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## The formation of an e-portfolio indicator for Malaysia skills certificate: a modified delphi survey

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### Abstract

The use of e-Portfolios over paper-based portfolio which provide a more effective means of information storage has become very popular nowadays. However, assessment indicators for e-Portfolios can vary according to a particular educational system. This also implies for the field of Technical Vocational Education Training (TVET). For TVET in Malaysia, students would undergo a technical competence certification called the Malaysian Skills Certification Malaysia (MSCM), established by the National Occupational Skill Standard (NOSS). This certification ensures that TVET students achieve certain competency standards in their area of specification upon graduation. These students are acquired to create paper-based portfolios to demonstrate their knowledge and competence level. The problem is that current studies show that paper-based portfolios are problematic and e-Portfolios have the potential to address this problem. Nevertheless, recent studies show that there is a lack of an e-Portfolio indicator for TVET. In an attempt to address this problem, the study aims to investigate the factors and indicators of e-Portfolio in accordance to the standards of MSCM. A modified Delphi study was conducted with a panel of 11 experts who are competent and experienced in the use of portfolio and ICT in TVET. The study consisted of three Delphi rounds. In the first round, 17 indicators of a TVET e-Portfolio were identified via the literature. These elements were categorized into four main groups: (i) the recognition of prior achievements, (ii) virtual learning space, (iii) competency assessment, and (iv) operating system. In the second and third rounds, the elements from each previous round were assessed by the expert panel until a consensus was achieved. These findings were then analyzed using mean analysis and inter quartile range. The analysis indicated that the 17 indicators identified were important in assessment of TVET graduates. The new indicator for MSCM could be used to measure whether TVET students have achieved the level of knowledge and competency required by NOSS in order to be competent for the workplace.

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## 1. Introduction

Electronic Portfolios or “e-Portfolios” are a collection of artifacts in the form of digital, interactive, systematic way to monitor students' knowledge and easier to use in publishing information on-line (Bullock & Hawk 2005; Handa et al. 2011; Kilbane & Milman 2005; Young & Morriss 2007). It can be used to store information in digital form and can be accessed regardless of place and time (DiMarco 2006; Ku & Chang 2011; Montgomery & Wiley 2008; Stefani et al., 2007). Halstead & Sutherland (2006) explained the benefits of converting portfolios electronically, which are: (i) the work of many students now are in electronic form, (ii) most of the students have access to the Web, and (iii) database available through the Web allows students to store information more easily.

To date, current studies suggest that e-Portfolios seems to work only as a repository of artifacts without connecting to the actual learning process (Ku & Chang 2011). As a result, although e-Portfolios are aimed in providing to assist learners through the use of technology, but the actual aims of e-Portfolios are not achieved. Zeichner and Wray (2001) describes seven questions in the development of e-Portfolios: (i) The purpose of the e-Portfolios?; (ii) Who makes the decisions? What should be included in the e-Portfolios?; (iii) How is the evidence in the e-Portfolios managed?; (iv) What are types of artifacts to be stored in e-Portfolios?; (v) What type of information to be made available by teachers during the process of teaching and learning?; (vi) How e-Portfolios are evaluated?; and (vii) What should happen to the e-Portfolio after it is produced?

When an educational institution chooses to use e-Portfolios in teaching and learning, it is important to understand and define the characteristics of e-Portfolio required to meet the needs of that particular institution. The aspects to be considered are: guiding, types of artifacts, evaluation, communication and collaboration, course management, hosting, learning outcomes, reflection, report, rubric, information sharing, templates and technology requirements. Other aspects that also worth considering during the e-Portfolio design process are: consumer characteristics, potential e-Portfolio, technology features and capabilities and usability of e-Portfolio (Jafari 2004).

Various e-Portfolio design models have been developed to be applied in education such as models developed by Ku and Chang (2011) and Balaban et al. (2011). Ku and Chang's (2011) developed an e-Portfolio design model to be used as a platform for learning and evaluation. There are three key elements of the model, which are: the exhibition space, learning management systems and social space. Meanwhile, Balaban et al. (2011) developed a model of e-Portfolios that are used as a platform for lifelong learning. The model consists of four key elements of the exhibition space, learning management system, social space and job application. In comparison, both e-Portfolio design models suggest that e-Portfolios should include aspects such as exhibition space, learning managements system and social space. The difference between the two models is that Ku and Chang's (2011) model did not include the job application aspect which indicate that e-Portfolios design models for different educational systems may be different and should be developed according to the needs of that particular educational system. Moreover, e-Portfolios should also be designed to meet the requirements and need of students in learning.

## 2. Background of research

In the Malaysian Skills Certification, portfolios are used as a archives to evaluate the knowledge and performance level of students in which their use is paper-based and limited as a mere artifact storage. Nowadays, the use of a paper-based portfolio is become irrelevant for the Malaysian Skills Certification. This is due to the fact that paper-based portfolios are: (i) static; (ii) limited in allowing information to be shared with others; and (iii) the management, evaluation and updating of materials process is difficult and are not capable of improving professional skills (McAllister & Hauville 2010; Smyth et al. 2011; Stefani et al., 2007). An alternative tool to paper-based portfolios are e-Portfolis. e-Portfolios can be utilized to store and organize material more easily, facilitate information searching, enable sharing of information anywhere, anytime, as well as enhance the professional skills of graduates (Bhattacharya & Hartnett 2007; Halstead & Sutherland 2006; McAllister &

Hauville 2010; Smyth et al. 2011). Since e-Portfolios are online, it offers a means of a more secure data repository system and aid towards a greener environment as it can reduce paper usage. Therefore, e-Portfolios have a great potential in improving the quality of Malaysian Skills Certification and expand the usage of ICT in education.

However, assessment indicators for e-Portfolios can vary according to a particular educational system. This also implies for the field of Technical Vocational Education Training (TVET). For TVET in Malaysia, students would undergo a technical competence certification called the Malaysian Skills Certification Malaysia (MSCM), established by the National Occupational Skill Standard (NOSS). This certification ensures that TVET students achieve certain competency standards in their area of specification upon graduation. These students are required to create paper-based portfolios to demonstrate their knowledge and competence level. The problem is that current studies show that paper-based portfolios are problematic and e-Portfolios have the potential to address this problem. Nevertheless, recent studies show that there is a lack of an e-Portfolio indicator for TVET. In an attempt to address this problem, the study aims to investigate the factors and indicators of e-Portfolio in accordance to the standards of MSCM. In order to prepare TVET students in facing the ever-challenging work market, the e-Portfolio indicator should be open, flexible and focus on the use of technology in teaching and learning process (Assessment and Teaching of 21st Century Skills-ATC21S 2011; Neal 2011). Moreover, the e-Portfolio should be designed according to aiming to upgrade the existing training system, to further enable the nation in producing a more competent labor force that are knowledgeable, competitive, innovative and competitive.

### **3. Methodology**

This study is quantitative research, where a modified Delphi technique is used in the creation indicator of e-Portfolio Malaysia skills certification system. Modified Delphi study approach was chosen to identify indicators of e-Portfolio required through the validation experts.

#### *3.1 Data collection method*

In the first round the researcher gathered information by doing a literature review of previous studies on the concept of a virtual learning and e-Portfolio model that has been applied in teaching and learning. The review was conducted to identify appropriate indicators in Malaysia skills certification. Next, the researcher identifies indicators for each factor to develop the questionnaire used in the modified Delphi study. The Delphi panel is a panel of experts selected by referring the list of specialties from the Malaysian Department of Skill Development.

In the second round, questionnaires (the factors and their respective items were given) were distributed to the Delphi panel. In this round the experts required to state their level of agreement with each item using a five-point Likert scale. The results of the second round is then brought to the third round. The process is the same in the third round, where the expert is required to state their level of agreement with each item. To enable the experts examine and answer these instruments, they will be given a period of two weeks in each round to interact with the instrument.

#### *3.2 Delphi Panel*

The Delphi panel consisted of 11 experts. The criteria used in the selection of experts are those who have experience in the issues discussed, capable of contributing opinions, capable of conducting assessments and decision-making to achieve the consensus (Pill 1971). Delbecq et. al (1975) indicate that two groups qualify as Delphi expert, which are: (i) the top-management – decision-makers who will use the results of the Delphi study; and (ii) professional staff in the relevant field. Thus, in this study, the selection of experts were based on the following criteria: (i) experts who are involved in the implementation of the Malaysian Skill Certification; (ii) experts who are knowledgeable in the curriculum of Malaysian Skills Certification; (iii) experts who are directly involved in portfolio management; and (iv) experts who are knowledgeable in e-learning. As such, the Delphi

panel was selected from the Department of Malaysia Skill Development (DMSD). DMSD is a department under the Ministry of Human Resources that serves to coordinate and control the implementation of skills training to produce K-workers to the job requirements. It also functions in the research and development of occupational standards of competency and expertise to improve the quality of skilled human resources to contribute to economic growth.

### 3.3 Research procedure

The modified Delphi approach is used in producing e-Portfolio system indicators. The modified Delphi technique is a procedure to find a consensus among the experts by using a questionnaire that does not involve face-to-face interaction (Wiersma & Jurs, 2009). The modified Delphi technique proposed by Wiersma & Jurs (2009) applied in this study, where the first round of interviews in the Delphi method is not needed and modified Delphi process started with a second round of exploration questionnaires subject. This is because the issue in the first round of the Delphi method is sufficiently defined by the researchers.

In the first round, the first step taken researcher in conducting this study is by making a literature review on models of virtual learning, e-Portfolio models and analysis of documents related to skills education in Malaysia. This step is aimed in creating a benchmark to directly identify the relevant variables and indirectly formed to be the domain of study. Next, the instrument in the form of questionnaires are produced. A panel of experts in the relevant field were selected, based on their qualifications to evaluate and provide feedback on the criteria required for each of the items selected. The experts selected are those that have experienced and responsible in the formation of the Malaysian Skills Certification System.

In the second round, a panel of experts selected by the Department of Malaysia Skill Development are given the questionnaire. The panel of experts is required to assess, indicating their level of agreement and comment related on the Malaysian Skills Certification portfolio. All questionnaires received back were analysed. In the third round, each expert provided a questionnaire based on the feedback from the second round of the consent of each item. Respondents were asked to review the assessment of all the items that have been analysed by the researcher. After considering all factors, the experts were asked to decide on the choices they made. They can maintain their choices or change any of the answers. The results were analysed and the findings the researchers conclude the agreement on the elements of e-Portfolio selected.

## 4. Data analysis

Data obtained from the questionnaire results in each Delphi round was analysed using the Statistic Package for Social Science (SPSS). Results of the analysis are presented in the form of descriptive statistics of percentages, mean and median to represent the results of the expert panel consensus. Descriptive statistics are used to describe a variable phenomenon and it needs to be explained logically by using certain methods (Balnaves & Caputi 2001; Chua Yan Piaw 2006; Vogt, 2007). One of the methods is by using a central tendency measurement. According to Asnul Dahar Minghat (2012), in the descriptive statistics based central tendency measurement per cent can used to seek the views of an expert panel about items of the questionnaire.

The mean scores reflected the order of prioritized items. The median score reflected statement required to form questionnaires in each Delphi round. To reflect the degree of consensus panel of experts on the questionnaire items, the Inter Quartile Range (IQR) of 0-1 (high consensus), 1.01-1.99 (moderate consensus), and more than 2 (no consensus) were used in this study.

## 5. Findings and discussion

Data analysis in the formation of indicator for e-Portfolio Malaysia Skill Certification are categories as the following: (i) review of literature (the first round modified Delphi) (ii) the second and third modified Delphi rounds.

### 5.1 Findings of the first modified Delphi round: Literature review

In the early stages of a modified Delphi study, a literature review of previous studies and documents related to e-Portfolio was conducted to create a questionnaire that was used in the first Delphi round. The literature survey identified four main elements of e-Portfolios in education, namely: (i) the recognition of prior achievements, (ii) virtual learning space, (iii) competency assessment; and (iv) operating systems (Balaban et al. 2011; DiMarco 2006; Ku & Chang 2011). Table 2 shows the findings that have been classified according to their categories.

Table 1 Element and indicator of e-Portfolio

Element	Literatur Review	Indicator
<b>Recognition of prior achievements</b>	(Bahril Balli & Wahid Razzaly 2011; Department of Malaysia Skills Development 2011; Noraini Kaprawi et al. 2010; Perry et al. 2009; Singh 2007)	Personal detail Academic Qualifications Non-academic qualifications Prior experience Core abilities Declaration authorization
<b>Virtual learning space</b>	(Ku & Chang 2011; Nunez et al. 1998; Pereira et al. 2000; Punie 2007)	Exhibition Learning Management Learning assessment Personal space
<b>Competency assessment</b>	(Ministry of Human Resources Malaysia 2013)	Competency information Achievement record Achievement evidence
<b>Operating systems</b>	(Barrett 2010; Galatis et al 2009; Gibson & Barrett 2003; Sweat-Guy & Buzzetto-More 2007).	Information sources Information management Communication Reflection

### 5.2 Findings of the second and third Delphi rounds

In this round each expert is required to state their level of agreement on the indicators presented. Table 3 shows the modified Delphi findings for the second and third rounds. In the second and third rounds all of the six indicators personal detail, academic qualifications, non-academic qualifications, prior experience, core abilities and declaration authorization for recognition of prior achievements element achieved a high degree of consensus among the expert panel. IQR value of the item was 0 and 1, while the median was 4 and 5.

For the virtual learning space element, results of the analysis in the second and third round showed a high consensus and agreement among expert panels, with IQR achieving a value of 1 and the median is 4 and 5. The mean value of the virtual learning space indicators (learning managment, exhibitions, learning asesment and personal space) in both Delphi rounds were high. In relation, the concept of virtual learning space should contain four elements such as the knowledge space, collaboration space, consultation space and experiment space (Nunez et al. 1998; Punie, 2007).

Here, it can be concluded that the structure of the virtual learning space should have three main environments, namely: (i) an environment that allows users to interact with each other; (ii) an environment that allows the user to interact with the source; and (iii) reflective space and social space. With the revolution of information and communication technology, TVET training institutions should create a learning environment that is more open and flexible to students. Virtual learning should be much more student-focused, where students actively solve the given problem through exploration, discussion and high thinking.

The next in the second and third elements competency assessment, the analysis shows that all three indicators of competency information, achievement record and achievement evidence reached a high consensus based on the IQR score which was 1. The median is 4 and 5 and the mean values for all three items are also high. In Malaysia, the National Occupational Skills Standards (NOSS) developed a competency profile chart for the Malaysia Skills Certification program. The main elements of the profile are the profile of core ability charts, chart paths for programs, matrix core ability, achievement record and evidence achievement for all work activities were evaluated (Ministry of Human Resources Malaysia, 2013).

All three indicators agreed by experts are important in assessing student competence. Competency assessment was used as a benchmark for identifying and evaluating the effectiveness of learning as well as improvements to the training needs in the workplace. Aspects of competency assessment refers to the knowledge, skills and behaviours that individuals should have in order to perform a task or take responsibility on their tasks. Nowadays, the industry requires competency assessment among technical resources that enable employees to be competent to the task and become more competitive.

Finally, research data modified Delphi for second and third rounds of the operating system element indicates the degree of consensus and agreement among the panel experts is high. The IQR score achieved was 0 and 1, while the median is 4 and 5. The mean value was high for all four items: information resources, information management, communication and reflection – indicating a high level of agreement among the experts. Barrett (2010) states the e-Portfolio operating systems should contain elements of information presentation, information management, reflection, collection of artifacts, assessment, feedback, and social networks. Gibson & Barrett (2003) describes the required operating element in the development of e-Portfolios are communication, collaboration, reflection and information management. In the development of e-Portfolio operating system is very important, that the system developed can be used properly and meet user requirements, in this case the TVET students.

Table 2 Modified Delphi study for the first and second rounds.

Indicator	First Round				Second Round			
	Mean	Med	IQR	Level of Consensus	Mean	Med	IQR	Level of Consensus
<b>Recognition of prior achievements</b>								
Personal detail	3.37	4	1	High	4.39	4	0	High
Academic Qualifications	4.20	5	1	High	4.70	5	1	High
Non-academic qualifications	3.71	4	1	High	4.38	5	1	High
Prior experience	4.73	5	0	High	4.85	5	0	High
Core abilities	4.00	4	1	High	4.50	5	1	High
Declaration authorization	4.55	5	1	High	4.73	5	1	High
<b>Virtual learning space</b>								
Learning Management	3.97	4	1	High	4.35	5	1	High
Exhibition	4.64	5	1	High	4.57	5	1	High
Learning assessment	4.03	4	1	High	4.25	4	1	High
Personal space	3.98	4	1	High	3.36	4	1	High
<b>Competency assessment</b>								
Competency information	4.51	5	1	High	4.27	4	1	High
Achievement record	4.64	5	1	High	4.27	4	1	High
Achievement evidence	4.64	5	1	High	4.46	5	1	High

<b>Operating systems</b>								
Information sources	4.48	5	1	High	3.99	4	1	High
Information management	4.39	5	1	High	4.88	5	1	High
Communication	3.68	4	1	High	4.26	4	0	High
Reflection	4.21	5	1	High	4.54	4	1	High

## 5. Conclusions

The analysis of the literature review and descriptive analysis of the modified Delphi study has identified three elements and 17 indicators in the development of an e-Portfolio system for Malaysia Malaysian Skills Certification. It is categorized under four domains, which are: (i) Recognition of Prior Achievement (personal details, academic qualification, non-academic qualifications, prior experience, Core abilities and declaration authorization), (ii) virtual learning space (learning management, exhibition, learning assessment and personal space), (iii) competency assessment (competency information, achievement record and achievement evidence) and (iv) operating system (information sources, information management, communication and reflection).

When an institution chooses to use e-Portfolios in teaching and learning, it is important to understand and define the concepts and indicators necessary to meet the needs of an institution (Jafari, 2004; Sweat-Guy, & Buzzetto-More, 2007). To produce an e-Portfolio system, it requires detailed planning to ensure that the resulting system meets the needs of users, as well as the educational institutions. This study provides an overview of the importance of an e-Portfolios indicator. Thus, it can be concluded that the modified Delphi study conducted produced indicators and items that could be useful for the implementation of e-Portfolios for Malaysia Skills Certification in the field of TVET.

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