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Surveying motor vehicles office staff members' attitudes and behavioural intentions toward e-learning

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Abstract: The main purpose of this study was to use the concept of a three-tier technology use model (3-TUM) to design a questionnaire for measuring the use of the 'Taipei e-campus' and 'e-learning+' platforms by the motor vehicles office staff. This study explored the attitudes and behaviours of the motor vehicle office staff on an e-learning platform. The study found that e-learning had a number of positive effects on the participating staff members. The usefulness of one's e-learning perception had a positive impact on learner self-efficacy and system environmental function quality. The learner's behavioural intentions had a positive impact on their satisfaction with the system and perceived usefulness. Interactive learning and multimedia teaching had a positive impact on the e-learning effect and the functional quality of the system environment. The other effects and the functional quality of the system environment had no significant effect on the quality of the e-learning system.

Keywords: e-learning; electronic learning; three-tier use model; motor vehicles office; self-efficacy; behavioural intention.

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River Su, advised by Chih-Kai Chang, was a Master's student of the Department of Information and Learning Technology, National University of Tainan. He is also a staff of the Tainan Motor Vehicles Office of Directorate General of Highways of Ministry of Transportation and Communications.

1 Introduction

Based on correlational statistics from the Director-general of Personnel Administration, Executive Yuan (2018), from 2008 to 2015, the average e-learning hours of public servants' lifelong learning hours increased from 33 to 43.1 hours. This yearly upward trend indicates that by applying e-learning, the lifelong learning hours of public servants have been gradually increasing. Accordingly, as a benchmark for non-governmental learning websites, the governmental learning website should concentrate on better understanding learners' requirements, with the goal of creating more convenient learning environments. Currently, how to integrate the scattered e-learning resources into a holistic system has been the most important issue.

To keep abreast of current efforts to promote and combine emerging e-training trends, executive yuan and examination yuan have an agreement that integrates every resource from the governments at all levels and has progressively improved the simplification of the e-learning platforms. Toward this end, the Director-General of Personnel Administration has worked on building the e-learning+ platform (<https://elearn.hrd.gov.tw>), integrating the learning resources from the public sector, applying the new-trending technology, reinforcing e-training contents, and building an open-learning and resource sharing e-learning channel. This is to promote the "integration of learning resources from the public sector, reinforcement in the application of new e-training trend, construction of open-learning resources and increasing sharing circumstances." The aim of this vision is to achieve the goal of e-learning, which is to offer a single entrance for "multiple learning, complete recording, and applications increasing" and thereby make public servants' e-learning more efficient and their training more systematic. Officially opened in June 2017, as of April 2019, the platform have offered more than 1,600 courses and had more than 345,000 members, while more than 6,881,000 people had taken its courses.

Taipei e-campus (<http://elearning.taipei.gov.tw/>) was created by the Taipei City Government for the main purpose of training its employees, while also including the registered public servants from other governments and civilians. After its official implementation on November 2011, this e-learning website has been revised three times, in March 2003, July 2005, and July 2011. To keep abreast of current trends, the courses' innovative contents have been continually updated, creating a multi-scale e-learning website. As of April 2019, the site's members already exceeded 846,000, who had been offered more than 1,600 courses, while more than 1,031,233 people had enrolled in the courses (Department of Civil Servant Development, Taipei, 2019).

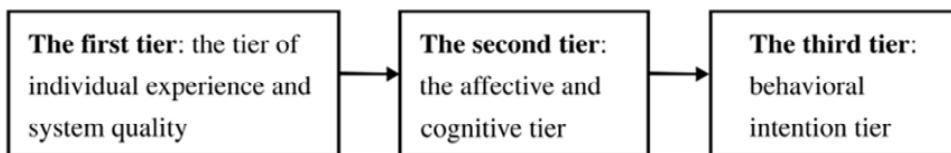
To probe the users' attitudes and behaviours, this research adopted the 3-TUM theory of Liaw (2008), which was based fundamentally on Davis' (1989) technology acceptance model (TAM). The research collected data by questionnaires and applied a quantitative research method to explain the attitudes and behavioural intentions of motor vehicles office staff members when using the Taipei e-campus and e-learning+ platforms.

2 Literature review

This section focuses on describing the three-tier technology use model (3-TUM), which was chosen as the fundamental theory of this research. According to Liaw et al. (2007), developing an efficient e-learning frame and designing an e-learning environment

requires the interaction of three factors: autonomous learning, multimedia environments and instructor-led learning. Therefore, to illustrate the influence among the key factors of e-learning, they identified the three tiers of *personal motive theory*, *social cognitive theory*, *theory of planned behaviour* and the *TAM*. As shown in Figure 1, the first tier describes learners' individual experiences and system quality, including the degree of users' confidence and the holistic systematic environmental quality, including the functions related to environments like interaction, the quality of multimedia video and audio, and so on. The second tier depicts the affective and cognitive facets, focusing on whether the users have felt satisfied or regarded the interaction as helpful for their learning. The third tier is the behavioural intention tier, probing if students have enjoyed their learning experience. The first tier, individual experience and system quality, influences the second tier, the affective and cognitive tier, which then has a continuing influence on the third tier, behavioural intention.

Figure 1 Three-tier technology use model (3-TUM)



On the basis of 3-TUM, integrating the other coefficient of correlational research, which probes the acceptance of such new technology platforms, has been of lesser urgency, but it also gradually has been affirmed and applied to a certain extent by the academia of Taiwan and other countries. The factors involved include the following (Liaw et al., 2007):

- Examining the system development and evaluation of smart interactive play.
- Probing the true image of implementing Taiwanese English on the foreign language teaching e-learning+ platform.
- Evaluating the students' perceived usefulness and behavioural intention of perceived satisfaction, using 3-TUM as an example (Khalid, 2014).
- Noting the influences on students' learning behaviours of the teacher's professional quality and perceived factors on the internet (Khalid et al., 2015).
- Probing Turkish vocational school students' factors of behavioural intention with a learning management system (LMS) (Cigdem and Ozturk, 2016).
- Comparing the research example of e-learning satisfaction of management courses in the University of Thailand (John and Duangkanong, 2018).

Chen (2014) uses the diffusion of innovations model to explore the e-learning effectiveness perceptions of government staff. However, this study tried to explore more than e-learning effectiveness. After considering the intrinsic quality of public servants, the functional quality of the system environment, and the effective and perceived factors, we have chosen 3-TUM as the final model for this research, with the intention of using it to probe learners' attitudes and behavioural intentions toward the platform (Liaw et al., 2007). Furthermore, the 3-TUM model was often used to evaluate e-learning systems

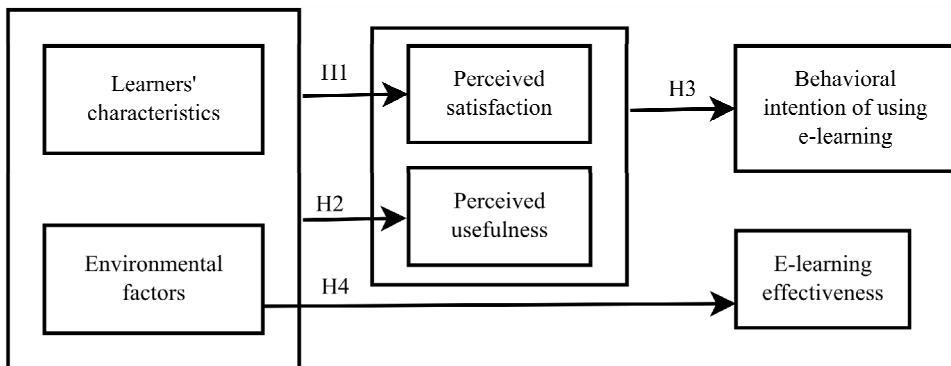
success, study national success on e-learning systems, or explores instructors' and students' perspectives (Al-Fraihat et al., 2020; Cidral et al., 2018; Al-Samarraie et al., 2018).

3 Research method and hypotheses

This research used questionnaires and a quantitative research method to probe and explain the motor vehicles office staff members' behavioural intentions when using the public sector's e-learning websites, the platforms of Taipei e-campus and e-learning+. As concerns the e-learning system environment, learners are the most direct and important perceivers. A learner's experience of using the website will indirectly reflect on their behavioural intention about 'informative technology'. Learners' attitudes toward the Taipei e-campus and e-learning+ platforms will be the decisive factor to succeed in e-learning. Therefore, when developing the e-learning system, we need to consider the characteristics of the target group. Among these characteristics are self-directedness (Passerini and Granger, 2000) and self-efficacy, which applies to the judgement the learners use when evaluating their e-learning when they use the computer and platform and is one of the variables in the experiment. The functional quality of the system environment is the other variable, including the management interface, the multimedia instruction, and the interactive activity by which learners can enjoy the pattern of a given system. Moreover, according to the perception of 3-TUM, learners' characteristics and system quality will have a positive impact on learners' affective and cognitive factors (Liaw et al., 2007). Figure 2 shows the sketched map for the hypotheses of this experiment. Based on the above perception, we propose Hypotheses 1 and 2.

- H1 E-learning perceived satisfaction has a positive impact on learners' self-efficacy and environmental system quality.
- H2 E-learning perceived usefulness has a positive impact on learners' self-efficacy and environmental system quality has a positive impact.

Figure 2 Hypothesis based on the 3-TUM model



Based on 3-TUM, learners' behavioural intentions will be influenced by system satisfaction and perceived usefulness (Liaw, 2008). Furthermore, behavioural intention shows how much effort an individual is willing to give, while perceived usefulness shows the scale of a learner's perception on applying a technological system, for increasing the work effectiveness. Based on the above perception, we propose Hypothesis H3:

H3 Learners' behavioural intentions have a positive impact on system satisfaction and perceived usefulness.

In addition, in terms of the involvement of learners' interactive communication and multimedia instruction, the higher the interactivity, the higher the involvement of learners, and the more effective on learning (Northrup, 2001). Based on the above perception, we propose Hypothesis H4:

H4 E-learning effectiveness has a positive impact on the functional quality of the system environment.

3.1 Subjects

To research the attitudes and behavioural intentions of those involved in e-learning, we chose those motor vehicles office staff members who used the Taipei e-campus and e-learning+ platforms, which were the e-learning websites for the public sector. We conducted stratified random sampling on these as our experimental subjects, choosing the sample according to the scale of the level of each person's profession. We sent out 252 questionnaires, of which 239 were returned. Deducting 26 invalid questionnaires left 213 valid samples, for an overall response rate of 84.4%. As the population and representatives of the sample were 464 motor vehicle staff members, we needed to achieve a confidence level of 95% and a sampling error below 5%. Therefore, with a sample total of at least 210 pieces (Israel, 1992), the response of these questionnaires has already conformed to the guidelines.

3.2 Research instruments

The revised 3-TUM questionnaires focused mainly on learners using the Taipei e-campus and e-learning+ platforms, including measurements of perceived self-efficacy, perceived satisfaction, perceived usefulness, behavioural intention, e-learning efficiency, interactive learning, e-learning efficiency, multimedia teaching, and fundamental information, and consisted of a total of 37 questions. To prevent the questionnaires from error translations and contextual influences, which can cause subjects to misunderstand the original meaning of the questionnaires, we invited an expert in English to give some advice on the contents of the questionnaires.

The survey combined papers and online questionnaires and applied a seven-point Likert scale to measure whether the respondent (1) extremely disagrees to (7) extremely agrees, while three opposite questions were included for evaluating if the participants paid only cursory attention to answering the questionnaire. The range of participants is mentioned in Section 3.1, and the survey time was December 1 to December 30 in 2018.

4 Results of survey

This research used SPSS23 to analyse the relationships between the research variables and understand the differences between practical and hypothetical research on the real subjects, integrating the analysis as described below.

4.1 Fundamental data analysis

A total of 252 questionnaires were sent out and 239 were returned, for a return rate of 94.8%. Of these, 26 were rejected as invalid, leaving 213 valid responses, giving an 89.1% total for all returned questionnaires and a return rate of 84.5% for valid questionnaires. As shown in Table 1, the fundamental data analysis included 94 men, for a total of 44.1%, while the number of women was 119, for a total of 55.9%. The largest age distribution was among 50–59 year-olds, at 34.7%, while the lowest was among those aged 29 and under, at 4.2%. The highest rate of job tenure was among those who had worked for 21–30 years, accounting for 31.9%, while the shortest job tenure was less than two years, accounting for 5.6%. The highest rank among public servants was employees of junior rank, accounting for 38.5%, while the lowest rank was maintenance workers, accounting for 1.9%; of the other ranks, 17 managers filled out the questionnaires, accounting for 8%. In terms of e-learning platforms, 43.7% of the subjects made use of the e-learning+ and Taipei e-campus platforms at the same time, while up to 44.1% of the subjects used only the Taipei e-campus platform, and 12.2% subjects chose only the e-learning+ platform. As for hours attested to using Taipei e-campus, 25.4% of respondents used it for 1–10 hours, and up to 25.8% did not use the e-learning+ platform at all. Moreover, 32.9% of the subjects used Taipei e-campus more than 41 hours, indicating the subjects much preferred Taipei e-campus as their e-learning platform.

4.2 Reliability and validity analysis

We determined the validity of the scale by highlighting the return rate of the questionnaires, checking the coefficient of internal consistency of the facet scale in researching the data, and using Cronbach's α coefficient in an exploratory factor analysis to calculate the reliability. In every facet scale of the valid questionnaires, Cronbach's α coefficient was more than 0.7, indicating the reliability in every variable was favourable, with enough internal consistency. For confirmation factor analysis, Likert is the most common scale, especially for measuring sense and attitude, and the measure mode constructed from the 3-TUM has been divided every variable. Since we wished to know the bearing capacity in the factors of standardisation in every variable from the measurement model in this research, the research cited the questionnaires made by Liaw (2008), through confirmation factor analysis, composite reliability, and the average variance extracted. The analytical outcome of reliability and validity showed composite reliability was between 0.801~0.955, which was above the normal value of 0.7, and the average variance extracted was between 0.507~0.878, which was above normal value 0.5. In conclusion, using composite measure mode ensured good internal consistency and convergent validity.

Table 1 Descriptive statistics of the fundamental data (N = 213)

<i>Variables</i>	<i>Category</i>	<i>Numbers of participants</i>	<i>%</i>
Gender	Male	94	44.1
	Female	119	55.9
Age	Under 29	9	4.2
	30–39	43	20.2
	40–49	71	33.3
	50–59	74	34.7
	More than 60	16	7.5
Job tenure	Under 2 years	12	5.6
	3–5 years	18	8.5
	6–10 years	29	13.6
	11–20 years	59	27.7
	21–30 years	68	31.9
	More than 31 years	27	12.7
Rank	Manager	17	8.0
	Senior rank	41	19.2
	Junior rank	82	38.5
	Contract employee	52	24.4
	Contingent worker	17	8.0
	Workers	4	1.9
E-learning platform	Taipei e-campus	94	44.1
	E-learning+	26	12.2
	Both	93	43.7
Hours of attestation in using the e-learning+ platform	0 hour	55	25.8
	1–10 hours	54	25.4
	11–20 hours	25	11.7
	21–30 hours	21	9.9
	31–40 hours	27	12.7
	More than 41 hours	31	14.6
Hours of attestation in using the Taipei e-campus platform	0 hour	17	8.0
	1–10 hours	30	14.1
	11–20 hours	24	11.3
	21–30 hours	35	16.4
	31–40 hours	37	17.4
	More than 41 hours	70	32.9

4.3 Correlation analysis in the 3-TUM model

Probing the relationship between every variable in 3-TUM, this study found the Pearson's product-moment correlation coefficient ranged between -1 and 1 . The closer

the correlation coefficients were respectively to 1 and -1 , the more obvious the relationship of the variables was. Table 2 shows the variables correlation matrix this study found using 3-TUM. The study shows each variables' significance is 0.01, and correlation coefficient > 0.4 , which is a moderate relation, showing that the behaviours of the motor vehicle staff members attending the e-learning are positively related to every aspect of 3-TUM. The higher each degree of the aspects is, the higher is the degree of the public servants' willingness to use an e-learning website.

4.4 Analysis of subjects using 3-TUM from different backgrounds

To examine the influences by external variance on subjects with different backgrounds, this research depended on collected data, which we subjected to an independent sample T-test analysis of gender, analysis of variance (ANOVA) analysis of age, and Scheffé and Games-Howell

post-hoc comparison tests. In addition, we conducted an a posteriori test of the motor vehicles office staff by comparing the differences from all facets of 3-TUM and the rest of the variable statistical analysis of background information and found a number of significant differences, as explained in the following paragraphs.

4.4.1 Variance analysis on motor vehicles office staff in different job tenures

We used ANOVA to compare the differences in 3-TUM on the score in every facet of the motor vehicle office staff members' job tenure. As shown in Table 3, except for e-learning system quality, which showed no significant differences, ANOVA found significant differences in the rest of the facets. To find the differences between each variable and factor of job tenure, we conducted a homogeneity test for variance, which, based on the a posteriori test, showed that the attendance rates of interactive learning in e-learning and validity for those workers whose job tenure was 21–30 years were much higher than those workers whose job tenure was 3–20 years. Also, for those workers whose job tenure was 3–20 years, their behavioural intention in e-learning was also much higher than those workers whose job tenure was 3–5 and 11–20 years. Finally, for new workers whose job tenure was under two years, their e-learning behavioural intention was higher than those who worked for 3–20 years.

4.4.2 Variance analysis on motor vehicles office workers of different ranks

Using ANOVA, we compared the differences in 3-TUM on the score in every facet of the motor vehicle office staff members' rank. In Table 4, the results show the P-value in every facet of ANOVA to be $< .05$, which was a significant difference in the post-test score level. The result shows that for the group of motor vehicle staff members in junior rank, assistant rank, and clerk rank, the e-learning perceived self-efficacy, perceived satisfaction, system quality, e-learning effectiveness, and multimedia instruction were significantly lower than most of the ranks.

Table 2 Correlation matrix among variables

	Means	SD	PSE	PS	PU	BI	ELSQ	ILA	ELEF	MMI
Perceived self-efficacy (PSE)	5.45	.843	1	.660**	.649**	.605**	.655**	.552**	.585**	.620**
Perceived satisfaction (PS)	5.41	.999		1	.797**	.823**	.717**	.719**	.794**	.704**
Perceived usefulness (PU)	5.44	.922			1	.746**	.666**	.613**	.753**	.670**
Behavioural intention (BI)	5.25	1.187				1	.633**	.770**	.815**	.749**
E-learning system quality (ELSQ)	5.27	1.002					1	.657**	.656**	.706**
Interactive learning (ILA)	4.84	1.213						1	.811**	.723**
E-learning effectiveness (ELEF)	5.21	1.103							1	.743**
Multimedia instruction (MMI)	4.99	1.049								1

Note. **Correlations are significant at 0.01 (two-tailed).

Table 3 The ANOVA table based on job tenure

<i>Variables</i>	<i>ANOVA</i>		<i>Homogeneity test</i>		<i>Scheffé</i>	<i>Games-Howell</i>
	<i>F value</i>	<i>Significance (p value)</i>	<i>Levene (F value)</i>	<i>Significance (p value)</i>		
Perceived self-efficacy	2.370	.041	1.623	.155	P	
Perceived satisfaction	4.165	.001	1.779	.118	P	
Perceived usefulness	2.396	.039	3.137	.009		P
Behavioural intention	6.335	.000	3.612	.004		P
E-learning quality	1.858	.103	.817	.539	-	-
Interactive learning	6.352	.000	.921	.468	P	
E-learning effectiveness	6.339	.000	2.869	.016		P
Multimedia instruction	2.748	.020	1.168	.326	P	

Table 4 Rank and ANOVA table

<i>Variables</i>	<i>ANOVA</i>		<i>Homogeneity test</i>		<i>Scheffé</i>	<i>Games-Howell</i>
	<i>F value</i>	<i>Significance (p value)</i>	<i>Levene (F value)</i>	<i>Significance (p value)</i>		
Perceived self-efficacy	2.831	.017	2.260	.050	P	
Perceived satisfaction	4.057	.002	4.269	.001		P
Perceived usefulness	3.697	.003	2.810	.018		P
Behavioral intention	3.394	.006	1.022	.406	P	
E-learning quality	5.091	.000	4.420	.001		P
Interactive learning	3.366	.006	1.138	.341	P	
E-learning effectiveness	3.849	.002	2.569	.028		P
Multimedia instruction	4.333	.001	2.304	.046		P

4.5 Research hypothesis regression analysis

H1: E-learning satisfaction has a positive impact on learners' self-efficacy and environmental system quality. In Table 5, research hypothesis regression analysis shows that $F(4,208) = 103.887$ and probability $p = .000 < .05$, achieving a significant level, and residual mean squares = .339 is relatively small. In addition, after the adjustment, adjusted R-square $R^2 = .660$, representing about 66% of the variable in perceived satisfaction, which can be explained by the linear regression of perceived self-efficacy and environmental factors, while the variables of environmental factors include e-learning system quality, interactive learning, and multimedia instruction. Moreover, the probability of all variables < 0.05 has a significant effect. The biggest effect is interactive learning ($\beta = .314$). Furthermore, in the aspect of collinearity diagnosis, concerning the variance inflation factor, the smaller the variance inflection value (VIF) value is, the fewer collinearity problems there will be. When the VIF values are < 10 , it means each independent variable does not have the problems of collinearity coincidence. Research shows the biggest VIF value is $2.747 < 10$, which indicates that none of the independent variables has a problem of collinearity. To sum up, e-learning satisfaction has a positive impact on learner's self-efficacy and environmental system quality. \square

Table 5 Regression analysis for Research hypothesis H1

N: 213		R-square: .666		
F(4,208) = 103.887		Adjusted R-square: .660		
Prob. > F = 0.000		Residual MS: .339		
<i>Perceived satisfaction (PS)</i>	β	<i>t value</i>	<i>Significance (p)</i>	<i>VIF</i>
Perceived self-efficacy (PSE)	.221	3.972	.000	1.932
E-learning system quality (ELSQ)	.251	3.954	.000	2.508
Interactive learning (ILA)	.314	5.149	.000	2.322
Multimedia instruction (MMI)	.163	2.455	.015	2.747

Table 6 Regression analysis for Research hypothesis H2

N: 213		R-square: .575		
F(4,208) = 70.295		Adjusted R-square: .567		
Prob. > F = 0.000		Residual MS: .368		
<i>Perceived usefulness (PU)</i>	β	<i>t value</i>	<i>Significance (p)</i>	<i>VIF</i>
Perceived self-efficacy (PSE)	.278	4.423	.000	1.932
E-learning system quality (ELSQ)	.223	3.117	.002	2.508
Interactive learning (ILA)	.141	2.042	.042	2.322
Multimedia instruction (MMI)	.238	3.177	.002	2.747

H2: E-learning perceived usefulness has a positive impact on learners' self-efficacy, and environmental system quality has a positive impact. As shown in Table 6, research hypothesis regression analysis gives $F(4,208) = 70.295$, probability $p = .000 < .05$, achieving a significant level, and the residual mean squares = .368 is relatively small. In addition, after the adjustment, adjusted R-square $R^2 = .567$. To sum up, e-learning

perceived usefulness has a positive impact on learners' self-efficacy, and environmental system quality has a positive impact.

H3: Learners' behavioural intentions have a positive impact on system satisfaction and perceived usefulness. As shown in Table 7, research hypothesis regression analysis gives $F(2,210) = 244.840$, probability $p = .000 < .05$, achieving a significant level, and the residual mean squares = .427 is relatively small. In addition, after the adjustment, adjusted R-square $R^2 = .697$. For the aspect of collinearity diagnosis, the research shows the biggest VIF value is $2.740 < 10$, indicating that none of the independent variables has problems of collinearity. To sum up, learners' behavioural intentions have a positive impact on system satisfaction and perceived usefulness.

Table 7 Regression analysis for Research hypothesis H3

N: 213		R-square: .700		
F(2,210) = 244.840		Adjusted R-square: .697		
Prob. > F = 0.000		Residual MS: .427		
<i>Behavioural intention (BI)</i>	β	<i>t value</i>	<i>Significance (p)</i>	<i>VIF</i>
Perceived satisfaction (PS)	.627	10.013	.000	2.740
Perceived usefulness (PU)	.247	3.943	.000	2.740

H4: E-learning effectiveness has a positive impact on the functional quality of the system environmental factors. As shown in Table 8, research hypothesis regression analysis shows that e-learning effectiveness has a partly positive impact on the functional quality of the system environmental factors. Among these, interactive learning and multimedia instruction have positive impacts, but do not achieve a significant level in e-learning system quality. The analysed reason is that although e-learning system quality, interactive learning, multimedia instruction, and e-learning effectiveness are highly relational (each zero-order correlation is .656, .811 and .743), there is a great deal of overlapping in the independent variables; if the overlapping parts are reduced, the correlation between e-learning system quality and e-learning effectiveness decreases (partial correlation .069~.129), and the predictability of e-learning system quality to e-learning effectiveness also does not achieve a significant level ($\beta = .103, p = .062 > .05$). In other words, as far as the e-learning effectiveness is concerned, e-learning system quality, interactive learning, and multimedia instruction may be significant variables, but, at the same time, considering the independent variables does not more effectively anticipate the e-learning effectiveness than considering only the single one.

Table 8 Regression analysis for Research hypothesis H4

N: 213		R-square: .713					
F(3,209) = 173.384		Adjusted R-square: .709					
Prob. > F = 0.000		Residual MS: .354					
<i>E-learning effectiveness (ELEF)</i>	β	<i>t value</i>	<i>Sig. (p)</i>	<i>VIF</i>	<i>Correlation coefficient</i>		
					<i>Zero-order</i>	<i>Partial</i>	<i>Part</i>
ELSQ	.103	1.874	.062	2.190	.656	.129	.069
ILA	.541	9.615	.000	2.306	.811	.554	.356
MMI	.280	4.673	.000	2.609	.743	.308	.173

5 Discussion and conclusions

The research shows that there is no significant difference between gender and ages in all the facets of 3-TUM, including perceived satisfaction, indicating that regardless of gender and age, involving e-learning in the variables of 3-TUM, the perspectives are not significantly different.

For the aspect of job tenure, the research shows that those motor vehicle staff members whose job tenure was 21–30 years, their attendance of interactive learning, effectiveness, and behavioural intention were significantly higher than those motor vehicle staff members whose job tenure was 3–20 years, which is mainly those middle-aged public servants whose job tenure was 50–59 years. The possible reason is those motor vehicles office staff members who have longer job tenure have a more profound sense of identity on unit performance goals and employment ethics, because of the time background factors and accumulative job experiences. Furthermore, the research also found those new workers whose job tenure was lower than two years, their probability of behavioural intention for attending e-learning was high. The age of new staff members is mainly under 29 years old. These individuals are not unfamiliar with computer science technology, as they grew up during the proliferation time of computer science technology, thus have had more chances to access computers or learn to use them. Through e-platforms, it is now possible to improve or promote self-learning while using work computers.

Concerning the aspect of rank, among the group of motor vehicle staff members of junior, assistant, and clerk rank, the research shows that the areas of e-learning, perceived self-efficacy, perceived satisfaction, system quality, e-learning effectiveness, and multimedia instruction were significantly lower among those staff members whose job tenure was about 6–20 years and 30–49 years old. The possible reason is the staff members of this rank are responsible for contacting people. They need to use their free time to attend e-learning and cannot perfectly arrange their learning hours.

5.1 *E-learning effectiveness has no significant effect on e-learning system quality*

E-learning effectiveness has a positive impact on the functional quality of the system environmental factors, but does not achieve a significant level in e-learning system quality. This conclusion is partly supported by the research of Liaw (2008), and the analysed reason is that although e-learning system quality, interactive learning, multimedia instruction, and e-learning effectiveness are highly relational (according to the regression analysis from the above section, each zero-order correlation is .656, .811 and .743), there is lots of overlapping in the independent variables. Accordingly, if the overlapping part can be reduced, the correlation between e-learning system quality and e-learning effectiveness decreases (partial correlation .069–.129), plus the predictability of e-learning system quality to e-learning effectiveness also does not achieve a significant level ($\beta = .103$, $p = .062 > .05$). According to Lam's (2005) guidelines, considering the independent variables does not effectively anticipate the e-learning effectiveness more than considering only one. In other words, as far as e-learning effectiveness is concerned, whether e-learning system quality, interactive learning, and multimedia instruction are significant variables is unclear in the study. Upon further analysis of the causes, e-learning effectiveness shows no significant difference with the functional selection

manipulation and the reaction rate of e-learning system quality, which means the degree of relationship between the difficulty of manipulating the functional selection in the e-learning platform and its effectiveness is weak. The inferable reason may be that only if the learners successfully choose the class in Taipei e-campus or e-learning+ platform and get enough in-class hours and meet the test standard, as the regulation rules, will they be able to successfully gain the certification hours, which is the major source of behavioural intention.

5.2 Research contribution

The subjects of this research were motor vehicle staff members, to whom no studies have been devoted in the past. This group of people consists of street-level bureaucrats, whose qualities have a direct impact on the administrative effectiveness of the country, which spends a considerable amount of money on cultivating them. Therefore, the practical effect of e-government learning is worth paying attention to. The emphasis of this research study is on the personal tier, to identify and measure the influences on personal e-learning attitudes and behavioural intentions. Although the research focuses only on the personal tier, its findings can improve the entire evaluation of organisation-tier factors. Therefore, to improve the e-learning of public servants, we should expand from the top to the bottom, and from the point to the facet, the central government leads to practice learning online, and gradually implement these in the lower government agencies, as well as deal with different governments and different jobs. This should include, for example, the motor vehicle office station standing at the frontier to serve the public by crafting designs that are customised for e-learning courses and create a system of awards that will encourage the employees to participate. Also, use those who have the longer job tenure and higher ranks for the benchmarking, from the top to the bottom, when implementing e-learning in the public sector.

Moreover, the results can form a practical reference for the Director General of Highways to promote the Taipei e-campus and e-learning+ platforms. In addition, the research shows that for the interactive learning facet, the average value is located within the range of 'no-comment' and 'a-little-bit-agree', indicating that the Taipei e-campus and e-learning+ platforms can reinforce the interactive contents of the e-learning platforms and that such an interactive system can increase the willingness of learners to participate in e-learning.

5.3 Suggestions from the research

According to the results, e-learning becomes much more important under each variable in 3-TUM to motor vehicle staff members. The following focuses on three main aspects to give the research recommendations, including learners, contents of e-learning environment and the future research line. The research shows that those motor vehicle staff members whose job tenure is 21–30 years have significantly higher attendance rates of interactive learning, effectiveness, and behavioural intention than those motor vehicle staff members whose job tenure is 3–20 years, which are mainly those middle-aged public servants whose job tenure is 50–59 years. The possible reason is that those motor vehicles office staff members who have a longer job tenure have a more profound sense of identity on unit performance goals and employment ethics, due to the time background factors and accumulative job experiences. The research shows that the rate of junior

workers' behavioural intention is lower than the senior workers, especially the motor vehicles staff in the junior, assistant and clerk ranks. Their attendance rate of perceived satisfaction, perceived usefulness, e-learning system quality, e-learning effectiveness, and multimedia instructions are much lower than the staff in other ranks. Therefore, we recommend the junior workers should follow senior workers' good examples and enrich their e-learning literacy.

Nowadays, the contents of every e-learning platform in our country not only enhance the professional and management skills, policy capability, leadership development management, regulation training, and so on, but also cover computer professional self-growth and humanistic literacy courses. Now, such platforms also cooperate with other governments to setup business intelligence training, which each government can base on their own needs. For example, after applying the e-learning+ platform, we can directly obtain the professional training area and cyberspace. Such courses include open courses, assembly courses, small private online course (SPOC), MOOCs, micro-learning, e-book, live broadcast courses and others. Therefore, by sharing resources and cooperating, the Director General of Highways can plan the customised courses database according to the abovementioned courses, to increase the varieties of e-courses, and prevent the course selection becoming just a 'form'.

In addition, to design the suggested curriculum, the e-learning platform can focus on different kinds of rank and job tenure. In that case, depending on the log-in rules, the screen will show the customised website, reinforcing the learners' interactions, thereby increasing the willingness to attend classes. Moreover, according to the H4 outcome, the degree of relationship between how difficult it is to manipulate the functional selection in the e-learning platform and how effective the e-learning platform will be is weak. The inferable reason is only if the learners get enough in-class hours and meet the test standard, as the regulation rules, will there be a strong relationship to successfully gaining the certification hours as the highest goal. At the same time, problems like the reaction rate in learning patterns and the problem of manipulating the platform are no longer the primary considerations.

There are two future research directions:

- 1 There are a total of seven motor vehicles offices under the Director General of Highways, and there are many motor vehicles stations under each motor vehicle office. This research can be conducted on each motor vehicles station from a motor vehicles office, to understand more about the motor vehicles staff members' attitudes and behavioural intentions on attending e-learning, recommending the following researchers can expand the range to six other motor vehicles offices, increasing the inclusiveness of the research.
- 2 This study is based on the integrity of two major e-learning websites, the e-learning+ platform and Taipei e-campus, and applied Liaw's 3-TUM questionnaire tool to probe the learning attitudes and behavioural intentions of subjects. We suggest that besides using the 3-TUM questionnaire tool, follow-up researchers could also use other TAMs to explain, diagnose, and anticipate the user's attitude and behaviour when using the e-learning website, to probe the key factors in the user's acceptance of computer science technology.

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