Exploratory Factor Analysis of Hybrid Media Models for Distance Learning for Higher Education

Asst.Prof Dr.Kemmanat Mingsiritham*

Abstract

This research provided exploratory factor analysis of hybrid media models for distance learning for higher education. A sample included 250 higher education instructors, selected by simple random sampling method. A tool used in the research was a multiple choice questionnaire covering five areas: personnel, media and technology, teaching methods, management of environment, and assessment. Data analysis was conducted by Principal Component Analysis and Orthogonal Rotation Analysis using Varimax method.

The research found that there were four factors of hybrid media models: 1) personnel for distance learning, 2) learning and communication methods, 3) distance learning media and supporting technology, and 4) assessment of distance learning.

Keywords: Exploratory Factor Analysis, Distance Learning, Hybrid Media

Background and importance of the issue

The educational goal of Thai Qualifications Framework for Higher Education (TQF) focuses on learning outcomes of students. The framework provides quality assurance of graduates from each level including; Diploma Degree, Bachelor's Degree, Master's Degree, Higher Graduate Diploma, and PhD. It has also communicated to society and community, including domestic and international higher education institutes, to create mutual understanding and have confidence in graduate's learning outcomes that were developed to have the same standards as renowned domestic and international higher educational institutes. TQF has established the standards of education management at every step. It allows higher educational institutes to develop curriculum and teaching and learning process in a number of methods to ensure the final outcome which is the quality of students who graduate from an institute to achieve the desirable learning outcomes. The graduates will be able to work happily and proudly, be satisfied by employers, be a good person in the society,

* Asst.Prof Dr.Kemmanat Mingsiritham
Office of Educational TechnologySukhothai Thammathirat Open University

and be able to enhance and strengthen the capacity of country development (Office of Higher Education Commission, 2009). Therefore, to achieve the learning standard of each field, it is necessary to use appropriate teaching methods and media for various learning models as well as continuous assessment of teaching performance. These factors are important to ensure that students will be qualified graduates that have the desirable learning standard.

Distance education is a program held by an educational institute to expand education opportunity to people in the country. Instructors and learners are distant from each other but there are interactions via every type of communication system to connect knowledge between instructors and learners. Distance education is useful for solving education problems because it allows everyone to access to education equally, therefore, increasing effectiveness and efficiency in teaching and learning (Juntharin, 2000). It is an educational system that instructors and learners are distant but learning is made possible by using multimedia such as textbook, audio tapes, graphs, and computers. Telecommunications and mass media, including radio and television are also used to deliver education to those who wish to learn from every part of the country (Malitong, 2005). Students have to study by themselves using the media provided by an institute. Therefore, learners in this education system have to be self-motivated and be able to control themselves to study. Otherwise, they will not succeed in learning (Sumphunyuth, 1997). However, in the past, it was found that most students did not use media that met the learning standards to be qualified graduates. This was because distance education focused on using text-based media with only one type of other supporting media. This did not meet the needs of different learners and did not cover the five desirable characteristics of graduates according to TQF set by the Office of Higher Education Commission.

The researcher studied documents and research and found that the rapid changing trends of management, competition, and technology have led to new ideas in learning management for distance education. Blended learning has combined various media to create more effective learning in response to the learning standard. Khlaisang and Koraneekij (2009) mentioned that hybrid/blended learning was learning management under distance education. It enabled learners to study without the limit of time and place (Anyone, from Anywhere, and at Anytime).

Distance education emphasizes on allowing learners to research for information by themselves. Therefore, media plays an important role in learning. One type of media cannot respond to different characteristics of learners. Thus, various media, called “Hybrid Media”, are used for better learning. Hybrid media combines different types of media by focusing on

distinctive features of each one to allow learners to access learning contents. This method is better than using only one type of media to deliver learning. Hybrid media can maximize the strengths and minimize the weaknesses of learning and create suitable learning for learners. Tanthasuraseth et al (1999) noted that in distance education, learners would spend most of the time studying from hybrid media. Students often faced problems of contacting instructors when they did not understand or needed to know more. Therefore, multimedia played more roles in teaching and learning as they can meet the needs of learners rapidly and diversely. Malitong (2005) stated that when choosing or providing media for distance education, it was important to acknowledge psychological principles that if learners interacted with media for a length of time, they would become bored. Especially, if the media was the same type or had complex contents, learners would feel discouraged to learn on their own. Therefore, media should reinforce, motivate, and allow learners to know their learning progress periodically. Multimedia should contain one main media and other supporting media because each type of media had its useful features and limits. Studying from only one type of media might not make learners to fully acquire knowledge. Other media then should be used to support learning.

To create effectiveness in distance learning and produce desirable graduates according to TQF, the researcher had an idea to develop hybrid media model suitable for distance learning. The model will be useful for planning, developing, and improving teaching and learning activities as well as will be used as a tool for transferring knowledge to different learners. Various media with different distinctive features will be used to meet the needs of distance education learners.

Research objective

To analyze exploratory factors of hybrid media models for distance learning for higher education.

Sample

A sample included 250 instructors who have taught in distance education system in higher education. The size of the sample was based on factor analysis principle, using the minimum number of samples: 1 sample to 3 variables (Stevens, 1996; Tabachnick and Fidell, 2001; Munro, 2001, cited in Shingchangchai, 2006). The ratio used was 5 samples to 1 variable. There were 48 variables. The calculated sample was 240 people but the researcher expanded the sample size. Therefore, the sample composed of 250 people.

Research tool

Research tool was a checklist questionnaire. An opinion questionnaire was a tool to collect data from the sample. It consisted of two parts: 1) General information of an instructor incliding gender, age, educational level, academic position, organization, teaching experience, and 2) Factors including personnel, media and technology, teaching methods, management of environment, and assessment. The developed questionnaire was tested for content validity, language, completeness, and coverage of questions by three experts.

Data collection

Data was collected from the questionnaire for 250 instructors who have taught in distance education system in higher education. The data obtained from the questionnaire was analyzed using Principal Component Analysis method.

Data analysis

1. Descriptive Statistic analysis including mean and standard deviation
2. Factor analysis of hybrid media models for distance learning using Principal Component Analysis and Orthogonal Rotation Analysis by Varimax method as follows:
   2.1 Factor extraction of Eigen Value that is equal or higher than 1.00
   2.2 Rotation of axes by Orthogonal Rotation using Varimax method and selecting the factor which has a value equal or higher than .30
   2.3 Naming the factors

Research Results

Factor analysis of hybrid media models for distance learning for higher education included: Factor analysis of hybrid media models for distance learning.

The researcher used the questionnaire to analyze the factors by Principal Component Analysis and Orthogonal Rotation Analysis using Varimax Method. The research results are as below.

1. Factor extraction

Factor extraction was done by Principal Component Analysis. It obtained the number of factors, eigen value**,** percentage of variance**,** cumulative percentage of variance**,** and factor loading of the questionnaire on factors of hybrid media models for distance learning**.**

Table 1 The results of the test for significance of correlation matrix among the questions using KMO (The Kaiser-Meyer-Olkin) analysis and Bartlett's Test of Sphericity

Kaiser-Meyer-Olkin Measure of Sampling Adequacy	.911
Bartlett's Test of Sphericity Approx. Chi-Square	15,387.008
df	1128
Sig	.000

Table 1 showed the results of the test from the two methods. KMO value was used to determine the appropriateness of the sample size. KMO value of more than 0.50 was considered acceptable. Bartlett's Test was used to check the correlation matrix of population if it was identity matrix. The value of Bartlett's Test should be statistically significant which means that the correlation matrix is not identity matrix. The results revealed that the value of KMO was .911 (higher than .05) and the value of Bartlett's Test had statistical significance at .00 (less than. 05). Therefore, it can be concluded that data collected from the sample was appropriate for factor analysis of hybrid media models for distance learning.

There were 6 factors from the sum of squares of coefficient of each factor that has Eigen Value higher than 1.00. When considering the 6 factors, it was found that cumulative percentage of variance of the 6 factors was 75.656 of the total variance. The analysis result was shown in table 2.

Table 2 Factors, Eigen Value, Percentage of Variance, and Cumulative Percentage of Variance of each factor of the questionnaire on hybrid media models for distance learning.

Factors	Eigen Value	Percentage of Variance	Cumulative Percentage of Variance
1	25.362	52.837	52.837
2	4.568	9.517	62.354
3	2.118	4.413	66.768
4	1.882	3.921	70.688
5	1.295	2.698	73.386
6	1.090	2.270	75.656

Table 2 showed that there were 6 factors, based on Eigen Value higher than 1.00 which was the sum of squares of coefficient of each factor that had eigen value higher than 1.00. When considering the 6 factors, it was found that cumulative percentage of variance of the 6 factors was 75.656 of the total variance.

2. Rotation of axes

Orthogonal Rotation was done by Varimax Method to clearly relate the variables and the factors in. It was found that factor loading of each 48 variable had 6 factors.

Among 48 variables of the questionnaire on factors of hybrid media models for distance learning, there were 6 factors that had factor loading higher than .30. However, among these 6 factors, there were 2 factors that had less than 3 variables which were factor 5 and 6. This was less than the criteria that there must be at least 3 variables in each factor. The said factors then were removed. Therefore, there were 4 prominent factors: 1, 2, 3, and 4 with 47 variables in total. Factors were analyzed using scree test as shown in figure 1.

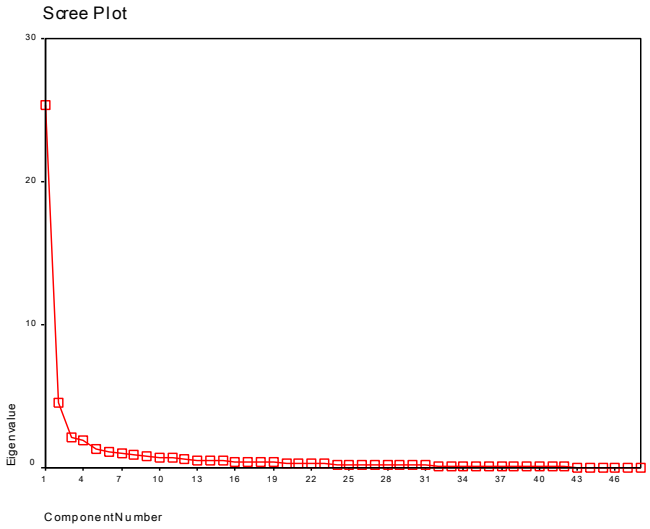

Figure 1: Eigen of factors of hybrid media models for distance learning

Figure 1 showed that Eigen Value of factors of hybrid media for higher education analyzed by scree test, found that there were 4 prominent factors: 1, 2, 3, and 4 which was relevant to the analysis of factor loading after Orthogonal Rotation using Varimax Method.

Factor 1: Personnel for distance learning. Factor loading was between .528 and .793 and Eigen Value was 9.704 with 20 variables including: curriculum focuses on self-learning; curriculum focuses on learners' responsibility for themselves and society; instructors have knowledge in the field of teaching and have ability to transfer knowledge; instructors have

teaching experience; instructors have an ability to simplify contents that are difficult to understand; learners can apply knowledge in work; technical staff are available; facility staff are available; learning equipment and facilitating technology to access contents are provided; various media are emphasized; tools for exchanging opinions are available; text-based media (such as books, guidelines, textbooks, practice exercises, test, newspaper, etc.); electronic and telecommunication media (such as telephone, teleconference, computer network, virtual classroom, online community, internet, etc.); focusing on activities via different media; flexible learning enables students to control their learning; focusing on interaction between students and instructors; focusing on interaction between students and peers; focusing on content presentation; communication between instructors and learners; and reference resources are available.

Factor 2: Learning and communication methods. Factor loading was between .627 and .796 and Eigen Value was 5.204 with 10 variables including: instructors focus on present information or problems for learners to solve; student is the center of self-learning; learners are free to set learning time, location, and methods; learners research for information from resources; learners brainstorm to do a task; technology facilitates instructors; focusing on interacting between learners and contents; focusing on activity-based learning; facilities such as libraries and technical support are provided; and various communication tools are provided.

Factor 3: Distance learning media and supporting technology. Factor loading was between .489 and .781 and Eigen Value was 4.762 with 11 variables including: curriculum is improved continuously; curriculum is suitable for learners; instructors are able to answer learner's questions or provide additional information; using up-to-date media and technology; media are improve constantly; communication tools (such as telephone, fax, etc.) are provided; visual media (such as graphics, material, drawings, pictures, audio tapes, videos, etc.) are provided; mass media (such as radio broadcast, television, etc.) are provided; there are constant presentation; communication outside teaching hours; and additional resources for studying are provided.

Factor 4: Assessment of distance learning. Factor loading was between .538 and .731 and Eigen Value was 2.366 with 6 variables including: management tools are available; improving, controlling, and backing up learning report are done periodically; feedback from instructors; assessment from pre-test scores, assessment from formative test scores; and assessment from summative test scores.

Veridian E-Journal, Silpakorn University
ISSN 1906 – 3431

Discussion

The factor analysis of hybrid media models for distance learning found that there were 4 factors as described below:

1. Personnel for distance learning is necessary for teaching and learning. Distance learning is the transferring of knowledge and experience to learners via various media. Courseware is developed by instructor or expert team. Therefore, the management of this teaching and learning involves many parties, including experts, educational technologists, and supporting staff. This is relevant with Sungsri (2015) that distance learning required a team of instructors or experts to produce contents for each course and transfer into various media. Mostly, instructors or experts in the same subject would work together to produce the content. Other steps such as developing curriculum, delivery media to learners, and assessing learning also involved a team of experts.

2. Learning and communication method for distance learning. Instructors and learners in this learning method are far away from each other. Therefore, communication is necessary for creating interaction between instructors and learners, enabling instructors to transfer experience, knowledge and response to learners via media and technology. Communication and interaction can build good relation between instructors and learners from different locations. This is relevant to Sungsri (2015) who stated that distance learning was teaching and learning that learners and instructors did not have to be at the same place because distance learning emphasized on using media. Then, instructors and knowledge givers will transfer knowledge and experience in the form of media and deliver to learners without meeting each other. Learners will study from media. Educational institutes might allow instructors and learners to meet occasionally. However, learners will spend most of the time to study by themselves. Pusiri (2015) noted that digital era was an era that computer and internet were for distance education. Media would enable two-way communication and interaction with learners. Interaction between learners and media, instructors, and other learners will be increased. Also, learners will receive feedback of their assignment from instructors in timely manner. This way of exchanging of knowledge and opinions can create learning society. Also, the world is entering technology era “Internet of Things”, meaning that electronic appliances (such as telephone, television, office supplies, home appliances, machines used in everyday life, etc.) can connect to the internet and communicate. The advancement of technology enables leaners to access and exchange information by using mobile devices or other devices, leading to ubiquitous learning; u-Learning.

3. Distance learning media and supporting technology is medium for transferring knowledge. Learning which instructors and learners are far away needs to have technology to connect between instructors and learners. According to Brahmawong (2015), technology was the center of distance learning, covering behavior management, techniques, communication, management of environment, and assessment. Educational media was one type of technology important to transfer knowledge and experience to leaners. Media structure needed to be organized to be suitable for transferring of knowledge to learners everywhere. Sungsri (2015) stated that distance learning used media as a tool to manage teaching and learning. In distance learning, teaching and learning was done by using media such as press media, radio broadcast media, radio, television, audio tape, computer, satellite, etc. as medium to transfer knowledge. Person can occasionally be as an extra media. The use of media may consist of only one media or various media. Sungsri (2006) also noted that distance education was relevant to the advancement of media and technology. It has been developed by using modern technology with an emphasis on promoting interaction between learners and instructor as much as possible. This will make students feel like learning in a real classroom and be able to communicate with the instructor any time.

4. Assessment of distance learning is essential for distance education to know the progress in teaching and learning. According to Brahmawong (2015), distance education institutions must have an appropriate assessment system, including pre-test, formative test, and summative test. The assessment system must be approved by the Academic Board of Distance Education of the Institute. Sungsri (2015) stated that distance education personnel would assess how the performance of the target group of distance learning or training had improved. Assessment can be done by other methods such as authentic assessment. In addition, is can be assessed on how the whole system of distance education is appropriate.

Suggestions

1. Suggestions for implementation

1.1 These factors are important factors for higher education institutes that are ready for distance learning. Before implementation, it is needed to study each factor in detail.

1.2 Success factors in using hybrid media for distance education needs collaboration from several parties, including production team, system designer, educational measurement and assessment personnel, supporting personnel, etc.

1.3 In order to transfer of knowledge and experience through hybrid media to fully reach to learners effectively, it is needed to develop and keep pace with changes of technology used to provide access to learning and learning.

2. Suggestions for further research

2.1 Study of open learning and 3.0-generation technology for distance learning.

2.2 Study of guideline to promote and control the quality of distance education using the hybrid media.

References

Brahmawong, C. (2015). Distance Education Structure and Distance Education Model. **Material for Distance Education Course** (Chapter 2, Page 1-42). Nonthaburi: School of Educational Studies Sukhothai Thammathirat Open University.

Juntharin, S. (2000). Trends of Distance Educational Technology of Ramkhamheang University in the year B.E.2552. Bangkok: Office of Educational Technology Ramkhamheang University.

Khlaisang, J and Koraneekij, P. (2009). Pedagogy-based Hybrid Learning: From Theory to practice. **Journal of Education Studies**. 38(1)(July-October2009), 93-108.

Malitong, K. (2005). **Technology and Education for Education**. Bangkok: Aroonkarnpim Publisher.

Office of Higher Education Commission. (2009).**Thai Qualifications Framework for Higher Education (TQF: HED).** Bangkok: Ministry of Education.

Pusiri, T. (2015). Media in Distance Education. **Material for Distance Education Course** (Chapter 5, Page 60-61). Nonthaburi: School of Educational Studies Sukhothai Thammathirat Open University.

Sumphunyuth, S. (1997). Self-Directed Learning Characteristics of Students in Distance Education System of Sukhothai Thammathirat Open University. (Master of Education degree in Adult Education) Srinakharinwirot University.

Sungsri, S. (2015). Knowledge about Distance Education. **Material for Distance Education** (Chapter 1, Page 1-42). Nonthaburi: School of Educational Studies Sukhothai Thammathirat Open University.

Sungsri, S. (2006). **Distance Education** (1st Edition). Nonthaburi: Sukhothai Thammathirat Publisher.

Tanthasuraseth, N; Withayagiat, S and Sungsri, S. (1999). Trends of Distance Learning in Thailand. **Sukhothai Thammathirat Journal**.12(1)(January-April1999), 96 – 104.