

Efficiency Evaluation of Web-based Learning on Multinational: A Case Study on Financial Industry

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ABSTRACT Based on the web-based learning efficiency of Taiwan's financial industry investing in China in 2010-2012, Data Envelopment Analysis (DEA), Sensitivity Analysis, and Malmquist Productivity Index are integrated to measure the total efficiency (TE), pure technical efficiency (PTE), and scale efficiency (SE) of eleven banks which invested in China for further web-based learning improvement. The empirical results show that Mega International Commercial Bank and Bank of Taiwan present the best total efficiency (1.00), followed by Cooperative Bank (0.93); Mega International Commercial Bank and Bank of Taiwan reveal the best pure technical efficiency (1.00), followed by Land Bank (0.92); and, Mega International Commercial Bank and Bank of Taiwan appear the best scale efficiency (1.00), followed by Cathay United Bank (0.85). From Malmquist Productivity Index, Taiwan Cooperative Bank, Mega International Commercial Bank, and Bank of Taiwan show improvement on pure technical efficiency change that the web-based learning effectiveness is enhanced.

INTRODUCTION

According to the statistics of Investment Commission, MOEA, forty percent approved outward investment in China, ranked the first. The enormous demands for capitals when Taiwanese businesses invested in China and the increasing savings deposit resulted from economic growth in China are the major factors in financial businesses establishing branches in China. From the aspect of Taiwanese businesses, presently close economic partnership across the Taiwan Strait has largely increased the demands of Taiwanese businesses in Mainland China for Taiwanese-funded banking.

For instance, the inconvenience of indirect remittance is time-consuming with higher costs. Besides, Taiwanese businesses in China could not receive finance from Taiwanese-funded banking that the increasing cost cannot benefit the operation. In this case, financial industry in Taiwan has actively planned the establishment of branches in China in order to satisfy the capital demands of local Taiwanese businesses, expand the business, and avoid the opportunity being acquired by other foreign banks in Mainland China. Because of the high homogeneity in fi-

ancial industry, financial products without differentiation and insufficient professional cultivation have resulted in fragile asset scale and business construction of financial industry, in comparing with foreign banks.

The emergence of the internet has the world wide web-based e-instruction become a trend. As the branches of financial industry spread everywhere in Taiwan, the members need to go to the head office for trainings so that the time and expenses are increased. E-learning could break the restrictions of time and space, allowing immediate release of the large amount of training expenses and time costs for financial industry. Financial industry has permanently devoted to e-commerce, like e-banking and e-ordering, that the employees and businesses are highly digitalized and present high acceptance of new technological learning as web-based learning. Furthermore, financial industry has actively developed various businesses in recent years that the sales representatives are numerous but appear high turnover rate. For this reason, the demands for trainings are relatively increasing. Moreover, web-based learning could assist financial industry in rapidly and largely training sales representatives; and, the rapid propagation and updating of web-based learning allow training sales representatives with learning platforms and standardized learning resources without being restricted by time. Web-based learn-

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ing performance is therefore evaluated for Taiwanese financial industry investing in China.

Literature Review

I. Web-based Learning

Yueh and Chung (2009) mentioned a web-based learning environment as a teaching situation with online browsing and communication, allowing all teaching and learning activities being preceded on the internet, presenting location and time independence, and allowing students proceeding online learning according to individual learning schedule. In a review of research on computer supported inquiry learning, Mustafa and Soner (2010) pointed out computers have been used to create environments that engage learners in scientific inquiry. Mustafa and Soner (2010) addressed "computerized inquiry learning has positive effect on students' conceptual understanding." Web-based instruction aims to help and enhance learning, while the learning theory tends to understand the learning reaction, behavior representation, and cognition model of learners based on psychological cognition and to assist learners in achieving the learning objectives and promoting the learning effectiveness through "explanations for learning methods".

An elementary teacher, Adiguzel (2011) examined the utilization of audio modification in vocabulary assessment in science subject. Adiguzel (2011) stated, "Utilizing computer technology to assess science vocabulary competency can help to assist students with learning. Technology supported programs can offer multiple forms of representation and communication to all students who are in the process of developing literacy." Lu (2010) also indicated that the teaching contents in a web-based learning environment covered content instruction, teaching materials placing, program announcement, assignment evaluation, course guidance, homework hand-in, learning outcome evaluation, and interaction between teachers and students, while the learning contents contained teaching material reading, program information acquisition, learning condition response, opinion communication, and peer interaction.

II. Web-based Learning Effectiveness

In a web-based learning environment, the learning effectiveness shows more dimensions

than face-to-face programs do. Chou (2009) considered the evaluation of learning effect in a web-based learning environment being different from traditional face-to-face learning environments and divided it into (1) learning outcome, (2) learning satisfaction, (3) group learning environments, and (4) individualized learning model. The effectiveness evaluation of web-based learning therefore should focus on the process, rather than the results.

Hung (2009) regarded the evaluation of teaching effect in web-based instruction, same as the other instructions, from (1) normal programs and (2) potential programs. In addition to the system design and instructional implementation, the evaluation of learning effectiveness in web-based instruction should correspond to the basic requirements for web-based instruction ruled by Ministry of Education in order to ensure the teaching quality, reduce the shortcomings in web-based instruction (such as interpersonal interaction and cheating), and effectively proceed more learning activities on the Internet with specific learning effects. Bostrom et al. (1990) pointed out the actual learning effectiveness of learning contents (accuracy of work) being the measuring standard for the effectiveness evaluation of web-based learning in financial industry and learners' attitudes towards web-based learning environment being a primary measuring index. Whipp and Chiarelli (2004) pointed out appropriate self-monitoring and record retention being the key characteristics of web-based learning. Wu (2010) discovered that learners with high self-efficacy more often utilized high-level learning strategies in web-based learning situations for effective learning and presented significantly positive effects on promoting the self-efficacy when acquiring supports and feedback from the peers in the web-based learning process system. Wu et al. (2011) also indicated that learners in financial industry could effectively master in self-learning conditions and further promote the learning effectiveness through the self-regulation system.

III. Data Envelopment Analysis (DEA)

Data Envelopment Analysis, an efficiency evaluation model developed by Charnes et al. in 1978, replaced present functions with non-preset production functions to estimate the efficiency and calculate the efficiency frontier curve with

mathematical planning model; the actual outputs were compared with the original production function to be the efficiency. Envelopes, as the theoretical basis of DEA which was established by Pareto in 1972 based on Pareto Optimality, are defined as no-one being able to enhance individual benefits without damaging other's benefits. DEA, without considering the weight of multiple outputs to multiple inputs, tends to compare the quantified results of all DMUs and select a DMU with better performance; then, all efficient DMUs are drawn a curve as the efficiency frontier. The distance between the observed value of individual DMU and the efficient enveloping surface are calculated for the relative efficiency. In summary, DEA, as a relative index, is an efficiency boundary constructed by the actual observed value through linear planning and measures an organization's efficiency by the difference between individual observed value and the efficiency boundary as the relative inefficiency.

RESEARCH METHOD

I. Research Subject

As Taiwan's financial market is small and saturated, managers in financial industry should constantly expand the financial territory to effectively enhance the business competitiveness and present the internationalization. Nevertheless, Taiwan's financial industry could merely establish branches and offshore banking units (OBU) in China before the agreement of MOU or ECFA. The businesses merely covered the financial businesses with financial institutes, corporate organizations, and individuals in Mainland China or the cross-strait financial businesses, including credit granting, with foreign exchange banks nominated by Central Bank and Chunghwa Post. The businesses of domestic financial industry have been largely restricted. According to the statistics by 2012, eleven banks are approved to establish branches in China that they are regarded as the research subjects.

Modified Delphi Method is utilized for enhancing the benefits of questionnaire survey so that the experts could focus on the research subject and objectively select the inputs/outputs. Four input/output variables are selected in this study, and eleven DMUs are strictly screened. All variable data are the open income statement, prospectus, and annual reports in 2010-2012 of the banks investing in China.

II. Definition of Inputs and Outputs

(1) Input Variable

1. Number of employees refers to the total number of employees of a company, including sales representatives (field staff) and administrative staff (back office force).
2. Web-based instructional expenses refer to the expenses in the web-based instruction of an enterprise.

(2) Output Variable

1. Net sales includes gross sales-sales returns and allowances
2. Before tax net profit. Before tax net profit" operating income non-operating revenue (loss) shows the profit of a company made money before paying taxes.

EMPIRICAL ANALYSIS

I. Analysis of Relative Efficiency

Table 1 shows the relative efficiency of the banks. Mega International Commercial Bank and Bank of Taiwan presented the best total efficiency (1.00), followed by Taiwan Cooperative Bank (0.93), and E.Sun Bank the worst (0.71).

Mega International Commercial Bank and Bank of Taiwan showed the best pure technical efficiency (1.00), followed by Land Bank (0.92), and Chinatrust the worst (0.75). Mega International Commercial Bank and Bank of Taiwan revealed the best scale efficiency (1.00), followed by Cathay United Bank (0.85), and E.Sun Bank the worst (0.66).

Table1:Relative efficiency of various banks in financial industry

<i>Bank</i>	<i>Total efficiency</i>	<i>Bank of Taiwan</i>	<i>Scale efficiency</i>
Chang Hwa Bank	0.88	0.91	0.73
Cathay United Bank	0.88	0.86	0.85
Taiwan Cooperative Bank	0.93	0.99	0.76
Hua Nan Bank	0.82	0.88	0.70
Chinatrust	0.73	0.75	0.68
First Bank	0.82	0.90	0.72
Land Bank	0.86	0.92	0.74
Mega International Commercial Bank	1.00	1.00	1.00
Bank of Taiwan	1.00	1.00	1.00
E.Sun Bank	0.71	0.78	0.66
Taiwan Business Bank	0.76	0.81	0.71

II. Sensitivity Analysis

The input/output variables were gradually deleted for DEA so as to understand the sensitivity to efficiency. From Table 2, two relatively efficient DMUs still remained when deleting total fixed assets and trash cleaning volume, showing the least effects of such two variables. When deleting number of employees and cost, the number of relatively efficient DMUs was reduced, revealing the importance of such two variables in the evaluation of relative efficiency.

III. Analysis of Malmquist Productivity Index

Table 3 shows the Malmquist efficiencies in 2010-2012, where the total element productivity of Mega International Commercial Bank and Bank of Taiwan was larger than 1, while the rest was

less than 1, presenting the decreasing productivity.

The pure efficiencies of Taiwan Cooperative Bank, Mega International Commercial Bank, and Bank of Taiwan were improved, while the rest appeared the worsened efficiency. Regarding the scale efficiency in two phases, Mega International Commercial Bank and Bank of Taiwan moved toward the permanently optimal scale, while the rest, with the efficiency less than 1, showed the businesses moving far away from the permanently optimal scale. Moreover, Taiwan Cooperative Bank, Mega International Commercial Bank, and Bank of Taiwan were found to present improved production techniques, but not the rest.

CONCLUSION

Total eleven banks were selected as the valid samples in this study by investigating the banks

Table 2: Sensitivity analysis of gradually deleting single input/output

<i>DMU</i>	<i>Original relative efficiency</i>	<i>Deleting number of employees</i>	<i>Deleting web-based instructional expenses</i>	<i>Deleting net sales</i>	<i>Deleting before tax net profit</i>
Chang Hwa Bank	0.88	0.92	0.95	0.83	0.80
Cathay United Bank	0.88	0.87	0.88	0.86	0.86
Taiwan Cooperative Bank	0.93	0.97	0.95	0.88	0.86
Hua Nan Bank	0.82	0.85	0.83	0.76	0.72
Chinatrust	0.73	0.77	0.73	0.70	0.71
First Bank	0.82	0.88	0.84	0.78	0.71
Land Bank	0.86	0.90	0.87	0.83	0.80
Mega International Commercial Bank	1.00	0.96	0.98	1.00	1.00
Bank of Taiwan	1.00	0.97	0.93	1.00	1.00
E.Sun Bank	0.71	0.82	0.80	0.66	0.61
Taiwan Business Bank	0.76	0.85	0.80	0.72	0.70
Number of efficient DMU	2	0	0	2	2

Table 3: Malmquist efficiency analysis in 2010-2012

<i>Bank</i>	<i>Technical change in two phases TECHCH</i>	<i>Pure efficiency change PECH</i>	<i>Scale efficiency change in two phases SECH</i>	<i>Total factor productivity change TFPCH</i>
Chang Hwa Bank	0.96	0.96	0.76	0.91
Cathay United Bank	0.90	0.89	0.88	0.95
Taiwan Cooperative Bank	1.01	1.02	0.80	0.98
Hua Nan Bank	0.90	0.91	0.79	0.87
Chinatrust	0.82	0.86	0.75	0.80
First Bank	0.91	0.93	0.80	0.86
Land Bank	0.93	0.95	0.77	0.85
Mega International Commercial Bank	1.06	1.08	1.01	1.01
Bank of Taiwan	1.02	1.03	1.03	1.02
E.Sun Bank	0.80	0.82	0.72	0.80
Taiwan Business Bank	0.83	0.85	0.76	0.80

investing in China, with the years 2010-2012 being the dimension. Data Envelopment Analysis is applied to evaluating the web-based learning performance of the banks. The research results show that the pure efficiency of the banks in 2010-2012 is less than 1 that the pure efficiency should be first improved in order to enhance the technical efficiency. In this study, Mega International Commercial Bank and Bank of Taiwan present better web-based learning performance possibly because the short-, medium-, and long-term web-based learning strategic objectives and vision have been definitely formulated in the beginning of web-based learning promotion and successfully assist the companies in definite directions and objectives for promoting web-based learning. Furthermore, the support of high-level managers and the enterprises being a learning organization could assist the promotion of web-based learning. The establishment of development team for promoting web-based learning also appears great benefits on the organization promoting web-based learning. The classification of lessons, high investment in information hardware, and professional management of learning platform, which is planned the colleges of finance, management, language, and information, could further benefit the access of employees.

RECOMMENDATIONS

Aiming at enhancing web-based learning efficiency, the following suggestions are proposed in this study.

1. Reinforce the guidance and strategic mechanisms for employees promoting independent operation and enhancing self-confidence. Proper self-monitoring and record retention are the key characteristics of web-based learning. The administrative sectors in financial industry should guide the employees cultivating positive and active attitudes towards problems, direct them to properly record the learning conditions, provide favorable web-based learning environments, and encourage online and real-time assistance in problem-solving. An independent operating environment could reinforce the professional and independent capabilities of employees and enhance the self-confidence.
2. Provide information related to web-based learning. Employees could actively adjust the cognition, motivation, or behaviors through self-regulation learning to achieve the objectives with better achievement. In this case, a company should cultivate the self-regulation learning capability of employees, actively offer information related to web-based learning, guide the employees utilizing web-based learning for exploring the required knowledge, and cultivate the multiple learning capabilities of employees through self-regulation learning.
3. Diverse learning models. In a web-based learning environment, various options could be provided, and appropriate teaching contents and instructional methods could be designed for the employees in order to enhance the learning motivation. For instance, providing several course materials, like pictures, videos, and interactive learning web pages) in a web-based learning environment allows the employees learning with diverse learning models and cultivating learning interests for the learning effectiveness.

REFERENCES

- Adiguzel T 2011. Use of audio modification in science vocabulary assessment. *Eurasia Journal of Mathematics Science and Technology Education*, 7(4): 213-225.
- Bostrom R P, Olfman L, Sein MK 1990. The importance of learning style in end-user training. *MIS Quarterly*, 101-173.
- Charnes A, Cooper WW, Rhodes E 1978. Measuring the efficiency of decision making units. *European Journal of Operational Research*, 2: 429-444.
- Chou Szu-wei 2009. The use of IT to enhance electronic classroom- A theoretical review. *Curriculum and Instruction Quarterly*, 5(1): 145-164.
- Hung Ming-chou 2009. Effects of web-based instruction program design on learning effectiveness. *Journal of Chinese Management Review*, 3: 89-98.
- Lu Hsin-chang 2010. The study of Campus MBO network construction examples of National Kaohsiung Normal University. *Bulletin of Educational Psychology*, 34(1): 43-60.
- Mustafa B, Soner D 2011. The effectiveness of computer supported versus real laboratory inquiry learning environments on the understanding of direct current electricity among pre-service elementary school teachers. *Eurasia Journal of Mathematics Science and Technology Education*, 6(1): 47-61.
- Wu Che-hsu, Hsiao Hsien-sheng, Chang Kuo-en, Song Yao-ting, Chao Mei-sheng 2011. Establishment of self-regulation simulation teaching system. *Journal of Education and Psychology*, 34(1): 29-54.
- Wu Pei-yi 2010. The effect of learning motivation on web-based learning behavior and academic achievement. *Ministry of Education Computer Center Newsletter*, 8709: 23-39.
- Whipp JL, Chiarelli S 2004. Self-regulation in a web-based course: A case study. *Educational Technology Research and Development*, 52(4): 5-22.
- Yueh Hsiu-ping, Chung Wan-li 2009. Communication and interaction in project-based learning group. *Educational Review*, 25: 1-23.