

## **E-portfolio indicator for competency assessment and virtual learning in Malaysia Skills Certification**

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### **Abstract**

The use of e-portfolios which provides a more effective method for recording and managing competency achievement has become increasingly popular. For Malaysian Skills Certification (MSC), students are required to create paper-based portfolios to demonstrate their knowledge and competence level. Nevertheless, existing literature indicated that paper-based portfolios were problematic i.e. they tend to be static, had limited portability, active management and evaluation and were difficult in updating information. E-portfolios have the potential to address these problems. This paper investigates the potential of e-portfolios for competency assessments and virtual learning in accordance with the standards stipulated in MSC. A modified delphi study was conducted with a panel of 11 experts who are competent and experienced in the use of portfolios and ICT in TVET. The study consisted of three Delphi rounds. In the first round, 32 indicators for virtual learning and seven indicators for competency assessment were identified via literature reviews. 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 analysed using a statistical dispersion technique i.e. interquartile range. Twenty two indicators for virtual learning and five indicators for competency assessment were identified as important in relation to MSC. The use of e-portfolios in education proves to provide an efficient method for students' competence evaluation, descriptions of students' development process, storage of artefacts, assessments and online learning. For that, e-portfolio offers immense potentials in improving the quality of MSC System.

### **1 Introduction**

Malaysian skills certification is an education that provides individuals with specific skills in a certain field of work. This education is important in the making of professionals and semi-professionals to generate nation's income and economic development. The challenge now in skills education is to improve delivery system in the teaching and learning activity based on ICT (Information Communication and Telecommunication) (Ministry of Human Resources 2008).

To date, various concepts of teaching and learning which integrate ICT have been introduced such as e-learning, aided training and blended learning. E-portfolio is a teaching product using ICT tools based on e-learning. It is a collection of digital and interactive form of artefacts, systematic in monitoring students' knowledge and handy in publishing online information (Bullock & Hawk 2005; Handa et al. 2011; Kilbane & Milman 2005; Young & Morriss 2007). In education, e-portfolios are used in recording learning outcomes, plans and

evidences as well as presenting and reflecting learning activities and evaluation (Batson 2002; Feeney & Pitman 2010; Montgomery & Wiley 2008; Stefani et al. 2007).

E-portfolio is a product that uses the concept of a virtual learning space, which is based on e-learning. In the concept of learning space, Nunez et al. (1998) explained that one cannot learn on his or her own; rather, required a tool to aid learning. Virtual learning space is a learning environment using computer where students can obtain information needed to learn. Cerna (2008) listed course contents, measurement and communication tools as the elements that need to be included in a virtual learning concept of teaching and learning. The objective was to develop a learning system that can provide support for students to learn with each other, share resources and ideas. The structure of the virtual learning space must comprise an environment that allows users to interact with each other and its source, some reflective spaces and for users to socialize (Pereira et al. 2000).

In Malaysian Skills Certification System (MSC), portfolio is used as a document to assess students' competency stage. The portfolio is kept in paper-based form in which the function is only limited to artefact storage. Nevertheless, the use of printed portfolio has been identified to be less relevant with present situation. This is because the printed portfolio is static, restricted in information sharing, process management and evaluation. Also, it has been less convenient in updating materials, thus impede professional skills record improvement (Mcallister & Hauville 2010; Smyth et al. 2011; Stefani et al. 2007).

The use of e-portfolios in education, on the other hand, provides an efficient method for students' competence evaluation. As well, it provides students' development process descriptions, for storage and teaching materials preparations (Montgomery & Wiley 2008). Apart from being used as teaching materials, storage for artefacts and assessments, e-portfolio is also used to record employability skills and professional competence, for lifelong learning and to create a productive workforce (Hallam et al. 2010). E-portfolio has several advantages in contrast to a printed portfolio i.e. (i) the ability to store and organise materials easily and quickly, (ii) the ability to integrate students' course work; (iii) for development of professional skills and (iv) the ability to describe students' competency and potential (Bhattacharya & Hartnett 2007; Halstead & Sutherland 2006; Mcallister & Hauville 2010; Smyth et al. 2011). Hence, e-portfolio deems to offer a great potential in improving the quality of MSC system.

When an institution chooses to use e-portfolio system in its teaching and learning activities, it is important for the institution to understand and determine the required characteristics of the e-portfolio that meet the needs of the institution. This is to ensure that the new system meets the intended users' requirements. In the implementation of e-portfolios system for the purpose of assessing competence and skills of virtual learning education in Malaysia, a detailed study needs to be carried out. The study is to identify the required elements that are appropriate in producing an e-portfolio system that is user-friendly, appealing to teachers and students and meets the MSC standards.

## 2 Methodology

This study used a modified Delphi technique in the formation of Malaysian Skills Certification E-portfolio indicators for the purpose of students' competency assessment and virtual learning. The modified Delphi technique is a procedure to find a consensus among experts using questionnaire by not meeting face to face (Wiersma & Jurs 2009). Figure 1 presents the study implementation procedures on the formation of Malaysian Skills Certification E-portfolio systems indicators using a modified Delphi approach as proposed by Wiersma & Jurs (2009).

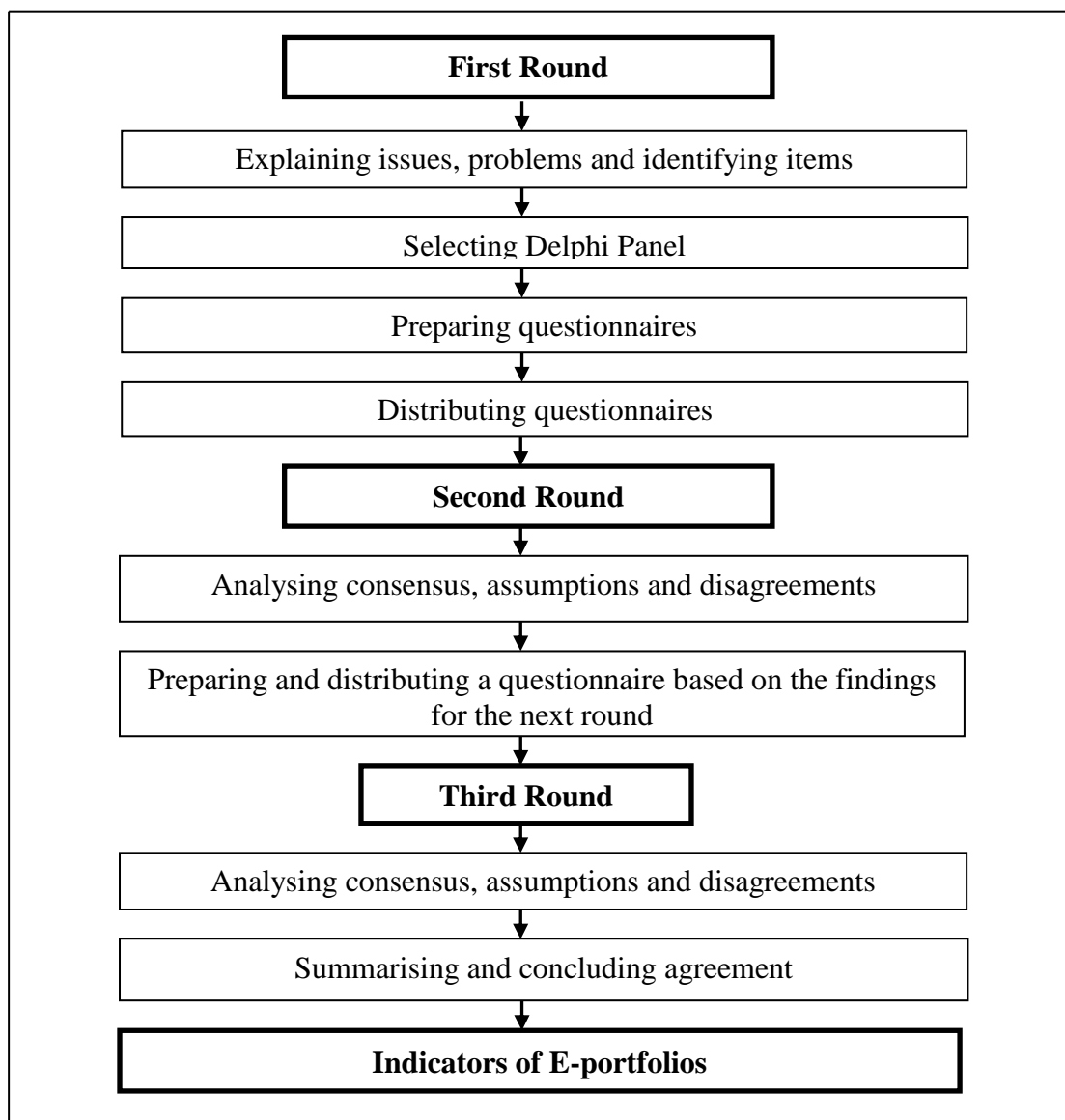


Figure 1: The procedures for the implementation of a modified Delphi study  
Source: adapted from Wiersma & Jurs (2009)

Eleven experts from the department of skill development were selected as the sample for this study. The criteria used in the selection of the experts were based on relevant experience of the issues discussed, the ability to contribute views and the ability to assess and makes decision to achieve consensus (Pill 1971). Therefore, in this study the selection of experts were set based on the following criteria i.e. (i) involved in the implementation of MSC system, (ii) knowledgeable in the curriculum of the Malaysian Skills Certificate, (iii) were directly involved in the management of Malaysian Skills Certification portfolio and (iv) knowledgeable in E-learning system.

The data obtained from the questionnaires in every cycle of this modified Delphi research were analysed using Statistic Package for The Social Science (SPSS). The results of the analyses were presented in the form of descriptive statistics of percentages, means and median scores to represent the expert panel agreements. To reflect the consensus of the expert panel towards the questionnaire items, the following inter quartile range scores (Table 1) were used in this study.

Table 1: **The Level of consensus on items**

Score IQR	Level of Consensus
0 – 1	High consensus
1.01 – 1.99	Moderate consensus
$\geq 2$	No consensus

Source: Peck & Devor (2012)

### 3 Findings and discussion

The analyses on the formation of Malaysian Skills Certificate E-portfolio indicators for virtual learning and competency assessment were divided into two i.e. (i) the first-round of modified Delphi and (ii) the second and third rounds of modified Delphi.

#### 3.1 The first round of modified delphi: literature reviews

At the initial stage of modified Delphi study, literature review of previous research materials and documents related to e-portfolio were gathered to form questionnaire items that would be used in the second round. The literature review identified four elements as well as 32 key indicators for virtual learning and seven indicators for competency asessement. Table 2 reflects the findings which were grouped according to the respective concepts.

Table 2: **The E-portfolio indicator for virtual learning and competency assesment**

Purpose	Element	Indicator
<b>Virtual Learning</b> (Ku & Chang 2011; Punie 2007; Nunez et al.1998; Pereira et al. 2000)	Exhibition	<ul style="list-style-type: none"> <li>- Editing information</li> <li>- Collecting learning material</li> <li>- Presenting learning material</li> <li>- Storing personal information</li> <li>- Presenting information in various ways</li> </ul>
	Learning management	<ul style="list-style-type: none"> <li>- Posting homework</li> <li>- Guiding students</li> <li>- On-line monitoring</li> <li>- Detection of the learning process</li> <li>- Posting practical work</li> <li>- Teacher's control</li> </ul>
	Assessment	<ul style="list-style-type: none"> <li>- Online discussion activities</li> <li>- Test in the form of right or wrong answers</li> <li>- Test in the form of multiple-choice answer</li> <li>- Test in the form of short essay</li> <li>- Comments by members of the same group</li> <li>- Comments by members of different groups</li> <li>- Overall score testing</li> <li>- Formative test</li> <li>- Summative tests</li> <li>- Comment by teacher</li> <li>- Assessment verification.</li> </ul>
	Personal space	<ul style="list-style-type: none"> <li>- Space for sharing ideas</li> <li>- Space for working together</li> <li>- Space to send messages</li> <li>- Space for reflection</li> <li>- Space for socializing</li> <li>- Space for communication between the students and the students in my class</li> <li>- Space for communication between teachers and students</li> <li>- Space for communication between teachers and families of students.</li> <li>- Space for communication between students and other students.</li> </ul>
<b>Competency Assesment</b> (Ministry of Human Resource 2013)	Malaysian Skills Certification competency assesment	<ul style="list-style-type: none"> <li>- Core abilities profile chart</li> <li>- Evidence of achievement based on Competency Unit (CU)</li> <li>- Cumulative Record (CR) of achievement of the program</li> <li>- Matrix core ability</li> <li>- CR of core ability</li> <li>- Training route chart</li> <li>- Performance evaluation of core abilities that have been evaluated for each CU</li> </ul>

### 3.2 The second and third round modified delphi

The literature review identified that 32 indicators of e-portfolios for virtual learning and seven indicators for competencies assessment. Table 3 demonstrated the detailed data analysis of virtual learning indicators for the second and third round.

In the second round, the analysis revealed 10 virtual learning indicators needed to be dropped from the list (3, 4, 11, 12, 14, 17, 18, 25, 28 dan 31). All experts had high level of agreement towards 22 other indicators with a score of IQR 1 and the means value between 3.50 to 5.00 (high). Indicators 10, 15, 30 scored IQR value of 2 which reflected no consensus among the panel of experts. Yet, the three indicators were at an acceptable level of means scores, thus, the indicators remained in the list.

In the third round, all 22 indicators for virtual learning spaces scored high level of consensus and agreement among the panel of experts. The IQR valued between 0 and 1 and the mean values between 3.50 to 5.00 (high). This clearly showed that all the 22 indicators received high approval among the panel of experts.

Table 3: **The data analysis of virtual learning indicators for the second and third round**

No	Indicator	Second Round			Third Round		
		Mean	IQR	Cons	Mean	IQR	Cons
<b>Exhibition</b>							
1	Editing information	4.6	1	H	4.6	1	H
2	Collecting learning material	4.6	1	H	4.5	1	H
3	Presenting learning material	2.8	1	H	Remove 2nd round		
4	Storing personal information	2.7	1	H	Remove 2nd round		
5	Presenting information in various ways	4.6	1	H	4.6	1	H
<b>Learning management</b>							
6	Posting homework	4.5	1	H	4.5	1	H
7	Guiding students	4.2	1	H	4.5	1	H
8	On-line monitoring	4.5	1	H	4.6	1	H
9	Detection of the learning process	4.4	1	H	4.3	1	H
10	Posting practical work	3.8	2	NK	3.8	1	H
11	Teacher's control (for learning activities at school)	2.9	1	H	Remove 2nd round		
12	Teacher's control (for learning activities at home).	2.9	1	H	Remove 2nd round		
<b>Assessment</b>							
13	Online discussion activities	4.6	1	H	4.5	1	H
14	Test in the form of right or wrong answers, and	3.1	0	H	Remove 2nd round		
15	Test in the form of multiple-choice answer	4.0	2	NK	4.1	1	H
16	Test in the form of short essay	4.4	1	H	4.2	1	H

No	Indicator	Second Round			Third Round		
		Mean	IQR	Cons	Mean	IQR	Cons
17	Comments by members of the same group	3.2	1	H	Remove 2nd round		
18	Comments by members of different groups	3.2	1	H	Remove 2nd round		
19	Overall score testing	4.5	1	H	4.4	1	H
20	Formative test	4.4	1	H	4.3	1	H
21	Summative tests	4.4	1	H	4.4	1	H
22	Comment by teacher	4.5	1	H	4.5	1	H
23	Assessment verification	4.5	1	H	4.2	1	H
<b>Personal space</b>							
24	Space for sharing ideas	4.6	1	H	4.3	1	H
25	Space for working together	2.7	1	H	Remove 2nd round		
26	Space for send messages	4.4	1	H	4.6	1	H
27	Space for reflection	4.2	1	H	4.6	1	H
28	Space for socializing.	2.8	1	H	Remove 2nd round		
29	Space for communication between the students and the students in my class	4.2	1	H	4.3	1	H
30	Space for communication between teachers and students	4.1	2	NK	4.0	0	H
31	Space for communication between teachers and families of students.	2.9	1	H	Remove 2nd round		
32	Space for communication between students and other students.	4.4	1	H	4.3	1	H

The element of exhibition analysis results indicated a degree of consensus and agreement among the panel of experts on editing information indicators, collecting learning material and presenting information in various ways. On the other note, two indicators which were on presenting learning material and storing personal information were removed. In this study, exhibition space is defined as a repository of personal information and learning materials which is accessible at any time (Ku & Chang 2011; Punie 2007; Nunez et al. 1998). Specifically, the concept refers to three important indicators i.e. in editing information, collecting learning material and various ways of presenting information. These indicators are crucial in the virtual learning system because it provides a more structured, quick and easy way to facilitate information or articles stored.

For the learning management element, the indicators for posting homework, guiding students, on-line monitoring, detecting learning process and posting practical work were agreed by the experts. However, two indicators were eliminated i.e. the teacher's control (for learning activities at school) and the teacher's control (for learning activities at home). The five indicators agreed by the experts were important in allowing students to submit assignment easily. Teachers also would be able to detect the students' learning process and to guide them online.

For assesment elements, eight indicators achieved the experts agreement i.e. the online discussion activities, tests in the form of multiple-choice answer, tests in the form of short essay, an overall score testing, formative test, summative tests, comments by teacher and assessment verification. However, three indicators were denied by the experts i.e. the tests in the form of right or wrong answers, comments by members of the same group and comments by members of different groups. Punie (2007) asserted that assessment of students knowledge and skills through formal or non formal education are easier to be conducted online. Therefore, e-portfolio is an effective platform to support the idea in assessment activities and has been used in various education fields (DiMarco 2006; Mcallister & Hauville 2010; Montgomery & Wiley 2008).

Next, six indicators for personal space element received high consent among the experts. The indicators were space for sharing ideas, send messages, reflection, communication between students and the students in my class, the communication between teachers and students and communication between students and other students. However, three indicators were eliminated i.e. space for working together, socializing and communication between teachers and families of students. Personal space refers to an environment that allows users to interact with each other and resources, reflective space and socializing (Pereira et al. 2000; Punie 2007; Nunez et al. 1998; Ku & Chang 2011). Personal space is important in web-based learning because it allows students to organise and develop their own learning environment that match their learning style (Attwell 2007; Wilson et al. 2007).

In Malaysia education system, the use of virtual learning space in teaching and learning is still scarce (Abdullah 2006; Liaw & Muzafar 2011; Sukri et al. 2010). Virtual learning is an easy and fun learning process where students can learn anywhere and at anytime (Punie 2007; Pereira et al. 2000; Nunez et al. 1998). It allows students to manage their time more effectively and they can explore information that has been downloaded from the website. Hence, the formation of virtual learning indicators as discussed in this study can produce an E-portfolio system for learning. The outcome of the e-portfolio is important in providing a learning space for students and exposure to the vocational education system in Malaysia in applying Information and Communications Technology (ICT).

Overall, it can be concluded that the concept of virtual learning space that has been discussed, has the potential to provide many benefits to vocational education in Malaysia i.e. (i) there is no gap of time and distance that prevents learning to take place, (ii) sources of information can be easily and quickly obtained and (iii) attract more users to master Information and Communications Technology (ICT) skills. Also, e-portfolios provide a dynamic facility for personal interaction, reflection, support information exchange and convenient for online discussions.

Table 4 revealed the results of data analysis of the second and third round competency assesment indicators. The analysis conducted on seven items found two indicators were dropped (1 and 4) in the second round. The experts highly agreed on five other indicators with a score of IQR 1 and the mean value between 3.50 to 5.00 (high).



In the third round, all the five indicators of competency assessment received high consensus and agreement among the panel of experts. The IQR value obtained was 1 and the mean value ranged between 3.50 to 5.00 (high). In other words, all the five indicators were highly accepted by experts.

Table 4: **The data analysis of competency assesment for the second and third round**

No	Indicator	Second Round			Third Round		
		Mean	IQR	Consensus	Mean	IQR	Consensus
1	Core abilities profile chart	2.8	1	H	Remove 2nd round		
2	Evidence of achievement based on competency unit	4.5	1	H	4.3	1	H
3	Cumulative Record (CR) of achievement of the program,	4.5	1	H	4.3	1	H
4	Matrix core ability	2.9	1	H	Remove 2nd round		
5	Cumulative Record (CR) of core ability	4.6	1	H	4.3	1	H
6	Training route chart	4.6	1	H	4.3	1	H
7	Performance evaluation of core abilities that have been evaluated for each Competency Unit (CU)	4.6	1	H	4.6	1	H

The elements of the five indicators of competency assessment were the evidence of achievement based on competency unit, the cumulative record of achievement of the program, the cumulative track record of core ability, training route chart and performance evaluation of core abilities. The five had obtained agreement among the panel of experts while the core profile ability chart indicators and matrix core ability were rejected and eliminated from the list.

The evidence of achievement based on competency unit refers to all forms of students' work such as drawing, assignments, reports and other relevant data recorded by CU that have been determined by NOSS of a specific field. Students' works need to be recorded using the e-portfolio because all the information can be securely stored, structured and systematically in monitoring students knowledge or skills (Bullock & Hawk 2005; Handa et al. 2011; Kilbane & Milman 2005; Young & Morriss 2007). The records from online evidence would enable valid and accurate assessment of students' level of competence in a particular field of study.

The cumulative record (CR) of achievement of the program presents work activities or CU that have been achieved by student in a program where the assessment is continuously conducted. Barrett (2006) claimed that e-portfolio provides an effective method in recording

student achievement and has been identified as an effective platform to support the assessment of competence in various fields of education (Batson 2002; Feeney & Pitman 2010; Mcallister & Hauville 2010; Montgomery & Wiley 2008). Thus, it is proposed that the use of e-portfolio would enable a quicker and easier process of recording student's achievement and verification.

Further, the Cumulative Record (CR) of core ability is a form of authentication to depict students' mastery in generic skills for their effective involvement at workplace. The assessment of RPK core abilities was conducted via observations as well as students' experience during training. To add, performance evaluation of core abilities that have been evaluated for each CU refers to the overall assessment of the abilities based on modules and level of achievement. There are nine core abilities in vocational education in Malaysia to be mastered by students: (i) seek and process information, (ii) transfer and exchange information, (iii) work and interact with others, (iv) working with the system, (v) plan and manage work activities and (vi) resources management. Apart from technical skills, core abilities are indeed needed by graduates, especially in this era of global competition. (De Leon & Borchers 1998; Dickerson & Green 2004; Yahya Buntat 2004). Thus, core abilities assessment should be carried out continuously to ensure that students truly master them. It is important to create a workforce that are competitive and meeting the industry's requirement.

In the field of education, E-portfolio is an effective platform for competence assessment and to monitor students' progress (Bhattacharya & Hartnett 2007; DiMarco 2006; Montgomery & Wiley 2008; Smyth et al. 2011). According to Kilbane & Milman (2005) E-portfolio is able to visualise the experience and the level of skills of the students in the particular field that they are into. Shepherd and Hannafin (2008) stipulate that the E-portfolio is important in education since the 1980s, in which it gives an opportunity for teachers to assess the competence and the progress of students in a certain time period. To sum, E-portfolio is an advantage as a competency assessment mechanism due to its ability to make judgement on students' progress by assessing overall students' achievement.

However, e-Portfolios indicator may vary according to a particular educational system. For Malaysia Skills certification, students would undergo a technical competence according their field, where this competency standard established by the National Occupational Skill Standard (NOSS). This certification ensures that 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. In order to prepare students in facing the ever-challenging work market, the portfolio should be open, flexible and focus on the use of technology in teaching and learning process (Neal 2011).

## 5 Conclusion

The analysis of the literature review and descriptive analysis of a modified Delphi study have identified a total of 22 key indicators of Malaysian Skills Certificate E-portfolio for the purpose of virtual learning and five key indicators for the purpose of competency assessment. When an institution chooses to use E-portfolios in teaching and learning, it is important for the institution to understand and define the concepts and indicators needed to meet their needs (Jafari 2004; Sweat-Guy & Buzzetto-More 2007). To produce E-portfolio system, it requires detailed planning to ensure that the system developed in accordance to the needs of consumers and educational institutions. This study has provided a clear picture of the E-portfolio indicator that is important in Malaysian Skills Certificate for virtual learning and competency assessment. It can be concluded that the modified Delphi study conducted has produced indicators for the implementation of Malaysian Skills Certificate E-portfolio for the purpose of virtual learning and competency assessment.

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