The Technology Acceptance Model with Online Learning for the Principals in Elementary Schools and Junior High Schools

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\textbf{Abstract:} - With the rapid development of information technology and network infrastructure construction, the online learning system has been changed from traditional face-to-face classroom to speedy information technology. On the past decades, few of researchers have constructed specifically for the principals' attitudes toward online learning. The purpose of this study was to develop a Technology Acceptance Model (TAM) for the principals in elementary schools and junior high schools. The TAM on this study was framed by six subscales: perceived ease of use, perceived useful planing, perceived useful learning, perceived useful contents, attitudes toward using online learning, and behavioral intentions to manage via online learning. This study would also explore the relationship between online learning and the principals' leadership. At the same time, the study introduced perceived useful planing, perceived useful learning, and perceived useful contents as new factors that reflected the principals' intrinsic belief in online learning acceptance.

\textbf{Key-Words:} - Online learning, Technology Acceptance Model (TAM), Management in the schools, Principals in elementary schools and junior high schools.

\section{Introduction}

In the past decade, the Internet and World Wide Web (WWW) have been considered important in the schools as part of the learning environment. The value of online learning has become widely recognized with development of information technology so as to accept gradually by instruction in the schools. Through the network, everyone can learn anytime and anywhere. This kind of learning convenience completely changes the traditional teaching model. But it is seldom understood about the principals' behavioral intentions to use WWW.

In 1989, Davis [1] proposed the Technology Acceptance Model (TAM) to address how other factors affected perceived usefulness, perceived ease of use, attitudes toward use, behavioral intentions to use and actual system use. In other words, TAM was made use of expressing the potential user's behavioral intentions to use a technological motivation. Factors contributing to the acceptance of a new information technology (IT) varied with the network, users' belief, and online context. Thus, research on the acceptance of the online learning would enhance researchers' understanding of the principals' beliefs or motivation to use the WWW and to show how these factors affected the principals' use acceptance of the online courses.

The purpose of this study was to extend the TAM in the online learning context. We proposed three new variables--perceived useful planing, perceived useful learning, and perceived useful contents to enhance understanding of the principals' attitudes in online learning. This research also assessed the effect of the difference between the principals' administraion factors on their online learning acceptance behavior--administrative management.
2 Backgrounds

2.1 Technology Acceptance Model (TAM)
In 1989, Davis [2] has shown that TAM could explain the usage of IT. He indicated that perceived usefulness and perceived ease of use represented the beliefs that lead to IT acceptance. According to TAM, perceived usefulness was the degree of which a person believed that using a particular information system would enhance his or her job performance. Perceived ease of use was the degree of which a person believed that using a particular system would be free of effort. Two other constructs in TAM were attitudes toward use and behavioral intentions to use. Attitudes toward use were determined by the user's beliefs and attitudes toward using the system. Behavioral intentions to use were determined by these attitudes toward use the system [2].

Fig. 1. Technology acceptance model [1]

TAM’s dependent variable was actual system use. Behavioral intentions to use lead to actual system use. It had been a self-reported measure employing the application in IT. Fig. 1 showed the original TAM model. Some authors had studied the effect of ease of use or usefulness directly on behavioral intentions to use [3]. Some had considered adding new additional relationships factors to attitudes towards use [4]. Hence, to maintain instrument briefly and permit the study of perceived ease of use and perceived usefulness to attitudes towards use, the current research similarly studied the direct effect of ease of use and usefulness on behavioral intentions to use.

However, in the context of online learning and the school’s factors, they were the principals in the schools, were considered additional variables. Online learning was proposed as a motive for learning online experience here. Additionally, the school’s factors were defined that the principals led teachers to participate online learning activities. Therefore, to increase external validity of TAM, it was necessary to further explore the nature and specific influences of administration at schools and online learning context factors that may alter the principals’ acceptance. Fig. 2 showed the model in the current study.

Fig. 2. The research model in online learning

2.2 Research Model
Fig. 2 illustrated the extended TAM examined here. It asserted that the intentions to manage via online learning were a function of: their perceived usefulness by course contents, learning activities and planning course of online learning, perceived ease of using online learning and attitudes toward using online learning. Intentions were the extent to which the principals would like to manage via online learning in future. Moreover, perceived usefulness was defined as the extent to which the principals believed that online learning would fulfill the purpose. Additionally, perceived ease-of-use was the extent to which the principals believed that online learning was effortless.

The basic assumption was that perceived usefulness in online learning would have a positive effect on the principals' attitudes toward using online learning and their behavioral intentions to manage via online learning.

2.3 Hypotheses
This research model adopted the TAM usefulness – attitude – intention – behavior relationship, so the following TAM hypothesized relationships were proposed in the context of online learning:

**Hypothesis 1.** Perceived ease of use is positively related to perceived useful planning in online learning.

**Hypothesis 2.** Perceived ease of use is positively related to perceived useful learning in online learning.

**Hypothesis 3.** Perceived ease of use is positively related to perceived useful contents in online learning.

**Hypothesis 4.** Perceived ease of use is positively related to attitudes toward using online learning.

**Hypothesis 5.** Perceived useful planning is positively related to perceived useful learning in online learning.
Hypothesis 6. Perceived useful planning is positively related to perceived useful contents in online learning.

Hypothesis 7. Perceived useful planning is positively related to attitudes toward using online learning.

Hypothesis 8. Perceived useful planning is positively related to behavioral intentions to manage via online learning.

Hypothesis 9. Perceived useful learning is positively related to perceived useful contents in online learning.

Hypothesis 10. Perceived useful learning is positively related to attitudes toward using online learning.

Hypothesis 11. Perceived useful learning is positively related to behavioral intentions to manage via online learning.

Hypothesis 12. Perceived useful contents are positively related to attitudes toward using online learning.

Hypothesis 13. Perceived useful contents are positively related to behavioral intentions to manage via online learning.

Hypothesis 14. Attitudes toward using online learning are positively related to behavioral intentions to manage via online learning.

3 Research Method

3.1 Data Collection
T Empirical data were collected by conducting a survey of the principals’ conference in Pingtung, Taiwan. Subjects were the principals in elementary schools and junior high schools. The questionnaires survey yielded 91 usable responses. 76.9% of the respondents were male, and 23.1% were female; 81.3% of the respondents were principals in elementary schools, and 18.7% were principals in junior high schools.

3.2 Data Analysis
The questionnaires were adopted from the thesis on master of education [5]. The internal consistency (Cronbach's α) was 0.9469. The validity and reliability of the scales were deemed adequate. The scale items for perceived ease of use, perceived useful contents, perceived useful learning, perceived useful planning, attitudes toward using online learning, and behavioral intentions to manage via online learning were developed from the study of Yang [5]. The scales were slightly modified to suit the context of online learning. Each item was measured on a five-point Likert scale, ranging from ‘disagree strongly’ (1) to ‘agree strongly’ (5).

To test these proposed hypotheses, data was collected and analyzed using the structural equation modeling (SEM), which combined multiple regression with a series of interrelated dependence relationships. The number of IT studied that use the SEM approach to examine empirically the proposed model was increasing (e.g. [3, 6]).

4 Results
The intent of our study was to extend TAM by adding perceived useful planning, perceived useful learning, and perceived useful contents concepts in online learning. We hoped to explain principals’ acceptance of the online learning. The hypothesized relationships were tested using path analysis presented in Fig. 3.

4.1 Hypothesis Testing
Hypotheses 1, 2, 3, and 4 examined the links between perceived ease of use and perceived useful planning, perceived useful learning, perceived useful contents, and attitudes toward using online learning: perceived ease of use was significantly related with perceived useful planning (path coefficient= 0.53, t-value= 4.418, p<.01) and perceived useful learning (path coefficient= 0.58, t-value= 4.742, p<.01) and perceived useful contents (path coefficient= 0.59, t-value= 4.823, p<.01) and attitudes toward using online learning (β= 0.32, t-value= 3.598, p<.01). Therefore, hypotheses 1, 2, 3 and 4 were all not rejected.

Hypotheses 5, 6, 7 and 8 examined the links between perceived useful planning and perceived useful learning, perceived useful contents, attitudes toward using online learning and behavioral intentions to manage via online learning: perceived useful planning was significantly related with perceived useful learning (path coefficient= 0.77, t-value= 5.791, p<.01) and perceived useful contents (path coefficient= 0.71, t-value= 5.477, p<.01) and attitudes toward using online learning (β= 0.40, t-value= 3.505, p<.01). But perceived useful planning was not significantly related with behavioral intentions to manage via online learning (β= 0.02, t-value= 0.161, p=.872). Therefore, hypotheses 5, 6 and 7 were not rejected.

Hypotheses 9, 10 and 11 examined the links between perceived useful learning and perceived useful contents, attitudes toward using online learning and behavioral intentions to manage via
online learning: perceived useful learning was significantly related with perceived useful contents (path coefficient= 0.69, t-value= 5.373, p<.01) and behavioral intentions to manage via online learning (β= 0.30, t-value= 2.725, p<.01). But perceived useful learning was not significantly related with attitudes toward using online learning (β= 0.10, t-value= 0.835, p=.404). Therefore, hypotheses 9 and 11 were not rejected.

Hypotheses 12 and 13 examined the links between perceived useful contents and attitudes toward using online learning and behavioral intentions to manage via online learning: attitudes toward using online learning was not significantly related with attitudes toward using online learning (β= 0.08, t-value= 0.756, p=.450) and behavioral intentions to manage via online learning (β= 0.14, t-value= 1.388, p<.165). Therefore, hypotheses 12 and 13 were rejected.

Hypotheses 14 examined the links between attitudes toward using online learning and behavioral intentions to manage via online learning: attitudes toward using online learning was significantly related with behavioral intentions to manage via online learning (β= 0.42, t-value= 4.380, p<.01). Therefore, hypothesis 14 was not rejected.

4.2 Technology Acceptance Model Testing
AMOS 5 was used to test our measurement model. The overall model fit was assessed using three kinds of goodness-of-fit indices: absolute fit measures, incremental fit measures, and parsimony fit measures. Absolute fit measures were a direct measure of how well the model specified by the observed data [7]. Absolute fit measures included χ², comparative fit index (CFI), root mean square residual (RMSR) and root mean square error of approximation (RMSEA). Incremental fit measures assessed how a specified model fits relative to some alternative baseline model [8]. Incremental fit measures included adjusted goodness of fit index (AGFI), normalized fit index (NFI), relative fit index (RFI), non-normalized fit index (NNFI), and goodness of fit index (GFI). The third indices, parsimony fit measures, provided information about which among a set of competing models was best [8]. Parsimony fit measures include parsimony goodness of fit index (PGFI), Hoelter’s critical N and χ²/ df. The results showed that all fit indices had clearly exceeded the minimum recommended values that were suggested for a good model fit except parsimony goodness of fit index, as shown in Table 1.

<table>
<thead>
<tr>
<th>Fit indices for measurement model</th>
<th>Acceptable fit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Absolute fit measures</strong></td>
<td></td>
</tr>
<tr>
<td>χ²</td>
<td>p&gt;.05</td>
</tr>
<tr>
<td>GFI</td>
<td>&gt;0.90</td>
</tr>
<tr>
<td>RMSR</td>
<td>&lt;0.08</td>
</tr>
<tr>
<td>RMSEA</td>
<td>&lt;0.08</td>
</tr>
<tr>
<td><strong>Incremental fit measures</strong></td>
<td></td>
</tr>
<tr>
<td>AGFI</td>
<td>&gt;0.90</td>
</tr>
<tr>
<td>NFI</td>
<td>&gt;0.90</td>
</tr>
<tr>
<td>RFI</td>
<td>&gt;0.90</td>
</tr>
<tr>
<td>NNFI</td>
<td>&gt;0.90</td>
</tr>
<tr>
<td>CFI</td>
<td>&gt;0.90</td>
</tr>
<tr>
<td><strong>Parsimony fit measures</strong></td>
<td></td>
</tr>
<tr>
<td>PGFI</td>
<td>&gt;.50</td>
</tr>
<tr>
<td>CN</td>
<td>&gt;200</td>
</tr>
<tr>
<td>χ²/df</td>
<td>&lt;3.00</td>
</tr>
</tbody>
</table>

4.3 Path Analysis
A path analysis of the TAM (see Fig. 3) showed acceptable fit to the data (see Table 1). The percentage of the variance explained (R²) of attitudes toward using online learning was 59% and behavioral intentions to manage via online learning was 61%. Based on our hypothesis 11 and 14, perceived useful learning and attitudes toward using online learning had significant direct effects on behavioral intentions to manage via online learning. However, the perceived ease of use, perceived useful planning, and perceived useful contents also had indirect effects, mainly through perceived useful learning and attitudes toward using online learning, on behavioral intentions to manage via online learning, as shown in Table 2.
Perceived ease-of-use was significantly related with attitudes toward using online learning. They involved both direct and indirect paths:

- **Direct path:** perceived ease-of-use → attitude = 0.32
- **Indirect path:** perceived ease-of-use → perceived useful planning → attitude = 0.53 \times 0.40 = 0.21
- **Total:** Direct + Indirect = 0.32 + 0.21 = 0.53

Perceived useful planning was significantly related with attitudes toward using online learning. They involve both direct and indirect paths:

- **Direct path:** perceived useful planning → attitude = 0.40
- **Indirect path:** perceived useful planning → perceived ease-of-use → attitude = 0.53 \times 0.32 = 0.17
- **Total:** Direct + Indirect = 0.40 + 0.17 = 0.57

Perceived useful learning was not significantly related with attitudes toward using online learning, but they still had indirect paths:

- **Indirect path:**
  - perceived useful learning → perceived useful planning → attitude = 0.77 \times 0.40 = 0.31
  - perceived useful learning → perceived ease-of-use → attitude = 0.58 \times 0.32 = 0.19
- **Total:** Indirect = 0.31 + 0.19 = 0.50

Perceived useful contents were not significantly related with attitudes toward using online learning, but they still had indirect paths:

- **Indirect path:**
  - perceived useful contents → perceived useful planning → attitude = 0.71 \times 0.40 = 0.28
  - perceived useful contents → perceived ease-of-use → attitude = 0.59 \times 0.32 = 0.19
- **Total:** Indirect = 0.28 + 0.19 = 0.47

Perceived ease-of-use was not significantly related with behavioral intentions to manage via online learning, but they still had indirect paths:

- **Indirect path:**
  - perceived ease-of-use → attitude → intention = 0.32 \times 0.42 = 0.13
  - perceived ease-of-use → perceived useful planning → attitude → intention = 0.53 \times 0.40 \times 0.42 = 0.09
- **Total:** Indirect = 0.13 + 0.09 + 0.17 = 0.39

Perceived useful planning was not significantly related with behavioral intentions to manage via online learning, but they still had indirect paths:

- **Indirect path:**
  - perceived useful planning → perceived useful planning → attitude → intention = 0.53 \times 0.32 \times 0.42 = 0.07
- **Total:** Indirect = 0.17 + 0.07 + 0.23 = 0.47

Perceived useful learning was significantly related with behavioral intentions to manage via online learning. They involve both direct and indirect paths:

- **Direct path:** perceived useful learning → attitude → intention = 0.77 \times 0.40 \times 0.42 = 0.13
- **Indirect path:**
  - perceived useful learning → perceived ease-of-use → attitude → intention = 0.58 \times 0.32 \times 0.42 = 0.08
- **Total:** Indirect = 0.30 + 0.13 + 0.08 = 0.51

Perceived useful contents were not significantly related with behavioral intentions to manage via online learning, but they still had indirect paths:

- **Indirect path:**
  - perceived useful contents → perceived useful planning → attitude → intention = 0.69 \times 0.30 = 0.21
  - perceived useful contents → perceived useful planning → attitude → intention = 0.71 \times 0.40 \times 0.42 = 0.12
- **Total:** Indirect = 0.21 + 0.12 + 0.08 = 0.41

Attitudes toward using online learning were significantly related with behavioral intentions to manage via online learning. They just had direct path:

- **Direct path:** attitude → intention = 0.42

Table 2 Effects on attitudes toward using online learning and behavioral intentions to manage via online learning

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>Dependent variables</th>
<th>Direct effects</th>
<th>Indirect effects</th>
<th>Total effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived ease-of-use</td>
<td>attitude</td>
<td>0.32</td>
<td>0.21</td>
<td>0.53**</td>
</tr>
<tr>
<td>perceived useful planning</td>
<td>attitude</td>
<td>0.40</td>
<td>0.17</td>
<td>0.57**</td>
</tr>
<tr>
<td>perceived useful learning</td>
<td>attitude</td>
<td>n.s.</td>
<td>0.50</td>
<td>0.50**</td>
</tr>
<tr>
<td>perceived useful contents</td>
<td>attitude</td>
<td>n.s.</td>
<td>0.47</td>
<td>0.47**</td>
</tr>
</tbody>
</table>

R² = 0.59
Perceived ease-of-use intention n.s. 0.39 0.39**

perceived useful planning intention n.s. 0.47 0.47**

perceived useful learning intention 0.30 0.21 0.51**

perceived useful contents intention n.s. 0.41 0.41**

attitude intention 0.42** n.s. 0.42**

R²=0.61

Note: n.s. means no significant; ** P < 0.01.

5 Conclusion

According to the AMOS analysis, the model demonstrated good fit with the data. The results provided evidence of the utility of TAM in online learning. We also found that TAM, which was originally designed to study the initial behavioral intentions, could also be used to understand principals' online learning. Finally, TAM showed potential to provide a more complete explanation about principals' management behavior via online learning. This TAM accounted for more variance in perceived ease of use, perceived useful contents, perceived useful learning, perceived useful planning, attitudes toward using online learning, and behavioral intentions to manage via online learning.

This study revealed that the acceptance of online learning could be predicted by extended TAM (R²=0.61). Perceived useful learning and attitudes toward using online learning significantly and directly affected behavioral intentions to manage via online learning. Notably, differing from the findings of previous TAM studies, the results of this study indicated that perceived useful planning did not motivate principals to manage via online learning, but it directly affected attitudes toward using online learning. However, according to the analytical results, perceived useful learning directly affected principals' behavioral intentions to manage via online learning. Hence, we inferred that other factors related to the acceptance of online learning should be considered. Perceived useful planning and perceived useful learning were likely to be important influences on the acceptance of online learning.

References: