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An analysis of senior high school students' perceptions of computers, and their attitudes and behavioural intentions towards computer use

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ABSTRACT: The purpose of the study was to explore senior high school students' perceptions of computer usefulness and the ease of use, as well as their attitudes and behavioural intentions towards computer use. Differences were found according to students' gender, grades and home environments, which were examined in the study. Cluster sampling was employed in order to conduct a survey, wherein a questionnaire was sent to senior high school students with 662 valid responses. The results of the statistical analysis indicated that all subjects' perceptions, attitudes and behavioural intentions towards computer use were positive and active. The results also indicated that male students' behavioural intentions towards computer use were higher than for female students'. In addition, senior students' perceptions, attitudes and behavioural intentions towards computer use were more positive and active than for junior students. However, the results obtained were still restricted, to a certain extent, to predicting behavioural intentions towards computer use, although students' perceptions of computers, concerning their usefulness and ease of use, were highly related to their attitudes towards computer use theoretically.

INTRODUCTION

The Technology Acceptance Model (TAM) looks at a user's characteristics, interfaces with technological tools, perceived usefulness and ease of use, attitudes and behavioural intentions towards using technological tools. The TAM also tries to predict the attitudes and behavioural intentions of using technological tools based on their perceived usefulness and ease of use. In other words, the higher the indicator of users' perceived usefulness and ease, the more positive will be the users' attitudes and behavioural intentions. This can result in practical behaviour when using technological tools [1-3]. In addition, the perceived usefulness and ease of use towards using technological tools are also influenced by users' age, gender, educational background, profession and habit in computer use.

Some former studies suggested that the perceived usefulness and ease of use to using technological tools might influence the attitude of usage and concrete behavioural performance [4-8]. Studies also showed that the perceived ease of use would reinforce the degree of perceived usefulness towards using technological tools. In addition, perceived usefulness and ease of use to using technological tools are also influenced by factors of interface of technological tools, such as the use of image, touch screens, mouse, etc [9-14].

However, among the studies mentioned above, adults were the main research subjects. In contrast, teenagers and youngsters have been seldom surveyed about their perceptions, attitudes and behaviour to using technological tools [15][16]. As such, senior high school students were chosen to be the research subjects in this study. The results of this study have also confirmed computers to be a concrete category of technological tools and the authors explore the perceptions, attitudes and behavioural intentions towards computer use.

PURPOSE OF THE STUDY

The purpose of this study was to explore senior high school students' perceptions of computer usefulness and ease of use, as well as their attitudes and behavioural intentions to computer usage. Another aim was to investigate and analyse the factors and paths of senior high school students' behavioural intentions towards computer use.

RESEARCH DESIGN

Research Subjects

Cluster sampling was employed for the sample population of senior high school students in Taiwan. Three sample schools were chosen based on the regions of northern, central and southern Taiwan. The researchers then requested the dean of studies or teachers of the sample schools to select two classes from Grades 1 to 3. Thus, 18 classes were selected to be the sample classes. Three hundred questionnaires were sent to each sample school and a total of 900 questionnaires were sent to the three sample schools.

Research Instruments

A questionnaire on *Perceptions and Use of Computer* was developed for this study, based on computer related measurement. The main content of the questionnaire sought to investigate the degree of the perceived computer usefulness and ease of use, as well as attitudes and behavioural intentions towards computer use. In the questionnaire, 15 questions targeted the perceived computer usefulness were used to investigate the degree of approval in using computers to promote working efficiency, 15 questions focused on the perceived ease of use and the degree of approval that computers are easy to use, and nine questions about attitudes

and behavioural intentions towards computer use were utilised to investigate the concepts, opinions and purposes towards using computers. A five-point Likert scale was designed for the questionnaire, with *1* representing strongly disagree and *5* representing strongly agree with a given statement.

The *Perceptions and Use of Computer Questionnaire* was constructed via a thorough process. Eight professional experts were invited to review and verify the content in order to enhance the credibility and validity of the instrument. In addition, the Cronbach alpha coefficient was utilised to examine the internal consistency and reliability of the instrument [17]. The statistical results of the study indicated that the Cronbach alpha coefficients values of the four variables were between 0.74 and 0.75, which were above the conventional level of 0.70 [18].

Data Collection

The data collection was conducted from March to April 2004. There were 900 questionnaires sent to the three sample schools. A total number of 766 questionnaires were returned, incorporating 412 questionnaires completed by male students and 354 filled out by female students. The response rate was 85.1%. After careful inspection, 104 questionnaires were judged as invalid questionnaires because of incomplete or missing background information, with 10 questions left unanswered or more (about $^1/_5$ of the total number of questions), or if answers were difficult to recognise or found to have been carelessly filled out (eg answers were arranged by the regular S type). As a result, the total number of valid responses was 662 (about 73.5% of the sent questionnaires).

Data Analysis

This study administered a descriptive statistical method by utilising the mean scores and standard deviation to analyse the data so as to understand the concentrated and dispersed situation of the sampled students' perceptions of computers, plus their attitudes and behavioural intentions towards computer use. In addition, due to gender differences, grades, and home environments of senior high school students, the results of their perceptions of computers, attitudes and behavioural intentions towards computer use were contrasted and compared. As such, the researchers applied t-test and the statistical analysis of variance (ANOVA) to examine the measured results. Furthermore, the researchers adopted the path analytic approach to analyse the influential factors and paths of the behavioural intentions towards computer use.

Research limits have been identified. The study results may not be able to be inferred to students of other subjects, or different school levels of students, since this study was only aimed at exploring senior high school students' perceptions of computer, and their attitudes and behavioural attentions to computer use. Also, there were many complicated variables, but this study only focused on the variables of gender, grades and home environment.

STATISTICAL RESULTS

Differences in Gender of the Sampled Students

The mean scores of male and female sampled students' perceived usefulness of computer were all higher than the average mean score. According to the results, the mean score of the sampled male students was 3.66 (SD=0.33), while the mean score of the sample female students was 3.68 (SD=0.29). Yet the results of the t-test analysis indicated that there was no statistically significant difference in the mean scores between the male and female students. In addition, the mean scores of the male and female students' perceived ease of use towards computer were also higher than the average mean score. The mean score of the sampled male students was 3.68 (SD=0.35), while the mean score of the sampled female students was 3.66 (SD=0.35). However, a t-test analysis indicated no statistically significant difference in this case as well.

Furthermore, the mean scores of the sampled male and female students' attitudes towards computer use were 4.04 and 4.03 respectively (SD=0.55; SD=0.53). A t-test analysis revealed no statistically significant difference. In addition, the results of behavioural intentions towards computer use showed that the mean score of the sample male students was 3.91 (SD=0.59) and the mean score of the female students was 3.68 (SD=0.63). In this case, a t-test analysis showed there was a statistically significant difference ($t=4.921$, $p<0.01$). In other words, the behavioural intentions towards computer use of senior high school male students were more positive than for female students'. The statistical information is listed in Table 1.

Table 1: Sample male and female students' perceptions of computer, and their attitudes and behavioural intentions towards computer use.

	Male Students		Female Students		t-test
	Mean	S.D.	Mean	S.D.	
Perceived usefulness	3.66	0.33	3.68	0.29	-1.002
Perceived ease	3.68	0.35	3.66	0.35	0.696
Attitudes	4.04	0.55	4.03	0.53	0.274
Behavioural intentions	3.91	0.59	3.68	0.63	4.921**

**$p < 0.01$

Differences in Grade-Levels of the Sampled Students

The mean scores of the first, second and third grade sample students' perceived usefulness of computer use were all higher than the average mean score of the questionnaire. The mean scores of the first, second and third grade students were 3.66 (SD=0.32), 3.66 (SD=0.31) and 3.70 (SD=0.31), respectively. The results of an ANOVA analysis indicated no statistically significant difference in the mean scores between the first, second, and third grade sampled students. In addition, regarding the category of the perceived ease of use of computers, the results showed that the mean scores of the first, second and third grade sampled students were 3.65 (SD=0.35), 3.62 (SD =0.35) and 3.74 (SD=0.33), respectively. An ANOVA analysis showed there to be a statistically significant difference ($F=7.29$, $p<0.01$) in this case.

Furthermore, the results of Scheffe's *post hoc* test indicated that the mean scores of the third grade sample students were higher than those of the first and second graders. As a result, the third grade students' approval degree of perceived ease of computer use was higher than for the first and second grade students.

Concerning the attitudes and behavioural intentions towards computer use, the mean scores of the first grade students were 4.02 and 3.81 (SD=0.53 and SD=0.61), respectively; the mean scores of the second grade sample students were 3.97 and 3.70 (SD=0.57 and SD=0.69), respectively; while the means of the

third grade sample students were 4.11 and 3.91 (SD=0.50 and SD=0.53), respectively. An ANOVA analysis showed that the mean scores of the two groups of the first, second and third grade students all reached a statistically significant difference (F=4.16, p<0.01 and F=5.96, p<0.01). In addition, Scheffe's *post hoc* test revealed the mean score of the third grade students to be higher than the second grade students. Therefore, the third grade students' ideas, opinions and behavioural intentions towards computer use were superior to those of the second grade students'. The statistical information is listed in Table 2.

Table 2: Different grades sample students' perceptions of computer, and their attitudes and behavioural intentions towards computer use.

	1st Grade		2nd Grade		3rd Grade		F
	Mean	S.D.	Mean	S.D.	Mean	S.D.	
Perceived usefulness	3.66	0.32	3.66	0.31	3.70	0.31	1.429
Perceived ease of use	3.65	0.35	3.62	0.35	3.74	0.33	7.288 (3)>(2), (3)>(1)
Attitudes	4.02	0.53	3.97	0.57	4.11	0.50	(3)>(2)
Behavioural intentions	3.81	0.61	3.70	0.69	3.91	0.53	5.962 ** (3)>(2)

**p < 0.01

Factors and Paths that Influenced Senior High School Students' Behavioural Intentions towards Computer Use

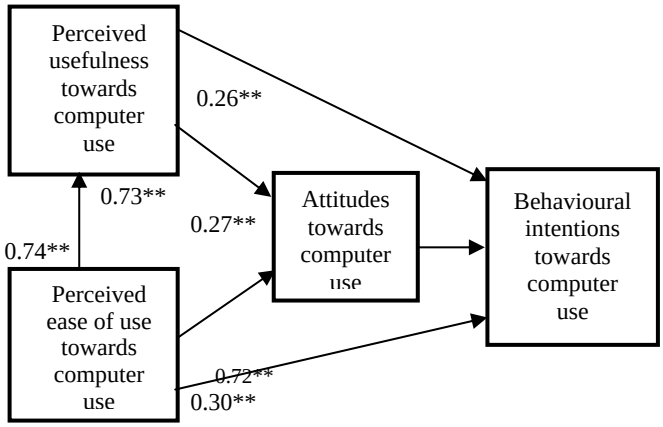
According to the results of the path analysis, the path coefficient value was 0.74 with 0.55 of R^2 from perceived ease of use to perceived usefulness towards computer; this was statistically significant (t =28.39, p<0.01). That is, senior high school students' approval of perceived ease of use towards computer use contributed to the approval of increasing work efficiency using computers. In addition, the path coefficient values of 0.73 and 0.72 from perceived usefulness and perceived ease of use towards computer use to attitudes towards computer use were statistically significant (t =27.65, p<0.01; t =26.81, p<0.01). The R^2 values were 0.54 and 0.52, respectively, indicating senior high school students' perceptions of computers greatly influenced their ideas and opinions of computer usage. See also Table 3.

Table 3: The statistical information of the path analysis.

	Path Coeffic't	Standard Error	t-test	R^2
Perceived Usefulness				
Perceived ease of use	0.74	0.02	28.39**	0.55
Attitudes				
Perceived usefulness	0.73	0.02	27.65**	0.54
Perceived ease of use	0.72	0.02	26.81**	0.52
Behavioural Intentions				
Perceived usefulness	0.26	0.02	7.04**	0.07
Perceived ease of use	0.30	0.01	8.06**	0.09
Attitudes	0.27	0.02	7.31**	0.08

** p < 0.01

Furthermore, the path coefficient values of 0.26 and 0.30 from perceived usefulness and perceived ease of use towards computer use to behavioural intentions towards computer use were statistically significant (t=7.04, p<0.01; t=8.06, p<0.01). The path coefficient value of 0.27 from attitudes to behavioural intentions towards computer use was also statistically significant (t=7.31, p<0.01). According to these results, senior high school students' perceptions of computers and their attitude towards computer use may influence behavioural intentions towards computer usage. Those factors that affect behavioural intentions towards computer usage are shown in a path analysis (see Figure 1).



** p < 0.01

Figure 1: Path analysis of the factors that affect behavioural intentions towards computer usage.

From the results of the path analysis, senior high school students' perceptions of computer concerning usefulness and ease of use were closely related to attitudes towards computer use. Yet these results were restricted, to a certain extent, to predicting behavioural intentions towards computer use. As such, there should be some variances that the researchers have not yet explored among the perceived usefulness, ease of use, attitudes, and behavioural intentions towards computer use.

CONCLUSION

This study was well designed with a number of research methods implemented to analyse the data and to obtain accurate results. The research methods included a survey questionnaire and statistical methods, such as t-test, ANOVA, product-moment correlation and path analysis. The findings of the study are given below.

The results indicate that the mean scores of high school students' opinions and ideas towards computer were higher and more positive than the intentions of computer use. The mean scores were very low regarding increasing work efficiency or degree of approval of ease of use. This indicates that high school students' attitudes towards computer use were active, but they did not think that computers were easy to use or useful.

Senior high school male students tended to be more active than female students when utilising computers. Third year students' approval degree of ease of computer use was also higher than for second and first year students, which indicates that senior high school male students had greater contact with machines and tools than females, thus becoming more familiar and skilled. As a result, the behavioural intention towards using computer technology was more active. In addition, senior year

students had more time and chances for contact with computers, and were also familiar with all kinds of computer functions. Thus, computers were easy for them to use.

The perceptions of computers concerning usefulness and ease of use are highly related to attitudes towards computer use. However, the results were somewhat restricted to predicting behavioural intentions of computer use. In summary, senior high school students' perceived ease of computer use may influence their perceived sense of computer usefulness, and their perceived ease of use and usefulness may affect their attitudes towards computer use. However, their attitudes to computer use had a smaller influence on their behavioural intentions towards computer use.

SUGGESTIONS

The first suggestion is to design an easy-to-use and useful computer interface and facilitate a positive computer-use attitude. Students' perceived computer ease of use might affect their perceived computer usefulness. Both perceived computer ease of use and usefulness may affect their attitude towards computer use. Thus, the researchers suggest that both software and hardware design should follow the *easy-to-use* principle. An easy-to-use computer interface enables users to recognise the usefulness of computer and thus increase their productivity and work efficiency, thereby building more accurate attitudes to computer usage.

Secondly, systematised computer software and hardware learning courses should be established, from easy to difficult, in a step-by-step manner, to cultivate information literacy and proficiency. Senior high school students' perceived computer usefulness and ease of use, and their attitudes and behavioural intentions to computer use, were positive and active. Thus, it is important to provide more systematised software and hardware learning courses for students to engage in various computer-learning activities based on students' different background and interests. Such courses should be designed from easy to difficult, with gradual increases in learning length and time, thereby cultivating computer literacy and proficiency.

SUGGESTIONS FOR FUTURE STUDIES

This study explored senior high students' perceived computer usefulness and ease of use, plus their attitudes and behavioural intentions to computer use. Due to the study's limitations, the results may not verify all models of computer usage. However, it is worthwhile for researchers to conduct further studies based on the findings of this study in the near future.

Concerning research instruments, there are still some related research instruments that need to be explored and tested, like the verification of the computer acceptance model, including a cognition evaluation of users' behaviour, and the interaction evaluation of users' behaviour and design functions.

The research approach could be expanded concerning research subjects, as there is no specific subject group for using the computer acceptance model; anyone aged from pre-school to adulthood can be a research subject in the computer acceptance model. In many previous studies, adults were the research subjects. Youngsters and teenagers' perceptions, attitudes or behaviour towards computer use were rarely discussed.

Although the findings of this study provide in-depth discussions and suggestions of teenagers' perceptions, attitudes and usage behaviour towards computers, these results still cannot be referred to other age groups of people. Thus, it is necessary to conduct similar studies on other age groups in order to verify the computer acceptance model.

REFERENCES

1. Davis, F.D., Bagozzi, R.P. and Warshaw, P.R., User acceptance of computer technology: a comparison of two theoretical models. *Management Science*, 35, **8**, 982-1003 (1989).
2. Davis, F.D., User acceptance of information technology: system characteristics, user perceptions and behavioral impacts. *Inter. J. of Man-Machine Studies*, 38, 475-487 (1993).
3. Davis, F.D. and Venkatesh, V., A critical assessment of potential measurement biases in the technology acceptance model: three experiments. *Inter. J. of Human-Computer Studies*, 45, 19-45 (1996).
4. Etezadi-Amoli, J. and Farhoomand, A.F., A structural model of end user computing satisfaction and user performance. *Info. & Management*, 30, 65-73 (1996).
5. Palvia, P.C., A model and instrument for measuring small business user satisfaction with information technology. *Info. & Management*, 31, 151-163 (1996).
6. Abdulla, A-G., The impact of user satisfaction on computer-mediated communication acceptance: a causal path model. *Info. Resources Management J.*, 9, **1**, 17-26 (1996).
7. Zweig, D. and Webster, J., Personality as a moderator of monitoring acceptance. *Computers in Human Behavior*, 19, 479-493 (2003).
8. Schiaffino, S. and Amandia, A., User-interface agent interaction: personalization issues. *Inter. J. of Human-Computer Studies*, 60, 129-148 (2004).
9. Warshaw, P.R., A new model for predicting behavioral intentions: an alternative to Fishbein. *J. of Marketing Research*, 17, **2**, 153-172 (1980).
10. Igbaria, M., Iivari, J. and Maragahh, H., Why do individuals use computer technology? A Finnish case study. *Info. and Management*, 29, **5**, 227-238 (1995).
11. Igbaria, M., Parasuraman, S. and Baroudi, J.J., A motivational model of microcomputer usage. *J. of Management Info. Systems*, 13, **1**, 127-143 (1996).
12. Venkatesh, V. and Davis, F.D., A model of the antecedents of perceived ease of use: development and test. *Decision Sciences*, 27, **3**, 451-481 (1996).
13. Jackson, C.M., Chow, S. and Leitch, R.A., Toward an understanding of the behavior intention to use an information system. *Decision Sciences*, 28, **2**, 357-389 (1997).
14. Agarwal, R. and Prasad, J., Are individual differences germane to the acceptance of new information technologies? *Decision Sciences*, 30, **2**, 361-391 (1999).
15. Venkatesh, V., Creation of favorable user perceptions: exploring the role of intrinsic motivation. *MIS Quarterly*, 23, **2**, 239-260 (1999).
16. Moon, J.W. and Kim, Y.G., Extending the TAM for a World-Wide-Web context. *Info. and Management*, 38, **4**, 217-230 (2001).
17. Cronbach, L.J., Coefficient alpha and the internal structure of tests. *Psychometrika*, 16, 294-334 (1951).
18. Nunnally, J.C., *Psychometric Theory* (2nd edn). New York: McGraw-Hill (1978).