9-24-2007

The Information Systems Academic Discipline in Taiwan: A Focus on Top-Tier Universities

Ching-Chang Lee
National Kaohsiung First Technological University, Taiwan

Ting-Peng Liang
National Sun Yat-Sen University, Taiwan, tpliang@facmail.nsysu.edu.tw

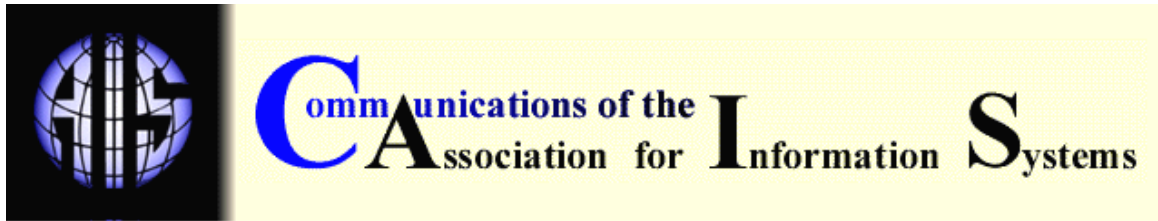# THE INFORMATION SYSTEMS ACADEMIC DISCIPLINE IN TAIWAN: A FOCUS ON TOP-TIER UNIVERSITIES

Ching-Chang Lee
Department of Information Management
National Kaohsiung First Technological University, Taiwan

Ting-Peng Liang
Department of Information Management
National Sun Yat-Sen University, Taiwan
tpliang@facmail.nsysu.edu.tw

ABSTRACT

Information Systems (IS) as a relatively new business discipline in Taiwan has grown rapidly in the last two decades and was once the first choice for high school students entering business schools. Even after the dot com bubble burst in 2000, it is still one of the most popular majors for college and graduate students. Most graduates have no problem finding jobs in high-tech manufacturing or service industries. This study explores the status of IS as a discipline in Taiwan by analyzing historical data collected from the IS professional association - the Chinese Association of Information Management (CSIM) and by examining characteristics of IS programs and IS research across 9 top-tier Taiwan universities. The findings indicate that the IS discipline is highly professionalized and is identified as a separate and mature field that enjoys a high level of respect in Taiwanese universities.

Keywords: Information Systems, IS discipline, Taiwanese universities, case study

I. INTRODUCTION

Information Systems (IS), called information management (IM) in Taiwan, has been the fastest-growing business discipline in the past two decades. Based on the 2006 educational report from the Ministry of Education, IS was the most popular major among college students. The total number of IS majors was 38,000, out of nearly a million college students. Business administration ranked second and electronic engineering was third. Before the dot com bubble burst in 2000, the area was often the top choice for high-school students who were interested in business majors. This was primarily due to Taiwan's strong high-tech manufacturing industry, which offers a very good job market. Nearly 80 percent of the notebook computers worldwide are produced by the super-efficient supply chains of Taiwanese companies that link manufacturers in Taiwan, China, Vietnam, and channels in the United States and Europe. A recent report indicates that more than 120 IS programs exist in around 150 universities and colleges, with program sizes ranging from 100 to 3000 students each.

The purpose of this study is to report the evolution and current characteristics of Information Systems programs and Information Systems research across universities in Taiwan. The broad

study also seeks to assess the strength of the IS presence in Taiwanese universities, to evaluate the maturity of IS as an academic discipline in Taiwan, to identify emerging trends in IS in Taiwan universities, and to identify main influences on IS in Taiwan universities. The remainder of the paper is organized into five sections. Section II provides background of higher education in Taiwan. Section III describes the evolution of the IS discipline in Taiwan during the past two decades. Section IV outlines the research approach. Section V shows the research results. Section VI summarizes our findings and discusses implications and limitations.

II. HIGHER EDUCATION IN TAIWAN

Taiwan is an island with more than 23 million in population and is a major high-tech manufacturing base for the world. The average income per capita was around US$15,000 in 2006. Most people in Taiwan stress family values and education.

Higher education in Taiwan has experienced rapid growth in the past decade. The number of universities and colleges increased from 60 in 1995 to around 145 in 2006 (excluding military and police academies). This was primarily due to the upgrading of junior colleges to four-year colleges and technological universities. The total student enrollment in higher education has almost tripled in the past fifteen years. The largest growth was in the graduate sector, in which the masters programs increased by 410 percent and doctoral programs increased by 274 percent. Around the same time, the total number of full-time faculty at universities and colleges increased by 149 percent, from 18,020 in 1995 to 44,787 in 2004.

Of the 145 degree-granting higher education institutions at the time the survey was conducted, 75 are public and 70 are private universities. These universities are divided into several categories based on their funding sources and the degree programs they offer. In general, public universities are more prestigious than private, and comprehensive universities are more prestigious than technological universities.

Most universities have a short history (shorter than 50 years) due to a short economic development history in Taiwan. In fact, most universities were established after the KMT party was forced to move to Taiwan in 1949. The student enrollment at most Taiwanese universities ranges from 8,000 to 30,000, with an average of around 12,000. The government closely controls higher-education policies. All degree programs must obtain official permission before they can recruit students. Foreign universities are not allowed to operate in Taiwan, although the government is experimenting with loosening this regulation. Before 1995, top students went abroad (especially to the United States) for their graduate studies. This is, however, no longer the case. A major portion of top college students prefer receiving a local graduate degree and entering a high-tech company for very attractive compensation packages.

Among the public universities, a small group of elite universities has been identified as research universities that provide multiple doctoral, masters, and undergraduate programs of superior quality. These universities also receive better research support from the Ministry of Education and National Science Council. From 1995-2004 the top three business schools (National Taiwan University, National Cheng-Chi University and National Sun Yat-Sen University) received 23 percent of the total number of National Science Council business research grants. The IS area has been very active in the grant competing process. In 2006, the Ministry of Education started a five-year NT$50 billion (around US$1.6 billion) campaign for research excellence (called the Top University Initiative) at 12 universities. National Taiwan University received NT$3 billion, National Sun Yat-Sen University received NT$600 million, and National Cheng-Chi University received NT$300 million per year, for five years.

III. UNDERSTANDING THE IS DISCIPLINE IN TAIWAN

The IS area as an academic discipline in Taiwan is new, compared with other business disciplines. The first IS department was started in 1981. The evolution of IS education can be

divided into three major stages. The first stage was the initiation of undergraduate programs. From 1981 to 1990, only a few IS programs were permitted to recruit students at the undergraduate level. The first undergraduate program was offered by Fu-Jen Catholic University in 1981. Interestingly, that first program was proposed to be *management information systems*, but was later asked to be changed to *information management* by the review board, for consistency with the names of other disciplines such as marketing management and operations management. Subsequent undergraduate programs were offered in 1984 at National Sun Yat-sen University (NSYSU) and National Chengchi University (NCCU). Since then, the IS discipline has grown rapidly, to reach almost 120 separate programs. More than 20,000 students graduate from IS programs every year, most being able to find good jobs on the market.

The second stage of IS evolution is characterized by the establishment of graduate programs. After a few years of running undergraduate programs, the first batch of graduate programs was offered by National Sun Yat-sen University and National Chengchi University in 1989. By 2005, Taiwan had more than 40 graduate IS programs that offered masters degrees.

The third stage features the development of doctoral programs. The first batch of doctoral programs was offered by three national universities: National Sun Yat-sen University, National Chao Tung University and Nation Central University. The IS programs in Taiwan started to train Taiwan's own faculty members from that time. The first doctoral graduate in IS was Shin-Yuan Hung, from National Sun Yat-sen University in 1998. This signaled the ability of Taiwanese IS programs to train their own faculty members. Shin-Yuan Hung was promoted to full professor in 2005 at National Chung Cheng University. There are 12 IS doctoral programs in Taiwan in 2006 and more than 30 doctoral candidates completing each year. Some programs admit as many as 17 doctoral students every year.

IV. RESEARCH APPROACH

THEORETICAL FRAMEWORK

Many of the characteristics of IS are consistent with those observed across emerging disciplines in the early stages of their development. For example, in the early evolution of management as a discipline, some of the characteristics manifested at that time have been seen more recently in the development of IS, including:

- A heavy reliance on reference disciplines
- A paucity of theory specific to the discipline
- A perceived lower status than for established disciplines, leading to the adoption of methods from the higher status disciplines
- Limited numbers of textbooks that review the discipline
- Poor definition of the boundaries of study
- Incorporation organizationally as a subset of an established discipline

This research is part of the Pacific Asia multi-state case study (IS-in-PA) that adopts a theoretical framework derived from Whitley's theory of scientific change. The framework considers: (1) degree of professionalization as a discipline and (2) maturity as a scientific field [1984a, 1984b].

The first construct concerns the degree of "professionalization" of the discipline, which is expected to increase as the impact of local contingencies decreases. Where a discipline is not highly professionalized, local contingencies such as political pressures, have high impact. Consequently, the degree of professionalization of IS can be evidenced by the extent of variation in the nature of its research across the Pacific-Asia region over time and at present.

The second construct has been derived from Whitley's three conditions for the establishment of a distinct scientific field:

1. Scientific reputations both become socially prestigious and "control critical rewards" i.e. those in the discipline have the potential for prestige and power through prominence in that discipline;
2. Standards of research competence and skills become established;
3. A unique symbol system is developed that allows the exclusion of outsiders and unambiguous communication between initiates within the discipline.

CASE STUDY PROTOCOL

As this study is one of the IS-in-PA projects, and similar studies were conducted in other Asian states by separate researchers, a common research protocol was used to facilitate comparability and consistency among the different cases. The protocol draws heavily on the approach suggested by Yin [2003] and incorporates some of the ideas of Walsham [1995]. Selected experts in Taiwan were interviewed in different circumstances, including panel meetings and a few on-site review sessions for technological universities.

THE SAMPLE

In 2005, the Ministry of Education in Taiwan launched the "Top University Initiative" to promote world-class research. Twelve universities as listed in Table 1 were chosen to share a five-year NT$50 billion grant (about US$1.6 billion).

Table 1. Research Universities in the Top-University Initiative

University	Abbreviation	Founded Year
National Taiwan University	NTU	1928
National Cheng Kung University	NCKU	1931
National Chung Hsing University	NCHU	1943
National Chengchi University	NCCU	1955
National Tsing Hua University	NTHU	1955
National Chiao Tung University	NCTU	1958
National Central University	NCU	1962
National Taiwan University of Science and Technology	NTUST	1974
National Yang-Ming University	NYMU	1975
National Sun Yat-sen University	NSYSU	1980
Chang Gung University	CGU	1987
Yuan Ze University	YZU	1989

Note: Listed by the founding year.

In order to reflect the research profile of IS in Taiwan, the sample universities were primarily chosen from the first-tier universities. As National Tsing Hua University and National Yang-Ming University in the list are science and medical universities that do not offer IM programs, and the IM departments of National Chung Hsing University and Chang Gung University are new and relatively small in size, they are excluded from this study. The IM Department of National Chung Cheng University (CCU) is included in this study because the department offers doctoral

programs and has a strong research presence. As a result, this study included nine top IS programs in Taiwan. Their profiles are shown in Table 2.

Table 2: Profile of the Sample Universities

University	Founded Year	Ownership	No. of Students	Main Campus	Website
NTU	1928	Public	>30,000	Taipei City	http://www.ntu.edu.tw
NCKU	1931	Public	>20,500	Tainan City	http://www.ncku.edu.tw
NCCU	1955	Public	>14,500	Taipei City	http://www.nccu.edu.tw
NCTU	1958	Public	>12,000	Hsinchu City	http://www.nctu.edu.tw
NCU	1962	Public	>10,500	Taoyuan County	http://www.ncu.edu.tw
NTUST	1974	Public	>9,500	Taipei City	http://www.ntust.edu.tw
NSYSU	1980	Public	>10,000	Kaohsiung City	http://www.nsysu.edu.tw
CCU	1989	Public	>12,000	Chiayi County	http://www.ccu.edu.tw
YZU	1989	Private	>10,000	Taoyuan County	http://www.yzu.edu.tw

National Taiwan University (NTU) was the first university in Taiwan, being established 74 years ago. The predecessor of NTU was Taihoku (Taipei) Imperial University, founded in 1928 during the period of Japanese rule. In 1945, Taihoku Imperial University was reorganized, and renamed National Taiwan University after Taiwan was returned to China after World War II. As of the 2005 academic year, the university has a total of 11 colleges, 54 departments, 96 graduate institutes (which offer 96 masters programs and 83 doctoral programs) and more than 30,000 students. National Cheng Kung University (NCKU) also originated from a college during the period of Japanese rule and then converted to a comprehensive university later. It also has more than 20,000 students. Most other universities were established after 1950 and are smaller in student numbers.

Yuan Ze University (YZU) is the only private university selected in this study. It was founded by Mr. Y. Z. Hsu, the founder of Far Eastern Textile Group, in 1989 as Yuan-Ze Institute of Technology and then converted to Yuan Ze University in 1991.

In later sections, the status of the IS programs in technological universities will also be explored based on one author's interviews of more than 100 faculty members while chairing the three-year review committees requested by the Ministry of Education. More than 20 IS programs were visited between 2004 and 2006. Most data in the analysis in later sections were collected in 2006.

V. ANALYSIS OF THE IS PROGRAMS SELECTED IN THIS STUDY

BASIC INFORMATION

Table 3 shows the background information of the programs offered by the selected universities. Most of these programs are offered in their business schools, excepting Yuan Ze University, which has its IM programs in the School of Informatics.

Most selected universities offer a full range of undergraduate, masters, executive masters, and Ph.D. Programs, except for NCKU and NCTU. NCTU does not offer an undergraduate IS program.   NCKU only offers small-scale masters and Ph.D. programs within its Industrial Management department.

Table 3: Profile of the IM Department Selected in This Study

University	No. of faculty members	Programs			
		UG	Masters	Executive masters	Ph. D
NCU	26	✓	✓	✓	✓
NCCU	24	✓	✓	✓	✓
NSYSU	20	✓	✓	✓	✓
YZU	17	✓	✓	✓	✓
NCKU	16	-	✓	-	✓
NTUST	16	✓	✓	✓	✓
NTU	15	✓	✓	✓	✓
CCU	13	✓	✓	✓	✓
NCTU	11	-	✓	✓	✓

The number of full-time faculty members in the IS departments ranges from 11 to 26. NCU and NCCU have more than 20 faculty members and are in first and second place in terms of the number of faculty. NSYSU has 20 faculty members and is the third-largest IS faculty in Taiwan.

THE IS PROGRAMS

Undergraduate education

Undergraduate study is a four-year program. Students must take a college entrance examination and are assigned to a department based on their preferences and test scores. The number of students who can be admitted into a department is regulated by the Ministry of Education. The undergraduate IM program has been popular since its introduction. It is still so even following the dot com bubble. Most IM departments have no problem recruiting adequate students. Table 4 shows the status of IS undergraduate programs included in the study. NCCU and NSYSU were the earliest national universities that offer IS undergraduate curriculums, (in 1984). In terms of undergraduate student size, Yuan Ze University was the largest.

Masters Programs

Masters studies in Taiwan are two-year programs. A masters thesis is required in addition to course work. The IS masters programs are no exception. Graduate studies used to be free in Taiwan, but universities started charging tuition and fees from around 1999. Due to the very high demand, most universities offer full-time and evening executive programs. Table 5 shows the status of the full-time IM masters programs. NSYSU and NCTU were the first movers offering these in 1989. In terms of student size, NTU's program is the largest, with more than 100 students.

Table 6 profiles evening executive masters programs. Four universities introduced executive IS masters programs in 1999. As the curriculum design for the evening program is usually based on a three-year duration, the size of the evening programs may be larger than that of the full-time

programs for some departments. These evening programs create extra resources and provide contacts with industries for research. YZU's executive program has the largest student size of 180. NSYSU is the largest of the national universities.

Table 4: Undergraduate IS Programs in Taiwan

University	Year Founded	Number of Students
NCCU	1984	>350
NSYSU	1984	>160
NCU	1985	>400
NTUST	1989	>260
NTU	1991	>200
YZU	1993	>500
CCU	1998	>200
NCKU	n/a	0
NCTU	n/a	0

Table 5. Size of the Full-time IS Masters Programs

University	Year Founded	Number of Students
NSYSU	1989	94
NCTU	1989	65
NCU	1991	85
NCCU	1992	85
NTU	1994	110
YZU	1995	65
CCU	1994	62
NCKU	1998	55
NTUST	1999	91

Doctoral Programs

Doctoral programs in Taiwan are highly regulated by the Ministry of Education. A program needs to have at least two full professors, a strong publication record, and high market demand before it can be approved. Therefore, only a few universities have been approved to offer doctoral programs in IS. The typical length of study for doctoral students is five years. Table 7 shows the status of IS Ph.D. programs in the sample universities. NCTU, NCU and NSYSU were the first three universities approved to offer IS Ph.D. programs, in 1994. NCKU and YZU were the latest to offer, and admitted three doctoral students each in 2005.

Table 6: Size of the Executive Masters Programs

University	Year Founded	Number of Students
YZU	1999	183
NSYSU	1999	148
CCU	1999	97
NCTU	1999	90
NCCU	2000	75
NCU	2000	66
NTU	2002	43
NTUST	2003	69
NCKU	n/a	0

Table 7. Doctoral Programs

University	Year Founded	Number of Students
NCTU	1994	73
NCU	1994	68
NSYSU	1994	55
NTU	1995	63
NCCU	1996	57
CCU	1999	39
NTUST	1999	78
NCKU	2005	3
YZU	2005	3

STUDENT ENROLLMENT

Undergraduate student admission is through a rigid centralized mechanism governed by the College Entrance Examination Center. Changes in enrollment trends can only be discerned from longitudinal scores of students admitted into the IM department in the same universities. The downturn following the dot com crash did have an impact on students' interest in IM programs but this was not as bad as that experienced in most American and European countries. Most departments still have no difficulty attracting a sufficient number of students, but the minimum admission score line may decline from above that of the finance major to below it.

For graduate programs, students apply to individual programs and are admitted by program admission committees. We also have not seen a significant downturn of student enrollment in masters and doctoral programs in most major universities. The average acceptance rate of full-time masters programs in the study in the past three years is below 10 percent. For instance, NSYSU had received 1085, 608, and 841 applicants for its full-time masters program in 2004,

2005, and 2006, respectively, while only 40 of them were eventually admitted in each year. The average acceptance rate was less than 5 percent.

Enrollment in the doctoral program in Taiwan is different from the masters programs. Because of the success of high-tech manufacturing in Taiwan, most masters students in IS can find a very good job after receiving their degrees. The salary for assistant professors is not very competitive, compared to the salaries offered by industry. The starting salary for a new assistant professor is around US$30,000. A senior IS engineer with a masters degree and a few years of experience could earn twice as much. Therefore, the average admission rate of doctoral programs in Taiwan is usually higher than 30 percent. NSYSU, for instance, admitted around 10 to 12 from around 60 applicants each year from 2004 to 2006.

IS FACULTY SPECIALTY STRUCTURE

The role of information management in Taiwan is different from the typical IS programs in the United States. Students are required to learn not only strategic and organizational aspects of information systems but also the design science aspect of programming and system development. Therefore, most IM departments have a mixture of faculty members, with educational background and research interests in management information systems, computer science (CS), and decision sciences (DS). Students are also required to take courses in all three areas.

The IS faculty members in Taiwan are well-trained in research. More than 90 percent of faculty members in these universities hold doctoral degrees from United States or European universities. They have close relationships with the international research community. Most also travel and collaborate internationally to remain current.

Table 8 shows the specialties of faculty members in IS Departments in Taiwan, based on their final degrees. In addition to those holding MIS and CS degrees, there are many with a background in decision sciences (DS). Production and operations management, industrial engineering, and other quantitative oriented disciplines also provide a substantial portion of IS faculty members in Taiwan. Other specialties include psychology, communications, education, accounting, and other related areas.

Table 8. The Specialties of Faculty in IS Departments

University	Specialty (Final Degree)			
	Information Systems (IS)	Decision Science (DS)	Computer Science (CS)	others
NCCU	10	5	6	3
NCU	9	3	4	10
CCU	7	1	4	1
NSYSU	6	6	7	1
NTUST	2	4	9	1
YZU	2	3	7	4
NCTU	1	3	7	0
NTU	0	3	9	3
NCKU	0	13	3	0
Total	37	40	55	23

www.manaraa.com

As we can see from the data in Table 8, the foci of the IS programs in Taiwan fall into three groups: IS-oriented, CS-oriented and DS-oriented. NCCU, NCU, CCU and NSYSU are IS-oriented, because they have more than six faculty members with educational backgrounds in information systems. At the time the survey was conducted, NCCU had the largest number of faculty members with management information systems academic training. NTUST, YZU, NCTU and NTU are CS-oriented, because a substantial portion of their faculty members have an educational background in computer science. Please note that these universities also have separate computer science and engineering departments in their engineering schools. NCKU is probably the only one that is DS-oriented. This is because its IM program is actually run by the Industrial Management department, which is heavily oriented toward production and operations management.

CURRICULUM DESIGN

Like the faculty composition, the IS curriculum in Taiwan is different from that in the U.S. The IS curriculum has more technical content. In addition to the classic core courses such as introduction to MIS, database management, systems analysis, and design and data communications, different programs may have different foci. Some programs with more technical orientation offer courses ranging from computer algorithms, data mining, computer security, to computer graphics. Other universities are more design oriented. They offer a complete set of multimedia and design courses to target a different market. Table 9 shows the distribution of undergraduate core courses and masters level courses in the sample. We can see that technical courses often outnumber IS courses at the undergraduate level. Information system courses become dominant in the masters level curriculum. The course units shown in the table for the masters programs include both required and elective courses. The graduation requirements for the masters program vary from 30-42 credit hours.

Table 9. Course Distribution in Different Programs

University	Undergraduate Core Courses[1]				Masters Program		
	Total Core Course credits	General	IT	IS	Total course credits	IT	IS
NTU	81	43	21	17	72	18	54
YZU	80	36	24	20	96	39	57
NCU	74	35	24	15	60[2]	6	54
CCU	66	27	18	21	87	24	63
NCCU	66	29	15	22	117	30	87
NTUST	63	30	23	10	84	42	42
NSYSU	57	26	18	13	87	21	66
NCKU	-	-	-	-	48	15	33
NCTU	-	-	-	-	78	21	57

Note: 1. Only show required core courses. Each course is typically 3 credit units.

2. NCU has IS and IT tracks. The data are for the IS track.

The curriculum design for teaching-oriented technological universities is often more technically oriented. In order to show how IM programs in research and teaching universities differ, we surveyed the curriculum of five technological universities, including Mingshin University of Science and Technology (MUST) in Northern Taiwan, National Yunlin University of Science and Technology (NYUST) and Chaoyang University of Science and Technology (CUST) from middle Taiwan, National Kaohsiung First University of Science and Technology (NKFUST) and Southern Taiwan University of Technology (STUT) in Southern Taiwan. The result shown in Table 10 is quite different from the research universities, particularly in graduate elective courses. They typically offer more elective IT courses than IS courses. This also reflects the nature of the IS job market in Taiwan. Students need to acquire both technical and managerial skills. In a few informal interviews, recruiters indicated that they need candidates to be able to develop in-house application systems and maintain servers, in addition to handling organizational issues.

Table 10. Curriculum of Technological Universities

University	Undergraduate Core Courses[1]				Masters Program		
	Total Core Course credits	General	IT	IS	Total Course Credits	IT	IS
NYUST	68	20	30	18	76	39	37
NKFUST	46	15	18	10	92	42	50
MUST	59	17	34	8	58	33	25
CYUT	52	16	24	12	117	90	27
STUT	76	23	39	14	107	60	47

Many IS graduates find their first jobs require a certain degree of coding. For instance, an IS graduate from NSYSU in 2006 held a position in the IS department of a major integrated circuit manufacturing company. His primary responsibility was to maintain and tailor part of the manufacturing systems, even though the company has adopted a fully functioning ERP system from SAP.

IS RESEARCH AND FUNDING SOURCES

Major Funding Sources

For faculty members in the sample research universities, research is a major portion of their duties. Research performance, as measured by funded projects and journal publications, is critical to promotion and tenure decisions. The major source of funding for IS faculty members is the National Science Council (NSC). Active researchers can receive up to two grants, with a total amount up to US$30,000 each year to support graduate research assistants and cover other expenses.

In addition to the funding from NSC, other funding sources such as the Ministry of Education and Ministry of Economic Affairs are also quite generous. Many faculty members receive grants from them to conduct applied research and mission-specific studies. Some of these projects may also result in publishable papers.

Research Areas

Since the programs in the selected universities have different faculty specialty structures, their research emphases also differ. Table 11 outlines their major research foci and research groups/labs as surveyed from their Web sites. As we can see from the table, the research labs cover both IM and some computer science areas. The most common research areas across these universities are e-commerce/m-commerce and knowledge management (KM). This is consistent with the global research trend.

Table 11. IS Research Foci and Groupings in Selected Universities

University	Areas of IS Research	IS Research Groupings/Labs
CCU	DSS/GDSS/SIS Information Technology Management Information Economics Electronic Commerce Health Informatics	M-commerce & Information Security Database & Knowledge Base E-Manufacturing and E-Commerce Collaborate Commerce & DSS Global Logistics Management Healthcare Information Management
NCCU	Commerce Automation E-Commerce/ M-Commerce Marketing Information System Finical Information System Supply Chain Management Manufacturing Information Systems Knowledge Management High-Tech Management	XML and Information Integration IT Innovation ICT and Organizational Intelligence Virtual Reality Digital Innovation & Management E-Commerce Ambient E-Services BPM & Enterprise Systems Advanced Planning and Scheduling Simulation Optimization Knowledge Management
NCKU	Intelligent Systems E-Commerce Hospital Information Systems	Individual
NCTU	Electronic Commerce Internet applications Business Communications Financial Engineering Internet Geographic Information Systems Database applications Internet community	Communications Network Database and Information System Enterprise Information System Financial Information Industrial Competitiveness and Habitual Domains Logistics Management Multi-media Operations Research
NCU	Enterprise Resource Planning (ERP)	ERP Center

The Information Systems Academic Discipline in Taiwan: A Focus On Top-Tier Universities by C.-C. Lee and T.-P. Liang

University	Areas of IS Research	IS Research Groupings/Labs
	Information Economics	Computer Network
	IS project management	Data Engineering
	IS service quality management	Distributed Systems
	Data Mining	E-Commerce & ERP
	Customer Relationship Management	Intelligent Information Systems
	E-Commerce/Mobile Commerce	IT & Intelligence Strategy
	Knowledge Management	IT & Organization Interaction
	DSS	Knowledge & Decision Science
		Mobile Communication Network
		Organizational Technology & Economy
		Taiwan & Mainland China
		Technology Based Learning & Organization Performance
		Technology Management
		Web Behaviors
NSYSU	DSS/GDSS/SIS	E-Commerce Research Center
	Negotiation Support Systems	Intelligent System Lab
	E-Commerce	Electronic Decision Lab
	Knowledge management	Multimedia Lab
	Workflow Management	Network Management Lab
	Human Computer Interaction	Software Engineering Lab
	Network Security	IS & Organization Lab
	Distributed IS	Automated Data Collection Lab
	Medical information systems	
NTU	Mobile Multimedia Communication	
	Information Economics	
	Database and AI	Content and Knowledge Management
	Data Mining/ Web Mining	Network System and Services
	E-Commerce/Mobile Commerce	Distributed IS
	Knowledge Management	Computer Multimedia, E-Business and SCM
	DSS	Information and Behavior
	Bioinformatics	
	Distributed Systems	
NTUST	DSS/ Production Information System;	Computer Graphics and Multimedia
	Parallel Processing;	Computer Networks
	Data Security;	Database Systems
	Distributed Processing;	Financial Management Information System
	Computer Graphics	Information Security

University	Areas of IS Research	IS Research Groupings/Labs
	Financial Information System	Integrated Digital Service
	Mobile Computing	Logistics Management
	Data Mining	Network Technology and Application
	Bioinformatics	Parallel & Distributed System Laboratory
	Knowledge Management	Software Engineering and Management
	Computer Network	Strategic Management Information System
	Electronic Government	System Management
YZU	Medical Information System	Business Intelligence
	DSS/Expert System	Management Automation and Organizational Design
	Workflow Management	Decision Support System
	Neural Networks and Fuzzy Logic	Computational Intelligence
	Information Systems Security	Advance Information Systems
	E-Commerce/M-Commerce	Financial Data Mining
	Database/Data warehousing/Data Mining	Industrial Information System

The reason e-commerce and m-commerce are popular in Taiwan is that the government has invested heavily in building the infrastructure and promoting on-line and mobile services. For instance, the National Information and Communication Initiative (NICI) of the Executive Yuan (Cabinet), Ministry of the Internal Affairs, and Ministry of Economic Affairs (MOEA) jointly proposed the *M-Taiwan Initiative* in 2005, which allocated a budget of approximately US$1 billion in the following five years to develop a ubiquitous business environment. This project has boosted research in mobile commerce.

Research in EC and KM faces a similar environment. The Ministry of Economic Affairs has appropriated more than five hundred million U.S. dollars to subsidize the adoption of e-commerce and KM in local companies since 1999. A series of new initiatives (Programs A, B, C, D, E, F) have been implemented to rapidly upgrade the infrastructure for international procurement, supply chain management, financial operations, and collaborative design. These initiatives have motivated related academic research. A limited amount of funding from private companies is sometimes available, but those projects are typically consultation-oriented and targeted at solving a specific problem. They are less likely to generate publishable papers.

Publication Outlets

Most faculty members in research universities are required to publish in international journals, particularly those included in the ISI citation databases. The surveyed universities often require one such publication every other year to have a good opportunity for promotion. Some universities provide monetary rewards to encourage such publication. This is necessary because there is virtually no other means to reward research, as faculty salary is completely seniority-based. Doctoral students need to publish at least one paper in an international journal before their graduation. The number of international publications has increased because of these policies. For instance, the IM department of NSYSU was ranked among the top 50 worldwide in terms of papers published in the top eight IS journals and its doctoral graduates are also ranked among the top 50 [Clark and Warren 2006]. The quality and quantity of research in other universities such as NCU and NTU have also been substantially enhanced in the past decade. The performance of technology-oriented programs is also very good, although their faculty members often do not choose IS journals as their primary publication outlets.
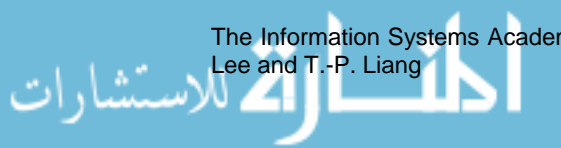
In addition to international journals, there are a few local Chinese journals that publish IM papers. The most popular one is the *Journal of Information Management* (JIM). It publishes four issues a year and is into its 14th year. *Systems and Management* is another journal that publishes many IS papers. A citation database managed by the Social Science Research Center of NSC, called *Taiwan Social Science Citation Index* (TSSCI), includes around eight journals in business and management. They are highly preferred publication outlets for faculty members. These local journals provide a platform for knowledge sharing among researchers in Taiwan.

PROFESSIONAL ORGANIZATIONS AND ACTIVITIES

The IS academics in Taiwan have been active since 1980, when a group of IS professionals formed the Chinese Society of Information Management (CSIM). CSIM is Taiwan's largest and most important professional association in IS. Currently, it has more than 500 members. In addition to this academic organization, there are many other specialized associations for ERP, EC, KM, SCM, and other topics. Most of these organizations are more practitioner-oriented and work closely with the government.

Another special organization that has played a major role in IS development in Taiwan is the Institute for Information Management (III). The Institute was founded by a government grant and matching funds from private companies in early 1980. Its primary mission is to develop government information policies. It usually receives more than US$ 15 million research funding from the government to develop software technology annually. Their research findings are rarely published in academic journals. Some faculty members work closely with the Institute and receive small research grants from it.

The Chinese Society of Information Management (CSIM) is the major academic organization in Taiwan and has 12 committees to facilitate its functioning. Major academic activities include journal publication and conferences, as follows:

(1) Journal Publication

    CSIM publishes the major quarterly IS journal, *Journal of Information Management*. It publishes 8-10 papers in an issue and is included in the Taiwan Social Citation Index (TSSCI).

(2) International Conference on Information Management (ICIM)

    ICIM is a conference in May and has been held for 16 years. At the most recent meeting, approximately 500 papers were submitted and the acceptance rate was about 40 percent. Approximately 1,000 participants from academe and industry attended the conference.

(3) Conference on Information Management and Practice

    The conference is usually held in November or December and has been held every year since 1995. In the most recent meeting, approximately 400 papers were submitted and the acceptance rate was about 45 percent. The participants numbered around 800.

(4) National Student Information Systems Project Competition

    Since a one-year IS project is required in most undergraduate IM curricula, the association runs an IS student project contest every year. Outstanding student projects may be nominated by their instructors to participate in this national contest. The participating team has to demonstrate its project in front of referees in a one-day show. This provides an opportunity for the IM department to link their teaching with industrial needs, and students have a chance to integrate their systems development knowledge and skills before they go to the job market. The contest has been held every year since 1997. In the most recent contest, approximately 110 teams participated in the event.

(5) Annual Doctoral Consortium

In order to equip doctoral students with better research capabilities, an annual doctoral consortium has been held in April every year since 1998. Doctoral candidates at their dissertation stage are encouraged to attend this event and to present their research, share with their peers, and receive comments from senior faculty members.

Evaluation and Accreditation of IS Programs

Another event that has played a key role in the development of IS education in Taiwan is the three-year program review conducted by the Ministry of Education. Initially, this was only required for programs in technological universities but is now required for all universities and colleges. The Ministry of Education forms a review committee every year to review the administration, curriculum, and research of IM departments. Outstanding performers will receive more funding from the government and poor performers will be asked to reduce their student quota.

This review is similar to the AACSB accreditation but is at the department level. Review committee members spend a full day on campus to review documentation, to interview faculty members, students, and possibly alumni, to examine teaching and research facilities, and to sit in classrooms. At the end of this, the committee writes a report for the Ministry of Education and rates the programs. Since this review affects not only the reputation but also the actual funding from the Ministry of Education, most universities are very serious about the review. The review serves as a major mechanism for quality assurance in Taiwan.

A few business schools in Taiwan are now seeking AACSB-accreditation. For instance, National Sun Yat-Sen University was the first national university that received AACSB-accreditation in 2005. National Cheng Chi University received the same accreditation in 2007. More research universities are in the process of applying for the accreditation.

KEY FIGURES WHO HAVE INFLUENCED IS IN TAIWAN UNIVERSITIES

There are several people who have influenced IS development in Taiwan. In the early stage, pioneers in IS education included K. Song and C. K. Farn, who established the IM Department at NSYSU, founded CSIM, and kicked off the national conference when they were with NSYSU. They also set up early IS curriculum standards in Taiwan and created an effective platform for IS academics to communicate and share knowledge.

More recently, Ting-Peng Liang has played a leading role in encouraging the community to be more research-oriented and international-oriented after his joining NSYSU from Purdue University. He was the founder of the first Pacific Asia Conference on Information Systems (PACIS), held in Kaohsiung in 1993 (it was called Pan Pacific Conference on Information Systems at that time). This was the first major IS conference in the region and gradually evolved into an AIS-affiliated conference. All papers presented in the conference series are available at http://www.pacis-net.org/.

Younger researchers such as Eric Wang and M.H. Huang are playing an increasingly important role by providing research support through the Management Funding Panel of the National Science Council. They have helped push the research momentum in the area to a higher level. H. G. Chen who has served as the chief editor for the *Journal of Information Management* for more than five years has also played a role in maintaining the quality of research outlest.

VI. FINDINGS, IMPLICATIONS, AND LIMITATIONS

SUMMARY OF FINDINGS

In this paper, we have outlined IS development in Taiwan by examining IS programs in nine major universities. In the past two decades, Taiwan's higher education sector has experienced

rapid growth. The IS discipline has also flourished in that time, to become one of the most popular disciplines with students. The total number of IS students is approximately 40,000. Most Taiwanese universities offer IM undergraduate and masters degree programs, while a few research universities also offer doctoral degree programs. Information obtained in interviews about these programs provide a snapshot of IS education and research in Taiwan.

In summary, we found:

(1) More than 80 percent of Taiwanese universities have IS departments. Most of these departments are located in management or commerce faculties, excepting the IS department in YZU which is in the Informatics Faculty.

(2) The IS area is very attractive for students, as evidenced by the number of students enrolled in the IM departments.

(3) Most IM departments in Taiwan include faculty from a mix of backgrounds - generally IS, CS, and Decision Sciences. Some departments focus on CS, while others are more balanced in faculty specialty backgrounds.

(4) The IS curriculum is different from that in the United States in that it includes more technical courses in Taiwan. This provides students with the broad range of skills the market demands.

(5) Curriculum developed by individual departments must go through a rigorous review conducted by the Ministry of Education every three years. This is a major mechanism for quality assurance.

(6) Research performance is measured by funded projects and journal publications. International journals (particularly those included in the ISI citation database) and local journals included in Taiwan Social Citation Index are the preferred outlets for publication.

(7) The National Science Council (NSC) is the most important funding source for research projects. The Ministry of Education and other funding agencies also play an important role in research support.

(8) The job market for IM undergraduate and masters students is very good in Taiwan. Many students receive three to five offers within a short time period after graduation. Doctoral graduates have no problem finding a job in a teaching school, but finding a job in a highly ranked research school is very competitive.

(9) The strength of high-tech industries in Taiwan is a major driving force in the demand for IS professionals. These companies offer high salaries and very good year-end bonus packages to outstanding graduates.

(10) The dot.com crash had a minor effect on student enrollments, although it did slightly lower the admission scores for undergraduate IM programs. Acceptance into masters programs is still extremely competitive.

(11) Professional organizations are very active in sponsoring conferences and student events such as IS project competition and doctoral consortiums.

IMPLICATIONS AND CONCLUSION

As the purpose of this study was to investigate two aspects of IS education in Taiwan: (1) degree of professionalization as a discipline and (2) maturity as a scientific field, the findings allow us to conclude as follows:

The degree of "professionalization" of the discipline is expected to increase as the impact of local contingencies decreases. A discipline is not highly professionalized if local contingencies, such as political pressures, have a high impact on it. The data we have collected from the top-tier universities in Taiwan show that the area has its own curriculum and is monitored by a review

committee of professionals. Most IS research areas in Taiwan are in line with global IS research trends, such as e-commerce, DSS, technology adoption issues, knowledge management, and so on. The size of IS within the studied universities is reasonably large and the job market is healthy. Funding agents, such as the National Science Council, provide stable support to IS research. Thus, it is reasonable to conclude that the IS discipline in Taiwan is highly professionalized.

The maturity of the discipline as a separate scientific field can be observed from the evolution of IS in Taiwan. Over two-third of Taiwanese universities now have IM departments or graduate institutes and a number of universities have doctoral programs. The local doctoral programs are able to produce graduates to fill faculty teaching positions. The area has reached a relatively mature stage. As the largest academic discipline in business, the IM area is also large enough to be an independent and influential discipline in Taiwan. The "scientific" aspect can be evidenced by the research requirements to publish in international journals and maturity of local publication outlets, including local journals and active academic conferences. Most of the faculty members we interviewed are proud of being in the IM area and faculty members from different background disciplines (such as computer science) have a good consensus on what kind of research is IS-related research. IS academics in Taiwan have their own professional organizations, journals and conferences. Therefore, we can conclude that the IS area in Taiwan is quite mature.

By comparing the IS enrollment in Taiwan and that in the US, we find that the major factor affecting the status of the IS discipline in Taiwan is the job market. In particular, the manufacturing industry provides a large portion of the demand for IS graduates. This is because the IS program in Taiwan provides a balanced education between technology and management. Students are told that they have an advantage over engineering students because they know management and they have an advantage over other business students because they know technology. This strategy seems to sell well in Taiwan's manufacturing-oriented economy, where IT applications and system integration are more important than IT innovation.

LIMITATIONS OF THE STUDY

The paper has highlighted the IS discipline in Taiwan, with a particular emphasis on the research-oriented top universities. Although a large number of teaching universities follow these research universities in research and curriculum design, an obvious bias is that the sample included in the study was not randomly selected. The information provided here may not be an accurate illustration of what happens in the remaining universities. Another major constraint is that a substantial portion of the data was collected from the Web sites of these programs. Reasonable effort has been made to ensure data accuracy, but they can only reflect the facts at the time of data collection. The actual situation by the time the paper is published may be different from that at the time the data was collected (e.g. faculty profile of a certain program may change every semester). Nonetheless, the findings in the paper provide much insight into IS education in Taiwan.

REFERENCES

Avgerou, C., J. Siemer, and N. Bjørn-Andersen. (1999). "The Academic Field of Information Systems in Europe," *European Journal of Information Systems*, (8)2, pp. 136-153.

Clark, J. G. and J. Warren. (2006). "In Search of the Primary Suppliers of IS Research: Who Are They and Where Did They Come From?" *Communications of the AIS*, (18) pp. 296-328.

Fitzgerald, G. (2003). "Information Systems: A Subject with a Particular Perspective, No More, No Less," *European Journal of Information Systems*, (12)3, pp. 225–228.

Sherer, S. A. (2002). "Academic Departments of Information Systems Faculty in the U.S.," *Journal of Information Systems Education,* (13)2, pp. 105-116.

Walsham, G. (1995). "Interpretive Case Studies in IS Research: Nature and Method," *European Journal of Information Systems*, (4), pp. 74-81.

Whitley, R. (1984a). "The Development of Management Studies as a Fragmented Adhocracy," *Social Science Information*, (23)4/5, pp. 775–818.

Whitley, R. (1984b). *The Intellectual and Social Organization of the Sciences*, Oxford, UK: Clarendon Press.

Yin, Robert K. (2003). *Case Study Research: Design and Methods, 3rd edition,* Thousand Oaks, CA.: Sage Publications.

BIBLIOGRAPHY

The other IS in Pacific Asia Region Study reports available in this volume of CAIS

Chau, P. Y. K. and K. K. Y. Kuan. (2007). "The Information Systems Academic Discipline in Hong Kong," *Communications of the Association for Information Systems.*

Gable, G. (2007a). "The Information Systems Academic Discipline in Pacific Asia – a Contextual Analysis," *Communications of the Association for Information Systems.*

Gable, G. (2007b). "The Information Systems Academic Discipline in Australia," *Communications of the Association for Information Systems.*

Gable, G., K-Y. Kwahk, J-N. Lee, and P. Green. (2007). "Administrative Placement of the Information Systems Academic Discipline: A Comparative SWOT Analysis," *Communications of the Association for Information Systems.*

Gable, G. and R. W. Smyth (2007). "The Information Systems Academic Discipline in Pacific Asia – Methodological Learnings," *Communications of the Association for Information Systems.*

Lee, C-C and T-P. Liang. (2007). "The Information Systems Academic Discipline in Taiwan : A Focus on Top-Tier Universities," *Communications of the Association for Information Systems.*

Lee, J-N. and S-W. Yoo. (2007) "The Information Systems Academic Discipline in Korea: A Focus on Top-Tier Universities," *Communications of the Association for Information Systems.*

Lehmann, H. and S. Huff. (2007). "The Information Systems Academic Discipline in New Zealand," *Communications of the Association for Information Systems.*

Tan, B. and T. Chan. (2007). "The Information Systems Academic Discipline in Singapore," *Communications of the Association for Information Systems.*

APPENDIX I. THE OVERARCHING STUDY:
 THE STATE OF THE INFORMATION SYSTEMS DISCIPLINE IN PACIFIC ASIA

Figure A-1 depicts the main components of the study "The State of the Information Systems Academic Discipline in Pacific Asia." The Pacific Asia study is motivated from a recognition that Information Systems as an academic discipline has evolved differentially around the world. The genesis of the study was a panel of the 6th Pacific Asia Conference on Information Systems (PACIS'02), Tokyo, Japan 2-4 September 2002, ultimately resulting in formal project commencement in 2004 with AIS endorsement and seed funding.

Principal of the several related sub-studies is a series of case studies across the States[1] of Pacific Asia. The overall study has from the outset been designed and executed with the expectation that it would be extended and repeated over time. It was decided early on to restrict the first iteration of the study to those areas in the region where IS is relatively more visible internationally – Australia, Hong Kong (China), Korea, New Zealand, Singapore and Taiwan.
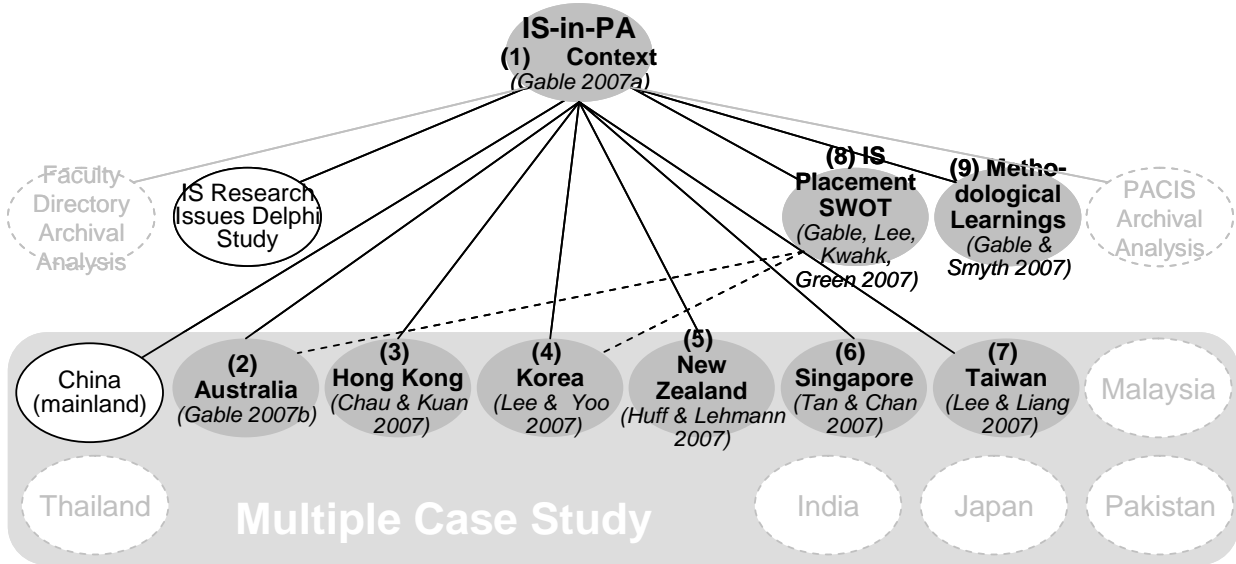
Figure A-1. The IS in Pacific Asia Region Sub-Studies

Shaded ovals in Figure A-1 represent those components completed in the first execution, with results reported in this special issue of *CAIS*. Unshaded ovals represent components in progress (i.e. Mainland China Case Study, IS Research Issues Delphi Study), and dashed ovals represent components soon to commence.

The largely exploratory and descriptive state case studies employed a common research framework [Ridley 2006a]. The framework considers the current and past state of IS in Pacific Asia universities from the perspective of the development of a discipline. The framework was guided by Whitley's Theory of Scientific Change [1984a 1984b]. It suggests that there is an inverse relationship between the impact of local contingencies and a discipline's degree of professionalism and maturity.

Given the descriptive and exploratory character of the overall study, the team harboured no illusions regarding the ultimate completeness of issues to be identified, related evidence to be gathered, and analyses to be conducted. It was acknowledged that the study offers a mere starting point for ongoing monitoring of the state of IS in the Pacific Asia region. Regardless, efforts were made to achieve some level of representativeness of the evidence and perspectives reported: (1) Selection of the study team – sought region-wide representation. This suggested state-based case reports. Senior and well known IS academics were approached. (2) Interviewees received an early draft of the state report in which their views were recounted. On the basis of feedback, changes were implemented by the state teams. (3) Selected "within state" local experts were sent a copy of the draft state report for review, aims being to: minimize potential adverse reaction from perceived misrepresentation, try to ensure the report is as representative of the state as possible, enrich the report with further insights, and ensure the process of peer-review results in papers of strong academic standard. (4) All authors on all papers of the special issue reviewed the complete draft special issue.

---

[1] The term "state" is used to refer to each of the national entities studied.

ABOUT THE AUTHORS

Chin-Chang Lee is associate professor of Information Management at the National Kaohsiung First University of Science of Technology in Taiwan. Prior to joining NKFUST in 2004, he had been the director of the Graduate Institute of Information Management of the Shu-Te University in Taiwan. He received his doctoral degree in Information Systems from the College of Management, National Sun Yat-Sen University in Taiwan. His primary research interests include IS curriculum design, electronic commerce, decision support systems and mobile commerce. His papers have appeared in a number of journals, such as *Decision Support Systems*, *Expert Systems with Applications* and *Journal of Information Management*. Dr. Lee is a member of AIS, DSI, and INFORMS. E-mail: cclee@ccms.nkfust.edu.tw

Ting-Peng Liang is national chair professor of Information Management and director of Electronic Commerce Research Center of the National Sun Yat-sen University in Kaohsiung, Taiwan. He is also an AIS Fellow. Prior to joining the University in 1991, he was associate professor at the Krannert Graduate School of Management, Purdue University. He was a pioneer in model management and intelligent decision support systems. His recent research interests include electronic commerce, knowledge management, and intelligent decision support. Professor Liang was the founder of PACIS in 1993 and has published in many academic journals, including *Management Science, MISQ, JMIS, DSS, Information and Management*, among others. He is the chief editor of the newly established *Pacific Asia Journal of Association for Information Systems*, an area editor of *Decision Support Systems*, and serves on the editorial board of *International Journal of Electronic Commerce* and several other academic journals. E-mail: tpliang@facmail.nsysu.edu.tw