

## Exploring Information Literacy Competence by Self-Determination On-Line Platform – DEA Analysis

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### ABSTRACT

Self-Determination On-line Learning Platform (SDOLP) was applied on the subjects from universities to measure the e-decision making thinking competence level of information literacy competence. By adopting the Data Envelopment Analysis (DEA), the e-decision making thinking competence level of 454 subjects from public and private universities in Taiwan was analyzed. The average e-decision making thinking competence level for the public university students possessed 75% which was better than the level of 71% possessed by private university students. And there was no significant variance against the average level possessed by the students major in none-information technology.

**Key words:** e-decision making thinking, information literacy, self-determination.

### Introduction

Information literacy competence is the personal competence to judge when the information is required and be able to access, evaluate, and perform the required information effectively. That is, information literacy competence becomes one of the basic literacies for everyone (Hannafin and Peck, 1988). Many researches related to information literacy explored how to educate and cultivate students with certain level of information literacy in the past few years (Eisenberg et al., 2004; Aroyo&Dicheva, 2004; Singh &Ritzhaupt, 2006; Coletta et al., 2008; Chang et al., 2009; Jou et al., 2010; Kitchenham et al., 2010; Liu & Lin, 2010; Joana et al., 2012). Most of the previous researches were conducted by qualitative and statistics analysis. But very few researches were conducted by quantitative analysis. Therefore, Data Envelop Analysis (DEA) is applied in this study to generate the model for the analysis of students' information literacy competence. Self-determination on-line learning platform (SDOLP)

developed by this study was applied on the subjects during the courses (Hsu, et al., 2013). The results from the questionnaires of SDOLP conducted by subjects were taken as the quantitative data to measure the e-decision making thinking competence level via Data Envelop Analysis (DEA) for this study

### Literature Review

#### 1 e-Decision Making Thinking Competence

Effective daily problem solving through strategic analysis and knowledge utilization is the important factor of competition ability according to the applications of Information Communication Technology (ICT), resource literacy and strategic making thinking (Peter & Jeanne, 2004; Andrew, 2005; Rebecca, 2007).

#### 2 Self-Determination Theory

In the application of education context, self-determination theory emphasizes how the factors that strengthen and damage intrinsic motivation in society influence individual self-determination

behavior, which focus on the promotion effect of intrinsic motivation and learning behavior for students (Deci & Ryan, 1985, 1991, 2000).

## Method

### 1 DEA - Data Envelop Analysis

DEA is a linear programming methodology that uses data on output and inputs, to construct a piece-wise linear surface over the data point. Authors use Data Envelopment Analysis computer Program, - DEAP 2.1- and a multi-stage DEA procedure to run the models.

## Subjects and Tool

### 1 Subjects

454 subjects cover the students of Information Technology field and non-Information Technology field from two public universities and two private universities in Taiwan.

### 2 Tool

The information literacy competence level is measured by the e-decision making thinking competence. SDOLP (Hsu, et al., 2013) developed by this study is applied on the subjects during the courses. The results from the questionnaires of SDOLP conducted by subjects are taken as the data for this study. The content of the questionnaire includes basic student data (such as gender, age, university and department) and e-decision making indicators (such as information definition ability, information access ability, information assessment ability, information management ability, information consolidation ability, information innovation ability, information propagation ability). The main goal aims to assess learning effectiveness through the indicators of e-decision making thinking competence. SDOLP simulates the contexts of questions in order to have subjects conduct correct decision making thinking through properly utilizing information ability. The design and interface of SDOLP fulfills self-determination learning theory. The cluster arrangement is adopted to develop the questions in order to design the context and examples for the question accordingly. Meanwhile, the experts from the related fields are invited to review the design of questionnaire and evaluate questions in order to ensure the questions of questionnaire

fulfill the requirements of teaching context. By the development of website SDOLP, the experiment can be remotely applied through the terminals with browsers and internet modems.

## Data Processing

Before doing DEA analysis, the total quantity of questions with correct answers for the e-decision making thinking competence indicators in terms of information definition ability, information assessment ability and information innovation ability is taken as the variance Y1 for information management knowledge cluster. Then the total quantity of questions with correct answers for the e-decision making thinking competence indicators in terms of information access ability, information management ability, information consolidation ability and information propagation ability is taken as the variance Y2 for information management skill cluster. The variance X1, which represents learning course content, is set up as 1 since all students are under the same education system. This study analyzes how to cultivate university students to be good problem solvers through university education. Therefore, the problem solving ability indicators are required to be developed for the clear guideline of enhancement. The coding for "school type" (Z1) is 1 for public universities and 0 for private universities. The coding for "field" (Z2) is 1 for information technology major and 0 for non-information technology major. The coding for "gender" (Z3) is 1 for male and 0 for female. The coding for "work experience" (Z4) is 1 for with experience and 0 for without experience.

## Discussion & Conclusions

Y1 and Y2 represent output variances and X1 represents input variance are taken as the variances for the empirical analysis of DEA approach. Z1, Z2, Z3 and Z4 are taken as the influence factors of information literacy competence such as information management knowledge (Y1) and information management skill (Y2) through regression analysis.

Refer to Table 1,

**Table 1. Descriptive statistics of output variable**

Variables	Total sample	Subjects			
		National University	Private University	Information Technology	Non-information Technology
Y1	8.30 (2.29)	8.44 (2.28)	8.14 (2.29)	8.22 (2.30)	8.52 (2.25)
Y2	10.83 (2.66)	11.26 (2.46)	10.38 (2.79)	10.84 (2.77)	10.83 (2.34)

( · ) denotes standard deviation

- The total quantity of the questions with correct answers for the information management knowledge cluster (Y1) is 8.30 which is less than 10.83 for the information management skill cluster (Y2). The finding represents that subjects have better information management skill.
- There is no significant difference of information management knowledge (Y1) between public universities and private universities (Z1). But the information management skill (Y2) between public universities and private universities (Z1) is significant. The information management skill (Y2) of the subjects from public universities is 9% better than the subjects from private universities (Z1). The finding represents the subjects from public universities have better information management skill.
- There is no significant difference of information management skill (Y2) between the subjects major in information technology and non-information technology (Z2). The information management knowledge (Y1) of the subjects major in non-information technology is 4% better than the subjects major in information technology (Z2). The finding represents the subjects major in non-information technology has better information management knowledge. The subjects major in non-information technology has minor leading performance in information management skill.

Refer to Table 2,

**Table 2. Technical efficiency estimation using DEA approach**

	Total sample	Subjects			
		National University	Private University	Information Technology	Non-information Technology
Sample size	454	233	221	334	120
Mean	0.731	0.753	0.707	0.728	0.738
Std. dev.	0.151	0.139	0.160	0.155	0.141
Maximum	1.000	1.000	1.000	1.000	1.000
Minimum	0.154	0.154	0.231	0.231	0.154
<60%	16.96	12.88	21.27	18.56	12.50
60-69%	18.06	12.88	23.53	18.56	16.67
70-79%	26.87	30.46	23.08	24.25	34.17
80-89%	26.66	31.33	21.71	26.05	28.33
90-100%	11.45	12.45	10.41	12.57	8.33

- The average information literacy competence of all subjects is 73%. 17% of their information literacy competence is lower than 60%. And 53% of them is within the range from 70% to 89%. The finding represents that the information literacy competence of all subjects still has 27% growth range to be improved.
- The average information literacy competence of the subjects from public universities is 75% which is higher than 71% for the subjects from private universities. It represents less gap of information literacy competence between the subjects from public universities.
- The information literacy competence of the subjects major in information technology is 73% which

has little difference compared with 74% for the subjects major in non-information technology.

- Both the subjects from public universities and private universities require to enhance information management knowledge.
- 44% of the subjects achieve 80% and above level of information literacy competence is from public universities. Only 32% of them is from private universities. In which, 39% of them is major in information technology and 37% of them is major in non-information technology.
- 13% of the subjects achieve 60% and below level of information literacy competence is from public universities. 21% of them is from private universities. In which, 19% of them is major in information technology and 13% of them is major in non-information technology.

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