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MEANINGFUL HYBRID e-TRAINING MODEL FOR WEB-BASED COMPUTER EDUCATION

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ABSTRACT

The main purpose of this study was to develop a model for meaningful hybrid e-training. Data collected from 213 ICT trainers were tested with confirmatory factor analysis using AMOS 7.0 to obtain two best-fit measurement models for the two latent variables. Overall reliability using Alpha-Cronbach test, items and persons reliability using the Rasch Model and content validation by experts suggested that the questionnaire is reliable and valid to measure a meaningful hybrid e-training program. The results showed that there is a positive strong relationship between hybrid e-training and meaningful e-training. In brief the study showed a substantial effect of hybrid e-training towards achieving meaningful learning. In conclusion, the study suggested that, 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.

KEY WORDS

Structural equation modelling, e-training, e-learning style, meaningful learning

1. Introduction

To date, many institutions of higher learning have endorsed funds to design and deliver alternative web-based educational or professional development programs. A close examination of new web-based programs has indicated a critical gap between rapidly developing technology and sound pedagogical models to determine program quality. In reference to the development of quality web-based programs, thorough planning is essential. Planning for the implementation of a successful web-based training programme requires not only the understanding of information and communications technology and its impact on higher education, but also other aspects [1] such as educational pedagogy and learner diversity. For Malaysia, introducing e-training is a major undertaking, but it represents an investment in the future productivity of its workforce. As such, many have developed e-training frameworks and models to address the concerns of the learner and the challenges presented by the technology so that web-based training, particularly the hybrid method, can take place effectively.

With the advent of knowledge-economy, embracing the concept of knowledge management (KM) for lifelong learning (LLL) as the foundation of a learning society takes priority. This is because people will have to continuously update their knowledge and skills to maintain a competitive edge in the global economy [2]. The Malaysian Qualification Framework (MQF) provides the structure for actualizing LLL because it facilitates learners in selecting a learning pathway that is most appropriate for them [2][3]. Thus, a response was made to create an academic culture capable of producing learners with qualities ranging from competencies in soft skills, intellectual qualities and affective attributes, in addition to the typical technical and professional skills [4].

To successfully create the much desired academic culture, the Committee of Deputy Vice Chancellors and Rectors of Malaysian Higher Learning Institutes [4] had among others a strategy to implement an updated, relevant curriculum with various delivery methods. No framework or model had yet been provided to implement the strategy; for that reason, this study had focused on developing a model for meaningful e-training using the hybrid method. Thus, the main purpose of this study was to develop a model for meaningful hybrid e-training. In

the process, the study also generated a new hybrid e-training curriculum in the form of a course handbook, a hybrid e-training blog, instruments for measuring the meaningfulness of a hybrid e-training program plus various forms of instructional media, such as a manuscript for a textbook on the use of computers in education, a CD-ROM series of how to integrate technology into teaching, and a modified model for instructional media design and development.

2. Objective of the Study

This study aimed to develop a model for meaningful hybrid e-training. The study sought to gather empirical evidence to show the adequacy of the meaningful hybrid e-training instrument in measuring what it was intended to measure. Additionally, the study utilized a measurement theory in resolving certain pertinent assessment and measurement issues. Specifically, the research question and hypothesis are as follows:

RQ1: Does Hybrid e-Ttaining influence Meaningful e-Training?

H01: Hybrid e-Ttaining influences the achievement of Meaningful e-Training.

3. Meaningful Hybrid e-Training

The main purpose of this study was to develop a model for meaningful hybrid e-training. Given the distinctly measurement-oriented nature of the questions asked, and the emphasis on "empirically quantifiable observations" [5], this study is categorized within the positivist research tradition and the quantitative research paradigm.

3.1 Hybrid e-Training

According to Marc Rosenberg [6], e-learning has been defined variously over the years where the general tendency among authors is to equate e-learning to putting courses online. In essence, e-learning is training delivered electronically. He added,

> "... I think it's more important to understand the concept of e-learning. That means that the definition of e-learning really needs to go back to how training professionals define their role. If professionals define their role narrowly, as in "we do training," then that definition is fine. If professionals expand their role to believe that their role is to improve performance, impact the business, and support knowledge workers, then the technology around learning and information becomes much broader than delivering training electronically. There's knowledge management, collaboration, communities of practice, and performance support. All of those things look nothing like training, and they're not developed like training. So, if we have a broader definition of our role, then we need to find a broader definition of e-learning, which is using Internet technologies to deliver a broad array of solutions that impact learning and performance. To do that, we need to think like architects. For example, carpentry doesn't give you a house, plumbing doesn't give you a house, and electricity doesn't give you a house. You need to combine and use all of these disparate resources in some kind of cohesive way to build a house..."

Rosenberg [6] added that for some, e-learning is considered a blended or hybrid learning; however, since there is a narrow definition of e-learning, there is also a narrow definition of blended or hybrid learning. For most people, blended learning equals blending instructor-led courses with online courses. A broad definition of instructor's role leads to a broad definition of e-learning, which leads to a broader definition of blended learning that includes knowledge management, online resources, Google, and so on. Hybrid e-training is a combination of terms derived by the researcher from various practices in e-learning better known as blended learning. Singh & Reed [7] and Margaryan & Bianco [8] defined blended learning as "the total learning arrangement where dimensions can be derived, all of which emphasize combinations between technologies, media and modes for the delivery of multiple learning methods and approaches. Verkroost et al. [9] define blended learning as a total mix of pedagogical methods, using a combination of different learning strategies, both with and without the use of technology. These definitions [6][7][8][9] were combined and adapted, then used as a starting point in this study. Operationally, the researcher defines hybrid e-training or HiTs in this study as a mix of various instructional delivery media (face-to-face, computer-mediated communication and self-learning media) using a combination of different educational technologies (new and old such as printed materials, CD-ROM-based e-books and the Web 2.0 technology).

All instructional media and technology used were planned based on the theories of andragogy and social learning, and guided by the outcome-based education principles provided by the Malaysian Qualification Framework [2][3]. The main component of the HiT system are the learners, facilitators and the knowledge management system, set up to achieve meaningful learning via various activities using various skills, such as the information communications technology (ICT) skill, the information-seeking skill and creative and critical thinking skills. Although not all of these components were tested in the study, all were used in designing the system. The terms *e-training* and *e-learning* are used interchangeably in this paper.

- **Contents**

According to Beerli et al. [10], good contents or quality

information assets consist of three parameters: comprehension, contextualization and valuation where information in such setting must be useful, usable, dependable, sound, well defined, unambiguous, reputable, timely, concise and contextualized. MacDonald et al. 11] on the other hand, define high quality content as being comprehensive, authentic or industry-driven and well-researched. In this study, high quality content was ensure by covering the topics in appropriate depth and breadth as needed by users based on the task analysis done earlier to ensure that the course content meets learner requirements. All content information was thoroughly researched and authentic in the sense that it was applicable and reflective of the issues and problems that arise in real life situations. To meet this objective, the problem-oriented project-based hybrid e-training strategy was used in conducting the course. In addition, content experts were engaged as expert reviewers for the course content.

- **Delivery**

Harris [12] asserts that e-learning has eight modes of delivery which are email, listserv, bulletin board, static web, interactive web pages, chat, video conference or a combination of any two or more of the tools. According to Polyson [13], limiting the delivery of material to only one format can restrict what and how learners come to understand issues. Therefore, a variety of media and communication tools for the delivery of content should be used to accommodate various learning styles.

MacDonald [11], in developing the Demand-Driven Learning Model (DDLM), maintains that quality delivery of content considers usability, interactivity and tools. Usability here means that web pages are kept up-to-date with no broken links. In addition, Mac Donald [11] writes that interactivity is a critical aspect of delivery and involves interaction between a learner and other learners, the facilitators or professors and content. Therefore, appropriate tools are needed. Tools for content interaction include video and audio clips, lectures through video conferencing, text documents, and journal presentations. Tools associated with social impact, on the other hand, include video conferencing, discussion groups, chat rooms and e-mail. The delivery tools for this study included (i) the conventional face-to-face delivery tools, such as Power Point slides, (ii) self-learning materials in the form of printed modules, CD-ROM or web-based materials, and (iii) other computer-mediated communication tools, such as blogs, web pages, FaceBook, Skype, instant messaging tools and other social learning tools using the Web 2.0 technology.

- **Service**

The Demand-Driven Learning Model (DDLM) defines high quality service as service that provides the resources needed for learning as well as for any administrative and technical support needed. Such service is supported by skilled and empathic staffs that are accessible and responsive [11]. Resources in DDLM help learners determine what their learning needs are and how those needs can best be met.

MacDonald [11] states that the resources in DDLM encourage learners to be reflective and aware of their own thinking and learning processes; such reflection, combined with how learners come to view and incorporate new information into the context of their lives, promotes development. Resources in DDLM are chosen to encourage social negotiation, which allows insights and the elaboration of concepts and ideas to occur. The Administrative and Technical Support staff, including the facilitators of DDLM should demonstrate effective collaboration, respect for roles, and effective communication; they also share their expertise as well as values [14].

The Service component in DDLM includes accessibility to staff, facilitators, technical support persons and services, such as libraries, bookstores and an extensive range of other learning resources as provided via the web links in the course blog. All requests for service and help are met with a minimum amount of waiting. This can be achieved by providing prompt feedback on assignments, fast responses to e-mails, and timely assistance. In this study, service was mainly provided by the facilitator although teaching assistants, technical and administrative staffs were readily available. As such, most of the time only the facilitators would be helping the learners determine what their learning needs were and how those needs could best be met. Similar to the services provided in DDLM, facilitators in this study encouraged learners to be reflective and aware of their own thinking and learning processes using reflection activities. These activities combined with how learners come to view and incorporate new information into the context of their lives helped to promote development of their critical thinking. The resources in this study also encouraged social negotiation, hence elaboration of concepts. In this manner ideas were generated easily.

- **Outcome**

In DDLM [11], outcome means (i) lower cost for the learner and employer, (ii) personal advantages for learner and (iii) learning outcomes achieved. Although the hybrid e-training focused on conventional training and education enhanced with technology instead of the full-time distance web-based distance learning as emphasized in the DDLM, the researcher still exercised the same outcome criteria. The slight different is, in this study the researcher focused more on the third criterion that is to achieve the learning outcomes.

However, the first two criteria of the outcome component were not eliminated, the reason being, unlike in the

conventional setting or short courses, learners do not have to meet face-to-face, except a few sessions. The time taken to travel and money spent are minimized. As such, for those who still need to keep a job while attending training, they do not have to experience the stress associated with financial risk, leaving a job, moving away from home and family, or moving their family to the training place.

Most importantly, this study focused on the learning outcomes that meet the demand of employers or future employers by providing a program whereby learners acquire problem solving skills within an authentic context. This is to enable learners to learn the skills for their future survival in the corporate world by engaging in the problem-oriented project-based environment offered by the course. It was hoped that through the course experience, learners would acquire new and relevant skills that may be applied directly to their real life or work situation. This in the long run would add value to their employer and family life.

- **Structure**

According to MacDonald [11], structure can be understood as:

> "... the required foundation that makes it possible to provide high quality content, delivery and service. The superior structure is achieved by anticipating the needs of the learners and considering what motivates learners. This will require a collaborative and healthy learning environment which has convenient access and where curriculum is designed according to program goals. Pedagogical strategies are implemented that are appropriate for online learning. The quality of WBL is monitored via a system of regular evaluation of learners..."

In this study, good structure was maintained in much the same way as the web based learning or WBL in DDLM that is by:

(i) Anticipating learner needs and tailoring the needs for specific content, media, and applications of technology integrated into HiTs. HiTs also address individual learning styles and preferences, background experience, and knowledge, while providing appropriate assessment and feedback. An appreciation of these needs guides the development and delivery of learning activities that meet the course learning objectives at the same time meeting the learners' objectives.

(ii) Considering what motivates learners by structuring to present relevant content that arouses learners perceptually. This involves creating aesthetically pleasing presentations and using technology that contains the relevance and value of what is being learned. Additionally, project assignments are planned to scaffold and make learners feel confident about being able to complete a learning task and to be challenged to find solutions. This involves presenting alternative and contradictory perspectives to inspire comprehension, application, analysis, synthesis, and evaluation of knowledge [15].

(iii) Establishing a collaborative environment that emphasizes the role of collaborative and constructive learning in which knowledge is gained through social negotiation. The learning environment supports and encourages collaboration among learners and between learners and learning facilitators. The principles of netiquette are explained, understood, and enforced with all users of the learning environment.

3.2 Meaningful eLearning

Meaningful learning requires substantial cognitive activity, which is 'the single important determinant' of what learners learn [16]. Meaningful learning occurs when learners actively interpret their experience using internal, cognitive operations [17], and it requires that teachers or instructors change their role from sage on the stage to guide on the side. Since students learn from thinking about what they are doing, the teacher's role becomes one of stimulating and supporting activities that engage learners in thinking.

Teachers must also be comfortable that this thinking may transcend their own insights. Meaningful learning requires knowledge to be constructed by the learner, not transmitted from the teacher to the student. In this study, meaningful learning is the ultimate objective of implementing the hybrid e-training course to learners with differentiated learning style preferences.

- **Cooperation**

According to Gokhale [18], the concept of collaborative learning (sometimes referred to as cooperative learning) where the grouping and pairing of students for the purpose of achieving an academic goal, has been widely researched and advocated throughout the professional literature. The term 'collaborative learning' refers to an instruction method in which students at various performance levels work together in small groups toward a common goal. The students are responsible for one another's learning as well as their own. Thus, the success of one student helps other students to be successful. In collaborative learning, students work together in small groups to complete projects by questioning each other, discussing and sharing information.

Johnson and Johnson [19] argue that collaborative or cooperative learning enhances both social and cognitive skills. There is strong evidence that cooperative teams

achieve higher levels of thought and retain information longer than students who work quietly as individuals. The shared learning gives students an opportunity to engage in discussion, take responsibility for their own learning, and thus become critical thinkers [20]. Jonassen, Peck & Wilson [17] define cooperative as collaborative and conversational. They explain that we live, work and learn in communities, naturally seeking ideas and assistance from each other, and negotiating about problems and how to solve them. It is in this context that we learn there are numerous ways to view the world and a variety of solutions to most problems. Meaningful learning, therefore, requires conversations and group experiences which we refer here in this study as cooperative learning. Cooperative activities in this study is implemented via group or individual projects where learners who chose to work individually or in small group to accomplish task associated to their course project uses computer-mediated technology mainly the Web 2.0 such as the blog, instant messaging and mobile communications.

- **Authenticity**

According to Jonassen, Peck & Wilson [17], authentic as in complex and contextual reflect thoughts and ideas that rely on the contexts in which they occur in order to have meaning. In other words, authentic learning is when activities associated to learning are presented from real life situation. Presenting facts that are stripped from their contextual clues divorces knowledge from reality. Learning is meaningful, better understood and more likely to transfer to new situations when it occurs by engaging with learners real-life, complex problems.

In this study, students were given guidelines and five small tasks to guide them in the right path towards completing their project. The themes were given and the learners selected their own topics to create projects that were authentic in nature. This means that the topic selected represented real life problems or issues that students were trying to solve in other subjects or at their work place. The problem-oriented project-based hybrid e-training (POPeye) strategy was used in the training implementation to ensure that the skills and knowledge provided in the course were authentic.

- **Active**

In contrast to rote learners, who merely memorize facts from a static knowledge base, meaningful learners actively construct their own learning and build flexible frameworks, which can be applied to diverse problems [21]. The behavioral and cognitive activities are complementary [22]. The act of writing their ideas down externalizes 'thinking' and exposes it to self-scrutiny and the scrutiny of others [23][24].

Meaningful learning requires that each learner actively construct his or her own knowledge. According to Bransford et al. [25], this new knowledge is constructed on the basis of prior knowledge, beliefs and preconceptions where new elements of learning are tied together like blocks and laid upon the foundations of prior knowledge in order to build effective overarching conceptual frameworks for their domains. Online discussions can help learners assimilate new knowledge into their schemas by directly or indirectly inviting a learner to recall prior knowledge including preconceptions, relate it to the topic under discussion and to other ideas [16].

According to Jonassen, Peck & Wilson [17], active or manipulative learning means that we interact with the environment to manipulate the objects within it and observe the effects of our manipulations. In this study, the hybrid e-training environment exposed the learners to the creative construction of knowledge and writing using the blogging platform. Online asynchronous discussions require the participant to engage in a behavioral activity such as writing, and a cognitive activity such as mobilizing tacit knowledge into a coherent argument, narrative or conversation.

- **Construction of Knowledge**

According to Hung, Keppell & Jong [26], the process of knowledge construction brings about meaningful learning when students articulate and reflect on new experiences and relate them to prior knowledge. It is through this construction process that learners create simple mental models to explain and understand the world. According to Jonassen, Peck & Wilson [17], learners must reflect on their activities and observations, and interpret them in order to have a meaningful learning experience because although activities are essential, participating in the activities per se is insufficient for meaningful learning. Corollary to these arguments, the learners in this study were required to post their weekly brief reflections on the task being worked on in order to accomplish the overall project. Such a process was hope and expected to result in not only reflective constructive learning, but also in other forms of meaningful learning such as a new knowledge construction and collaborative learning.

- **Intentionality**

Bereiter and Scardamalia [27] define intentionality or intentional learning as referring to:

> "... cognitive processes that have learning as a goal rather than an incidental outcome. All experiences, we assume, can have learning as an incidental outcome, but only some cognitive activity is carried out according to procedures that contain learning goals. Whether intentional learning occurs is likely to depend on both situational and intrinsic factors - on what the situation affords in goal-attainment opportunities and on what the student's mental

> resources are for attaining those goals. Thus, focusing on intentional learning provides a natural way of coordinating the two relevant research traditions-the tradition dealing with learning situations and the tradition dealing with learning skills..."

According to Jonassen, Peck & Wilson [17], human behaviors are naturally goal-directed. When students actively try to achieve a learning goal that they have articulated, they think and learn more. For course participants to experience meaningful learning, they must be able to articulate their own learning goals in line with the course learning outcomes and monitor their own progress. The component of intention in this course was planned accordingly and published as the course handbook for the e-training implemented in this study.

4. Methods

4.1 Sample Size and Research Respondents

This study employed the structural equation model (SEM). As stated by Kline [25], SEM is a large-sample technique that requires large sample sizes. Many factors, including the type of estimation algorithm used in the analysis, affect sample size requirements. In general, sample sizes of less than 100 would be considered "small", between 100-200 cases, considered "medium" and sample sizes that exceed 200 cases could be considered "large" [25]. The research respondents consisted of (i) educational developers and learning technologists, (ii) ICT trainers appointed by their institutions, (iii) teachers and teacher trainees, and (iv) ICT educators in the country or Asia in general. The terms ICT and Computer are used interchangeably in this study, so are the terms *trainees* and *trainers*.

4.2 Data Analysis Procedure

This study initially determine the reliability of the instrument using Alpha-Cronbach test with then a Rasch analysis was used to test the validity of the constructs besides testing for item and respondents reliability. The logit scores generated by the Rasch model analysis were used to assess the good-fit of the hypothesized model using structural equation modeling. This was an attempt to verify the hypothesized model. The study applied a two-stage structural equation modeling, using the AMOS (version 7) model-fitting program to test the research hypotheses. The study first assessed the validity of the measurement models for meaningful e-training and hybrid e-training. Next, the researcher examined the good-fit of the full-fledged meaningful e-training model. Once a model was estimated, the researcher applied a set of conventionally accepted criteria [29] to evaluate its goodness of fit.

To assess the fit of the measurement model and the full-fledged SEM, the analysis relied on a number of descriptive fit indices, which included the (i) normed or relative chi-square (χ^2/df), (ii) Comparative Fit Index (CFI), (iii) Tucker-Lewis Index coefficient (TLI), and (iv) Root Mean Square Error Approximation (RMSEA). Wheaton et al. in [29] and Arbuckle [30] suggest the use of a normed or relative chi-square (chi-square/df) as a fit measure. They suggest a ratio of approximately five or less as being the indicators of reasonableness. Carmines and McIve in [30], however, stated from their experience, that chi-square/df in the range of 2 to 1 or 3 to 1 are indicative of an acceptable fit between the hypothetical model and the sample data.

As for other fit measures, the possible values of CFI and TLI range from zero to one, with values close to one demonstrating a good fit and a value of .08 or less for RMSEA showing a reasonable error of estimation. Hair et al. [29] also mentions that a value of .08 for RMSEA is good, but a value of less than one is acceptable. Certainly one does not want to employ a model with a value for RMSEA that is more than 1. In search for a measurement model for Hybrid e-Training (HiT) and Meaninful e-Training (MeT), the researcher focused more on three fit indices, namely the CFI, TLI and RMSEA. With regard to "p" value as associated with the chi-square (χ^2) goodness of fit (GOF) measure, according to Hair et al. [29]:

> "...chi-square (χ^2) is the fundamental measure used in SEM to quantify the differences between the observed and estimated covariance matrices. Yet the actual assessment of GOF with a chi-square (χ^2) value alone is complicated by several factors. To provide alternative perspectives on model fit, researchers developed a number of alternative goodness-of-fit measures..."

5. Results and Discussions

To validate the likelihood of the revised two-constructs model, a five rounds of 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 magnitude of the factor loadings in the revised model were substantially significant with CFI = .972, TLI = .966 and RMSEA = .084. The result indicated that the parameters were free from offending estimates, ranging from .80 to .89 for the HiTs indicators and from .52 to .98 for the MeT indicators. CFI (.972) and TLI (.966) fit indicators exceeded threshold of .90 indicating a very good fit. The root-mean square error of approximation (RMSEA=.084) meet the bare minimum requirement for a reasonable error of approximation acceptance although a value of less than .01 is acceptable [29]. The normed chi-square (χ^2) for a good fit has also been met. Although the p value = 0 (normally acceptable $p > .05$) the model can still be accepted as chi-square fit sometimes can be a complicated indication. As such other fit indicators can

be used for fit indicators as suggested by Hair et al. [29]. The final fit indicates that the test fail to reject the hypothesized model. As such, the researcher concluded the model in Figure 1 as the validated structural equation model. To support the investigation of RQ1, the following hypotheses were tested as discussed in the previous subsections. Results of the test are concluded for the hypothesis as follows.

H_{01}: HiTs influences the achievement of MeT.
Fail to reject this hypothesis

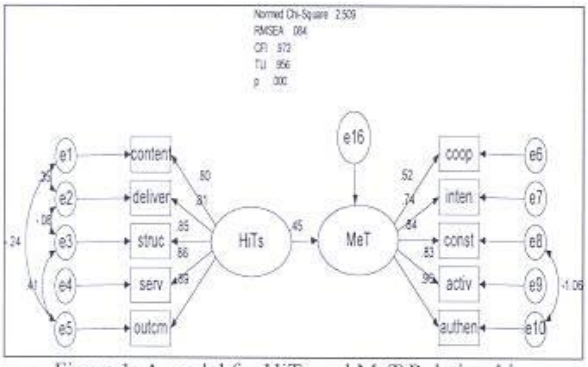

Figure 1: A model for HiTs and MeT Relationship

The results indicate that the hybrid e-training is strongly related to the perceived meaningfulness of the e-training courses in which the respondents had participated. The respondents' perception of the meaningfulness of the hybrid e-training was related to both their conviction that they, personally, can make a difference in a learner's learning by implementing the hybrid e-training approach, and to their belief that learners, in general, can control the effects of constraining external barriers to execute a meaningful e-training course. To a certain extent, this finding is in line with the notion that the training of trainers is the most promising factor in term of producing efficacious trainers [31][32] to implement a new technology for training. As Kimmel and Kilbridge [31] suggest, trainers can be trained to enhance their sense of self-efficacy through specifically designed trainings aimed at enhancing trainees' lack of instructional effort or poor instructional strategy.

6. Conclusion

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. Subsequently, the validated model is again tested to see its influence on learners' perception of what constitutes meaningful e-training. Clearly, despite various limitations, 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.

The data suggest that the hybrid e-training scale is useful for the diagnostic and formative or summative assessments of any hybrid e-training course[33][34]. This is due to the fact that the instrument is proven to be psychometrically sound. The results also suggest that the planning, implementation and evaluation hybrid e-training programs should consider the input from trainees, particularly concerning its effectiveness in helping trainers and trainees to perform more effectively. The results of the present study have expanded the existing body of knowledge in several ways. First, the positive effect of hybrid e-training on perceived meaningfulness of the e-training is substantially large and statistically significant. Second, regardless of the objectives of hybrid e-training courses, the training program appears to enhance personal and general training in using new technology. Third, the training of trainers is necessary to adequately help them sustain and develop new strategies for training with new technology.

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