Investigating Students' Satisfaction toward Network Learning Platforms

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Abstract--**Internet technology developed fast in recent years, it provided more mature development environment for e-learning. E-learning technologies have been widely used in private business or school, it usually through a CAI system which has been established completely, then can make learners freely use after classes on the network platform. Web-based learning is a technology-mediated learning that learners acquire knowledge through the information technology environment. Using network learning platform make users enhance their learning ability, and continuously develop resource and improvement, strengthen the learning convenience of users. The purpose of this study based on technology acceptance model is to explore perceived ease of use, perceived usefulness on students' e-learning efficiency. 297 valid responses of undergraduate students in Taiwan universities are our survey subjects. This study uses path analysis to test our hypotheses. The results found that Perceived Ease of Use has an influence on Perceived Usefulness, and Perceived Ease of Use and Perceived Usefulness also have an influence on Learning Satisfaction. All of three hypotheses are supported.**

I. INTRODUCTION

According to data from BackgroundCheck.org, by 2013 global webpopulation had rapidly risen to 3 billion. The MIC (Institute for Information Technology) estimated that the number of Taiwanese network users in 2013 had surpassed 13 million. Traditionally, teaching has been carried out based on books. In recent years, network technology has advanced rapidly, which not only leadspeople pay more attention to the incorporation of information technology into teaching [21], but also provides a much better developmental environment for e-Learning. There is a growing tendency for contemporary educatorsto apply information technology to teaching, andfor teaching activities to utilizetechnology and media which are outsideof stereotypical and traditional teachingmodes.

As a learning aid, e-Learning has been well-approvedin educationalcircles. As such, a number of schools have started to construct their own network learning platforms (NLP)in order to help strengthen students' learning by providing instant or non-instant e-Learning environments. The advantage of NLP is that it enables distantlearners to engage in network learning activities without the restrictions of time and place,as well as helping to reduce learning costs incurred through inconvenient learning conditions [17]. In addition, the rise of NLPaccelerates communication between teachers and students: on the one hand, class materials can be shared on the platform; on the other, students from various departments can audit courses, and uploaded and communicate with each other through network platformsfor free. Increasingly, universities and colleges at home and abroad are applying NLPs, and many teachers are requesting that their students use the system to assist their learning. Through the platforms, they can download teaching materials, hand in homework, take online exams, and take part in discussions. However, students' attitudes, intentions, and behavior towards the use of network learning platforms are key indicatorsto decide whether NLP building is helpful or not. Because learners are the most immediate and important experiencers of e-Learning systems, only when they are willing to use learning platforms can the expected goals of platform building be achieved.

Research on user behavior of information technology has been valued in the studies of tools or platforms of promotion activities. For this reason, Davis [6]has proposed the Technology Acceptance Model (TAM) and has successfully worked out users' acceptance levels of various kinds of information systems in many fields. Davis' research results have been widely tested [19;11;23; 27;16]. Based on the TAM perspective, this study would like to explore college students' satisfaction level with NLP, as well as consider how it couldbe improved. We have undertaken this study because understanding learners' level of acceptance and satisfaction of learning technologies is criticalin developing a successful e-Learning environment. Therefore, the main question that this study would like to deeply explore is: The impact of perceived ease of use toward network learning platforms on the level of university learners' perceived usefulness; and the impacts of both the perceived usefulness and the perceived ease of use on the level of university learners' satisfaction.

II. LITERATURE REVIEW

A. E-Learning

E-Learning, also known as on-line learning refers to new cross-time and cross-space learning activities carried out through the Internet [24].The acquisition of knowledge and skills in the Internet age is much easier today than in the past. E-Learning has made a breakthrough by incorporatinga wide variety of technologies into teaching.These technologies diversify and enrich the learning paths. Thus,it becomes possible for students to study throughthe Internet. These are some of the reasons whye-Learning has become a new and popular trend in education.

In this paper, e-Learning broadly refers to a learning style that utilizes digital media and platform equipment to transmit information in which learners can flexibly adjust their study plans according to their learning environment and conditions. Unlike traditional teaching, e-Learning breaks the restrictions of time and space[9]. Therefore, personal learning goals, motivations, and self-management are particularly important

for a learner in a room without teachers and classmatespresent at the same time. Chen and Shyu[3] suggest that the interaction of on-line teaching and practical lectures couldsubstantially enhance the effects of skills learning.

B. Network Learning Platforms

Network Learning Platforms (NLP) is a conduit passing on hypermedia and digital teaching materials to learners through the World Wide Web (WWW), bridging geographical and temporal gaps [25]. Utilizing the advantages of digital technologies, NLP provides a space on the Internet for information exchange. Actually, the designation of e-Learning platforms has never been unified; that is why they are called either ELP or e-Teaching supporting platforms. This is also true in foreign countries. There are different terms for the same thing and each term emphasizes one aspect. As for e-Learning platforms, in the beginning they were called e-Learning Delivery Platforms[8]. Recently, two other commonly used terms were Learning Management Systems (LMS) and Course Management Systems (CMS) [12]. E-Teaching platforms gradually developed in the early stages of Internet development when universities and colleges in Taiwan started to choose platforms appropriate for their schools in order to promote e-Learning on campus. Thus, the rapid development of e-Teaching platformshas made an indelible contribution to the improvement of the whole e-Learning environment.

C. Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) was developed by Davis[5] based onthe Theory of Reasoned Action (TRA). As one of the most common theoretical models for users' technology acceptance, this model serves as an effective tool to predict users' behavioral intensions towards new information systems[28]. Consisting of Perceived Usefulness, Perceived Ease of Use and other exogenous variables, the TAM is applied to explain, diagnose, and predict users' behavior when facing new information technologies [7].

Perceived usefulness concerns the users' perception that using a system can help improve job performance or efficiency. The greater perceived usefulness users show, the more positive their attitude towards the system. Perceived ease of use refers to users' perceptions of whether or not the system is easy to learn. When users feel that the system is easy to learn, they are more likely to adopt a positive attitude towards the system. Exogenous variables involve variables that may affect perceived usefulness and perceived ease of use, such as individual variables and environmental characteristics. However, perceived usefulness and perceived ease of use can influence users' behaviors and attitudes, users' behavioral intentions, and practical uses [6].

D. Learning Satisfaction

A successful NLP attaches importance not only on the setup of high-speed networks, the development of system platforms, and the design of course content, but also to the understanding of the characteristics, user status, and learning satisfaction of learners in e-Learning systems. Bolliger and Wasilik [1] hold that learning satisfaction refers to the satisfactory feeling and positive attitude produced from the learning activities involved in the learning process that are enough to meet learners' demands.This study has changed the behavioral intentions of the TAM for learning satisfaction definingthe latter as the learners' positive feelingstowards the learning platform created throughout the entire learning process [29], especially when they perceive that the learning activities can meet their learning demands[2].

E. The correlation between Perceived Usefulness (PU), Perceived Ease of Use (PEU), and Learning Satisfaction

Davis[6] and Davis *et al*.[7] have pointed out thatPerceived Ease of Use could affect Perceived Usefulness and that users' faith in both concepts is the most important factor influencing their attitude. Such a cause-and-effect relationship has been verified again and again by subsequent research with consistent results [14; 20]. Thus, this study proposes the following hypothesis:

H1: Perceived Ease of Use has a positive influence on learners' Perceived Usefulness.

Based on the study of users who continously use e-Learning systems, Roca et al.[22] point out that users' perceptions of usefulness and ease of use could have a positive influence on their learning satisfaction. Limayem and Cheung [15] as well as Lee[13] suggest that users' perceptions that a system is useful has a positive impact on learning satisfaction. Hence, this study also proposes a second and third hypothesis:

H2: Perceived Ease of Use has a positive influence on learners' learning satisfaction.

H3: Perceived Usefulness has a positive influence on learners' learning satisfaction.

III. RESEARCH DESIGN

A. Research Framework

Based on the Technology Acceptance Model (TAM) proposed by Davis[6], this study conducted empirical research on users of Network Learning Platforms (NLP)at TransWorld University, mainly exploring the relationship between the internal technology acceptance factors (PEU and PU) and a behavioral variable that indicates the use of NLP (Learning Satisfaction). As well, this study carried out a survey on exogenous variables (individual user variables and network platform use status). Research concepts are shown in Figure 1.

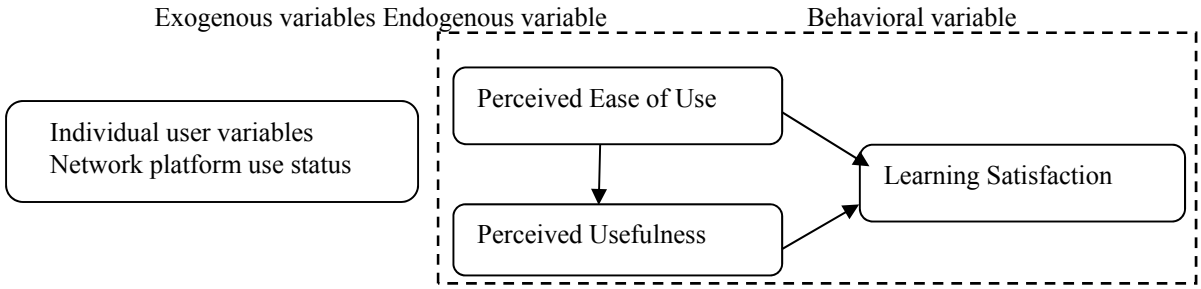

Figure 1. Research Framework

B. Research Variables

According to Figure 1, the variables in this study are to be explained as follows.

1) Individual user variables and network platform use status

These two variables consist of such options as gender, grade, and weekly NLP Use. In addition, two multiple choice questions are asked to understand the status quo of college students using NLP. The first question is "which function of NLP do you most commonly use"; the second is "what is the most annoying aspect of using NLP".

2) A Perceived Ease of Use scale was designed with reference to Davis [6] and Heijden[10]. The scale is comprised of three items: (1)You find that Network Academy System is easy to use, (2)You find that you need to spend little energy to interact with Network Academy System. (3)You find that Network Academy System is easy to operate.

3) A Perceived Usefulness scale was designed with reference to Davis [6] and Heijden[10]. The scale is comprised of three items: You find that using Network Academy System can help improve your learning ability. You find that through Network Academy System you can obtain information more quickly. You find that using Network Academy System is good for you.

4) A Learning Satisfaction scale was designed with reference to Mathieson et al.[18] and Syu[26]. The scale is comprised of six items: Although I know nothing about Network Academy, I still want to try it. I am willing to use Network Academy. I am willing to tell my classmates about Network Academy. I am willing to spend more time to understand Network Academy. I will recommend Network Academy to my classmates. I find that Network Academy System can help improve my learning performance.

The PEU Scale, PU Scale and Learning Satisfaction Scale are calculated using a five-point Likert scale. "Strongly agree"is given five points, "agree" four points, "neutral" three points, "disagree" two points, and "strongly disagree" one point.

IV. RESEARCH RESULTS AND ANALYSIS

A. The characteristics of the research objects

The objects of this study were mainly comprised of university students who have used Network Academy. Questionnaires were first distributed, and then stratified random sampling was conducted according to the students' colleges and grades. A total of 330 questionnaires were distributed and finally collected 297 valid questionnaires in total, giving a response rate of 90 percent.

Of the respondents, there were 160 girls (accounting for 53.9%) and 137 boys (46.1%). These subjects were from three different colleges: 100 from a Human Ecology College (33.7%), 99 from a Design College (33.3%), and 98 from a Management College (33%). In terms of grade, sophomores accounted for 31% of the respondents, followed by freshmen (28.6%), juniors (22.2%), and finally seniors (18.2%). In terms of weekly Network Academy use, one-day users accounted for 51.5% of the subjects, two-day users (33%), three-day users (12.8%), and finally four-day users (2.7%). The number of students who used Network Academy an hour a week constituted 67% of the total number of respondents, whichseems to indicate that students lack enthusiasm for active learning.

As concerns the multiple choices question, "Which function of Network Academy is most commonly used?" on average each respondent check marked 2.17 options. Of all the given items, "Hand in homework" took the lead (40.3%), followed by "Download course material" (30.5%), "Read notice" (15.7%), and "Exam" (10.1%). As to "what is the most annoying thing about using Network Academy", also a question with multiple choices, on average each respondent check marked 1.94 options. Of all the problems, "Slow network speed" came first (26.1%), followed by "Uploaded files damaged" (23%), "Unable to login" (19.9%), "Inadequate uploading capacity" (19%), and finally "Complex operation interface" (11.9%).

B. Perceived Ease of Use, Perceived Usefulness, and Learning Satisfaction

The whole scale of Perceived Ease of Use, Perceived Usefulness, and Learning Satisfaction had a high reliability level of 0.89, and each individual dimension had a reliability level of over 0.7. It follows that the whole scale is internally consistent. Table 1 shows the average, standard deviation, and reliability of each scale. As the questionnaire was in the form of a five-point Likert scale, the research objects had a positive view on an itemif the average is above 3 points [4]. Table 1 indicates that the averages of all the questions were greater than 3.3, indicating that users are generally satisfied with Network Academy.

TABLE 1 THE AVERAGE, STANDARD DEVIATION, AND RELIABILITY OF DIMENSIONS OF SCALES

Construct's Names (Cronbach's α)	Question Items	Mean	Standard Deviation
Perceived Ease of Use (0.83)	Do you think Network Academy is easy to use?	3.67	0.73
	Does it require a lot of energy for you to interact with Network Academy?	3.72	0.67
	Do you think Network Academy is easy to operate?	3.71	0.74
Perceived Usefulness (0.72)	Do you think using Network Academy System can help improve your learning ability?	3.47	0.74
	Do you think Network Academy System can help you obtain information more quickly?	3.68	0.67
	Do you think Network Academy System is helpful?	3.72	0.68
Learning Satisfaction (0.85)	Although I know nothing about Network Academy, I still want to try it.	3.65	0.72
	I am willing to use Network Academy.	3.76	0.65
	I am willing to tell my classmates about Network Academy.	3.51	0.71
	I am willing to spend more time to understand Network Academy.	3.36	0.70
	I will recommend Network Academy to my classmates.	3.30	0.74
	I find that Network Academy can help improve my learning performance.	3.38	0.77

In this study, a Pearson Correlation was applied to explore how well variables were related. Descriptive statistics (means, standard deviations and correlations) were performed for all dimensions (see table 2 for details): 1) Perceived Ease of Use 2) Perceived Usefulness 3) Learning Satisfaction. Statistically, means are used to refer to one measure of the central tendency of the random variable characterized by that distribution, which is the average score of each dimension in this study. It is clear that there is a high correlation between each and every dimension and the correlation is significant ($p < 0.01$). For example, the findings also showed that the correlation coefficient between perceived usefulness and learning satisfaction was the highest ($r = 0.59$); hence, both of the highly correlated variables lie within the acceptable range.

TABLE 2 MEANS, STANDARD DEVIATIONS, CORRELATIONS,AMONG STUDY VARIABLES (N = 297)

Variable	Means	SD	(1)	(2)	(3)
(1) Perceived ease of use	3.70	0.62	1		
(2)Perceived Usefulness	3.63	0.56	0.46**	1	
(3)Learning Satisfaction	3.49	0.54	0.56**	0.59**	1

**Correlation is significant at the 0.01 level (2-tailed).

Path analysis is a statistic technique used to analyze the correlation between variables by means of models. It is mainly employed to verify proposed impacts, prediction, or causal relationships based on the covariance of variables. In addition to being considered as a form of multiple regression focusing on causality, path analysis can be viewed as a special case of structural equation modeling (SEM) – one in which only single indicators are employed for each of the variables in the causal model. That is, path analysis is SEM with a structural model, but no measurement model.This study puts forward a path analysis model in accordance with the theoretical literature.

Table 3 shows the research hypotheses and the parameters for the paths among dimensions. The standardized regression coefficient (β) and the level of significance are used to predict the explanatory degree of dimensions.The level of significance is shown in *. That the value of β is significant means the predictability of the research hypotheses was affected by direct effects. There are three hypotheses in Figure 1 which indicates the path of analysis of the study. By means of path analysis, the predictability of these hypotheses all reach a significant level ($p<0.001$). This means "Perceived Ease of Use" has an influence on "Perceived Usefulness" (H1), and "Perceived Ease of Use" and "Perceived Usefulness" also have an influence on "Learning Satisfaction" (H2)(H3). All of three hypotheses are supported.

TABLE3 RESULTS OF PATH ANALYSIS (N = 297)

Independent variable	Dependent variable	Hypotheses	β	Sig	Yes/No
Perceived ease of use	Perceived Usefulness	H1	0.456	***	Yes
	Learning Satisfaction	H3	0.561	***	Yes
Perceived Usefulness	Learning Satisfaction	H2	0.589	***	Yes

***p<0.001

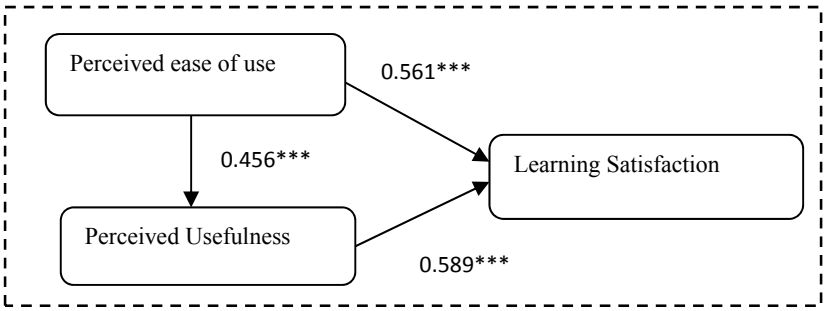

Figure 1 Path Analysis

V. CONCLUSIONS AND SUGGESTIONS

This study explored the effects of the network learning platform for college students from three dimensions utilizing a Technology Acceptance Model (TAM): "Perceived Ease of Use", "Perceived Usefulness", and "Learning Satisfaction". In accordance with the theoretical literature, this study proposed three research hypotheses. Empirical data was then collected through the distribution questionnaires. Afterwards, the authors verified research framework and hypotheses through statistic description, Pearson correlation, and path analysis. According to the results of our analysis, the study came to the following conclusions. We also came up with some suggestions in the hope of providing the educational circles with a reference for establishing and modifying e-Learning systems in the future.

A. Conclusions and Discussion

1) The importance of strengthening network learning platform systems

In recent years, the development of network technology has promoted the rise of online learning. Learners' studies have been mainly carried out through the Internet, intra-enterprise network, or inter-enterprise network. Due to the convenience of online learning, substantial resources from a wide variety of sources have been invested in the area. A network learning platform was set up at our case study's university was partly because of digital trends and partly because the Ministry of Education encourages universities to shorten learning time and distance and create more opportunities for teachers and students to interact and communicate. The case study university started to plan Network Academy in November 2001, but it did not offer any courses until February 2002. There were a total of 48 open courses for that semester. As of now, the university offers more than 400 open courses every year, and the number is rising year by year.

The year of 2012 is an important year in the development of higher educational history in the world because a new online teaching model of Massive Open Online Course (MOOC) was launched. New York Times entitled 2012 as the year of MOOC that looked like a Campus Tsunami to lay significant impact on the field of higher education for centuries. At present, several plans are developed in accordance with the concept of MOOC, such as Coursera, Udacity and edX. Unlike traditional courses, MOOCs require additional skills, provided by videographers, instructional designers, IT specialists and platform specialists. The platforms have availability requirements similar to media/content sharing websites, resulting from the large number of enrollees. MOOCs typically use cloud computing technologies.

Some scholars named it as post-IT era whose prominent feature is the in-depth blend of IT application with each filed. From the perspective of systematic science, the technical specifically features the changes in the features of the open and complicated giant system with in-depth relationship with humans; these are consisted of the following three parts: The prevalence of network system, the systematized big data era and system reorganization and the emerge of value reconstruction and the process reengineering. This trend exerts an influence on that: the traditional university education has clearly faced the challenge from MOOC. Although MOOC platform is not powerful enough to replace the position of universities and colleges, the impact on education from MOOC could rapidly promote the instructional reform of university courses, which is of great and extraordinary significance.

However, the results of our survey show that Network Academy was not frequently used by respondents. The majority of students used Network Academy for less than one hour a week (67%), and the greatest number of days of use was one day a week (51.5%). In terms of the most common functions, "Hand in homework" took the lead (40.3%), followed by "Download course materials" (30.5%). When it comes to the most annoying aspects of Network Academy use, "Slow network speed" (26.1%) and "Uploaded file damage" (23%) took the first two places, followed by "Unable to login" (19.9%) and "Inadequate uploading capacity" (19%).According to the foregoing analysis, the system and hardware construction of the network learning platform must give users adequate confidence, because only a strong system is able to attract students.

2) By adopting a Pearson correlation, this study found that there was a significantly high correlation between dimensions.

There was high correlation between "Perceived Ease of Use", "Perceived Usefulness", and "Learning Satisfaction". Path analysis verified that the three hypotheses of this study were valid and all showed a level of significance. This result is consistent with the relevant literature.

B. Research Contributions and Suggestions

Although e-Learning is conducted through networks, the subjects are still humans who complete learning and acquire knowledge via a series of learning activities. This study found that "Perceived Ease of Use" can affect "Perceived Usefulness," and "Perceived Ease of Use" and "Perceived Usefulness" can affect "Learning Satisfaction." Therefore, in such an e-Learning environment, how to encourage learners to self-study actively will be a key issue determining the success of e-Learning.

The results of this study verified the perspective of technology acceptance model, from the perspective of users; this study also takes into account the arrangement of the system interface. The network learning platform aims to ensure that students have the feelings of easiness in operating and perceiving the network learning platform while studying, which is conducive to enhance the willingness and frequency of usage. The digital resources are able to break the limits of space and time and thus assist the realization of the learners' vision in terms of having more opportunities for further implementation of the network learning platform. Network learning platform is actually a virtual classroom offered with a variety of tools for instructors, including teaching materials, rooms for discussion, bulletin boards and the like. It looks like a space of information exchange where students could get access to those resources that their teachers have uploaded for them. However, if one concept of comprehensive integration in terms of teaching design is missing, the network learning platform can only be a generally good interface FTP platform for use, which is just the dilemma currently confronted by designers of network learning platform. Therefore, being teachers and developers of the system, we should actively devote ourselves in enriching the functions and content of the platform in order to establish a good and easily operated network platform perceived and satisfied by students.

In addition, this study conducted a survey directed at college students at the case study university. Perhaps future studies could enlarge the survey sample and increase research variables, as well as taking further steps into the Technology Acceptance Model, in order to uncover relevant factors affecting users' reasons for using information systems. Furthermore, as business worldhave different motivations and purposes for using network teaching systems to conduct education and training, future research should also clear up the functions and needs of teaching in business circles.

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