Quantitative and Qualitative Results of the National Program for e-Learning in Taiwan

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Abstract: - This paper provides an overview of quantitative and qualitative outcome of the national program for e-learning in Taiwan (ELNP for short). The national program was planned and initiated in 2002 by the National Science Council. Taiwan government wished to promote e-learning industry and make all people have same opportunity to learn knowledge via e-learning. A five-year national program for e-learning started from 2003. This paper shows both of quantitative and qualitative outcomes of national program in the past four years from four different ways: public welfare, academic researching output, e-learning industry, technological results.

Key-Words: e-Learning, Government, Outcome, Taiwan.

1 Introduction

Due to the bankruptcy of "dot com" companies, the IT companies in Taiwan tried to adjust their R&D strategies and make an organization transformation in order to make them survive [7]. Moreover, when Severe Acute Respiratory Syndrome (SARS) occurred in Asia in 2003, the e-Learning becomes important to businesses and educational organizations just because employees and students can learn in different places [1].

Taiwan government foresaw the importance of the e-Learning, therefore, the National Science Council (NSC) started to plan the National Science and Technology Program for e-Learning (ELNP) in 2002 [6]. The objectives of ELNP are including "increase the national productivities", "increase the national competition", and "promote the e-Learning industry".

First of all, the national program is introduced in Section 2. Section 3 describes the outcomes of national program in the last four years from four ways. Finally, Section 4 makes a simple conclusion.

2 National Program for e-Learning

National Science and Technology Program for e-Learning is a five-year national program from Jan. 2003. The first phrase is from 2003 to 2007 and the national science council is now planning the second phrase, the promotion phrase (2008-2012). There are seven operational programs in ELNP, including "e-learning for everyone", "narrowing the digital divide", "mobile learning devices", "internet-based industrial park for e-learning (e-learning park)", "advanced e-learning technology R&D", "fundamental research on learning and cognition in e-learning", and "policy guidance and manpower cultivation".

In order to complete those seven operational programs twelve government agencies joined the national program, the twelve government agencies were National Science Council (NSC), Industrial Development Bureau of MOEA (Ministry of Economic Affairs), Industrial Technology Dept of MOEA (Ministry of Economic Affairs), Ministry of Education (MOE), Ministry of National Defense (MND, from 2003 to 2005), Bureau of Health (BOH), Council of Labor Affairs (CLA), Council for Culture Affairs (CCA), Council of Indigenous Peoples (CIP, since 2005), Council for Hakka Affairs (CHA, since 2005), Tainan County Government (from 2003 to 2005), and National Palace Museum (is considered one of world's great museums [4]).

Each government agency took responsibilities in one or more operational programs as following:

1. e-learning for everyone:
   a. **Ministry of National Defense (MND)**
   b. **Bureau of Health (BOH)**
   c. **Council of Labor Affairs (CLA)**
   d. **Council of Indigenous Peoples (CIP)**
   e. **Council for Hakka Affairs (CHA)**
   f. **Tainan County Government**;
2. narrowing the digital divide:

   a. **Ministry of Education (MOE);**
3. mobile learning devices:
   a. **Ministry of Education (MOE)**
   b. **Industrial Technology Dept of MOEA;**
4. internet-based industrial park for e-learning (e-learning park):
   a. **Industrial Development Bureau of MOEA**
   b. **Council of Cultural Affairs (CLA)**
   c. **National Palace Museum;**
5. advanced e-learning technology R&D:
   a. **Industrial Technology Dept of MOEA;**
6. fundamental research on learning and cognition in e-learning:
   a. **National Science Council;**
7. policy guidance and manpower cultivation:
   a. **Ministry of Education (MOE).**

Table 1 lists the total budgets of the national program for the last four years. Although the government final budgets could not reach the initial plan, every government agencies still tried pretty hard. In next section the achievement of the national program for the last four years was summarized based on six KPI (key performance index) dimensions.

Table 1.National Program Budgets (in Million USD)

Year	2003	2004	2005	2006	2007	Total
Planned	25.7	27	27	27	27	133.7
Actual[+]	24	24.8	25	18.8		

[+]final government budgets

3 Four Years Outcomes

National program for e-learning makes 108 KPI items and divided them into 10 major dimensions in order to get people and government understanding the quantitative outcomes of the national program. This paper shows some major KPI items and its results in 8 dimensions from four ways; the dimensions include public promotion, e-learning, academic, international, professionals, and economics; and, the four ways are public welfare, academic researching output, e-learning industry, and technological results,

3.1 Public Welfare

Because the first operational program in the national program is "e-learning for everyone", two KPI dimensions are needed to discuss first. The two KPI dimensions which are related to "people" are public promotion and e-learning.

The public promotion dimension demonstrates how many people might know there is a national program for e-learning in Taiwan and what e-learning really is. As we can see from Table 2, in the last four years the national program has held 279 public activities and the total participant number is around half million (549,834).

Table 2. KPI (Public Promotion)

item	2003	2004	2005	2006/6
Newspaper	72	71	182	112
Public Activities	48	42	125	64
Participants	24,487	201,290	226,677	97,380

The e-learning dimension shows how many e-learning websites have been already built (and most of them were free); how many people have been visited; how many courses have been developed; and moreover, how many items have been constructed. Until this June there are 29,668 e-learning courses have been developed in over hundred e-learning websites as Table 3 lists. Moreover, these e-learning courses also attract over 11 millions visiting counts to those e-learning websites.

Table 3. KPI (e-Learning)

item	2003	2004	2005	2006/6
Websites	35	61	53	39
Visitors	225,615	3,398,766	2,897,864	4,970,642
Courses	157	8,757	20,441	313
Hours[*]	239	85,398	16,145.4	414
Items[+]	1,001	2,601	2,009	2,180

[*]total e-learning course hours
[+]in item bank

Two cases can represent the qualitative results in the public welfare, Mr. Arnold (nickname) and Mr. Wu's cases. Arnold is a young person who does not have high school degree and Mr. Wu is a salesman currently working in a frozen fish company, Gallant Ocean Group. They all get successful experiences via the national program.

Arnold is a person who used to do nothing but only hanging out around the neighborhood, therefore, he doesn't have high school degree.

One day when Arnold was browsing without target in the Internet café as usual, he saw the Cultural Affairs School of E-learning (CASE). Arnold was attracted by those blended courses provided by

Council for Cultural Affairs and decided to apply the online school. His semester project was saving a hydrographic station during Japanese colonial period. After Arnold studied in CASE online school, he became a community reconstruction designer and had many cases in his hands.

Mr. Wu was a books salesman before he joined Gallant Ocean Group. He didn't have any knowledge about frozen fish.

Gallant Ocean Group built an e-learning environment for its employees. A salesman like Mr. Wu needed to learn necessary knowledge before they visited their customers. Wu learned a lot of things from the e-learning courses and made his customers thought that he was doing frozen fish business in his whole life. Mr. Wu became the number one salesman three months later after he joined Gallant Ocean Group.

3.2 Academic Outputs

As we all know, to promote e-learning industry need to have high quality e-learning products. Furthermore, high quality and good product needs to have know-how. At this moment, the academic researching outputs are taking place. Three KPI dimensions here are used to evaluate the academic outcomes of the national program, which are academic dimension, international dimension, and professionals dimension.

The academic dimension shows how many SSCI/SCI EI journal papers and conference papers have been published with National Science Council's grants; how many industry cooperative projects have been initiated; how many professors and degree holders have been joined NSC e-learning research projects; and moreover, how many future researchers and/or developers, that is, Ph. D students and Master students, have been involved in NSC research projects. Table 4 shows there are 258 SSCI/SCI/EI journal papers, 278 national journal papers and 870 conference papers have been published already; and, there are more than 200 professors and Ph. D holders run NSC e-learning research projects this year.

Table 4. KPI (Academic)

item	2003	2004	2005	2006/6
SSCI/SCI/EI	32	78	88	60
Nat'l Journal	75	62	70	71
Int'l Conf. Paper	85	133	77	62
Nat'l Conf. Paper	113	129	145	126
Industry cooperation	8	10	21	17
NSC project chairs	231	192	216	179
Other Ph.D holders	40	13	45	50
Ph.D students	60	101	108	56
Master students	303	369	411	340
RA – Master	62	64	70	54
RA - others	205	139	226	167

The international dimension demonstrates how many important international e-learning conferences have been held in Taiwan; how many e-learning related experts, scholars, and organizations have been invited to Taiwan for visiting, discussion, and giving talks; and also, how many e-learning international activities such as international conferences that Taiwan government has given funds to support researchers attending. Table 5 shows that Taiwan held IEEE Wireless and Mobile Technologies in Education (WMTE) in 2004, Computer Supported Collaborative Learning (CSCL), IEEE International Conference on Advanced Learning Technologies (ICALT) in 2005, Intelligent Tutoring System (ITS), and IEEE Systm, Man, and Cybernetics (SMC) in 2006 for the last 3 years.

Table 5. KPI (International)

item	03	04	05	06/6
Int'l Conf (to hold)*	1	2	5	1
Guest Inviting+	41	17	12	4
Participating Int'l Activities	68	53	12	8

*IEEE WMTE, CSCL, IEEE ICALT, ITS, IEEE SMC

+including experts/scholars/organizations

Following the academic dimension, the professionals dimension could be divided into academia part and industry part as Table 6 and Table 7 list. The professionals dimension lists how many reseach assistants have been hired for the national program; how many students have gotten their master degree; And, how many students have gotten their Ph.D degree. Table 6 shows there 1632 students who get their master degree in the past four years and 650 students who get their Ph.D degree.

Table 6. KPI (Professionals – academia part)

item	2003	2004	2005	2006/6
Research Assistants*	390	566	941	619
Masters	289	461	527	355
Ph.Ds	167	218	208	57

*research assistant number might be overlapped in different years

Taiwan held many important academic activities in the past four years, for examples, IEEE Workshop on Wireless and Mobile Technologies in E-learning 2004, Computer Supported Collaborative Learning Conference 2005, IEEE International Conference on Advanced Learning Technologies 2005, and International Conference on Intelligent Tutoring Systems 2006. Taiwan also cooperated with the Advanced Distributed Learning Co-Laboratory (ADL Co-Lab) hosted International Plugfest II and held the 2006 International Conference on SCORM 2004 in conjunction with International Plugfest II.

Beside the international academic activities, Latchem (2006), the editor of British Journal of Educational Technology, did a quantitative survey on the publications in the past five years. The results showed that Taiwan was ranked the 4th for the publications from 2000 to 2005 in the Journal [8].

3.3 Taiwan e-Learning Industry

The Economist Intelligence Unit and IBM conducted an e-Learning readiness white paper in 2003, in this report Taiwan sat on the 16th around world among 60 countries and was the 3rd place in Asia just behind the South Korea and Singapore (Economist Intelligence Unit & IBM, 2004). Be notable is Taiwan's e-Learning readiness in the business part was the 9th place of the world.

Fig. 1 represents the market size of Taiwan e-Learning industry from 2002 to 2005. As we can see from Figure 1, before the national program for e-learning started, the market size was only 24.1 millions USD. Although the market size was growing steadily, after the national program started from 2003 the market size grew extremely fast than anyone could imagine.

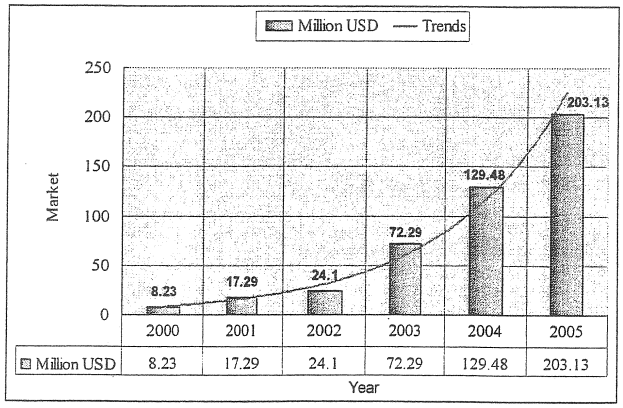


Fig. 1. Market Size of Taiwan e-Learning Industry (note: the national program started from Jan. 2003)

There are two dimension relate to e-learning indusrty, they are professionals dimension and econmics dimension. The industry part of professional dimension lists how many multimedia instructors have been trained by the national program; how many instruction designers have been trained; how many multimedia developers have been trained; and, how many IT professionals have been trained. Table 7 indicates that there are almost four hundreds (398) instruction designers have been trained. In general speaking, an e-learning course development team always has one instruction designer, two multimedia developers, and four to five IT professionals.

Table 7. KPI (Professionals – industry part)

item	2003	2004	2005	2006/6
Multimedia Instructors	4	4	45	48
Course Planners	68	258	85	56
Instruction Designers	84	213	64	37
Multimedia Developers	69	89	356	39
IT Professionals	2,027	2,037	2,675	1,019

The KPI items in the econmics dimension represent how much that business spent for applying e-learning and the estimated Taiwan e-learning market size.

Table 8. KPI (Economics)

item	2003	2004	2005	2006/6
Assisting*	29	44	55	
Business Spent$	4.3	37.2	10	51.5
Est. Marketing$	72.3	129.5	203.13	404.9

*assist how many e-learning ISPs
$in Million USD

There were two successful industry cases for representing the qualitative outcomes of the national program. The first case is FamilyMart Co., Ltd. and the second case is TransAsia Airways.

FamilyMart was first introduced in Japan in 1988. FamilyMart reached almost every corner of Taiwan. TransAsia was established in 1951. TransAsia wanted to become the best domestic airline and a globally renowned airline in the Asia-Pacific region.

FamilyMart currently has 1992 stores in Taiwan already. Being a chain store, usually, most of employees are part-time students. Most employees are part-time makes the company keep training new comers and spend a lot of money. Besides, in order to compete with other similar chain stores in Taiwan, FamilyMart has to have new lunch meals in every

two to four weeks. The problem is how to make all employees being well-trained before a new lunch meal is releasing.

FamilyMart thoughts that e-learning is a good methodology to provide employees fast and cheap on-job-training (OJT). Therefore, since 2003 FamilyMart developed e-learning platform and courses for fast delivery to employees.

Now when FamilyMart has a new product or promotional activities, it doesn't need to call all managers (or store employee representatives) back to headquarter to give them related lecture. FamilyMart delivers related e-learning materials directly to every store and saves a lot of money for the company and a lot of traveling time for employees. According to FamilyMart's estimation the opportunity cost of on-job-training was saving approximate totally more than 39 thousands USD (around 50% cut-off) yearly as Table 10 shows.

Table 9. Opportunity Cost (in thousands USD)

item	Opportunity Cost
Legal Personnels	Save approximate 9.15
Staffs	Save approximate 7.32
Part-time students	Save approximate 22.86
Total	**Save approximate 39.33/yr**

The number of passengers traveling by air has recently fallen due to the increased price of gas and the new high-speed railway. To increase competition and adapt to the market environment, Porter (1997) recommended that business should first reduce cost and provide various services [9]. Regular training is a large expense for an airline. Therefore, to reduce the cost of training, TransAsia decided in 2004 to replace traditional training with e-learning.

TransAsia developed 60 e-learning courses, including 36 courses (lasting about 80 hours) produced in-house. According to TransAsia's estimation the opportunity cost was saving approximate totally 800 thousands USD yearly as Table 10 shows.

Table 10. Opportunity Cost (in thousands USD)

item	Opportunity Cost
Flight Crews' Salary	Save approximate 340 (save training time, increase flying time)
Operation Earnings	Save approximate 840 (will be able to have additional flights)
Lecturers' Expenses	Save approximate 20 (do not need to spend money for lecturers)
e-learning Expenses	Spend approximate 400 (course development, infrastructure construction, learning management system, e-learning website etc.)
Total	**Save approximate 800/yr**

The TransAsia case not only received the government reward (approximately sixty thousands US dollars), but was also named a winner (bronze medal) in the Innovative Technology Category in the 2005 Brandon Hall Excellence in Learning Awards.

3.4 Research & Development Results

Industrial Technology Dept. of MOEA takes charge of the advanced learning technologies researching and development and Industrial Development Bureau of MOEA takes charge of e-learning park construction. These two tasks involve many new technologies and innovative ideas, therefore, the last KPI dimension here for the R&D results is the technology dimension.

The technology dimension shows that how many ideas have been applied for patterns; how many patterns have been received (as we all know that the reviewing process for pattern is quite long, it usually takes one to two years); how many patterns have been taken into production; how many businesses have been ask for technology transfer; and, of course, how much those businesses have been paid for transferring technologies.

Table 11 shows that there are 50 ideas have been applied for patterns around the world and there are 8 patterns have been received until June 2006. In the technology transfer statistics, there are 40 businesses have been ask for transferring 51 technologies from the government and paid for 780 thousands USD.

Table 11. KPI (Technology)

item	2003	2004	2005	2006/6
Pattern (applying)	19	19	11	1
Pattern (received)	0	5	2	1
Pattern (products)*	1	7	10	
Innovation+	5	6	2	2
Technology Transfer	12	16	23	
Transfer Business#	4	13	23	
Transfer Money$	64.7	297	418.8	

*e-learning products according to patterns
+including innovative systems/tools/modules
#how many bussinesses asked technology transfer
$in Thousand USD

4 Conclusions

Taiwan government initiated a five-year national program for e-learning since 2003. The advantage of national program is obviously as we can see the e-learning market size is keep growing amazingly from Fig. 1. Beside Taiwan e-learning market size, this paper also uses some important KPI items in eight dimensions to give audiences an overall view of the national program outcomes in the last four years.

Although the first phrase of the national program for e-learning is closing to the end (from 2003 to 2007), the program office is currently working on the second phrase plan. Since the national program is developing a lot of e-learning courses; having some innovative ideas; encouraging many businesses to apply e-learning into their organizations; and, building an e-learning park based on the ordinary science park operation model in the first phrase [3][5], the second phrase plan will focus on the e-learning promotion and e-learning supply-chain integration.

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