

A fit-gap analysis of e-business curricula and job demand in Taiwan and the US

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Abstract

During the past decade, many enterprises have been re-directing their resources into critical business areas to keep up with economic and market changes. They have adopted electronic business (EB) systems, such as supply chain management, enterprise resource planning (ERP), and enterprise application integration (EAI), to ensure seamless integration with internal processes as well as suppliers and customers. This phenomenon indicates that EB systems are playing an important role in attaining the effectiveness of enterprise operations. However, there is a constant complaint from recruiters that EB professionals with the right skills are hard to come by. To gauge the rapid changes in EB education and industry demand, EB curricula from top universities and job announcements from popular career Web sites in both the US and Taiwan are collected. We analyze the data and compare the results between the two countries to recommend remedial actions for narrowing the gap between industry and academia.

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1. Introduction

Information technology (IT) has been advancing rapidly in the past few decades, ranging from microprocessors to the Internet. IT changes not only business operations, but also business interrelationships. During the meltdown of Internet economy at the beginning of the new millennium, many dot-com companies vanished because they failed to meet investors' expectations. This phenomenon, however, did not stop the growing use of the Internet as an essential business tool (Pinker, Seidmann, & Foster, 2002). Electronic business (EB) still plays a major role in many industries. According to a Forrester (2005) report, expenditure on IT goods has increased from 9% to 10%, especially on communications equipment, IT consulting, outsourcing

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services, and software. However, expenditure on computer equipment has slowed down because IT investment has been moving away from traditional IT facilities to modern Internet services. In order to sustain the competitive advantages, it is vital for today's enterprises to improve their EB strategies and processes.

Essentially, EB can be described as a business model that encompasses almost any computer applications. Lal (2005) explains that EB encompasses information and communication technologies (ICTs) applications in all business processes, such as office automation, financial transactions, production processes, co-ordination with other plants, customer relationship management, supply chain management, and the management of distribution networks. E-business on the Internet, therefore, has the potential to revolutionize the way many businesses operate (Anderson, Hansen, Lowry, & Summers, 2005). While the enterprises invest in technologies and initiate IT projects to support business growth, human resource managers are expanding their workforces, adding IT personnel gradually to meet individual staffing needs (Lee, 2005). However, it is often difficult for an enterprise to recruit professionals with the right skills. A constant complaint from IT recruiters is that there is still a lack of IT professionals in the new economy (ITAA, 2001). This problem may be attributed to the misalignment between academic curricula and the needs of industry.

The business world is rapidly changing and the demand for EB professionals who possess greater multidisciplinary knowledge is ever increasing. Today's academic programs must offer relatively novel EB curricula in order to fully prepare students for effective assimilation into organizations (Becker, McGuire, & Medsker, 1992). Weber (2004) suggests that the rapidly changing information technology and business environment presents a challenge for faculty members in constantly learning the latest technologies and making education more closely related to industry demand. Because academics have the obligation to teach students effectively and to deliver a curriculum that is tailored to the needs of their future employers (Stohr, 1995), identifying the gap between academic curricula and industry demand is essential to curriculum development. Furthermore, many universities in the US have experienced a significant drop in student enrollment number in their IT programs in the past few years. This might be because there is a mismatch between curricula and job demand, calling for a study into the aforementioned gap. In response to this call, this study surveys the EB job demand and academic curricula in the US and Taiwan to explore the fits or gaps between curricula and job demand of these two countries. The rationale of including Taiwan in this study lies in the fact that Taiwan is well-established as a country with high-tech manufacturing focus. Its EB market and curricula are growing rapidly during the past decade and worth investigating. In summary, the study intends to answer the following three important questions for both countries:

- What are the types of current job demand in EB job market?
- What are the current EB curricula being offered in universities?
- Are we offering the right courses to meet the job demand in EB job market? Or, what are the fits or gaps between EB curricula and job demand?

The organization of the remaining sections is as follows. First, a review of literature is presented. Second, the categories of academic curricula and job demand in EB are described. Third, the research method including data collection and classification is discussed. Fourth, the fit-gap analysis and its findings are revealed. Fifth, conclusions are presented and discussed. Finally, some managerial implications and directions for both academics and practitioners are provided.

2. Literature review

Since the advent of Internet, there has been an increasing demand for e-business specialists and wider application of EB technology due to intensified business competition. Universities have responded by embracing EB in their academic programs, particularly in schools of business and computer science (Etheridge, Hsu, & Wilson, 2001). During the past few years, several researchers have surveyed EB academic programs and showed increasing numbers of different EB degree programs (see Table 1). Others put their attention on discussing the requirement of credit hour, course categories, courses topic, programs orientation, and among others (see Table 2). However, none of these studies has investigated whether the existing EB curricula meet the job demand of industry. To fill this gap, Davis, Siau, and Dhenuvakonda (2003) surveyed 38 top business

Table 1
Trend of e-business degree programs

Author	Etheridge et al. (2001)	Krovi and Vijayaraman (2001)	Fusilier and Durlabhji (2003)
Data collection date	September, 2000	January, 2001	November, 2001
MBA degree	31	39	57
Master degree	23	15	35
Bachelor degree	5	7	30
Non-degree (certification)	18	17	N/A ^a

^a N/A denotes the authors did not report this category.

Table 2
The relevant research of e-business program

Author	Data source	Sample size	Survey items
Durlabhji and Fusilier (2002)	AACSB ^a	Sixty-seven US schools	Type of degree, course category, credit hour
Mechitov, Moshkovich, and Olson (2002)	AACSB ^a , Peterson publications, BusinessWeek, US News	Thirty-six US schools, 18 foreign schools	Type of degree, course content, programs orientation
Novitzki (2002)	AACSB ^a , CEC ^b , Top25 ^c	One hundred and forty three US schools	Type of degree, courses topic

^a American Assembly of Collegiate Schools of Business.

^b Certified E-commerce Consultants.

^c Ranking from Computerworld magazine (Anonymous, 1999).

schools and 8 job market Web sites in the US trying to understand the kinds of EB specialists American enterprises want and the types of courses the academics offer. They conducted a fit-gap analysis and recommended the following actions: (1) increase training in specialized software applications, (2) integrate EB into traditional business courses, (3) embrace wireless technologies, (4) emphasize training in EB security, and (5) remain current in EB technologies.

2.1. Categories of e-business curricula

ICTs play an important role in the development of modern education around the world (Albirini, 2006; Kennewell & Morgan, 2006). Recently due to the rapid expansion of EB, there has been a tremendous demand for university EB curricula that meet the urgent needs of industry. Undoubtedly, numerous universities have begun to offer EB curricula as degree programs or as certificate programs and to provide students with enough knowledge to fulfill the needs of industry. Following Durlabhji and Fusilier (2002), these EB curricula can be divided into four categories: (1) business, (2) e-business technical, (3) e-business non-technical, and (4) technology.

- *Business category.* This includes traditional business courses that require no technical knowledge, such as enterprise resource planning (ERP), supply chain management (SCM), customer relationship management (CRM), enterprise application integration (EAI), business process re-engineering (BPR), and financial management.
- *Technical category.* This refers to traditional technical courses that require no business knowledge, such as Internet or Web programming and design, database management systems, data telecommunications, systems analysis and design, network practices and applications, and computer interface design.
- *Technical EB category.* This represents technical courses specifically related to EB, such as e-business systems development, electronic payment systems, e-business security, and radio frequency identification (RFID).
- *Non-technical EB category.* This encompasses business courses specifically related to EB and focused on fundamental business issues, such as EB marketing, EB strategy, global EB management, business models, business process re-engineering, legal and regulatory issues in EB, and other EB-related issues.

2.2. Categories of e-business professional jobs

As EB continues its impact on firms' operations today, educators and employers have realized the importance of providing and recruiting qualified EB professionals. Callahan and Pegido (2002) point out that IT professionals must know how to address the diverse needs of stakeholders, stay abreast of the latest technologies, and leverage those technologies to maximize strategic advantages over competitors. In addition to these, EB professionals must also know how to integrate IT tools with business processes; thus, the job positions are somewhat different than IT professionals. Following Davis's et al. (2003), an EB job position can be classified into two categories, technical and managerial.

The *technical* category consists of such subcategories as Web database, networking, programming, technical support, and Web administration. These subcategories usually include database-, Internet-, and programming-related technical skills, such as ORACLE, SQL, Internet protocol, Java, VB.NET, objective-oriented programming, ASP, XML, LAN/WAN, and distributed component object model/component object model (DCOM/COM). The *managerial* category can be further divided into such subcategories as analyst, manager, consultant, and other. These subcategories commonly include project management, risk management, industry analysis, SAS/SPSS, database management, ERP maintenance, CRM implementation, Web site management, business process control, SCM implementation, market investigation, etc.

There are two reasons for using this classification scheme. First, although these hierarchical categories may not be exhaustive, they actually indicate the types of skills required within each career track. Second, Davis's job classification is closer to Durlabhji and Fusilier's curriculum classification, thus allows us to contrast job demand with EB curricula.

3. Research method

3.1. Sample

The paramount challenge facing both educators and employers is keeping up with an EB world that is constantly changing. In this research, we investigate EB academic curricula and industry demand in the US and Taiwan; the former has the most experience and expertise in EB, while the latter is the world's largest IT original equipment manufacturer (OEM). Both countries clearly play a vital role in the global EB market. Our sources of EB curricula encompass 38 universities in the US whose business schools are among the top-ranked schools reported in *BusinessWeek* and *US News*, and 93 universities selected from an online directory provided by Taiwan's Ministry of Education. As for the sources of industry demand, they encompass three US career Web sites (Monster.com, CareerBuilder.com, and Yahoo Hotjobs) and two Taiwanese career Web sites (104 JobBank and 1111 JobBank). Monster.com, CareerBuilder.com, and Yahoo Hotjobs are ranked as the top three US job Web sites by 100.com (Anonymous, 2004), whereas 104 JobBank and 1111 JobBank are the best-known career Web sites in Taiwan.

3.2. Data collection and classification

Because corporations prefer to hire candidates who already possess the right skills and knowledge (Callahan & Pegido, 2002), a survey of EB job announcements made by every corporation in the US and Taiwan would reveal the types of job demand in both countries. Likewise, a survey of EB courses being offered by every university in each country would reveal the courses being taken by EB students in both countries. Nevertheless, this does not give us a complete picture of labor statistics about the supply and demand of professionals in either country. Given the resource and time constraints, we are not able to perform a complete survey. Instead, we shall select a representative sample of career Web sites and universities to collect the survey data. Content analysis method will be used to classify each job position into a job category and each course title into a course category. For each job category, a percentage is calculated as a proportion of the number of a specific job position to the total number of job positions collected from the Web sites, hereafter referred as job demand. Likewise, the percentage of each course category is calculated as a proportion of the number of a specific course title to the total number of course titles identified from the Web sites, hereafter referred as cur-

ricular emphasis. Although these percentage estimates are not as accurate as the actual counts of student numbers and industry-wide job statistics, each gives us a ballpark value of how much emphasis the industry or academia places on each category of job or course.

To facilitate comparison between the two countries, we shall adopt the systematic comparative analysis method suggested by Bereday (1964). This method has two phases: (1) local research focused on one country alone and (2) comparative research focused on multiple countries simultaneously. The steps employed in the local research are investigation, content analysis, data coding, classification, validation, and fit-gap analysis.

3.2.1. Investigation of e-business curricula

To ensure that the data from our sampled schools are accurate and complete, we review over April, May, and June the curricula at both graduate and undergraduate levels across different schools (e.g., business, social science, informatics, engineering, and science) within each university's Web site and including any school with an EB concentration program or a sub-track EB program. The results reveal no e-business program in any non-business colleges among the sampled universities in the US, though many technical courses in the sampled e-business programs are supported by non-business colleges. The situation is different in Taiwan where e-business programs are offered by both business and non-business colleges. After scrutinizing the Web sites, we obtain a total of 21 EB programs in the US and 36 EB programs in Taiwan. These programs could be divided into the six program categories proposed by Davis et al. (2003): Master in E-business, MBA with a concentration in E-business, Master with a concentration in E-business, Bachelor in E-business, Bachelor with a concentration in E-business, and Certificate in E-business (see Table 3).

Table 3 indicates that the most popular program in the US is *MBA with a concentration in E-business* (11 programs), while that in Taiwan is *Bachelor with a concentration in E-business* (19 programs). This reflects the decline of the number of incoming undergraduate EB students in American universities during the last few years. Conversely in Taiwan, undergraduate EB programs are much more popular than graduate EB programs. Finally, five schools in both countries are offering *Certificate in EB* program.

3.2.2. Investigation of e-business job demand

Because June is the month for graduation ceremony in both countries and the graduates may start looking for jobs as early as April, we search the sampled career Web sites exhaustively during April, May, and June to collect the job announcement data in Taiwan and the US. To further ensure data representative, we collect data without any restrictions of location, industry, seniority, or salary. The results include a total of 1,006 US and 268 Taiwanese job announcements (see Table 4).

According to Table 4, the average number of job listings on the Web sites in the US is higher than that in Taiwan, while June accounts for the highest level of demand. Therefore, the industry demand is certainly higher in the US than in Taiwan and June is the better period to look for jobs as it has more available job positions than April and May. The data collected from these Web sites allow us to analyze the fits or gaps of curricula and job demand described in the later section.

3.2.3. Data coding and classification of e-business curricula

Through the Web sites of various colleges in each sampled university, we examine EB curricula in Taiwan and the US according to program type, number of business programs, number of technology programs, and

Table 3
The six categories of e-business programs in Taiwan and the US

Categories of e-business programs	US	Taiwan
MBA with a concentration in E-business	11	1
Master in E-business	3	4
Master with a concentration in E-business	1	1
Bachelor in E-business	0	6
Bachelor with a concentration in E-business	1	19
Certificate in E-business	5	5
Total	21	36

Table 4
Position demand from Taiwan and the US career Web sites

Month	US career Web sites			Taiwan career Web sites		Row total
	Monster.com	CareerBuilder .com	Yahoo Hotjobs	104 JobBank	1111 JobBank	
April	70	76	53	49	23	271
May	111	50	59	75	24	319
June	153	100	334	65	32	684
Total	334	226	446	189	79	1274

number of EB programs. E-business courses are further divided into technical or non-technical curricula. This dichotomy was proposed by Durlabhji and Fusilier (2002) as shown in Table 5. This coding mechanism is commonly used for classifying the types of courses offered in EB programs. Furthermore, we review course syllabi and descriptions in order to properly assign the courses to different categories.

3.2.4. Data coding and classification of e-business jobs

Similar to curricula, we perform a content analysis of the data from the sampled career Web sites. The analysis reveals a variety of job titles, such as Web database design, project management, and EB consultant. Like-

Table 5
E-business course categories in Taiwan and the US

Course category	US (%)	Taiwan (%)	Difference (%)
<i>Non-technical category</i>			
Business	11.80	17.03	5.23^a
Operations and Supply Chain Management	4.90	8.51	3.61 ^a
Enterprise Resource Planning	1.20	2.48	1.28
Financial Management	5.70	6.04	0.34
E-Business Non-Technical	60.70	38.39	-22.31^a
E-Business Marketing	14.20	6.35	-7.85 ^a
E-Business Strategy	14.60	5.88	-8.72 ^a
Introduction to E-Business	2.80	4.95	2.15
E-Business Management	9.30	9.29	-0.01
Entrepreneurship in E-Business	4.90	1.86	-3.04 ^a
E-Business Economics and Markets	8.50	3.10	-5.40 ^a
Global E-Business Management	0.00	1.08	1.08 ^a
Business Process Reengineering in E-Business	1.60	1.70	0.10
Legal and Regulatory Issues in E-Business	1.20	2.63	1.43
Business Models in E-Business	1.60	0.93	-0.67
Business to Business	2.00	0.62	-1.38
<i>Technical category</i>			
E-Business Technical	19.30	22.29	2.99
E-Business Technology	9.80	11.61	1.81
E-Business Systems Development	5.30	4.02	-1.28
E-Business Practicum	2.80	1.70	-1.10
E-Business Security	1.40	4.02	2.62 ^a
Electronic Payment Systems	0.00	0.93	0.93 ^a
Technology	7.90	22.29	14.39^a
Data Communications	3.50	4.95	1.45
Data Management	1.60	7.59	5.99 ^a
Interface Design	1.20	0.62	-0.58
Java and Object-Oriented Programming	0.80	3.10	2.30 ^a
Intelligent Systems	0.80	1.08	0.28
Computer Ethics	0.00	1.08	1.08 ^a
Other	0.00	3.87	3.87^a

^a Denotes the different is 5% or over.

wise, these jobs are classified into two major categories – technical skills and managerial skills – following a popular classification scheme developed by Davis et al. (2003). The results are shown in Table 6.

3.3. Reliability and validity of data

Whenever source data require coding into categories, there are concerns of content validity and inter-coder reliability. Content validity ensures that the measures include an adequate and representative set of items accurately reflecting the domain of the construct as defined conceptually. Cavana, Delahaye, and Sekaran (2001) suggested achieving content validity through literature review and experts' judgment. We therefore conducted a literature review for EB curricular and job categories, and consulted with three industry managers and four MIS academicians. After reviewing and discussing with these experts, job categories proposed by Davis et al. (2003) and curricular categories proposed by Durlabhji and Fusilier (2002) were chosen as the classification schemes of this study. As for coding the data into categories, two coders were assigned to identify and classify all course titles and job positions on the Web sites to ensure inter-coder reliability (Kassarjian, 1977). When a course or job position was found, the two coders independently classified it into a pre-established category. At the end of the data collection process, any difference in classification was discussed and resolved. During the classification process, one significant misclassification fell between the categories of Manager–Business Development and Manager–Project Management (disparity in 15.25%; i.e., 84.7% inter-coder reliability). Moreover, a significant course misclassification fell between E-Business Management and Introduction to E-Business (disparity in 21.54%; i.e., 78.5% inter-coder reliability). Eventually, all the differences were resolved and the classifications were consistent between the two coders.

3.4. Fit-gap analysis of curricula and job demand

In order to identify significant differences between curricula and job demand, we conducted a fit-gap analysis. By a fit or a gap, we mean the extent to which a job demand matches the EB curricular emphasis, and vice

Table 6
E-business job categories in Taiwan and the US

Job category	US (%)	Taiwan (%)	Difference (%)
Technical	31.23	47.01	15.78^a
Web Database – Design	0.50	0.00	–0.50
Web Database – Architecture	0.80	0.00	–0.80
Web Database – Administration	1.99	0.37	–1.62
Web Administration	3.68	4.85	1.17
Programming – Advanced High-End Programmer (ERP/CRM/SCM/EAI)	7.85	4.48	–3.37
Programming – Advanced Web Programmer	5.67	31.34	25.67 ^a
Technical Support	5.17	2.99	–2.18
Networking	5.57	2.61	–2.96
Programming – Advanced Mobile Web Engineer	0.00	0.37	0.37
Programming – Legacy Systems	0.00	0.00	0.00
Managerial	68.78	52.98	–15.80^a
Analyst – Project	3.58	3.36	–0.22
Analyst – Business	3.58	1.87	–1.71
Manager – Business Development	4.57	10.82	6.25 ^a
Manager – Marketing	11.93	22.01	10.08 ^a
Manager – Project Management	5.86	9.33	3.47
Consultant – ERP/CRM/SCM/EAI	19.38	1.12	–18.26 ^a
Consultant – E-Business Architecture	6.66	2.61	–4.05
Consultant – Technology Audit, Risk Assessment	1.69	0.37	–1.32
Consultant – Knowledge Management	0.10	0.00	–0.10
Consultant – Vertical Industry Specialist	10.44	0.37	–10.07 ^a
Other	0.99	1.12	0.13

^a Denotes the different is 5% or over.

Table 7
The characteristics of fit-gap quadrants

Category	Definition	Characteristic
Over-emphasis	Low demand and high emphasis	In this quadrant, the education system puts too much emphasis on courses for which there is little industry demand. For example, if too many EB marketing and EB technology courses are offered, emphasis may exceed demand, leading to a higher unemployment rate and, thus, a heavy burden on the national unemployment insurance system
Under-emphasis	High demand and low emphasis	In this quadrant, the industries are willing to recruit talent extensively to help their business operations and thus their competitiveness, but the emphasis of relevant courses is limited
Low-balance	Low demand and low emphasis	In this quadrant, both industry demand and the emphasis of relevant courses are very limited. Firms recognize the benefits of EB and implement EB technologies, but they tend to do so on a more limited scale and thus have a lower demand for specialists. Although emphasis and demand are judged as having a low-balance in this quadrant, such a balance could be the stepping-stone for stimulating the EB market from infancy to maturity
High-balance	High demand and high emphasis	This quadrant is the ideal situation in which schools have fully aligned their curricula with the corresponding industry demand. Schools in this quadrant not only come closest to narrowing the gap between theory and reality, but also introduce their students to the latest technologies, as they act as a supplier to the demands of industry. This means that students have sufficient marketing knowledge to succeed in the EB job market, and the industries can find the qualified talent to meet their needs

versa. In a later section, we use the percentage estimates calculated for EB curricular emphasis and job demand to conduct the fit-gap analyses for US and Taiwan independently, followed by a comparison between the two countries. During the analysis, we consider curricular emphasis and job demand as having a balance when the absolute difference between the two sides is less than 5%, or when the ratio of two percentages is less than 0.5. Otherwise, it is in over-emphasized or under-emphasized condition. A balance is considered as a low balance when the percentage of job demand is less than 10%; otherwise, it is a high balance. This classification scheme defines four quadrants of fit-gap conditions: over-emphasis, under-emphasis, low-balance, and high-balance. The characteristics of these four quadrants are listed in Table 7.

4. Results and discussion

4.1. E-business curricula in the US

Fig. 1 displays the percentages of curricular categories (i.e., business, e-business non-technical, e-business technical, and technology) for Master, Bachelor, and non-degree programs in the US. The results show that most EB courses in the US are offered in the EB non-technical category rather than in the other categories. This implies that students in American EB programs are not trained to create or maintain EB systems, but they must know enough EB technologies to develop IT-enabled EB models or strategies. Moreover, Master programs account for a higher percentage (60.94%) of EB non-technical curricula than Bachelor programs (42.84%) do. In contrast, Bachelor programs have greater EB technical content. This reflects the different orientations of the two degree programs. In non-degree (certificate) program curricula, 61.54% of the courses are EB non-technical and 18.46% are EB technical. As non-degree programs are for full-time practitioners to pursue part-time extended education and the percentages are not high (24% in the US and 14% in Taiwan), they have a lot of room to grow.

4.2. Demand for EB professionals in the US

In the US, advanced programming positions (high-end programmers and Web programmers) account for 13.52% of the demand in the technical job categories (see Table 6). These types of positions are different from traditional programming in that they focus on business engineering (e.g., ERP, SCM implementation). Networking (5.57%) and technical support (5.17%) positions are ranked as the third and the fourth most in demand technical jobs. This indicates that networking and technical support are areas that receive a lot of attention in the EB field, and they are considered part of the infrastructure that supports business operations.

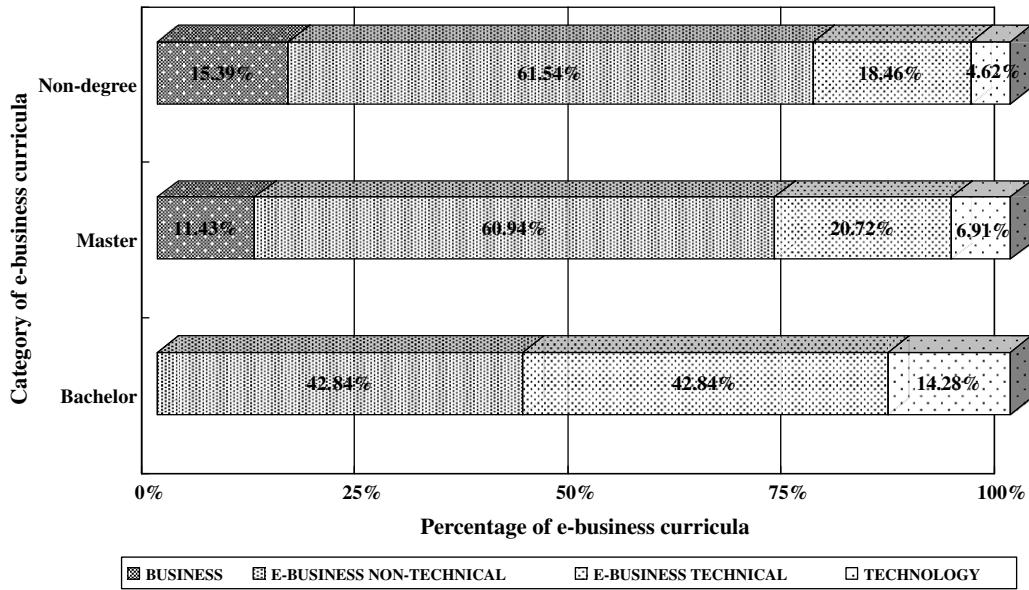


Fig. 1. E-business curricula in the US.

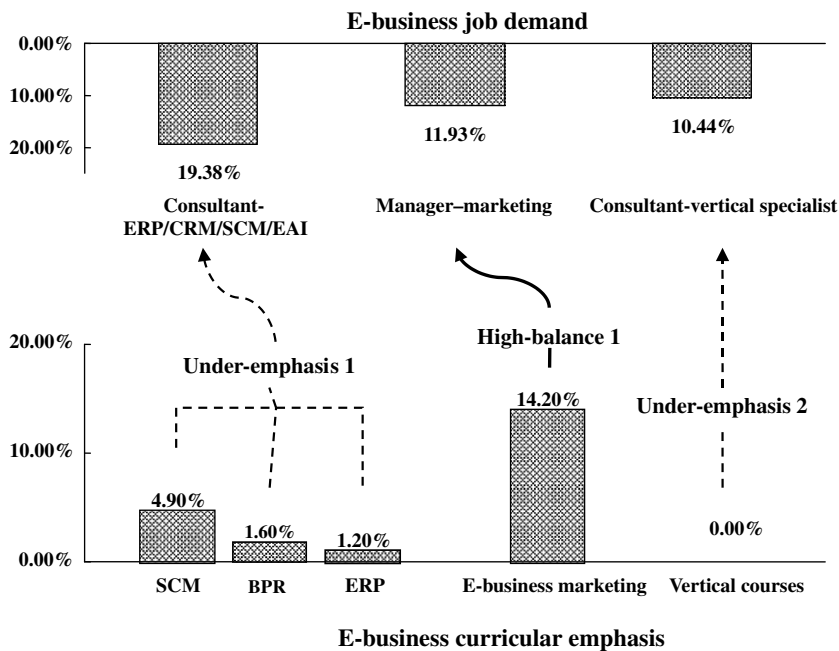


Fig. 2. Fits and gaps between EB curricular emphasis and job demand in the US (managerial category).

In managerial job categories, consultant–ERP/CRM/EAI (19.38%) and consultant–vertical industry specialist (10.44%) are in high demand (see Table 6). The advertisements on the Web sites are looking for professionals with expertise in specific ERP software programs (e.g., Oracle E-Business Suite 11i). The position of manager–marketing (11.93%) is the second most in demand. This reflects the intention of industry to hire qualified specialists who are responsible for coordinating enterprise-wide developments and for implementing comprehensive marketing plans.

4.3. Significant fits and gaps in the US

To obtain a comprehensive view of academic curricula and industry demand, fits and gaps are discussed in terms of the two general categories adapted from Davis et al. (2003) as shown in Figs. 2 and 3. In these figures, under-emphasis condition is represented by a dashed line while over-emphasis condition is represented by a solid line.

4.3.1. Managerial courses and job demand in the US

As Fig. 2 shows, there is a high demand in industry for consultants with suitable knowledge of ERP, CRM, EAI, and SCM. These jobs account for 19.38% of all positions. However, the related EB courses, such as ERP (1.2%), BPR (1.6%), and SCM (4.9%), are not emphasized in academia. Even though CRM is important to making long-term relationships with customers, and EAI is necessary for interorganizational operations, no course is offering these two subjects. This indicates a significant gap in this area (see Under-emphasis 1).

The situation is different with the job that is second most in demand – manager–marketing (11.93%). There is a relatively high curricular emphasis on EB marketing (14.20%), which indicates that the sampled schools have responded to this specific industry need, and there is a balance between curricular emphasis and job demand, both having high percentages (High-balance 1). However, with respect to the position of consultant–vertical industry specialist (which is third most in demand, at 10.44%), no course is offering this subject, indicating a significant gap between curricular emphasis and job demand (see Under-emphasis 2). This result is to our expectation because qualified consultants with vertical integration skills and industry knowledge must be trained through real-life on-the-job experience, rather than through academic courses.

4.3.2. Technical courses and job demand in the US

As Fig. 3 shows, in the technical categories, the position most in demand is programming–advanced high-end programmer (7.85%), the corresponding course categories are SCM (4.90%) and ERP (1.20%), with a

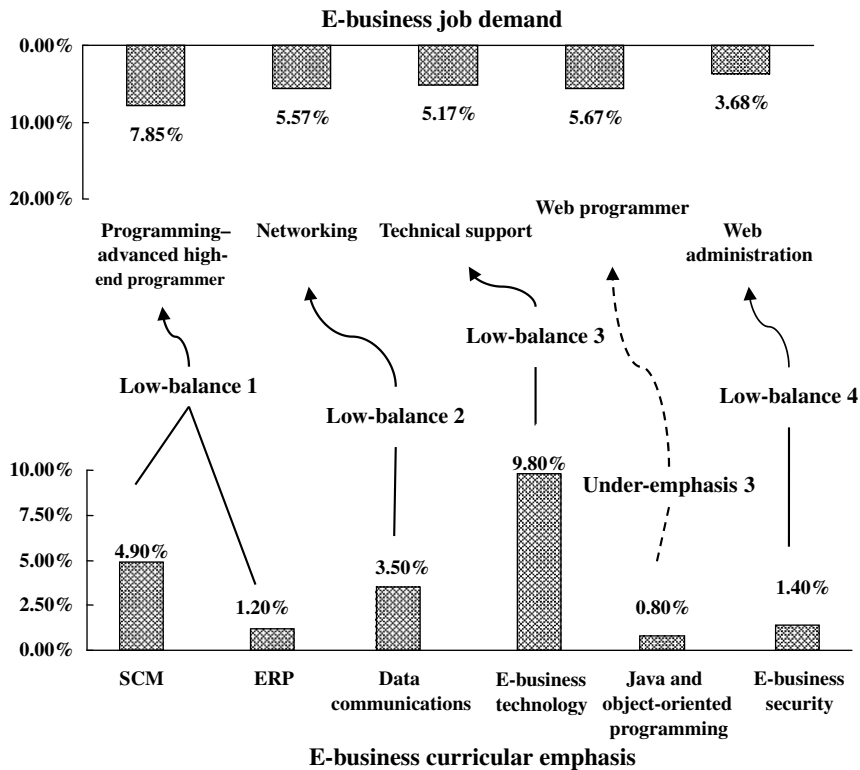


Fig. 3. Fits and gaps between EB curricular emphasis and job demand in the US (technical category).

total of 6.1%. This indicates a balance with job demand less than 10% (see Low-balance 1). Surprisingly, there is no course offering CRM and EIA subjects. Moreover, the job second most in demand is networking (5.57%) and the corresponding courses are related to data communications. These courses usually focus on the fundamentals of data communication networks and aim to (1) give insight into why networks are currently structured as the way they are and (2) provide an understanding of the issues facing data network designers. Fig. 3 shows that curricular emphasis in data communications (3.50%) is close to job demand for networking (5.57%), indicating a balance with job demand less than 10% (see Low-balance 2).

Demand for EB technical support (5.17%) appears to be in balance (Low-balance 3) with the emphasis on EB technology courses (9.80%), which is the highest emphasis among all technical EB courses. The results also reveal that demand for Web programmers (5.67%) is relatively high; but we found very few courses offering Java and objective-oriented programming (0.80%), revealing a significant gap in this area (see Under-emphasis 3). There is also a relatively high demand for Web administration professionals (3.68%) who are usually required to manage EB security (1.40%). The percentage difference indicates a fit between Web administration and EB security (see Low-balance 4).

These results shed light on the differences of EB emphases between industry and academia in the US. The companies and schools surveyed herein face the same job market, but view the EB context in very different ways. Based on our fit-gap analysis, as summarized in Fig. 4, the following conclusions can be drawn. First, there is no case of over-emphasis in the US. Second, industry demand and the curricular emphasis has a poor fit relevant to the positions of consultant–ERP/CRM/SCM/EAI, consultant–vertical industry specialist, and

	Job demand low	Job demand high
Curricular emphasis high	<p><u>Over-emphasis</u></p> <p>No samples occurred in this area</p>	<p><u>High-balance</u></p> <p>High-balance 1: Manager–Marketing (11.93%) vs. E-business marketing (14.20%)</p>
Curricular emphasis low	<p><u>Low-balance</u></p> <p>Low-balance 1: Programming–Advanced high-end programmer (7.85%) vs. SCM (4.90%) and ERP (1.20%)</p> <p>Low-balance 2: Networking (5.57%) vs. Data communications (3.50%)</p> <p>Low-balance 3: Technical support (5.17%) vs. E-business technology (9.80%)</p> <p>Low-balance 4: Web administration (3.68%) vs. E-business security (1.40%)</p>	<p><u>Under-emphasis</u></p> <p>Under-emphasis 1: Consultant–ERP/CRM/SCM/EAI (19.38%) vs. SCM (4.90%), BPR (1.60%), and ERP (1.20%)</p> <p>Under-emphasis 2: Consultant–Vertical industry specialist (10.38%) vs. Vertical courses (0.00%)</p> <p>Under-emphasis 3: Web programmer (5.67%) vs. Java and objective-oriented programming (0.80%)</p>

Fig. 4. E-business curricular emphasis and job demand matrix (US).

Web programmer. No enough curricula are offering courses for these professions. Therefore, curricula in these areas should be expanded to lower the costs of employee education and training for industry. Third, we found four cases (i.e., programming–advanced high-end programmer, networking, technical support, and Web administration) that fell into low-balance condition. This is consistent with the fact that many EB job positions in the US are now going offshore to cut costs (e.g., many business processes are outsourced to Infosys Technologies in India). Finally, there is a high demand for Manager–marketing profession in the US and the sampled schools have been offering EB marketing courses to meet this demand.

4.4. E-business curricula in Taiwan

Taiwan is one of the key players in the global EB market. The Taiwanese government has established a high-tech manufacturing economy with several world-class companies in different industries such as semiconductors (TSMC), integrated circuits (VIA), telecommunications (Zyxxel), computer fabrication (Quanta), and computers and peripherals (Asus and Acer). All of these industries have a direct relationship with EB and tend to hire suitable EB talent to meet the demand. Therefore, it is important to investigate the status of EB job demand and curricula in Taiwan.

The results of the survey show that most EB curricula offered in Taiwan fall into the EB non-technical category (see Fig. 5). This implies that the intent of the EB curricula in Taiwan is to prepare business management students for the EB job market. The percentage of EB non-technical curricula is higher in Bachelor programs (40.00%) than in Master programs (34.21%). Similarly, the percentage of EB technical curricula is higher in Bachelor programs (21.74%) than in Master programs (14.21%). Unlike the US curricula that focus on technical training, the undergraduate students in Taiwan receive more non-technical business training. Overall speaking, the proportions of technical and non-technical training for both Master programs and Bachelor programs are very much the same, indicating the emphasis of business training of EB programs in Taiwan.

4.5. Demand for EB professionals in Taiwan

In the technical job categories (see Table 6), Web programmer (31.34%) is the position most in demand. This indicates that enterprises in Taiwan have a great demand for Web programmers to write codes for their business operations (e.g., ASP or PHP programmers). There is no demand in the area of Web database design

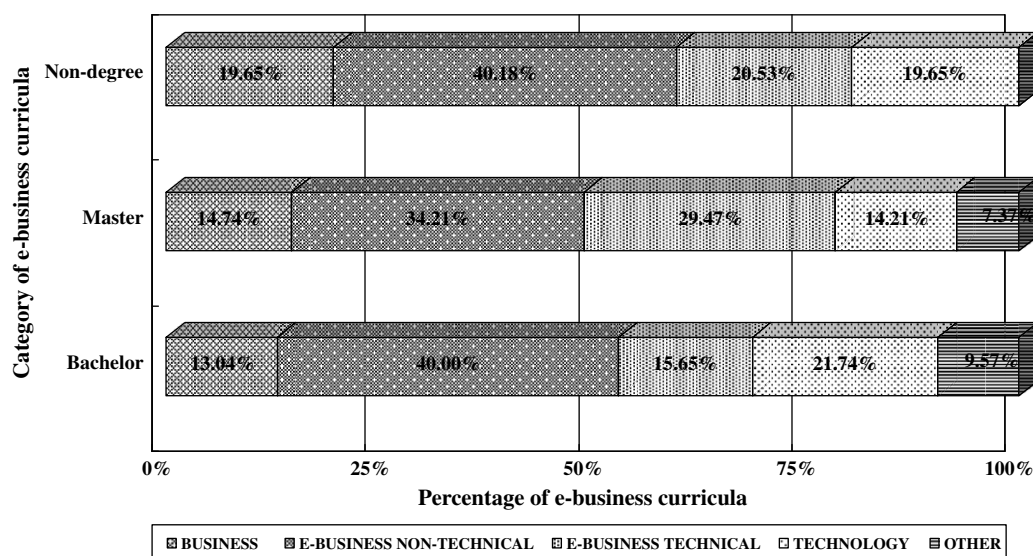


Fig. 5. E-business curricula in Taiwan.

and architecture. This reflects that most Taiwanese enterprises are small median enterprises with limited IT budgets. Their Web sites have very few transactional applications and only display company profiles and product information. They usually take advantage of Web programmers rather than database administrators to maintain their database systems.

In the managerial job categories, the two positions most in demand are manager–marketing (22.01%) and manager–business development (10.82%). This indicates that the center of gravity for businesses in Taiwan has migrated from technical focus to managerial focus. Hiring a qualified managerial employee in a specific field to explore new markets will bring new opportunities and accelerate the success of EB. However, Taiwanese enterprises seem to have little demand for ERP/CRM/EAI consultants (1.12%). This suggests that Taiwanese enterprises incline to rely on consultants from overseas (e.g., SAP or Oracle consultants) and seldom cultivate consultancy talent themselves or utilize locally-grown consultant companies.

4.6. Significant fits and gaps in Taiwan

In this section, the analysis of significant fits and gaps in Taiwan are divided into managerial and technical categories.

4.6.1. Managerial courses and job demand in Taiwan

As Fig. 6 shows, the job positions on the sampled Web sites show a high demand in industry for managers with knowledge of marketing (22.01%), which is considered a critical function for companies to attract prospective customers. However, the EB curricula provided by the sampled schools reveal that only 6.35% of EB courses aim at EB marketing. This indicates a significant gap in the EB marketing area (Under-emphasis 1). Furthermore, there is a relatively high industry demand for business development (10.82%) and project management (9.33%). In the EB curricula we surveyed, the emphasis is relatively high on the two related courses: EB management (9.29%) and EB technology (11.61%). Hence, the curricula in the sampled schools seem to

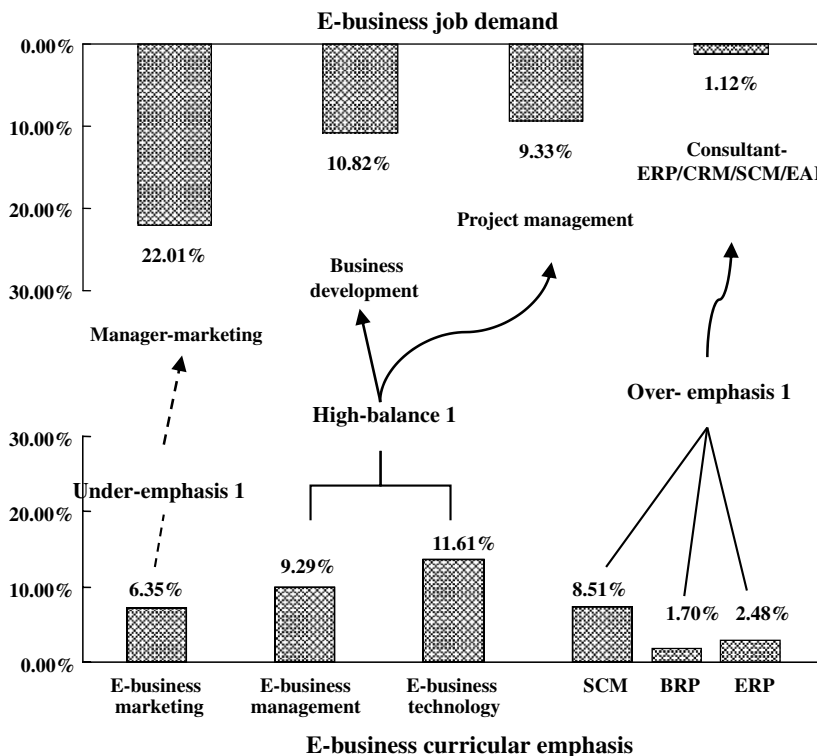


Fig. 6. Fits and gaps between EB curricular emphasis and job demand in Taiwan (managerial category).

respond to these specific types of demand, resulting in a well fit with job demand higher than 10% (High-balance 1). Consultants with knowledge of ERP, CRM, SCM, and EAI are low in demand and account for only 1.12% of all job positions. With respect to courses for this job position, there seems to be more available on SCM (8.51%), BPR (1.70%), and ERP (2.48%) courses than needed (Over-emphasis 1).

4.6.2. Technical courses and job demand in Taiwan

As Fig. 7 shows, there is a relatively high demand for Web programming professionals (31.34%). This type of position requires training in specialized software tools, such as Oracle, SQL, ASP, DCOM, and Java. However, the data show very few courses in Java and objective-oriented programming (3.10%), indicating a significant gap (Under-emphasis 2). In addition, Web administration positions account for 4.85% of job demand, whereas 4.02% of courses offered are in EB security (Low-balance 1). Programming–advanced high-end programmer (4.48%) is the job second most in demand in the technical job categories and the number of related courses offered (10.99%), such as SCM (8.51%) and ERP (2.48%), is much higher than demand (Over-emphasis 2). Demand for EB technical support (2.99%) and EB technology courses (11.61%) appears to have the same condition (Over-emphasis 3). EB technology is the most prevalent type of EB courses. The demand for networking professionals is relatively low (2.61%) and has a relatively good fit (Low-balance 2) with data communications courses (4.95%). Finally, there is very low demand for mobile Web engineers (0.37%) and no course on mobile engineering is available.

Based on the results of fit-gap analysis (see Fig. 8), we can make the following conclusions. First, Taiwan’s EB curricula are in line with the demand from job market for business development, project management, Web administration, and networking. Second, the educational system in Taiwan pays too much attention to courses that do not cater to industry demand. As a result, there are too many courses offered in EB technology, SCM, and ERP. Therefore, schools in this quadrant should balance the courses that are over-emphasized. For example, they should reduce EB technology and SCM/ERP courses in the EB curricula. Finally, the current under-emphases in Taiwan’s EB curricula include EB marketing and Java and objective-oriented programming. Current EB programs must extend its curricula to offer EB marketing and Web programming knowledge to students and help industry train competent EB professionals.

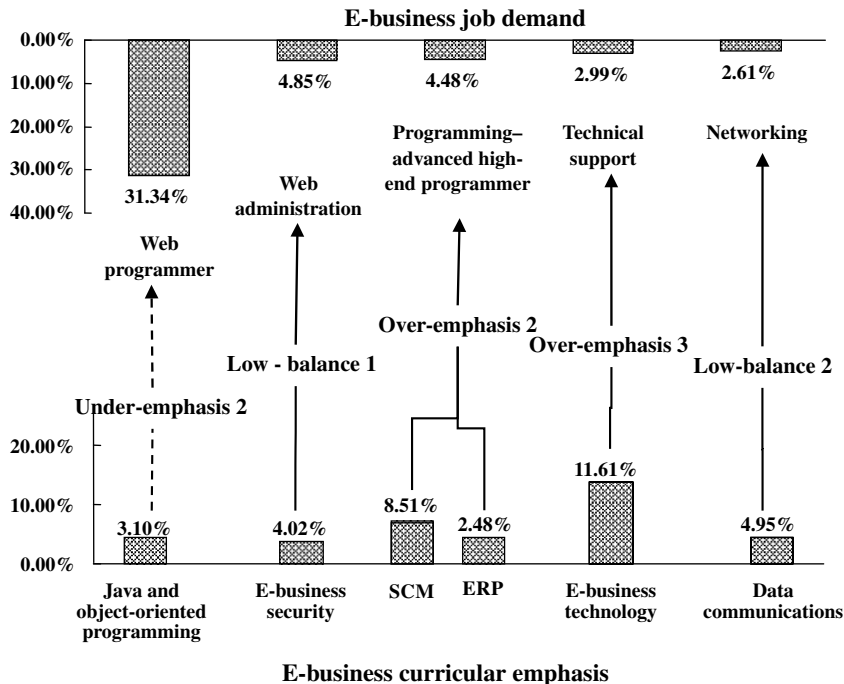


Fig. 7. Fits and gaps between EB curricular emphasis and job demand in Taiwan (technical category).

	Job demand low	Job demand high
Curricular emphasis high	<u>Over-emphasis</u>	<u>High-balance</u>
	<p>Over-emphasis 1: Consultant–ERP/CRM/SCM/EAI (1.12%) vs. SCM (8.51%), BPR (1.70%), and ERP (2.48%)</p> <p>Over-emphasis 2: Programming–Advanced high-end programmer (4.48%) vs. SCM (8.51%) and ERP (2.48%)</p> <p>Over-emphasis 3: Technical support (2.99%) vs. E-business technology (11.61%)</p>	<p>High-balance 1: Manager–Business development (10.82%) and Manager–Project management (9.33%) vs. E-business management (9.29%) and E-business technology (11.61%)</p>
	<u>Low-balance</u>	<u>Under-emphasis</u>
Curricular emphasis low	<p>Low-balance 1: Web administration (4.85%) vs. E-business security (4.02%)</p> <p>Low-balance 2: Networking (2.61%) vs. Data communications (4.95%)</p>	<p>Under-emphasis 1: Manager–Marketing (22.01%) vs. E-business marketing (6.35%)</p> <p>Under-emphasis 2: Web programmer (31.34%) vs. Java and objective-oriented programming (3.10%)</p>

Fig. 8. E-business curricular emphasis and job demand matrix (Taiwan).

4.7. A comparison of e-business curricula and industry needs in Taiwan and the US

The curricula of higher education in Taiwan have been greatly influenced by the US educational systems. The EB curricula are no exception. In various cases, the advanced experience of EB professionals in the US has served as a role model for professionals in Taiwan. In order to identify the differences between Taiwan and the US, we scrutinize Tables 5 and 6. As shown in Table 5, schools in the US tend to offer much more EB non-technical courses than their Taiwan counterparts, specifically in EB marketing (14.20% vs. 6.35%), EB strategy (14.60% vs. 5.88%), and EB economics and markets (8.50% vs. 3.10%). Taiwan’s schools, in contrast, offer much more data management courses than the US schools do (7.59% vs. 1.60%). Regarding job demand, Table 6 reveals that the industries in the US recruit more managerial professionals than those in Taiwan, especially the consultants in ERP/CRM/SCM/EAI (19.38% vs. 1.12%) and vertical integration (10.44% vs. 0.37%).

Nonetheless, Taiwan's industries demand more managers in business development (10.82% vs. 4.57%) and marketing (22.01% vs. 11.93%).

The demand for consultants—ERP/CRM/SCM/EAI in the US is 19.38%, whereas it is only 1.12% in Taiwan. This indicates that ERP and SCM have become vital for almost every American business to improve its competitiveness, thus ERP/SCM consultant has become a job in high demand in the US. In contrast, most businesses in Taiwan are small or medium and do not have sufficient budget to afford large expenditures on ERP or SCM systems. This affects the demand for ERP/SCM consultants. Undoubtedly, both Taiwan and the US play important roles in the global supply chain networks. To help the industries compete successfully worldwide, the US schools should put more effort into training in SCM, ERP, CRM, EAI, and vertical business skills; while Taiwan should reduce the number of these courses.

The demand for manager—marketing professionals in Taiwan is 22.01%, whereas EB marketing courses account for only 6.35% of courses offered. In the US, the demand for manager—marketing professionals is 11.93%, whereas 14.20% of EB courses are in marketing. This indicates that educators in the US emphasize more on EB marketing due to the high demand for marketing managers, while Taiwan does not pay much attention to this course subject. Finally, the demand for advanced high-end EB programmer in Taiwan and the US are different. In the US, this demand (7.85%) fits the curricular emphasis (6.1%), whereas it (4.48%) is much smaller than the percentage of related SCM/BPR/ERP courses (10.99%) in Taiwan. That is, Taiwan has an over-emphasis condition, while the US has a low-balance. This implies that Taiwan's industries could be the potential outsourcing partners for their counterparts in the US for advanced high-end programming projects.

5. Conclusions and recommendations

This study collects EB job announcements and curricula from various Web sites in the US and Taiwan. The data are manually coded and examined with content analysis to come up with descriptive statistics. These statistics are further analyzed by fit-gap analysis to explore the differences between industry needs and academic curricula in EB profession. In addition, we compare the current situations in Taiwan and the US to understand the differences between the two countries. There are several conclusions and recommendations that emerge from this investigation: (1) enhancing training in ICTs, (2) increasing e-marketing training, (3) increasing e-business programmer training, and (4) increasing networking specialist training.

5.1. Enhancing training in ICTs

EB consultants need to have a broad knowledge about ICTs because an EB system encompasses applications of ICTs in all business processes. They must grasp enterprise integration concepts such as SCM, ERP, and EAI. Therefore, US universities should make a number of enhancements in their curricula to respond to industry needs. In doing so, universities would benefit from creating courses that are more relevant to industry and student needs, and industry would benefit from being able to hire graduates who are more fully prepared to meet their needs (Davis et al., 2003). In Taiwan, ICTs for EB are still in their infancy stage. An upgrade of ERP, SCM, and EAI infrastructure and more education about enterprise integration know-how for business professionals are the key challenges Taiwan must face if it expects to flourish in the coming years. Taiwanese industry is facing challenges to its survival and competition in the e-era, as it must compete with international conglomerates that are heavily loaded with financial resource and sophisticated technologies. This means that if the poor fit between industry demand and curricular emphasis is not improved, it may hinder EB maturity in the region. In addition, strategic use of ICTs is now a common component in the marketing strategies of many organizations (Hoffman & Novak, 1996). Marketing managers need to understand the recent advances in ICTs to facilitate the development and maintenance of customer relationships.

5.2. Increasing e-marketing training

Conventionally, the role of marketing manager has been to establish, maintain, and enhance relationships with customers and other partners at a profit, so that the objectives of the stakeholders involved are met

(Grönroos, 1990). As time goes by, the role of marketing manager has changed, and he or she now needs more EB marketing knowledge than ever. EB marketing programs are designed to teach new marketing concepts and skills and the underlying business foundations required for the understanding and development of marketing management in the e-era. In the US, EB marketing is commonly accepted as a course that addresses concepts and skills critical to a broad range of careers and industries. In contrast, EB marketing has not yet evolved into a common practice in Taiwan. This may be because EB marketing is a new and rather poorly defined subject (Granitz & Hugstad, 2004). Therefore, to meet the industry demand, universities in Taiwan have to place more emphasis on introducing e-marketing with respect to the knowledge and skills that are required by e-marketing managers.

5.3. Increasing e-business programmer training

E-business programmers should be familiar with EB-related ICTs, such as SAP, Oracle, and Java. Our research shows that SCM and ERP courses for high-end EB programmers seem to be insufficient in both countries. This gap must be resolved because SCM and ERP systems are the foundation of seamless integration across organizations. Therefore, a solution to this gap is to create partnership between academia and industry. For example, through cooperation with industry and software companies, universities could create non-degree (certificate) programs in high-end programming for their students and grant them certificates after verifying their proficiencies (e.g., MSCE, Oracle JDBC Programmer, or Sun Certified Solaris Administrator).

5.4. Increasing networking specialist training

A recent survey conducted by the US Bureau of Labor US Bureau of Labor Statistics (2005) on employment growth in different occupations from 2002 to 2012 suggests that the networking field may offer increasing employment opportunities in the future, and data communications analyst is predicted to be the second fastest growing occupation in the US during the period. This indicates that the US still has a relatively high demand for networking specialists. However, our findings show that data communications curricula are still insufficient to satisfy industry needs in the US. In contrast, Taiwanese programs place too much emphasis on data communications courses while the need for networking specialists in Taiwan is relatively low. Therefore, to conserve educational resources, curricula in Taiwan should not overly offer data communications courses.

6. Limitations and future research

This research investigates the EB job demand and curricula in Taiwan and the US based on content analysis. There are several limitations need to be addressed.

First, the EB context is dynamic and fast-changing; therefore, it is necessary to conduct similar studies periodically to update the status of industry needs and curricular emphases. As curricular changes usually lag behind the changes of job demand by 2–4 years, depending on the university's policy of curriculum changes, the time interval to repeat the survey on academic curricula should be 2 years, while the interval for surveying industry needs could be one year. This allows us to conduct a longitudinal analysis of the fits/gaps and a trend analysis of the industry needs.

Second, because content analysis is laborious, we only surveyed representative universities and career Web sites for three months. A more comprehensive approach would be to survey more career Web sites for a longer time period as well as look into the curricula in smaller colleges and universities. Nonetheless, after several informal communications with EB managers, an agreeable recommendation is that Bachelor programs should aim at technical positions while Master programs should target at managerial positions.

Third, our curricular data are presented in terms of percentage of total course count, rather than the total student count. Using this percentage to rate a course only indicates the degree of emphasis the academic community places on the course. It does not represent the actual number of students trained by that course in the entire academic community. A census may be conducted to tally the actual number of students in each course into a total student count. However, it is infeasible for us to do so. Likewise, the percentage of job position in

this study has the same limitation. That is, it does not represent the actual number of positions available for a specific job type in the entire country.

Fourth, our data for job demand from the career Web sites do not include international career positions. Given the global nature of EB, many multinational companies now advertise overseas job positions domestically, or domestic job positions internationally. It would be interesting to study these types of advertisements and identify the trends about the international flows of EB professionals. Nonetheless, because these are not common practices, we decided to exclude them from this study.

Finally, a job announcement may go through series of approval in a company before it goes to the public. The lead time from sensing a need to making a job announcement might take months. Therefore, instead of surveying the career Web sites, it might be better to survey EB managers directly in order to find out what the companies need currently and in the future. This allows the universities to adjust their curricula earlier and improve the fits or gaps faster between the two milieus of academia and industry.

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