Building an E-Profiling System for Technical and Vocational Education and Training (TVET) in Malaysia

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Abstract
The study in Technical and Vocational Education and Training (TVET) has been progressively improving for the past decade supporting all possible market trade in supply and demand for workforce management. In the era of industrial revolutionary, most of the things are connected and administered by big data computational edge technology. The challenge is on how to manage the expansion of data within the workforce of TVET to meet the demand of skilled industrial workers with the right competencies. This study is deliberating on the big data growth of TVET instructors in Malaysia. TVET instructors in this country have distinct characteristics and governed by different background of ministries performing diverse policies including Ministry of Education (KPM), Ministry of Human Resources (MoHR), Ministry of Rural and Regional Development (KKLW), and to name a few. On contrary, they deliver one major similar task in providing technical training and skilled workforce career advancement. This research is to highlight on the use of eProfiling as the portal of TVET instructors as well as to study on the effectiveness of this system throughout the ministries involved in this project. The methodology used in this research includes the frequency study and partial least square (PLS) modeling for the effectiveness of the portal to its users. The eProfiling portal was built with subtlety and tangibility producing comprehensive technical instructors' profiles in this country. The number of profiles keeps growing in accordance to the growth of industrial sectors within the country's occupational framework and trade analysis.

Keywords: TVET, Technical Instructor, E-profiling

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Introduction

A centralized database development particularly for an administration of trainers' profiling and big data management is a project meant to gather the basic information of TVET trainers and instructors including their competency levels, academic qualifications, access of instruction, job assignments, instructor's mobility, pedagogical and self-assessment management for each of the ability checklist. This is with the aim to identify the level of competencies, training pathway planning and preparation, and effective career and expertise development for the personnel. Therefore, since year 2016, eProfiling system development for ability checklist in relevant trade areas has been initiated. The link for this purpose was assigned at https://eprofiling.ciast.gov.my.
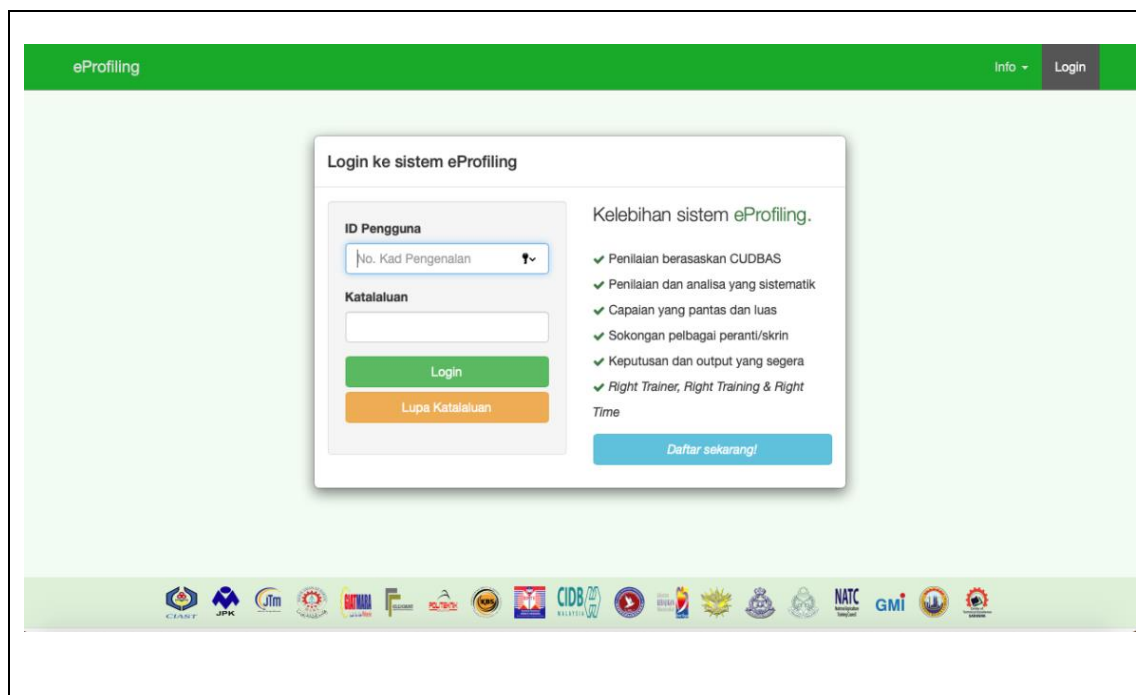

Figure 1. The user interface of the E-Profiling System.

Similar profiling system available include consumer profiling systems (Eldering, 2001) and student profiling system to most higher learning institutions (Tzouvelli, et. al., 2008). The same principle goes to profiling systems in bigger application scale such as the airlines users (DeGrave, 2004), the world wide web users (LeMole, 1999) and in healthcare area (Abbas, et. al., 2015).

This project was initiated in year 2010 when Curriculum Development Based on Vocational Ability Structure (CUDBAS) was introduced in collaboration between Ministry of Human Resources Malaysia (MoHR) with Japan International Cooepration Agency (JICA). Later, in the Tenth (10th) Malaysian Plan, the Department of Skills Development had started to manage the implementation of Public and Private skills training rigorously in Malaysia, hence in need for Training Need Analysis (TNA) and a data platform that records on the details of technical instructors (EPU, 2010). Consequently, in Eleventh (11th) Malaysian Plan, under the Strategy of Human Capital Development Empowerment Towards Developed Nation, incentives on E-Profiling system had started (EPU, 2015).

This E-Profiling system was built and governed by one of the renowned TVET institution in Malaysia known as Centre for Instructor and Advanced Skill Training (CIAST). CIAST has her unique historical timeline from her establishment under the Japanese government from 1983 until 1991 and had taken over by Ministry of Human Resources Malaysia from 1991 until today. This institution is a leading institution in the area of Capacity Building and Train-of-Trainers.

With vast training institutions and high volume of training providers, it is crucial to administer and register the details of the trainers to a centralised system. This is what the initiative that has taken by CIAST. Having more than 18 agencies to participate in this system to date and to target for about more 30,000 registered instructors by the year 2020 (EPU, 2015). It is certainly contributing to the big data of the instructors and require meticulous management on the system. Hence, continuous research should also complement it.

Hence, this project has been planned, designed, developed and tested on its feasibility to the need of a centralized system of the technical and vocational instructors' registration, their expertise and their training experiences to be shared and enhanced for the national agenda and human capital development.

In fact, the E-Profiling was built with the aim to be the data centre for TVET Instructors in Malaysia particularly in the details of qualifications and expertise and with the objectives of:

  i. Coordinating Ability Checklist Development in TVET.
 ii. Developing and Training Platform for Trainers' Ability Checklist.
iii. Building an E-Profiling System.
iv. Developing A Database Platform for TVET Trainers.
 v. Coordinating Training Needs.
vi. Performing Evaluation Research Program.

In addition, the functions of E-Profiling consist of the following listing: (i) for Personnel Registration, (ii) Updating the Personnel Details, (iii) Course Application, (iv) Course Approval, (v) Course Evaluation, and (vi) Course Feedback.

Characteristic of E-Profiling System

With the advent of online systems to most of business applications and the utilisation of technology, the challenge of managing increasing number in TVET institutions including their technical instructors are made possible. The area of big data and cloud computing which facilitate the machine learning platforms and Artificial Intelligence, the development of a profiling system to TVET instructors have been materialised and implemented. Among others, this system is to leverage the following items:
(i) There would be a centralised system that register and contain the details of all available technical and vocational trainers in this country (Malaysia).
(ii) There is a centralised system for searching the instructors with specific abilities and competencies that they do not limit their teaching delivery within their own institutions rather it can be shared and borrowed.

(iii) Transfer of Technology. Transfer of Knowledge and Expertise. Whence there is one a centre that creates pool of details for skilled teachers, it would be easier to find required master trainers to train others from the same discipline too.

(iv) Providing the instructors with the right Industrial Training Attachment. Once, the system was able to identify the instructor's ability, competencies and industrial sectors that they are capable, upgrading their skills should be simplified to the areas within the gap and within their specific discipline and specialisation.

(v) Further research on training methodology, skill upgrading, technical ability requirements and technology updates should be able to be identified from this system. It is through these researches that TVET training is hoped to be aligned with the latest industry analysis and market needs.
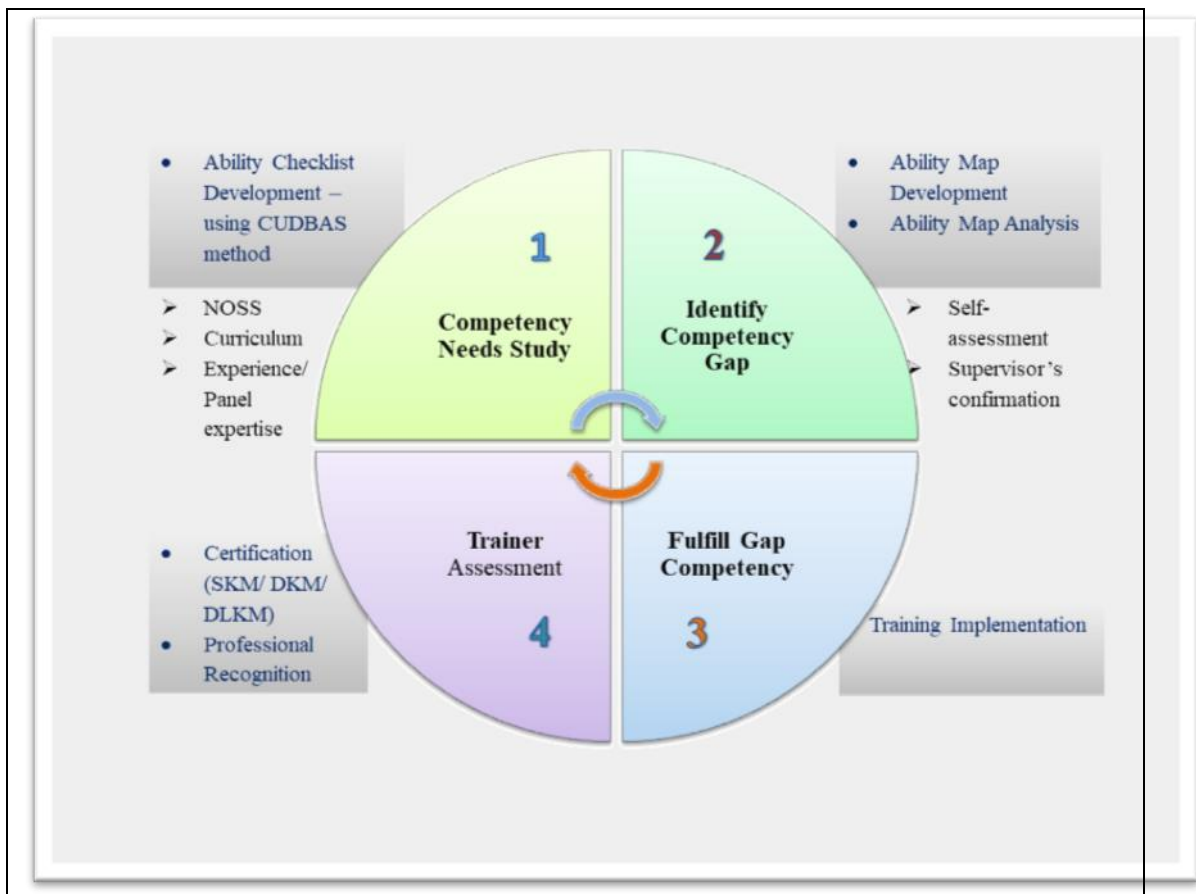
Figure 2. The process of identifying the training needs analysis for e-profiling system.

Satisfaction Survey on the Implementation of the E-Profiling System

Analysis was done in the aspects of frequency test, percentage, minimum value, and standard deviation. The data comprised of the demographic data of the study on the e-profiling system developed by this institution. The min test and standard deviation were carried out to analyze the level of satisfaction, knowledge, and ease-of-use among the users.

Figure 1 is showing the survey respondents who came from 18 governmental agencies that directly involve with E-Profiling system. From the study, the respondents that had submitted completed forms are 5,174 persons.

Respondent background

Table 1 below shows that the respondents of this study consist of all 18 agencies involved with the E-Profiling System. In this study, a total of 5174 respondents have answered the questionnaires that have been posted on the E-Profiling website. This represents 21.6% of the total number of users registered in the system. However, there are 19 respondents who are system users outside of these 18 agencies.

Table 1. The number of training centres under public and private institutions in Malaysia.

Type of Institution	Ministry	Name of Training Institutions	Number of Training Centres
Public	Ministry of Human Resources, Malaysia (MoHR)	Centre for Instructor and Advanced Skill Training (CIAST)	1
		Japan-Malaysia Technical Institute (JMTI)	1
		Advanced Technology Training Centre (ADTEC)	8
		Industrial Training Institute (ILP)	23
	Ministry of Youth and Sports (KBS)	National High-Skilled Youth Institute (IKTBN)	8
		National Skilled Youth Institute (IKBN)	13
		Youth Skilled Golf Academy (AKBG)	1
	Ministry of Agriculture (MoA)	Institute of Agriculture	7
		Institute of Fisheries	3
		Institute of Veterinar	2
	Ministry of Education (KPM)	Vocational College (KV)	77
		Secondary Schools with Basic Vocational Education (PAV)	>60
	Ministry of Higher Education (KPT)	Polytechnics	36
		Community College	94
	Ministry of Rural and Regional Development (KKLW)	High-Skilled College of MARA (KKTM)	10
		Skilled Institute of MARA (IKM)	14
		MARA-Japan Industrial Institute of Technology (MJIIT)	1
	Ministry of Tourism and Culture (MoTAC)	Tourism Training Institute	Unknown
Private	Not Related	Various Names	650

The highest respondents were from Polytechnic (1207), JTM (1148) and Community College (1070) while the lowest were from ATM (1), Centex (4) and PDRM (4). Table 2 above shows the comparison between survey respondents and the total number of users of the E-Profiling System in their respective agencies. From this data, the highest percentages of respondents were from JTM, which was 50.98% of total users in JTM and followed by AADK (48.6%), KBS (43.1%), and JPK (40.16%). The lowest percentage respondents were from ATM (0.65%), MARA (3.23%), PDRM (3.45%), GMI (5.17), Prison (5.61%) and BPTV (6.15%).

Respondents' access analysis showed that 78.5% of respondents were TVET instructors, 9% were training coordinators, 6.1% were HODs (head of department), 4.7% were Institute Admin, and 1.7% were agency administrations. Respondent distribution of E-Profiling based on access level can be referenced in Figure 2.
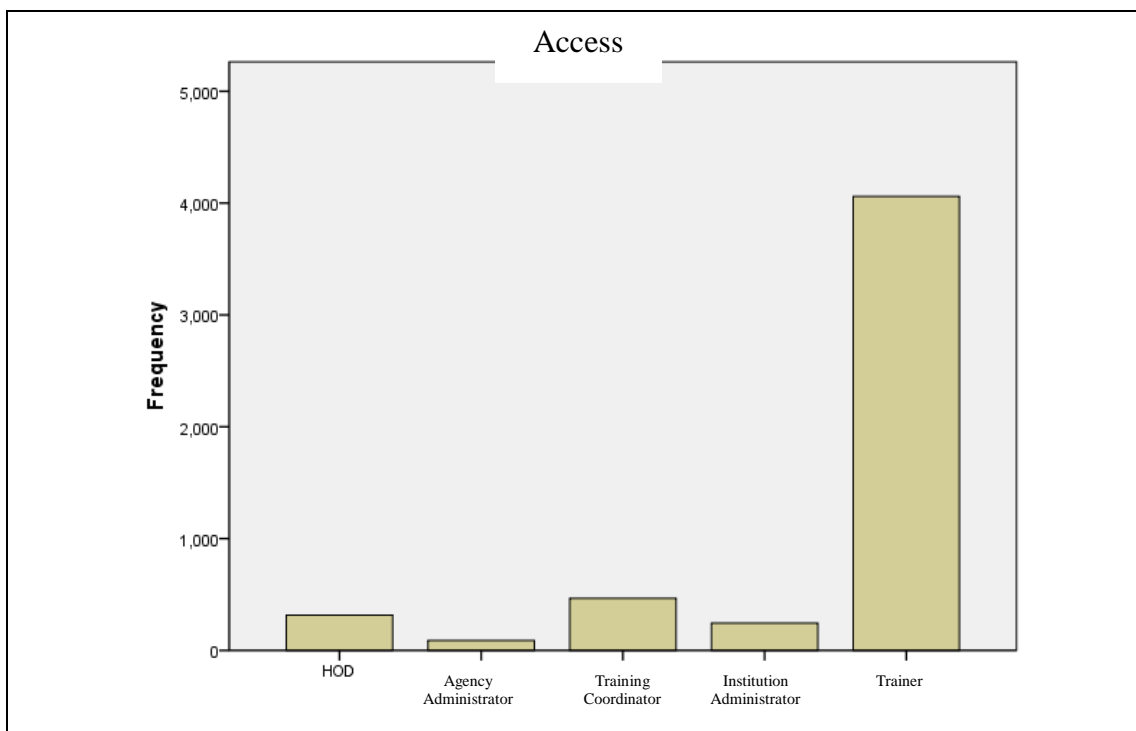

Figure 3. The respondent distribution of the survey.

The three-factor analysis of effectiveness found that E-Profiling users generally have high values for the three factors namely knowledge, convenience and satisfaction. These three factors are at the level of the mean score of 4 which is at a high level. The distribution of this data can be referred to Table 3.

Table 2. below shows the min score by agency for all three factors. Data shows that teachers from BLKP provide the lowest mean score for knowledge factor (3.96). Next to the satisfaction and usefulness factor, the lowest mean score was recorded by the respondents from GMI with a score of 3.79 and 3.75. In addition, almost all agencies recorded a mean score of more than 4.0 for these three factors. However, this value still shows the effectiveness of the system at a high level.

Participation in the number of respondents from the top 3 agencies found that these agencies also had a high number of TVET instructors compared to other agencies. These agencies have more than 2,000 TVET teachers. However, BPTV agency with more than 3,000 educators recorded a low number of respondents. Apart from that, there are two other agencies that have TVET instructors out of more than 1000 people who have lower respondents UNIKL and MARA. Hence this indicates there is a need to encourage TVET instructors to access the E-Profiling System more frequently.

For other agencies with low respondents, this may be due to various factors such as the absence of provisions (PDRM, JKM, Prison, ATM, BPTV, Centex), agency administrator role (BLKP GMI), and lack of engagement.

The findings of the study found that access level found that the distribution of respondents reflects the actual distribution of the respondents' population in which the TVET instructor is a large part of the respondents. The numbers of TVET instructors who are 78.5% of respondents are in parallel with the population.

However, studies have found that a small percentage of users are less likely to understand their access level. This is based on the number of respondents for agency admin and the training coordinator exceeds the actual number from within the system. This is because respondents are found to be choosing different access levels compared to actual access in the system. This data demonstrates the level of understanding of a small number of respondents (especially ranked other than instructors) on the level of accessibility access needs to be improved.

In terms of effective use, the respondents generally indicate that the E-Profiling System has a high effectiveness at 4.10 levels. However, in terms of agencies, survey results found that the effectiveness of GMI and BLKP was at the lowest level compared to other agencies.

Furthermore, this model also describes the relationship with the three factors measured. The proposed model also attempts to predict the effectiveness of users in using this eProfiling system.

Table 2. The min, max, mean value and standard deviation of the three items being assessed from the survey.

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Knowledge	5174	1.00	5.00	4.1633	.61931
Satisfaction	5174	1.00	5.00	4.0839	.61306
EaseofUse	5174	1.00	5.00	4.0773	.62685
Valid N (listwise)	5174				

Table 3. The Min of the Three Factors for Each Participating Agency.

| Agency / N | Factor | | | Min | Interpretation |
	Knowledge	Satisfaction	Ease-of-Use		
JTM (1149)	4.10	4.01	4.03	4.05	High
KBS (465)	4.13	4.04	4.03	4.07	High
MARA (46)	4.27	4.10	4.01	4.13	High
Politeknik (1207)	4.09	4.03	4.01	4.04	High
K. Komuniti (1070)	4.23	4.18	4.17	4.19	High
BPTV (218)	4.29	4.23	4.22	4.25	High
PDRM (4)	4.41	4.33	4.40	4.38	High
ATM (1)	5.00	5.00	5.00	5.00	High
Penjara (23)	4.33	4.23	4.25	4.27	High
JKM (11)	4.24	4.21	4.14	4.20	High
BLKP (37)	3.96	3.88	3.82	3.89	High
AADK (69)	4.36	4.22	4.25	4.28	High
Centex (4)	4.41	4.29	4.40	4.37	High
JPK (196)	4.18	4.08	4.02	4.09	High
CIDB (79)	4.16	4.05	4.03	4.08	High
GMI (12)	4.08	3.79	3.75	3.87	High
UNIKL (95)	4.20	4.06	4.02	4.09	High
GiatMARA (471)	4.22	4.12	4.13	4.16	High
Others (19)	4.31	4.20	4.16	4.22	High
Min	**4.16**	**4.08**	**4.07**	**4.10**	**High**

Results and Findings

In this study, there are variables that influence the effectiveness of the E-Profiling System. A conceptual model has been proposed to describe the relationship between each of the variables in this study.

Structural model of E-Profiling System effectiveness is developed based on three variables namely Satisfaction, Knowledge and Ease of Use. PLS-SEM software is used to analyze and develop the model.

The first criterion of the measured measurement model is internal consistency reliability. These measurements are conducted to see the level of validity and reliability of the items for each variable. The evaluation method for testing the internal consistency reliability model of this study refers to a value known as composite reliability (CR). Test results show that CR values for all variables are between 0.7 and 0.95 and do not exceed 0.95. Thus, this indicates that the level of internal consistency of items for each variable is high and reliable.

To see how much individual items in one variable have positive relationships with alternative items measuring the same variable, convergent validity tests are carried out. The items in each particular variable must indicate a high variation between one another so that it can explain the validity of the measured variable. The average variance extracted value (AVE) obtained from the analysis of the measurement model

for all variables is above the minimum set requirement of 0.50. It can therefore be said that the items that measure these variables have a convergent validity level of satisfaction.

Based on the findings of the structural model assessment, it is found that the knowledge factor has a significant positive relationship with satisfaction. This shows that when the knowledge (knowledge) on the E-Profiling System is high among the users, then the satisfaction of using the E-Profiling System is also high.

The findings of the structural model assessment also show that the knowledge factor has a significant positive relationship with ease of use. This suggests that when knowledge in the use of E-Profiling system is high, it will help the user to easily use the system.

The relationship between the ease of use and satisfaction indicates that both factors have significant positive relationships. This finding means that the user feels that the E-Profiling system is easy to use and user-friendly, so the user's satisfaction of the E-Profiling System is high.

Before the final model is proposed, the evaluation of this structural model uses a systematic approach to assess the capability and accuracy of model predictions (R2), the actual effect of independent variables on dependent variables (f2) and also whether the model model is relevant (Q2) . R2 values are between 0 and 1 and the higher R2 values then the expectation level of expectation will be higher.

The findings show that the value of R2 on ease of use is 0.654 at 95% confidence level. This means ease of use and knowledge are equally altered in a systematic pattern by sharing 65.4% of those changes. Hence, it shows that there is a correlation between the pattern of ease of use that can be explained by 65.4% by changing the knowledge factor pattern, while the remaining 34.6% changes are explained by other factors.

The second R2 value is viewed as a satisfaction factor that shares a total of 0.878 changes by ease of use and knowledge, at 95% confidence level. It can therefore be said that the 87.8% change of satisfaction factor is explained by the change of ease of use and knowledge while the other 12.2% is by other factors. It is argued that any change in one of the variables in this model is either an ease of use or knowledge, so it can predict the dependent variable.

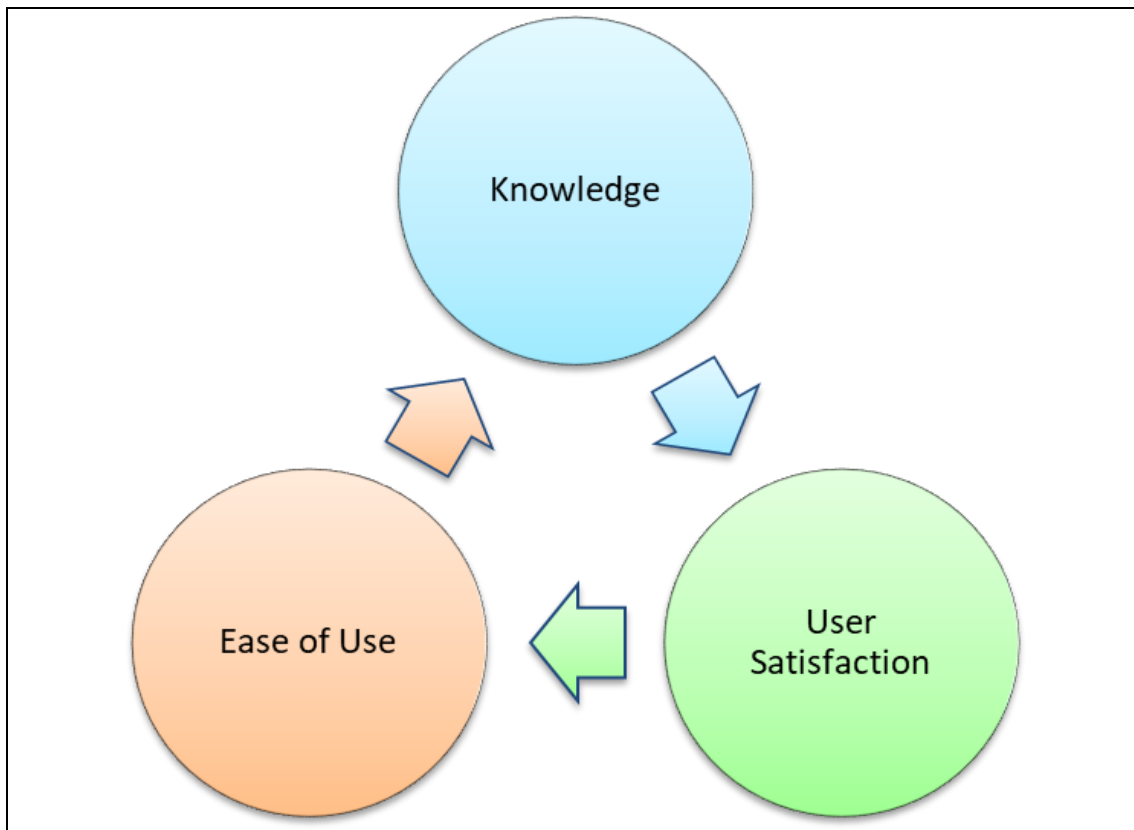The diagram below shows the model that results from the analysis carried out.

Figure 4. Structural model of E-Profiling System effectiveness.

Conclusion

Participation in the number of respondents from the top 3 agencies found that these agencies also had a high number of TVET instructors compared to other agencies. These agencies have more than 2,000 TVET teachers. However, BPTV agencies with more than 3,000 instructors recorded a low number of respondents. Apart from that, there are two other agencies that have TVET instructors in excess of 1,000 people who have lower UNIKL and MARA respondents. Hence this indicates there is a need to encourage TVET instructors to access the E-Profiling System more frequently.

For other agencies that are low respondents, this may be due to various factors such as inadequate allocation (PDRM, JKM, Prison, ATM, BPTV, Centex), frequent exchange of agency administrators (BLKP and GMI), and less engagement).

The findings of the study found that access level found that the distribution of respondents reflects the actual distribution of the respondents' population in which the TVET instructor is a large part of the respondents. The number of TVET instructors who are 78.5% of respondents are in parallel with the population.

However, studies have found that a small percentage of users are less likely to understand the role of access levels. This is based on the number of respondents for agency admin and the training coordinator exceeds the actual number from within the system. Respondents were found to choose different access levels compared to actual access in the E-Profiling System. This data indicates the level of understanding of the respondents apart from the instructors need to be improved.

In terms of effective use, the respondents generally indicate that the E-Profiling System has a high effectiveness at 4.10 level. However, in terms of agencies, survey results found that GMI and BLKP's efficiencies were at the lowest level compared to other agencies. Three factors of the effectiveness tested were knowledge, satisfaction and usefulness. These three factors also recorded a high score of min with the highest score of knowledge knowledge followed by satisfaction and convenience.

Furthermore, this model also describes the relationship with the three factors measured. The proposed model also attempts to predict the effectiveness of users in using this E-Profiling system.

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