Full Length Research Paper

Study on E-commerce workforce demand of small and medium enterprises in Taiwan

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In Taiwan, the small and medium enterprises account for over 97% of total enterprises, small and medium enterprises are the important force to support economic development of Taiwan. This study discusses the e-commerce workforce demand of small and medium enterprises in Taiwan and the e-commerce technology or ability that these enterprises need. This study regards the 71 relevant e-commerce workforces, and about 1,000 small and medium enterprises in Taiwan are our study objects. Importance analysis regarding courses and workforce would be carried out, Borich needs assessment model (BNAM) and modified BDN would be used to carry out workforce demand analysis.

Key words: E-commerce, course, workforce demand analysis, Borich needs assessment model (BNAM).

INTRODUCTION

According to the statistics from "white paper on small and medium enterprises In Taiwan", 2009, there are more than 1.234 million of small and medium enterprises in Taiwan in 2008, which accounts for 97.7% of total enterprises; the employment number is 7.966 million that accounts for 76.58% of total employment rate; employed staff number is 5.469 million that accounts for 69.21% of total employed staff rate. For the aforementioned indicators, the ratios that small and medium enterprises account for are higher than large-sized enterprises. Small and medium enterprises occupy sizable proportion in the economic activities of Taiwan, they are the important force to support the economic development of Taiwan. Since small and medium enterprises are so important to the industries Taiwan, this study discusses the e-commerce workforce demand of small and medium enterprises in Taiwan and the e-commerce technology or ability that these enterprises need.

The objective of this study is to solve the afore-mentioned problems; hopefully, this study result could assist the academia to propose more appropriate courses and training accurately when cultivating relevant work force.

LITERATURE REVIEW

E-commerce and courses

The foundation of e-commerce involves information tech-nology and managerial skills, not simply technological problem or managerial problem only. Setting up a website might only concern technological problem, while commercial activity involves product flow, logistics, cash flow, and information flow; however, e-commerce does not exist without websites. Therefore, the category of e-commerce is very extensive, basically it is based on information technology and then regards the methods that enterprise manages and administrates to reach the business transaction in order to obtain profits.

Durlabhji and Fusilier (2002) classified e-commerce courses into four main categories, including business and manage-ment, non-technology of e-commerce, e-commerce technology, and information technology. Davis (2003) discussed the need of e-commerce from the perspectives of e-commerce professional workforce and classified need into two main categories, including operation management and information technology.

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Although e-commerce is a part of the application of management information technology, its operation model that uses its applied theory to cover the entire enterprise would make the training of e-commerce talent become more complicated (Fusilier and Durlabhji, 2003). In the early days, the development of e-commerce courses cooperated with relevant management information departments to give courses; it then gradually develops into a single course (Liang, 2000). Some scholars indicate that it is not necessary to plan or establish courses and academic degrees for e-commerce individually, but most scholars indicate that e-commerce courses should be developed professionally (Leonhardt, 2000; Tabor, 1999).

ENTERPRISES AND E-COMMERCE

Small and medium enterprises in Taiwan and e-commerce

According to "sales of trade and food services" that was posted by Department of Statistics, Ministry of Economic Affairs in Taiwan in February 2006, it shows that 68% of the service providers have already computerized their business, wherein the applications in accounting and finance management, product ordering, product delivering, product transaction, and sales management are the most. Among the business computerized service providers, 47% has already carried out commercial communication through Internet, and their transaction methods mainly include the use of e-mail and set-up of website or webpage.

For the financial capability and workforce of small and medium enterprises (SMEs), it seems to be unable to do what the enterprise wants very much to do regarding the application of new technology onto operation; therefore, small and medium enterprise administration (SMEA) in Taiwan proposes some new policies to help the small and medium enterprises. "white paper on small and medium enterprises in Taiwan" in 2009 mentioned "digital value added application", details are shown as follows:

1. Using information service portal site, small and medium enterprises e-service, to assist small and medium enterprises to master information accurately.
2. SMEs digital learning (SME online University): The objective of the university is to establish high-quality network studying environment and drive SMEs to use network studying.
3. Digital application (Bridging the digital divide of the SME Project): This project focuses on the development of e-industry in remote areas so as to develop digital industry town.
4. Electronic operation (E-service of SME industry): the industry electronic service groups of small and medium enterprises: Integrating every kind of experts, industry

associations, and information service providers to form a guidance and assistance team so as to help the enterprises to plan e-needs.
5. SME e-commerce operation (E-commerce operation plan for industry): Its objective is to develop e-commerce application rapidly, including establishing e-commerce portal site and elaborating e-commerce application for industries.
6. Knowledge management (Promotion of SME knowledge management): Assisting SMEs to introduce knowledge management application.

Although Taiwan government provides some policies to help small and medium enterprises, only a few of them receive the assistance; the report in 2009 mentions that only several ten thousands of enterprises show the outcomes. This study believes that the small and medium enterprises should focus on the workforce of their e-commerce in order to solve their problems.

Borich needs assessment model (BNAM)

Lu and Mille (2002) used BNAM to explore the educational demands of teachers from the vocational schools in Ohio of U.S.A. and Taiwan towards knowledge, importance, and teaching skills, and the recognition of teachers was also compared. Edward and Briers (1999) made use of electronic questionnaire to ask about teachers' performances on 163 teaching abilities and their training demands on every ability. Second questionnaire had been carried out after sorting, in which the teachers were asked to sort the importance of these abilities, and then the mean weighted discrepancy score (MWDS) of Borich needs assessment model (BNAM) was applied for sorting study. The study by Garton and Chung, (1996) made use of BNAM to find out 12 agriculture teachers who taught only one to two years in Missouri from 50 professional abilities; and then, the questionnaire investigation was carried out in order to find out the most necessary training demand of agriculture teaching and the prioritized sorting of the demand. In addition, Waters and Haskell (1998) used BNAM to try to find out the training demands for teaching and administrative staff of agricultural cooperative association; Newman and Johnson (1994) also used this method to study the training demand for agricultural pilots; and Thompson and Balschweid (2000), Edwards and Briers (1999), and Ricketts et al. (2005) also used this method to study teaching demand.

Interpretation of BDN analysis

BDN analysis makes use of the method of opinion questionnaire investigation to allow the participants to address their opinions and thoughts. A certain course is addressed in the questionnaire, and the respondents are required to comment on the recognition towards course
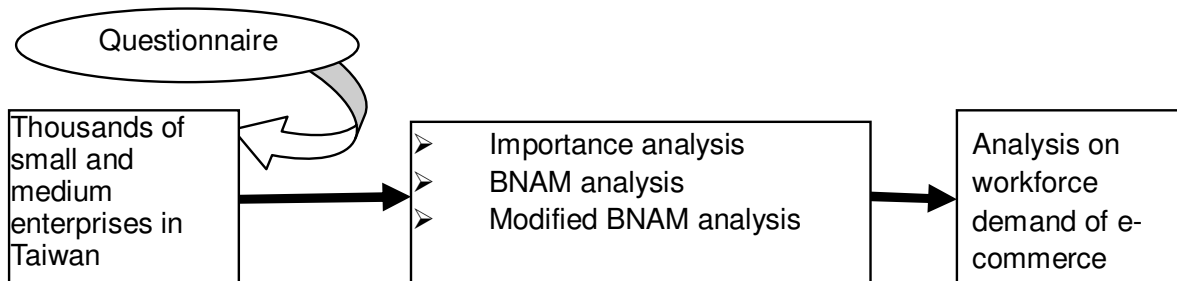
Figure 1. Study Framework.

importance and course understanding. The calculation method of BDN is subtracting the course understanding from the course importance, and then multiplying the obtained difference by course importance.

BDN = (Average of course importance – Average of course understanding) * Average of course importance Papritan (1985) explained that high negative shows there are enough courses; while high positive shows that course demand is very high, but there are not enough courses.

The value of understanding ranges from 0 to 4, where 0 represents not understand totally, 1 represents understand slightly, 2 represents somewhat understand, 3 represents understand, and 4 represents really understand. The value of importance ranges from 0 to 4, where 0 represents totally unimportant, 1 represents slightly important, 2 represents somewhat important, 3 represents important, and 4 represents very important.

For example, a course, JAVA programming, if the course understanding of the participant is 1 and the course importance is 4, then BDN = (4 to 1)*4; BDN = 12, this value represents the demand of JAVA course is very high. Another course, webpage design, if the course understanding of the participant is 3 and the course importance is 1, then BDN = (1 to 3)* 3; BDN = -6, this value represents that courses for webpage design are enough, so the number of relevant courses could be decreased.

Limitations and modification of BNAM

In BNAM, there are two parts for the questionnaire, the first part regards the course understanding and the second part regards the course importance, and then the formula is used to calculate the BDN value; the limitation of BNAM is that if that participant does not totally understand a certain course, but he/she uses his/her subjective recognition to decide that course is very important, then contradiction is formed. In this study, the course range of e-commerce is very extensive, and not every enterprise participant could understand all e-commerce-related courses; therefore, this study

proposes simple modification to solve this problem, which is for questionnaire with "0" course understanding, that course would be deleted. Thus, the deviation that is caused because of the total unfamiliarity towards that course could be removed.

STUDY METHOD

Study framework

The theme of this study is to focus on thousands of small and medium enterprises in Taiwan to carry out questionnaire investigation, importance analysis, BNAM analysis, and modified BNAM analysis, hopefully the demands from small and medium enterprises in Taiwan towards e-commerce courses could be found. The study framework is shown in Figure 1.

INTERPRETATION OF STUDY METHOD

Analysis of course importance

This analysis focuses on the importance part from the questionnaire, and the averages are analyzed directly in order to find out the more important courses.

Interpretation of Borich needs assessment model (BNAM)

This study regards Borich needs assessment model (BNAM) that Borich published in 1980 as the method of evaluating course importance, and this method has been successfully used by the educational world and enterprise world. The basic theory of this method is: the university thinks that the course that it opens is important, but the users from general public do not know its content and demand to obtain that course knowledge; thus, it is essential for the university to open that course or strengthen the teaching of that course. Borich discrepancy number (BDN) is used for analysis.

Interpretation of modified (Borich needs assessment model (BNAM)

The study by Li proposed a method to modify BDN in 2009. His method explains that if course understanding is 0 in the questionnaire, that means that participant totally has no idea towards that course; the reason for this situation is that the fields that e-commerce courses cover are very extensive, so some participants would have no idea towards certain courses. Therefore, the modification would be eliminating those items with "0" understanding (that is, have no idea towards that course), re-calculating BDN value, and then comparing again.

Table 1. The return situation of questionnaires.

Questionnaire object	No. of distributed questionnaires	No. of returned questionnaires	No. of valid questionnaires	Valid return rate
SMEs	754	316	316	41.5%

Source of materials: Arranged by this study.

IMPLEMENTATION OF QUESTIONNAIRE

Research subject

About 1000 companies are randomly chosen from small and medium enterprises, which are registered in Small and Medium Enterprise Administration, Ministry of Economic Affairs, for questionnaire investigation.

Data collection

The questionnaire includes two parts, course importance and understanding towards course knowledge.

Data analysis

Recognition of small and medium enterprises towards the importance of e-commerce courses: Borich discrepancy number (BDN) analysis and modified BDN analysis are carried out.

Reliability and validity analyses

Cronbach's α coefficient is the standard of measuring reliability. Before distributing the questionnaire, collection of documents and literature review are carried out, the first draft of questionnaire has also been evaluated by experts and scholars, and pre-test for 20 to 30 participants has been implemented, so as to modify the questionnaire to ensure the validity of the questionnaire content of this study.

Questionnaire design

The questionnaire of this study regards the 71 e-commerce-related courses that are proposed by Wu and Li in 2008 as the contents, considers the study from Liang (2000) as the foundation, regards relevant national and foreign documents, and collects the course data from national universities. The questionnaire content includes two big categories, technology-related courses and management-related courses. There are ten main technology-related courses and 21 main management-related courses, and 71 courses are sorted out. The questionnaire regards every course as one question, every questionnaire contains two parts: "knowledge" and "importance", and every part contains 5 choices.

STUDY RESULT

Questionnaire targets and received questionnaires

For the questionnaires that are distributed to small and medium enterprises, the small and medium enterprises in Taiwan are searched from Yahoo and Google and those that implement e-commerce are regarded as the sample. 958 questionnaire e-mails have been sent out and 204 e-mails have been turned back, thus 754 copies of questionnaire have been sent. In fact, 158 questionnaires have been received after urging the enterprises for three times, the effective rate of receiving questionnaire is about 41.5% (Tables 1, 2, 3 and 4).

Data statistics and analysis

Reliability and validity analyses

The overall reliability α coefficient of the course variables in this study questionnaire is 0.9866.

For validity analysis, the questionnaire validity would be confirmed in accordance with the accumulated interpretation variance, where the validity value lies in between 0.753 to 0.912; the validity of every question in the questionnaire reaches the standard.

Statistical analysis of questionnaire data

In this section, course importance analysis would be carried out for small and medium enterprises and BDN value is used to carry out workforce demand analysis.

Course importance analysis

This comparison result indicates that Introduction to Information Safety, Advanced Information Safety, and Information Safety Technology are the top three courses, thus the small and medium enterprises' importance towards information safety is obvious, which means the discussion of information safety is the most important one for small and medium enterprises.

BNAM workforce demand analysis

The BDN value of every questionnaire is calculated, and then a BDN average is obtained from all BDN values. For the calculation of BDN value, please refer to the Interpretation of study method.

Considering the workforce demand from the perspective of BDN value, Advanced Information Safety ranks the first, E-Commerce Law ranks the second, M-Commerce Application ranks the third, and Information Safety Technology ranks the fourth. The demand from small and medium enterprises towards the afore-mentioned talents is very high.

Table 2. Comparison table of the top ten course importance averages of e-commerce courses for small and medium enterprises.

Importance averages of e-commerce courses for small and medium enterprises		
Rank	Course	Mean
1	Introduction to information security	4.298
2	Advanced information security	4.228
3	Seminar on information security technology	4.219
4	Management information systems	4.079
5	Web technologies	4.053
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2	Advanced information security	4.228
3	Seminar on information security technology	4.219
4	Management information systems	4.079
5	Web technologies	4.053
6	Enterprise resource planning	4.053
7	Introduction to data base design	4.009
8	E-commerce application technology	3.991
9	Logistics management	3.965
10	Advanced business management	3.947

Table 3. Comparison table of the top ten e-commerce BDN workforce demand averages for small and medium enterprises.

BDN workforce demand averages for small and medium enterprises		
Rank	Course	Mean
1	Advanced information security	5.051
2	E-commerce and law	4.291
3	Mobile commerce application and design	4.082
4	Seminar on information security technology	4.013
5	Advanced data mining application	3.614
6	E-commerce regulating Model	3.589
7	Advanced network programming	3.576
8	Advanced decision support systems	3.538
9	Business process reengineering	3.513
10	Advanced data base design	3.468

Modified BNAM workforce demand analysis

If considering the workforce demand from the perspective of modified BDN value, there seems to be some changes. Advanced Information Safety still ranks the first, Multimedia Database System ranks the second, Advanced Network Programming ranks the third, Advanced Database Design ranks the fourth, M-Commerce Application ranks the fifth, and E-Commerce Law ranks the tenth.

Comprehensive comparison

The following findings are concluded after analyzing the aforementioned three analyses correlatively.

1) From the perspective of importance, small and medium enterprises focus on the information safety problems; from the perspective of workforce demand, small and medium enterprises emphasize higher level of information safety, since small and medium enterprises can solve general information safety problems, so they need more advanced technical workforce to solve higher-level of information safety problems.

2)   Comparing the original BDN and modified BDN, Advanced Information Safety still ranks the first; everyone thinks that E-Commerce Law is important, but everyone is not quite familiar with it (most of the knowledge degree is "0"), this is an interesting result; in addition, M-

Table 4. Comparison table of the top ten e-commerce modified BDN workforce demand averages for small and medium enterprises.

Modified BDN workforce demand averages for small and medium enterprises		
Rank	**Course**	**Mean**
1	Advanced information security	3.123
2	Multimedia data base system	2.614
3	Advanced network programming	2.518
4	Advanced data base design	2.491
5	Mobile commerce application and design	2.456
6	Advanced decision support systems	2.456
7	Enterprise resource planning	2.412
8	Web technologies	2.395
9	Advanced network access server management	2.281
10	E-commerce and law	2.281

Commerce Application and Information Safety Technology have the similar situation.

3) Original BDN indicates that whether the enterprises are familiar with those courses or technology or not, they would consider them as important subjectively, these courses might not be well-known or popular, such as E-Commerce Law, Advanced Application for Infor-mation Investigation, Operation of E-Commerce, and Information Safety Technology. If comparing the rankings of these courses from original BDN and modified BDN, one could find that the difference of their rankings is at least more than 3 places.

CONCLUSION AND SUGGESTIONS

Small and medium enterprises are very important management systems in the economy of Taiwan, which account for over 97% of total enterprises; the application and implementation of e-commerce are the goal that both government and small and medium enterprises want to achieve. This study aims to find out the e-commerce workforce demand of small and medium enterprises in Taiwan and the e-commerce technology or ability that these enterprises need. The following results have been obtained and could serve as reference for academia and industries.

Course importance shows the basis that enterprises have towards this kind of workforce importance; Introduction to Information Safety, Advanced Information Safety, and Information Safety Technology are the three most important courses, because information safety is what general enterprises care and value. In addition, the enterprises also think that Managerial Information System and Enterprise Resource Planning that integrate company's information and World Wide Web Technology that can develop the company's website are very important.

Based on BDN to carry out workforce demand analysis,

two analyses are carried out in this part:

1) For original BDN, Advanced Information Safety ranks the first, E-Commerce Law ranks the second, M-Commerce Application ranks the third, and Information Safety Technology ranks the fourth, showing that small and medium enterprises need the workforce for these technologies, in which problems of information safety, law, and prospective development of m-commerce are involved. With regard to enterprise management, the workforce demand of information safety is necessary to be more advanced. The problem of network law is something that the enterprises do not want to encounter but unavoidable. On the other hand, developing m-commerce in the future is something that small and medium enterprises would like to try, and they hope to develop this goal as soon as possible.

2) Comparing with the modified BDN, Advanced Information Safety still ranks the first, namely regardless of operators who are familiar or unfamiliar with Advanced Information Safety, it is definitely an important workforce demand. Multimedia Database System ranks the second, Advanced Network Programming ranks the third, Advanced Database Design ranks the fourth, M-Commerce Application ranks the fifth, and E-Commerce Law ranks the tenth.

3) In addition, technology or learning such as E-Commerce Law, Advanced Application for Information Investigation, Operation of E-Commerce, and special topics of Information Safety Technology might not be well-known or popular; thus, after comparing the rankings of these courses from original BDN and modified BDN, one could find that the difference of their rankings is at least more than 3 places.

E-commerce-related courses are very extensive, and different enterprises or companies have different workforce demands. This study result indicates that small and medium enterprises have very strong demand on the workforce and technology of advanced information

safety; in addition, information law and prospective development of e-commerce are the problems that small and medium enterprises have noticed and concerned about. Perhaps the academia could open more training courses of information safety technology or management so as to meet the enterprises' demand.

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