Taiwan; Seoul (2000) in Korea; Bangalore (2001) in India; Singapore (2002); Kuala Lumpur (2003) in Malaysia; Bangkok (2005) in Thailand; Kyoto (2006) in Japan;

Hanoi (2007) in Vietnam; Bali (2008) in Indonesia. The study also investigated the current XML-related courses available in Taiwan's 9 LIS schools. Furthermore, for the purpose of avoiding missing relevant information, the study distributed 2 English questionnaires, on 17 September and 9 November 2010 to the 96 LIS schools to confirm their XML-related courses.

### *Questionnaire surveys*

A research questionnaire with a total of 16 questions as shown in Table 1 was sent to Taiwan's LIS school graduates who took XML-related courses and graduated from 2001 to 2009 and left LIS schools at least 2 years ago, requesting their views on XML-related courses. The questions were organized into 3 categories: (1) Degree of XML-related courses satisfaction (code A1-A7); (2) Cognition of learning XML technology (code B1-B4); (3) Views of XML-related courses (code C1-C5).

**Table 1: Research Questionnaire**

Code	Question	Code	Question
A1	Teaching materials fit the course needs	B2	XML knowledge is useful for future jobs
A2	Teaching materials fit the students' ability and needs	B3	XML ability is one of my strong points in getting a job
A3	Course arrangement makes it easier for learning XML	B4	Knowledge of XML technology is required for my present and old jobs
A4	Learning XML enriches my professional qualification	C1	XML should be arranged as an individual course
A5	XML practical sessions give more thorough XML knowledge	C2	XML should be arranged in bachelor's level course
A6	The content of XML-related courses is sufficient for your job needs	C3	XML courses should be compulsory
A7	The XML-related courses fit graduates' job need and needs of pursuing higher education	C4	XML courses should contain practical sessions
B1	XML is one of LIS specialists' professional qualifications	C5	If library associations have continuing education on XML-related subjects, I would like to attend

The questionnaires were circulated between 9 March and 31 July 2010 through 9 LIS schools in Taiwan and the Google web questionnaire platform. The questionnaires were posted on Facebook, Plurk, and Taiwan's biggest BBS website PTT; also, they were circulated via authors' personal contacts. A total of 1,345 questionnaires were sent out and 151 valid questionnaires were returned.

### ***In-depth interviews***

These were carried out at the period of 5 May till 31 July 2010 via telephone and MSN online conversation with 10 randomly selected respondents who had returned questionnaires and expressed their willingness to volunteer further contact. The background of the respondents includes finance staff (A), database salesman(B), reference librarian (C), high school information staff (D), system librarian (E)(F), database system engineer (G), cataloging & acquisition librarian (H), lecturer of institute of technology (I), and high school teacher (J). Each interview took approximately 25-30 minutes.

## **RESEARCH RESULTS AND DISCUSSION**

Below are our research results and discussions collected from the 3 methodologies.

### ***Information gathering from the internet***

Through website investigation, we found that 8 LIS schools in Korea, India, Thailand and Singapore provided 13 XML-related courses. In Taiwan, 7 out of 9 LIS schools provide 11 XML-related courses. The 15 schools are listed below.

- 1) Division of Information Studies, Wee Kim Wee School of Communication and Information, Nanyang Technological University (Singapore)
- 2) Department of Library Science, Karnataka State Women University (India)
- 3) Department of Library and Information Science, Panjab University (India)
- 4) Department of Library and Information Science, University of Mysore (India)
- 5) Department of Library and Information Science, Kungsung University (Korea)
- 6) Department of Library and Information Science, College of Liberal Arts, Sungkyunkwan University (Korea)
- 7) Department of Library and Information Science, Hannam University (Korea)
- 8) Division of Information Management, School of Engineering and Technology, Asian Institute of Technology (Thailand)
- 9) Department of Library and Information Science, Hsuan Chuang University (Taiwan)
- 10) Graduate Institute of Library and Information Science, National Chung Hsing University (Taiwan)
- 11) Graduate Institute of Library and Information and Archival Studies, National Chengchi University (Taiwan)
- 12) Graduate Institute of Library and Information Studies, National Taiwan Normal University (Taiwan)
- 13) Department and Graduate Institute of Library and Information Science, National Taiwan University (Taiwan)
- 14) Department of Library and Information Science, Fu Jen Catholic University (Taiwan)
- 15) Degree Program of ECE and CS Colleges, National Chiao Tung University (Taiwan) (note: this program ceased in 2010)

At the time of writing, there is no reply from the 2 English questionnaire enquiries sent through the study to the 96 LIS schools to confirm their XML-related courses. Below is our analysis based on the course arrangement.

In Taiwan, among the 7 LIS schools which provide XML-related courses, National Taiwan University offers bachelor to doctoral programs; National Taiwan Normal University offers master and doctoral programs; Fu Jen Catholic University offers bachelor and master programs; National Chung Hsing University, National Chengchi University and National Chiao Tung

University offer master programs only; and Hsuan Chuang University offers bachelor program only.

The 8 LIS schools in Korea, India, Thailand and Singapore provide XML-related courses, Panjab University in India and Sungkyunkwan University in Korea offer degrees from bachelor to doctoral programs; Hannam University in Korea offers bachelor and master programs; Nanyang Technological University in Singapore, Karnataka State Women University and University of Mysore in India, and Asian Institute of Technology in Thailand offer programs of master and doctoral; Kungsung University in Korea offers bachelor program only.

There are more XML-related courses arranged for master's level (17 courses) than in bachelor's (7 courses) except for the LIS schools in Korea which are all arranged for bachelor's level. This may explain why they think XML is essential. Except for 3 courses in India and Korea that do not provide information, XML-related courses are arranged as more are selected (16 courses) than compulsory (5 courses). Among these, XML-related courses are arranged as compulsory and at bachelor's level at Sungkyunkwan University in Korea and Hsuan Chuang University in Taiwan. As to credit arrangement, most XML-related courses are arranged as 3 credits (14 courses), including the bachelor's level in Korea.

All the XML-related courses are arranged as section units in courses, except the course in Hsuan Chuang University which is arranged as an individual course. There are a total of 15 XML-related courses which have practical sessions listed as below, in which 10 are from the LIS schools in the 4 countries, and 5 provided in LIS schools in Taiwan. Among these, "Internet and Electronic Publishing", "Building Digital Libraries", "Database Design" and "Metadata and XML" are arranged as compulsory courses.

- 1) Database Management Systems; Web-based Information Systems (Nanyang Technological University)
- 2) Internet and Electronic Publishing (Karnataka State Women University)
- 3) Information Technology: Applications (Theory and Practice) ( Panjab University)
- 4) Digital Libraries (University of Mysore)
- 5) Metadata (Kungsung University)
- 6) Building Digital Libraries (Sungkyunkwan University)
- 7) Information Architecture for the Web; Internet Service Systems (Hannam University)
- 8) Database Design (Asian Institute of Technology)
- 9) Metadata and XML (Hsuan Chuang University)
- 10) Digital Archives and Digital Libraries (National Taiwan Normal University)
- 11) Multimedia Production and Archival; Digital Libraries and Museums (National Taiwan University)
- 12) Metadata Language and System Design (National Chiao Tung University)

The course topics covered in the XML-related courses are mostly topics on metadata, digital libraries, web technology, database, and electronic publishing. This is the same arrangement as in the LIS schools in the UK and the US as discussed in the Introduction.

When comparing continuing education provided by library associations, the Library Association of the Republic of China (Taiwan) (LAROC) has held 7 training courses on "Metadata and XML" since 2005 in response to the National Digital Archives Science and Technology Program and the National Program of e-Learning; yet, library associations in India, Thailand and Singapore show no XML-related training courses, and the Korean Library Association does not provide an English website, and so we have no knowledge of their training courses. Thus, it can be seen that the library association in Taiwan thought the same as the library associations in the UK and the US that knowledge of XML and metadata are essentials in the digital age, and thus could be regarded as core professional qualifications for LIS specialists.

### **Results from surveys**

Results of the top 2 percentages found from questionnaire surveys are described below by category and displayed in Figure 1.

#### *Degree of XML-related courses satisfaction*

49.23% of respondents had no opinion on whether teaching materials fit the course needs (A1), and 40.00% agreed. 52.31% of respondents had no opinion on whether teaching materials fit the students' ability and needs (A2), and 32.31% agreed. 50.77% of respondents had no opinion on whether course arrangement makes it easier to learn XML (A3), and 26.15% agree. There is the same percentage of 36.92% of respondents that had no opinion and those that agreed on whether learning XML enriches their professional qualifications (A4). There is the same percentage of 35.38% on whether XML practical sessions give them more thorough knowledge on XML technology (A5). 46.15% of respondents had no opinion on whether the content of XML-related courses is sufficient for job needs (A6), and 30.77% disagreed. 53.85% of respondents had no opinion on whether the XML-related courses fit graduates' job need and needs of pursuing higher education (A7), and 24.62% disagreed.

*Cognition of learning XML technology*

37.75% of respondents had no opinion on whether XML is one of LIS specialists' professional qualifications (B1), and 35.76% agreed it is. 38.41% of respondents had no opinion on whether XML knowledge is useful for future jobs (B2), and 32.45% agreed. 33.77% of respondents thought XML ability is one of their strong points in getting a job (B3), and 29.14% had no opinion. 35.10% of respondents disagreed that knowledge of XML technology is required for their present and old jobs (B4), and 29.14% had no opinion.

*Views of XML-related courses*

39.07% of respondents agreed that XML should be arranged as an individual course (C1) and 40.40% thought XML should be provided at bachelor's level (C2); whereas, 29.14% and 32.45% had no opinion on the 2 questions respectively. 39.74% of respondents had no opinion on whether XML should be arranged as a compulsory course (C3), and 27.15% thought it should. 39.74% of respondents thought that XML courses should contain practical sessions (C4), and 33.11% of respondents strongly agreed. 41.06% of respondents showed interest in attending continuing education on XML-related courses organized by library associations (C5), and 21.85% had no opinion.

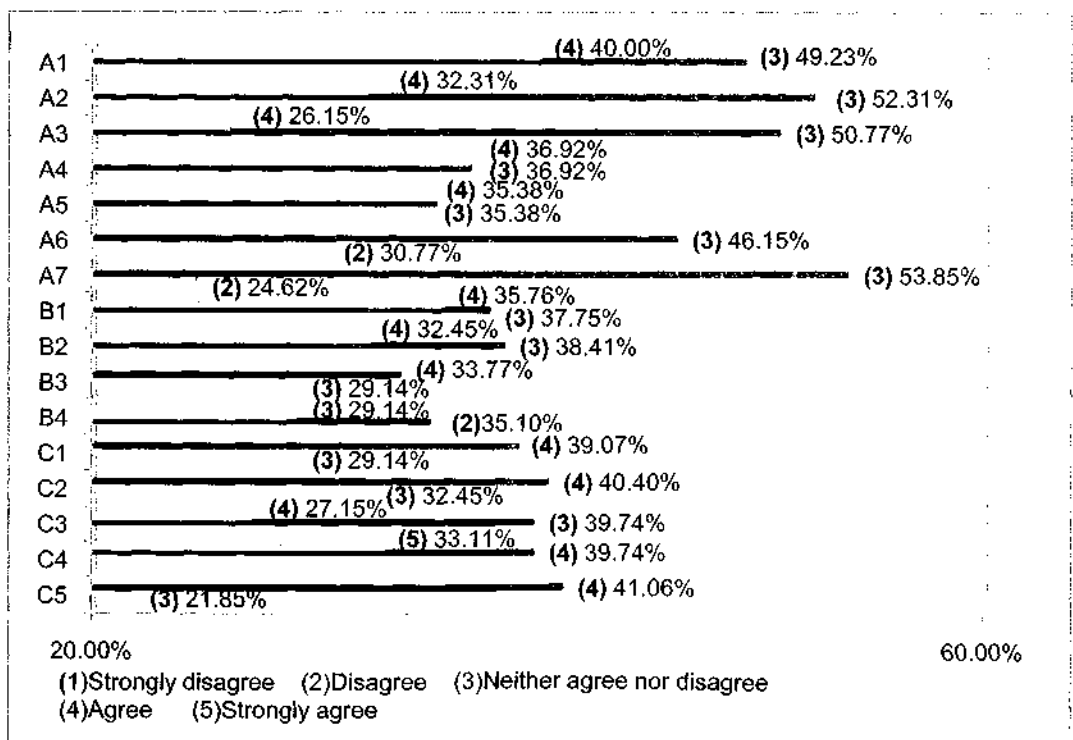


Figure 1: Results of the top 2 percentages

## **Results from Interviews**

Results found from in-depth interviews are described below by category.

### *Degree of XML-related courses satisfaction*

All participants indicated that what they learned about XML-related courses was from the section units in courses. They also thought the teaching hours and teaching materials were not sufficient to gain a good knowledge of XML. Interviewees G and I even learnt more knowledge of XML by self-study and taking more courses provided by organizations to meet their job needs.

### *Cognition of learning XML technology*

Interviewees in general all agreed that XML technology is one of the LIS specialists' professional qualifications, particularly for those who wished to have jobs in the information-related marketplace. For those who wished to work in the management area in libraries, basic XML knowledge is sufficient.

### *Views of XML-related courses*

Interviewees A, B, and E thought that in order to obtain good learning outcomes XML should be arranged as an individual course, and interviewees C, F, and G thought if there were learning tracks organized by LIS schools, XML should be arranged as an individual course. Interviewees D, H, I, and J thought it was fine to arrange XML as a section unit in LIS courses. Considering the learning outcomes and job needs, interviewees B, E, G, and J thought XML should be arranged as a compulsory course; whereas, the remaining interviewees thought XML should be arranged as an optional course. All the interviewees thought XML practical sessions were required no matter whether they were arranged as individual courses or as section units in courses.

In general, we discovered that those interviewed had the same views as the questionnaire respondents. In category A, a higher percentage of respondents have no opinion on most questions, except that respondents who are in an information-related field think the content of XML-related is not enough for their job needs or fits graduates' job needs. In category B, the top percentage of respondents think XML ability is one of their strong points in getting a job. And because most LIS graduates are in library management, more respondents think that knowledge of XML is not required for their present and former jobs. Also, this could be because XML is transparent to their work; therefore, they think XML is not required for their work. It is interesting to find that most respondents agree to questions in category C, and it is noteworthy that more than 70% of respondents agree or strongly agree that XML courses should contain practical sessions.

## **CONCLUSION**

Since there is no reply from the 2 English questionnaire enquiries sent through the study to the 96 LIS schools to confirm their XML-related courses, we were obliged to gather our information from the internet by browsing websites. This shows that LIS schools in Taiwan provide more XML-related courses and practical sessions than in Korea, India, Thailand and Singapore. The library association in Taiwan provides regular XML-related training courses, and this is not found in the library associations in the above mentioned 4 countries.

The importance of XML grows with the rapid move of the web environment; therefore, we conclude that although XML has not been well recognized as a core skill in library jobs or as part of the core programs in LIS schools; nevertheless, library associations in the US, the UK, and Taiwan have clearly exposed the key role of XML. LIS schools should consider providing optional XML-related courses with practical sessions, and library associations should provide regular XML-related continuing education to enhance LIS students' professional qualifications.



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