Using the Kinetic Magic Cursor in Education to Predict the Behavioral Intention in Using Technology

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Abstract **– A Unified Theory of Acceptance and Use of Technology (UTAUT) is a theory to measure how far users accept technology. This paper presents Venkatesh's theoretical framework and Unified Theory of Acceptance and Use of Technology (UTAUT2), which UTAUT extended. UTAUT2 was used to assess the user's acceptance of the Kinetic Magic Cursor (KMC). UTAUT's theoretical framework has eight dimensions to predict behavioral intention in using technology. These dimensions of the UTAUT2 consist of performance expectation, social influence, hedonic motivation, effort expectancy, facilitating condition, habit, price value, and behavioral intentions. This study aimed to analyze the UTAUT2 by the genders among undergraduate students in Taiwan. UTAUT2 was used as a theoretical framework and Analytic Hierarchy Process (AHP) with expert choice 11.5 to analyze the data. The study found no significant difference between female and male students in using technology. The validity of structure for male and female student performance in KMC has a slightly similar percentage in the effort expectancy and behavioral intentions; males were 17.7% and 13.1%, and females were 17.6% and 13.4%, respectively.**

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1. Introduction

Assessment of the user's acceptance of the science and technology innovation is one of the ways to measure how far the science and technology are accepted by the users [1]. Many researchers have studied users' acceptance of the technology through many theoretical frameworks. In 1985, Fishbein and Ajzen extended (The theory of Reasoned Action, TRA) into planned behavior theory (Theory of Planned Behavior, TPB) by adding cognitive-behavioral control (Perceived Behavioral Control, PBC) dimensions and by pointing out that PBC under control beliefs, perceived convenience of the perceived facilitation, and other factors [2]. In 1989, Davis, Bagozzi, and Warshaw also fixed the TRA model proposed Technology Acceptance Model (TAM) through empirical analysis; this effort showed that those information systems use the associated behavioral intentions and actual use of architecture [3].

In 2003, groups of researchers, through structural equation modeling (SEM) empirical analysis and summarizing previous different views, put forward 'the unified theory of acceptance and use of technology (UTAUT) [4]. Previously, the authors have also experienced using SEM to analyze a specific dimension as well as dimensions of UTAUT through SEM [5]. This theoretical framework integrated the usability assessment model previously with multiple perspectives and has gradually been widely adopted [6]. The recent UTAUT2 theoretical framework has eight dimensions of science and technology to predict behavioral intention. These dimensions included: performance expectation, social influence, hedonic motivation, effort expectancy, facilitating condition, habit, price value, and behavioral intentions.

This paper presents a Venkatesh theoretical framework to assess the user's acceptance of KMC. A brief review of the framework concepts and the KMC is discussed in the following section. Meanwhile, AHP using Expert Choice 11.5 is used to analyze the users' performance based on gender.

1.1. KMC (Kinetic Magic Cursor)

Today's technology innovation is the Kinetic Magic Cursor (KMC), with the familiar called somatosensory gesture, which develops human motion capture and refers to organ feel [7], [8]. KMC is being one of the most notable wireless technology acquired by Microsoft to PrimeSense company's patented technology. This sensor is applied first in Microsoft Xbox 360 consoles sold together, but Microsoft released the patent in 2012 from the source code (software development kit, SDK), in order to promote the joint development of all sectors of Kinect on Windows systems for various applications mode [9], [10]. It has also been developing several current sensing Kinect that can be converted into a Windows system message handling instructions intermediary software tools, such as Flexible joint action setting tool (Flexible Action and Articulated Skeleton Toolkit, FAAST) [11] and gesture cursor tool (Kinect Magic Cursor) [12].

1.2. AHP (Analytic Hierarchy Process)

The Analytic Hierarchy Process (AHP) is “a theory and methodology for relative measurement” [13], introduced by Thomas Saaty (1980) [14]. Researchers more emphasized the proportions of some quantities in relative measurement than the exact measurement of those quantities. Currently, the AHP is utilized as a technology for assisting decisions; it appears that its study belongs to decision analysis. The AHP contemplates a set of alternative options and evaluation criteria, among which the best decision should be made.

1.3. Venkatesh’s Framework to Assess the User’s Acceptance

UTAUT extends the UTAUT2 theoretical framework to understand the user's acceptance and use of technology. UTAUT has four keys constructed that are performance expectancy (degree of using technology to take the gain in the specific activities), effort expectancy (degree of the user in using technology), social influence (others who encourage the user to use technology), and facilitating condition (refers to user perception about the resources for using the technology). Further, Venkatesh developed the dimension of the UTAUT to become eight dimensions by adding hedonic motivation (the willing or the pleasure of the user in using technology), price value (the cost on the pricing of user perception toward the technology), habit and behavioral intentions (the intention of the user to use the technology) [4], [15]. Each dimension has items, there are 3, 4, 3, 4, 3, 3, 3, 3, respectively, and each dimension has a total of 23 topics.

UTAUT2 theoretical framework revised cumulative explained variance (cumulative explained variances) predicted behavioral intentions, from the original 56% could be raised to 74%, while by behavioral intentions intermediary variables to predict the behavior of the acceptance of the use of technology, the cumulative explained variance can be increased from 40% to 52%. Venkatesh et al. in 2012 proposed, including a "behavioral intentions" total of eight dimensions as the basis to assess compliance with the terms [15] and following the secondary somatosensory system, to fix 26 dimensions under the subject in order to establish the present study to construct validity table [8].

2. Method

2.1. Experimental Design

The user’s acceptance performance measure on KMC is undergraduate students in the Department of Education of a public university in Taiwan. The research was conducted when the first and second authors pursued their doctoral degrees. The number of students is a-35 students divided by gender (male and female). The framework of this study consists of three steps:

- ✓ Comparing students’ performance with two operations by using KMC and Mouse,
- ✓ Checking the KMC system architecture,
- ✓ Using AHP with the Expert Choice 11.51.

2.2. Comparing Student’s Performance with Two Operations, by using KMC and Mouse

To measure education students’ performance, we used the UTAUT2 (“Unified theory of acceptance and use of technology”) by Venkatesh. UTAUT2’s construct validity consists of 8 dimensions, according to the structural equation model analysis of Venkatesh [4],[15]. The subject of these facets, these dimensions have efficiency factor loadings between .70 to .87. The loading indicated a high number to claim the existence of the dimensions [5]. Meanwhile, the technology used to explain the behavior of the entire acceptance of 52%, with an average of 4.99 and a standard deviation of 1.28., (see Table 1.).

We designed the steps to compare the student's performance between KMC (Kinetic Magic Cursor) and mouse in Table 2. There are three steps:

- To control the screen cursor
- To choose the button on game
- To hold and drag object

Table 1. Indicator to assess the validity KMC acceptance

Structure of dimensions	M	SD
1.Performance expectation	4.40	1.15
2.Effort expectancy	5.25	1.02
3.Social influences	3.76	1.20
4.Facilitating Condition	5.18	1.08
5.Hedonic Motivation	4.60	1.28
6.Price Value	5.15	0.91
7.Habit	4.15	1.17
8.Behavioral Intention	4.89	1.14
Overall	4.99	1.28
Acceptance of KMC (cumulative variance explained of 52%)		

Table 2. The operating step comparison between Kinect Magic Cursor and mouse [12].

Operating Mode Step	A. Kinect Magic Cursor	B. Mouse
1.Control the screen cursor	1-1. To raise right hand	1-1. To move mouse
2.Choose button on game	2-1. To push left hand	2-1. To click left button
3.Hold and drag object	3-1. To hold right hand, and then move and release	3-1. To hold right button, and then move and release

2.3. KMC System Architecture

Bally, Brittan, and Wagner facilitated the program system development by taking a prototype strategy to develop the system's advantages, allowing system developers from the abstract demand through continuous testing correction and the rapid development of the system prototype. Developers can run efficiently for a subsequent evaluation system to be more likely to promote the subsequent application [16]. This study was taken to develop a prototype model of KMC.

In the KMC, the system includes a Kinect software development tool provided by Microsoft (Software Development Kit, SDK), and then with the computer operating system Windows 10, a single gun projector, and Kinect sensor hardware to complete the KMC [12]. Whole-body feeling gestures cursor planning framework as shown in Figure 1. When subjects are in the appropriate sensing Kinect distance (the best distance is 1.5 to 3.5 m), the palm is the cursor on the screen. When the palm of our hand moves, the cursor moves on the screen along with his palms like a mouse as cursor on. Then, the researchers moved on through gestures to control the screen.

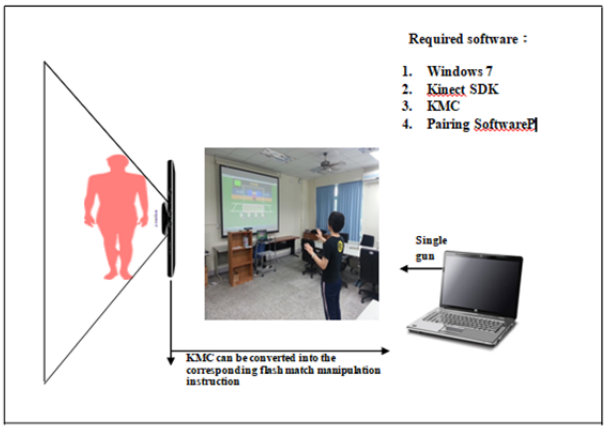


Figure 1. Framework planning in somatosensory gesture to manipulate cursor in match game learning software

2.4. AHP with Expert choice 11.5

Saaty developed the Analytic Hierarchy Process in 1971 as a multi-criteria method purposed to sustenance the decision-making process. The main feature of AHP is delineating the problem as a hierarchical form and comparing its element in pair-wise comparison by Saaty's scale [14]. The AHP is a comprehensive feature suitable for the situation when people make multi-criterion and multi-object for any number of alternatives to evaluate it.

The AHP framework assumes a unidirectional hierarchical relationship among decision levels. The highest level of the hierarchy is the overall goal, followed by factors, criteria, and sub-criteria in the middle of the level and decomposed to more specific elements until a level of manageable decision criteria is met in the lowest level. A complex problem can be described into its group for arranging in the form of a hierarchy to get the more systematic problems. Generally, prioritization results will be consistent in theory, logic, transparency, and participation when using AHP.

AHP is a widespread technique by Saaty for decision-making as commonly used to derive significances based on sets of pair-wise comparisons. Throughout the hierarchy perception and comparing the whole criterion given to judge the important thing over the other, AHP synthesizes all the judgments using the framework given by the hierarchy to achieve the overall significance of the elements [14]. The AHP point of judgment is computed on a ration scale with scales 1 and 9 together with their reciprocals.

The eight dimensions of UTAUT2 are tested by analyzing the dimensions by using the AHP with the Expert Choice 11.5 software matrix operation. The relative importance of each dimension was determined by comparing the correlation (Pearson's Correlation) between overall dimensions scores and scores of each dimension.

3. Results and Discussion

After collecting data and analyzing it through the AHP by using Expert Choice 11.5, there are no significant differences between female and male students. The validity of structure for male and female student performance in KMC has a slightly similar percentage in the effort expectancy and behavioral intensions dimensions (see Table 3.); for males, it is 17.7% and 13.1%, and for females are, 17.6% and 13.4%, respectively. Male students have the exact figure in effort expectation and hedonic motivation (17.7%) and performance expectation and facilitating condition (14.5%). The lowest percentage is inhabit (8.5%), followed by price value (7.6%) and social influences (6.5%). Female students tend to use KMC as the male students in all domains, except in facilitating condition; the female facilitating condition is 9.3%, while the male is 14.5%.

Another analysis is about the significant views between female and male students using the Pearson Correlation (see Table 4.). Based on the Pearson correlation, it is clear that females and males have the same perception about KMC and Mouse in learning.

Table 3. Gender difference between acceptance of KMC and Mouse

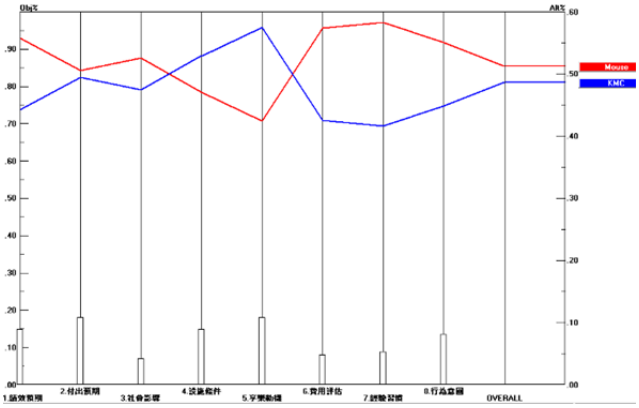
Validity structure	Gender		Total
	Male	Female	
1. Performance Expectation	2 (14.5%)	2 (17.2%)	2 (17.1%)
2. Effort Expectancy	1 (17.7%)	1 (17.6%)	1 (18.2%)
3. Social Influences	6 (6.5%)	8 (6.2%)	3 (14.4%)
4. Facilitating condition	2 (14.5%)	7 (9.3%)	4 (12.0%)
5. Hedonic Motivation	1 (17.7%)	3 (14.7%)	5 (11.8%)
6. Price Value	5 (7.6 %)	5 (11.3%)	7 (8.8%)
7. Habit	4 (8.5%)	6 (10.2%)	8 (8.6%)
8. Behavioral Intentions	3 (13.1%)	4 (13.4%)	6 (9.0%)

Table 4. The same views between female and male students

Item	Data
Pearson Correlation	.763*
Sig. (2 tailed)	.028
Sum of Squares and cross-products	94.381
Covariance	13.483
N	8

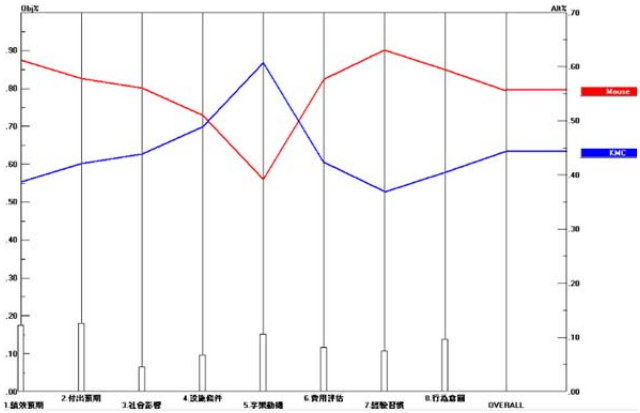
** Correlation is significant at the .028 level (2 tailed)*

The consideration of students using the mouse and KMC was analyzed. The dynamic performance sensitivity for males in KMC can be seen in Figure 2. Similarly, with the male students, overall female students are more common to use the mouse (57%) than KMC (48.9%), considering the eight dimensions through the AHP (see Figure 3.).



Dimensions

Figure 2. The graph of male's performance sensitivity



Dimensio

Figure 3. The graph of female's performance sensitivity

From the bar diagram, there are two dimensions in which females are superior, "Effort Expectancy" and "Hedonic Motivation" (17.7%). After a discussion of the overall sensitivity, we need to adjust it according to the provisional level considerations. However, there are factors that can also be upgraded to a hundred percent, while other factors are reduced to zero, the original is changed in the ratio assuming that the considerations of the hedonic motivation to upgrade to one hundred percent, the tool operating time to consider the case of students in class use KMC than the mouse. These results were also in line with researches by previous researchers, such as [17], [18]. Finally, through this study could be visualized how kinetic magic cursor is used in education in predicting behavioral intention by using technology acceptance model as in Figure 4.

Figure 4. Kinetic magic cursor in education in predicting behavioral intention

4. Conclusion

This paper analyses a user's acceptance of KMC as new technology through Venkatesh's framework, UTAUT2. UTAUT2 consists of 8 dimensions to assess the user's acceptance of technology, the eight dimensions of UTAUT2 are: performance expectancy, effort expectancy, social influences, facilitating condition, hedonic motivation, habit, price value, and behavioral intentions. The AHP is used as a framework to see the sensitivity of students' performance between using KMC and mouse. Based on the research, there are no significant different views on the importance of the dimensions of UTAUT2 between the female user and the male user. Using gesture movement or Kinect of Magic cursor (KMC) is not familiar compared to mouse operating.

References

[1]. Suprapto, N., & Pai, Y. F. (2015). Promoting science centers by using MOOCs: Model for communicating informal science education. *Man in India*, *95*(4), 1005-1012.

[2]. Ajzen, I. (1991). The theory of planned behavior. *Organizational behavior and human decision processes*, *50*(2), 179-211.

[3]. Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User acceptance of computer technology: A comparison of two theoretical models. *Management science*, *35*(8), 982-1003.

[4]. Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS quarterly*, 425-478.

[5]. Suprapto, N., & Mursid, A. (2017). Pre-service teachers' attitudes toward teaching science and their science learning at Indonesia Open University. *Turkish Online Journal of Distance Education*, *18*(4), 66-77.

[6]. Williams, M., Rana, N., Dwivedi, Y., & Lal, B. (2011). Is UTAUT really used or just cited for the sake of it? A systematic review of citations of UTAUT's originating article. In 19th European conference on information systems, Helsinki

[7]. Wu, P. F., Huang, M. J., & Chang, N. W. (2013, May). The learning experience of fine art by somatosensory game device. In *2013 Fifth International Conference on Service Science and Innovation* (pp. 108-114). IEEE.

[8]. Yang, Q., & Lou, S. L. (2013). Applied Research of Somatosensory Control Technology Based on Kinect in Innovation Design of Popular Science Exhibition Items. In *Applied Mechanics and Materials* (Vol. 437, pp. 901-905). Trans Tech Publications Ltd.

[9]. Pan, W. F. (2017). The Effects of using the Kinect motion-sensing interactive system to enhance English learning for elementary students. *Journal of Educational Technology & Society*, *20*(2), 188-200.

[10]. Pan, W. F., Tu, S. C., Chien, M. Y., & Zhang, Y. M. (2013). Feasibility Assessment of Using the KIP System to Achieve an Energy-Savings Potential for an Electronic Marquee. *The Journal of Technology Studies*, 80-90.

[11]. Suma, E. A., Krum, D. M., Lange, B., Koenig, S., Rizzo, A., & Bolas, M. (2013). Adapting user interfaces for gestural interaction with the flexible action and articulated skeleton toolkit. *Computers & Graphics*, *37*(3), 193-201.

[12]. Zeng, W. (2012). Microsoft kinect sensor and its effect. IEEE.

[13]. Brunelli, M. (2015). Introduction and fundamentals. In *Introduction to the Analytic Hierarchy Process* (pp. 1-15). Springer, Cham.

[14]. Saaty, T. L. (1994). *Fundamentals of decision making and priority theory with the analytic hierarchy process*. RWS publications.

[15]. Venkatesh, V., Thong, J. Y., & Xu, X. (2012). Consumer acceptance and use of information technology: extending the unified theory of acceptance and use of technology. *MIS quarterly*, 157-178.

[16]. Bally, L., Brittan, J., & Wagner, K. H. (1977). A prototype approach to information system design and development. *Information & Management*, *1*(1), 21-26.

[17]. Trana, K. T., Nguyenb, P. V., Nguyenc, Y. T., & Dod, N. H. (2020). Assessment of Organisation Satisfaction with the Electronic Tax System in Vietnam. *Assessment*, *11*(12).

[18]. Hamada A. A., Melik, H. N., & Raheem, S. H. (2020). The Use of Fuzzy Logic Theory in Control Charts (A Comparative Study. *International Journal of Innovation, Creativity and Change*, *11*(7), 389-402.