Hybrid E-Training Measurement Tool: Reliability and Validity

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Abstract: Hybrid E-Training had become prevalent in the field of computer and educational technology for both who were in the field and not exactly in the field. This paper discussed the e-Training being conducted in a hybrid environment. The objective of this paper was to examine the validity and reliability of the items on assessing perception towards the Hybrid E-Training system. The instrument used for the research was a set of questionnaire to measure the meaningfulness of the Hybrid e-Training. The number of samples is 213. The result showed that the overall reliability coefficient for the items on assessing perception towards the Hybrid E-Training system was 0.986. Reliability at the scale levels for these items was also acceptable, ranging from 0.886 to 0.971. Overall analyses suggested that these items were reliable to measure a hybrid e-Training system. It would be interesting to further investigate as to whether or not learning style is a mediating or a moderating factor towards achieving meaningful learning via the use of hybrid e-training programs as modelled in the final results.

Key words: Word · Hybrid · E-Training · ICT trainers · Meaningful learning · E-Training questionnaire

INTRODUCTION

Integrating technology with conventional teaching to create a hybrid training experience has been documented as beneficial and innovative. It is evident that in order to progress further into the area of e-Learning, particularly e-Training, an appropriate measurement scale is required. This scale would ideally distinguish the usefulness of a program in terms of its' content, delivery method, service, outcome and infrastructure. The origin of the hybrid e-training (HiT) framework which was developed in this study was from a credible model, the Demand-Driven Learning Model (DDLM) by MacDonald *et al.* [1]. DDLM has a companion evaluation tool [2] to design and evaluate an online course or module.

The DDLM development required collaboration between academics and experts from commercial, private and public industries. The goal of utility and currency of the model was built onto the development process; an early draft describing the DDLM was presented to a panel of industry experts which includes representatives from highly respected national and international commercial organisations including Nortel Networks, Alcatel, Lucent Technologies, Cisco Systems, Arthur D. Little Business School, Learnsoft Corporation, Lucent Corporation and KGMP Consulting Services [3]. These groups represent a sampling of the most influential and innovative Canadian stakeholders in on-line technology and education field. This group reacted with enthusiasm and interest in implementing the DDLM and tool in their operations.

The DDLM is a model of web-based learning designed for working adult learners. The model is defined by five key constructs: Superior Structure, Content, Delivery, Service and Outcomes [1, 2]. Superior Structure can be viewed as standard of high quality attained only by online programs that meet specific requirements. These requirements may be predicted by excellence of

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Content, Delivery, Service and Outcomes. In the DDLM framework, high quality content is considered to be comprehensive, authentic/industry-driven and researched.

In relation to the content, high quality delivery is defined as delivery that carefully considers usability, interactivity and tools. The DDLM defines high quality service a s service that provides the resources for learning as well as any administrative and technical support needed. Such service is supported by skilled and emphatic staff that is accessible and responsive. High quality programs provide outcomes such as personal advantages for learners with lower cost to employers while achieving learning outcomes. The publication and dissemination of findings on DDLM-based programs contribute to theory and practice hence on-going evaluations will ensure longevity and validity of the structure standard proposed [1, 2]. A consequence of the evolution of operational definition of the components in the DDLM is the need to adapt and improve the model and of course, the evaluation effort should include measurement of learning objectives specific to the program being evaluated [1]. The objectives of this paper were to determine the validity and reliability of the items on assessing perception towards the Hybrid E-Training system.

MATERIALS AND METHODS

This study established validity and reliability of the Hybrid e-Training Questionnaire (HiTQ). The study was conducted in a higher learning institution. Construct validity was determined by internal consistency and content validity. To investigate the internal structure, an exploratory factor analysis (EFA) was run and yielded a five-factor, 61-items questionnaire. Based on the 213 sample data collection, the overall reliability coefficients for the items on assessing perception towards the Hybrid E-Training system was 0.986. From the pilot study, the reliability at the scale levels for the section was also acceptable, ranging from 0.886 to 0.971.

A number of different communities of users are referred to in this study [4, 5]. Broadly speaking they are (i) ICT trainers appointed by the university ICT Center, whose role is to support and direct staff in the area of ICT and Computer Science; (ii) educational developers and learning technologists attached to the university's Computer Center, whose role is to work with or alongside practitioners to enable and enhance e-learning researchers into learning and e-learning, including academic researchers, action researchers and research-project workers; (iii) appointed ICT trainers, teachers and teacher trainees and (iv) ICT educators in the country. Despite their internal complexities, these communities will be referred to in this paper, simply as ICT trainers.

The sample consisted of 213 participants, 172 females and 37 males, studying at a public university in Malaysia. The trainees were enrolled in credit-bearing education and computer education courses. The age of trainees ranges from 20 to 48 years old. Highest frequency is in the range of 21-25 years old; that is 62% (132) of the whole sample. The trainees represented four origin, (31.9% (68) from East Malaysia, 51.6% (110) from West Malaysia, 1.4% (3) from Brunei and 14.6 (31) from main land China. They make up four main races with 71.4% (152) Malays, 23.9% Chinese, 2.8% (6) Indians and 1.4% (3) other from other races. All but 28.2% (60) of the participants had none or less than one year teaching experience.

The instrument involved in the study is the Hybrid e-Training Questionnaire, which involved 61 items on assessing perception towards the Hybrid E-Training system. The items are shown in Table 1. The questionnaire was edited by a professional language and education expert and most items were maintained except for some minor changes to make the English more consistent with local usage. During each administration of the questionnaire, some participants found various items to be ambiguous. To date, the questionnaire is version 6.2. Subsequent participants did not express any difficulty with the simpler phrases. The data was analyzed by using SPSS 12.0.1 (SPSS, Inc., Chicago, IL) and checked for accuracy. If a participant gave two answers to an item, the mean value was substituted. No other changes were made to the original data. Only completed questionnaires were included in each analysis. Analyses were then done in SPSS Version 12.0.1 (SPSS, Inc., Chicago, IL). Cronbach's Alpha test was used to determine internal reliability [6]. Construct validity was examined by inter-correlating the five measures of Hybrid e-Training System since they were presumed to be tapping similar underlying constructs.

Table 1: Contents of the e-Training Questionnaire

Factors indicating a superior Hybrid E-Training System	Item	Total Item
Content	C01 - C09	9
Delivery	C10 - C18	9
Service	C19 - C25	7
Outcome	C26 - C37	12
Structure	C38 - C61	24

*Total items = 61

RESULTS AND DISCUSSION

To determine the internal consistency and content validity, Cronbach's Alpha coefficient was conducted for the 61-item HiTQ. Cronbach Alpha for the e-Training Questionnaire as a whole is 0.962. Table 2 presented the reliability analyses for the hybrid learning system measures. As seen in the table, the alphas of the hybrid learning system measures were high in each of the five constructs (ranging from 0.886 to 0.971) and Cronbach Alpha for the whole section measures for the Hybrid e-Training System came out to 0.986. Overall analyses suggested that the E-training instrument is a reliable instrument used to measure meaningfulness and acceptance of the e-training materials.

Successful applications of hybrid e-training at the tertiary level depend on many factors especially the policy governing its implementation and issues in its applications. To come to that point, a model for appropriate infrastructure, content, delivery method, service and outcome needs to be validated and tested. Consequently, the questionnaire were again tested using confirmatory factor analysis to come up with a validated measurement model for hybrid e-training and meaningful learning measure in order to proceed for a full-fledge structural equation model to identify the influence of learners' perception of what constitutes meaningful hybrid e-training and how hybrid e-training effects meaningful learning.

Table 2: Reliability Analysis with Overall Reliability coefficient equals 0.986

Cronbach's Alpha for construct measure	Item	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Cronbach's	Correlation Alpha if Item Deleted
0.933 for CONTENT measures of the hybrid e-Training system N of items = 9	I am aware of the prerequisites for this course	31.9859	27.929	.747	.925
	I had the prerequisite knowledge and skills for the course.	32.0141	28.372	.750	.925
	I was well informed about the course objectives.	32.1502	27.685	.787	.923
	The course lived up to my expectations.	32.3991	27.543	.761	.924
	The course is relevant to my job.	32.0704	28.670	.700	.928
	Reading materials are relevant to the course.	32.1972	28.225	.699	.928
	There are strong links between theory and practice.	32.0000	28.123	.755	.925
	The content includes knowledge applicable in life.	31.9484	27.889	.765	.924
	The content covers current technology use.	32.0235	27.995	.786	.923
0.921 for DELIVERY measures of the hybrid e-Training system N of items = 9	The computer education blog at rosseni.wordpress.com:				
	Is concise and uncluttered.	30.7089	30.151	.703	.913
	Uses appropriate style for display.	30.5869	30.074	.796	.908
	Features aesthetically pleasing graphics	30.5775	30.792	.768	.910
	Provides descriptions to all links.	30.5775	29.490	.724	.912
	Provides materials that stimulates curiosity.	30.6291	30.414	.687	.914
	Has useful functions.	30.5493	29.164	.780	.908
	Support face to face lecture	30.5258	28.581	.732	.912
	Uses appropriate technology	30.4460	30.824	.735	.912
	Features reasonably fast download of files	31.0423	29.154	.628	.921
0.886 for SERVICE measures of the hybrid e-Training system N of items = 7	The instructor was well prepared.	23.9343	16.307	.719	.864
	Face to face instruction was helpful.	23.8685	16.360	.760	.860
	The online resources are useful.	23.8685	16.152	.741	.862
	The online support from peers were helpful.	23.8592	15.933	.789	.856
	Sufficient time was given to complete the project.	24.0798	16.357	.620	.876
	Comments are responded to within reasonable time.	24.4131	16.234	.501	.898
	Suggestions are quickly responded to.	24.3146	16.405	.696	.867
0.948 for OUTCOME measures of the hybrid e-Training system N of items = 12	The online support from peers were helpful.	42.7324	55.084	.678	.946
	The course project is in line with my expectations.	42.6995	53.268	.795	.942
	I have gained more knowledge about technology	42.7277	53.775	.727	.945
	I have acquired proficiency in blogging with Wordpress.	42.4225	53.745	.781	.943
	I have developed new skill in ICT	42.3146	53.830	.783	.943
	My attitude has changed.	42.2394	54.598	.767	.943
	I will be able to use the new skill throughout my career	42.9343	52.788	.746	.944
	I have applied the new knowledge in my life.	42.4131	53.913	.813	.942
	I initiated new ideas from the new knowledge	42.3333	54.525	.718	.945
	Interactive blogging was essential in the course.	42.4977	53.732	.787	.943
	The assessment criteria is fair.	42.6009	53.316	.749	.944
	I completed the required tasks for the project	42.6291	53.687	.734	.944

Table 2: Continued

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0.971 for STRUCTURE measures of the hybrid e-Training system N of items = 24	Free wireless connection is important for learning	89.9155	258.653	.757	.970
	The university provides free wireless connection.	89.0282	265.443	.499	.972
	The course content meets my need.	90.3286	261.325	.381	.976
	The course uses interactive technology.	89.9108	261.978	.651	.971
	The course engages me in the learning experience.	89.6385	259.722	.780	.970
	The course builds my confidence in problem solving.	89.7606	255.079	.855	.969
	The course builds my confidence in planning.	89.9296	253.490	.791	.970
	The course is interactive	89.9953	252.590	.766	.970
	The instructor act as a partner in learning	89.7512	256.622	.840	.970
	My opinions are considered in the course	89.6526	258.341	.774	.970
	The instructor was empathetic to my needs	89.7371	258.214	.748	.970
	The course creates a positive learning environment	89.7512	257.839	.747	.970
	The course content activities support learning goals	89.5211	257.694	.829	.970
	The instructor facilitates self-directed learning	89.6432	255.872	.746	.970
	The instructor makes his/her expectations clear	89.5962	258.855	.798	.970
	The instructor embeds learning in realistic contexts	89.5775	258.556	.823	.970
	The course allow me to make choices	89.5540	257.994	.800	.970
	The course provides sufficient practice opportunity	89.6103	256.192	.840	.970
	The course provides opportunities for self-reflection	89.6244	256.971	.856	.970
	The course provides opportunities for self-evaluation	89.5446	256.598	.881	.969
	The course supports exploratory learning	89.5962	256.798	.837	.970
	The course enhanced my learning	89.5962	255.836	.845	.970
	The course provides steps/links to further my learning	89.6667	253.384	.856	.969
	The course blog provides access to online resources	89.5681	256.699	.818	.970
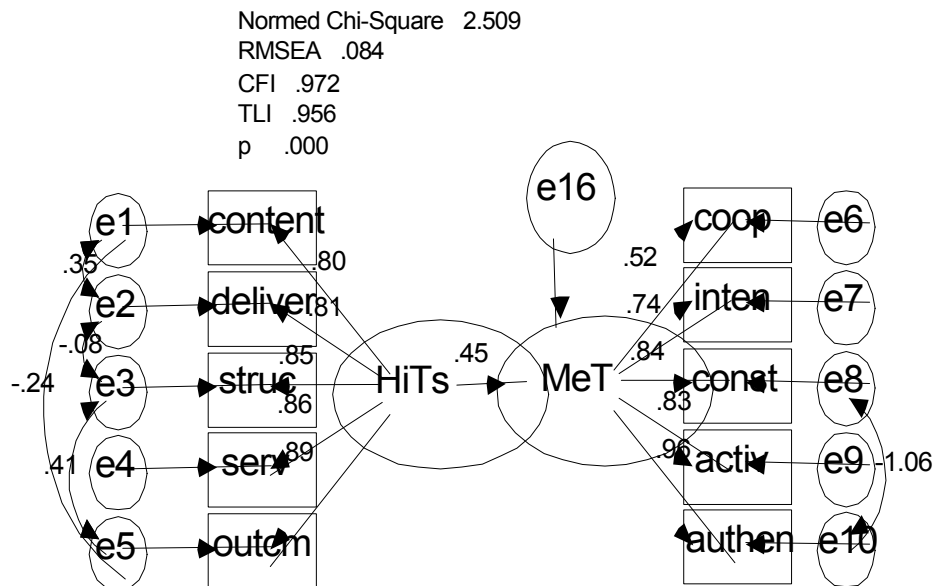
Fig. 1: A model for HiTs and MeT Relationship

To validate the likelihood of the revised two-construct model, a five rounds of structural equation modelling (SEM) analysis was applied on the same sample of the hypothesized model. The overall fit of the final revised model is summarized in Figure 1. The revised model was achieved after examining the modification indices in order to correlate the measurement error of content and delivery factor. The magnitude of the factor loadings in the revised model were substantially significant with CFI = 0.972, TLI = 0.966 and

RMSEA =0.084. The result indicated that the parameters were free from offending estimates, ranging from 0.80 to 0.89 for the HiTs indicators and from 0.52 to 0.98 for the MeT indicators. Comparative Fit Index (CFI=0.972) and Tucker-Lewis Index coefficient (TLI=0.966) fit indicators exceeded threshold of 0.90 indicating a very good fit. The root-mean square error of approximation (RMSEA=0.084) meet the bare minimum requirement for a reasonable error of approximation acceptance although a value of less than 0.01 is acceptable [6].

The results of the present study are relevant to give insights for theorists, trainers, academic staff and knowledge management system designers and developers towards the goal of achieving meaningful learning in the overall process of training or teaching and learning. Figure 1 showed that hybrid e-training had a substantial effect towards achieving meaningful learning with a coefficient or loading of 0.41. In general as accepted by SEM practitioners, any effect of a latent variable on another latent variable shown on a tested fit model can be considered as a significant effect and a coefficient value of greater than 0.3 shows a substantial effect.

CONCLUSION

Future training regarding the use of hybrid e-training should include all five components of a meaningful hybrid e-training instead of merely focusing on content or activities such as uploading and downloading e-training materials. With results showing weak relationship between learning style and hybrid e-training and negative relationship between learning style and meaningful e-training, instructional media designers and developers should now focus on integrating all five e-training components to ensure meaningful learning. It is strongly suggested that future research should focus on whether or not there is a mediating effect or a moderating factor exist in order to achieve meaningful learning via the use of hybrid e-training programs as modelled in the final results.

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