Measuring Computer and Web Attitudes Using Cas and Was Measurement Instruments

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Abstract. *The purpose of this article was to examine CAS (Computer Attitude Scale) and WAS (WWW Attitude Scale) measurement instrument for measuring computer and WWW attitudes in Region of East Croatia.*

The research questions to be answered by this study are: (R1) What is the relationship between the CAS and the WAS? (R2)What are the predictor variables of various computer experiences to the CAS and to the WAS? (R3) Are there significantly demographic differences on the CAS and on the WAS?

Internal consistency, stability and validity of the CAS and the WAS measurement instrument were tested and discussed.

Keywords. CAS, WAS, survey, multivariate statistical analysis

1. Introduction

Understanding why people accept or reject information technology has proven to be one of the most important and challenging issues in information system research [4]. In general, no matter how sophisticated and how capable the technology, its effective implementation depends upon users having positive attitude towards it. Discovering the relationship, similarity, and differences between computer attitudes and Web attitudes are crucial when using information systems, especially those systems integrated computer and Web technologies.

2. Literature review

Ajzen and Fishebein [1] specified that "Attitudes toward targets will predict multiple-act criteria, provided that the attitudinal and behavioral entitles involve the same target elements". (p. 981). Triandis [14] suggested that attitude consists of affective, cognitive, and behavioral components. The affective component of attitude is the emotion or feeling which includes statements of likes or dislikes about some certain objects.

The Computer Attitude Scale, developed by Loyd and Loyd [11], consists of computer anxiety, computer confidence, computer liking, and computer usefulness. Computer anxiety refers thereby to the fear of computers or a person's tendency of to be uneasy, apprehensive, and phobic towards current or future use of computers [7]. Computer confidence refers to the ability to use or learn about computers [6]. Essentially, computer confidence proved to be closely related to computer anxiety [3, 20]. Computer liking refers to liking or enjoying working with computers [3] and computer usefulness refers to the degree of perceived usefulness of using computers for present and future work [3]. In general, anxiety, confidence and liking represent the affective or feeling part of attitude, whereas usefulness represents the cognition or belief part of attitude [13]. In the Computer Attitude Scale, many studies [3, 13, 20] suggested that computer anxiety and computer confidence were part of the same continuum. In addition, Woodrow [16] provided the evidence that the three-scale version of the Computer Attitude Scale had two dimensions, affective and behavioural aspects. Moreover, Nash and Moroz [12] also suggested that the attitude toward academic endeavours associated with computer training should be incorporated into the Computer Attitude Scale. This part refers to the learning and training of computer courses or skills. However, in this article, we tried to answer one question: "How appropriate is CAS instrument for measuring computer attitudes in the Region of Eastern Croatia?"

In general, some studies of Web attitudes were based on Technology Acceptance Model (TAM). TAM developed from socio-psychological Theory of Reasoned Action (TRA; [1]), explained user acceptance of a technology based on user attitudes. A conspicuous difference between the TAM and TRA is that TAM omits subjective norms, mostly because of methodological reasons and partly because they were not significant in explaining behavioural intentions [4]. TAM suggests that two specific behavioural beliefs, perceived ease of use (EOU) and perceived usefulness (U), determine an individual's behavioural intention to use technologies. Perceived ease of use is the extent to which a person believes that using a technology will be free of effort. Perceived usefulness is the extent to which a person believes that using a technology will enhance his/her productivity [15]. In contrast to perceived ease of use, which is process expectancy, perceived usefulness is outcome expectancy. The behaviour intention to use technologies leads to actual system use. Previous research has demonstrated the validity of this model across a wide variety of Web systems [10, 17].

3. Research design

3.1. Research questions

The research questions to be answered by this study are: (R1) What is the relationship between the CAS and the WAS? (R2)What are the predictor variables of various computer experiences to the CAS and to the WAS? (R3) Are there significantly demographic differences on the CAS and on the WAS?
All of them are presented in the Figure 1.

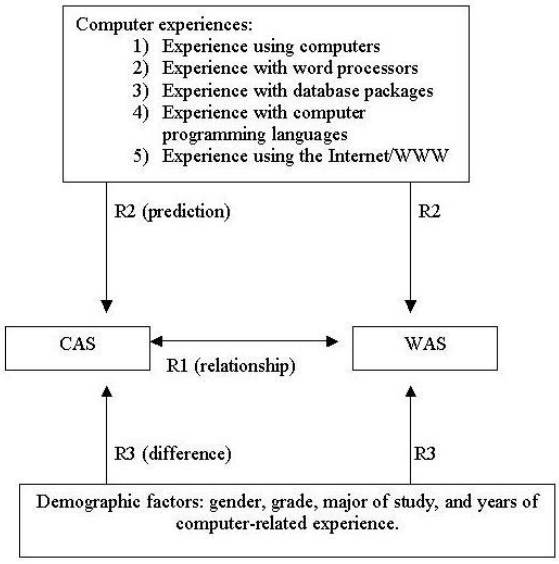

Figure 1: Research questions

3.2. Instruments

WAS items and computer experience items are all measured by seven-point Likert scales (from "no experience" to "highly experience"). Except CAS and computer experience items, questionnaire also included demographics questions.

3.2.1. Computer experience

In this component, subjects were asked to indicate whether they had experience using computers, experiences using the Internet/WWW, experience with word processors, experience with database packages, and experience with computer programming languages.

3.2.2. Measurement instruments

CAS measurement instrument

In this component, subjects were asked to indicate their perceptions toward computer self-efficacy, liking, usefulness, and intention to use and learn computers. These items were all measured by seven-point Likert scales (from "strongly disagree" to "strongly agree").

Computer Attitudes Scale (CAS)

(1=strongly disagree 7=strongly agree)

1. I feel confident using a personal computer.
2. I feel confident using floppy disk to store my data files.
3. I feel confident using word processors (e.g. Microsoft Word, Wordpad).
4. I feel confident learning new computer skills.
5. I like to use computers.
6. I enjoy talking with others about computers.
7. I like to have a computer in my home.
8. I feel comfortable using computer in my daily life.
9. I believe using computer is necessary in my school life.
10. I believe using computers is worthwhile.
11. I use computers multiple ways (e.g. doing word processing, using E-mail, surfing the Web) in my daily life.
12. An increased use of computers can enhance my academic performance.
13. The use of computers is helpful for my studying.
14. The use of computers can increase my job possibilities.
15. I believe that computers can serve as tools for learning.
16. I believe that knowing how to use computers is worthwhile.

WAS measurement instrument

In this component, subjects were asked to indicate their perceptions toward Web self-efficacy, liking, usefulness, and intention to use and learn the Web. These items were all measured by seven-point Likert scales (from "strongly disagree" to "strongly agree").

Web Attitudes Scale (WAS)

(1=strongly disagree 7=strongly agree)

1. I feel confident using the Internet/World Wide Web (WWW).
2. I feel confident using E-mail.
3. I feel confident using WWW browsers (e.g. Internet Explorer, Netscape Communicator).
4. I feel confident using search engines (e.g. Yahoo, Excite, and Lycos).
5. I like to use E-mail to communicate with others.
6. I enjoy talking with others about the Internet.
7. I like to work with the Internet/WWW.
8. I like to use the Internet from home.
9. I believe using the Internet/WWW is worthwhile.
10. The Internet/WWW helps me to find information.
11. I believe the Internet makes communication easier.
12. The multimedia environment of WWW (e.g. text, image) is helpful to understand online information.
13. I believe the Internet/WWW has potential as a learning tool.
14. I believe that the Internet/WWW is able to offer online learning activities.
15. I believe that learning how to use the Internet/WWW is worthwhile.
16. Learning the Internet/WWW skills can enhance my academic performance.

3.2.3. Sample characteristics

Face-to-face interviews with persons were conducted in the winter 2002 on a random sample of households in the region of East Croatia.

The demographic component of the questionnaire covered gender, age, finished education, momentary working status, number of household members, and usage of Internet and years of computer-related experience.

3.3. Sample

Table 1: Demographics characteristics of the sample

Variable	n	%
Number of respondents	275	100
Gender		
Female	142	51.6
Male	133	48.6
Momentary working status		
Employed	184	66.8
Unemployed	27	9.9
Students	64	23.3
Education level		
Primary school	13	4.7
Secondary school	138	50.2
Undergraduate degree	110	40.0
Postgraduate degree	14	5.1
Age		
-24	64	23.3
25-29	69	25.1
30-39	83	30.2
40 and more	57	20.7
Refusal	2	0.7
Members of household		
1	24	8.7
2	37	13.5
3	73	26.5
4	94	34.2
5 and more	46	16.7
Refusal	1	0.4
Internet users		
Users	260	94.5
None users	15	5.5

4. Results

4.1. Internal consistency

The first part of analysis was referring to internal consistency.

The CAS had 16 items, the mean was 90.99, and standard deviation was 16.88.

For the split-half coefficient, the first half included the first eight items and the second half contained the last eight items. For the first half, the mean was 43.14 and standard deviation was 9.47. For the second half, the mean was 47.76 and standard deviation was 8.48. Corrected item–total correlations of the first half were ranged from 0.33 to 0.79 and of the second half were ranged from 0.51 to 0.81. The alpha coefficient was 0.85 and 0.87 for the first and second half, respectively. In addition, Cronbach's alpha of the total instrument was 0.92 and corrected item–total correlations were ranged from 0.33 to 0.81.

The WAS had 16 items, the mean was 88.27, and standard deviation was 17.61.For the split-half coefficient, the first half included the first eight items and the second half contained the last eight items. For the first half, the mean was 41.11 and standard deviation was 11.12. For the second half, the mean was 47.16 and standard deviation was 8.02. Corrected item–total correlations of the first half were ranged from 0.48 to 0.77 and of the second half were ranged from 0.44 to 0.71. The alpha coefficient was 0.89 and 0.86 for the first and second half, respectively. In addition, Cronbach's alpha of the total instrument was 0.92 and corrected item–total correlations were ranged from 0.45 to 0.77.

4.2. Analysis of relationship

The correlation coefficient, r=0.92, P<0.001, presented a positively significant relationship between the CAS (*mean*=5.69, st.dev.=1.04) and the WAS (*mean*=5.52, st.dev.=1.10). This result indicated that there was a high correlation between the perception of computer and Web attitudes. Regarding the relationship between various computer and Web experiences and the CAS, and the WAS, the categories of: experience using computers, experience using the Internet/WWW, experience with word processors, experience with database packages, experience with computer programming languages, and years of computer-related experience all had significant relationship with the CAS (P<0.01) and with the WAS (P<0.01), except years of computer-related experience with experience with computer programming languages, and with WAS (P<0.05). The correlation among various computer experiences, the CAS, and the WAS were presented in Table 2.

Table 2: Correlations among various computer experiences, the CAS and the WAS

	Ex2	Ex3	Ex4	Ex5	C	W	Yrs
Ex1	0.75	0.67	0.38	0.29	0.44	0.44	0.48
Ex2		0.59	0.43	0.37	0.57	0.57	0.34
Ex3			0.35	0.31	0.41	0.41	0.45
Ex4				0.64	0.22	0.22	0.19
Ex5					0.14	0.14	0.15*
C						0.92	0.17
W							0.14*

a) C - Computer Attitude Scale
b) W - Web Attitude Scale
c) Ex1, experience using computers, Ex2, experience using the Internet/WWW; Ex3, experience with word processors; Ex4, experience with database packages; and Ex5, experience with computer programming languages; Yrs, years of computer-related experience.
d) Correlation was significant at the 0.01 level (P<0.01, two-tailed) in all cells, except in cells marked with one star, where correlation was significant at the 0.05 level (P<0.05, two-tailed).

4.3. Analysis of prediction

To check the effect of the computer experience variables on the CAS measurement instrument, in the third part of the analysis, a stepwise regression analysis was performed. The predictor variables were years of computer-

related experience, experience using computers, experience with word processors, experience with database packages, experience with computer programming languages, and experience using the Internet/WWW.

Table 3: Stepwise regression for computer experiences on the CAS

Variables	B	β	p
Constant	67.7		
Experience using the Internet/WWW	3.92	0.38	0.000
Experience with word processors.	1.67	0.15	0.024

a) B – Unstandardized regression coefficient
b) β – Standardized regression coefficient

The results, presented in Table 3, show that the "Experience using the Internet/World Wide Web (WWW)" and "Experience with word processors" were two predictors on the CAS ($F(2,255)=36.99$, $P<0.001$, $R^2=0.225$).

To check the effect of the computer experience variables on the WAS measurement instrument, in the third part of the analysis, a stepwise regression analysis was performed. The predictor variables were years of computer-related experience, experience using computers, experience with word processors, experience with database packages, experience with computer programming languages, and experience using the Internet/WWW.

Table 4: Stepwise regression for computer experiences on the WAS

Variables	B	β	p
Constant	3.75		
Experience using the Internet/WWW	0.36	0.51	0.000

The results, presented in Table 4, show that the "Experience using the Internet/World Wide Web (WWW)" was predictor on the WAS ($F(1,261)=71.50$, $P<0.001$, $R^2=0.258$).

4.4. Analysis of demographic differences

An independent-samples t test was conducted to evaluate the hypothesis that there had been significant gender differences on the CAS and WAS. The results indicated there was not a significant difference on the CAS, t(276)=1.11; P=0.269; and not significant difference on the WAS t(268)=1.66; P=0.09.

One-way ANOVA was conducted to evaluate the hypothesis that there had been significant differences on the CAS and WAS regardng age, completed education and employment status. The results indicated a significant difference on the CAS F(265,2)=4.336; P=0.014 (regarding age)[1] and a significant difference on the WAS F(267,2)=3.876; P=0.022 (regarding completed education)[2]; and no significant differences on the CAS F(274,2)=1.313; P=0.0271 and WAS F(266,2)=0.720; P=0.487 regarding employment status.

5. Discussion

The result of the relationship between the CAS and the WAS indicated that they had a very significantly positive correlation ($r=0.92$, $P<0.000$). Based on the result, it could be assumed that the CAS provided a criterion for the concurrent validity of the WAS. Similarly, the WAS also could be assumed as a criterion for the concurrent validity of the CAS. Thus, on the macro view, the result provided the evidence that the CAS could be used as a psychometric questionnaire for surveying individual perceptions toward Web technology. In other words, previous studies of computer attitude scales, such as the CAM (Computer Attitude Measure) developed by Kay [9] or the Computer Attitude Scale developed by Loyd and Loyd, may be available for surveying individuals' perceptions toward the Web. On the micro view, the finding presented that the CAS and the WAS could highly predict to each other.

The best predictor variable for the WAS was experience using the Internet/WWW. Additionally, the best two predictors for the CAS were experience with word processors, and experience using the Internet/WWW. The results indicated that some of those predictors that

[1]Post hoc test indicates that the average value of the CAS instrument for the age group up to 30 years (mean= 5.87; stand.dev. = 0.81) has statistically significant difference from the age group of the respondents older than 45 years (mean=5.38; Stand.dev. = 1.25), with a difference of +.0.49123 and significance=0.041.

[2]Post hoc test indicates that the average value of the WAS instrument for the respondents with completed primary-school education (mean= 6.37; stand.dev. = 0.24) differs significantly from the means for WAS ot the respondents with completed high-school education (mean=5.46; Stand.dev. = 1.13), as well as from those with completed university education or more (mean=5.49; stand.dev. = 1.09). Both of the mentioned differences are significant (P<0.05).

affected CAS could also influenced on the WAS. These results also generally confirmed researches that based on the CAM, Computer Attitude Scale, and TAM. Based on previous research, users' computer experience would affect their feelings toward computers and the Web. In other words, when users have more computer and Web experiences, they also have more positive attitudes toward computers and the Web.

6. References

[1] Ajzen, I.; Fishbein, M.: Attitude-behavior relations a theoretical analysis and review of empirical research. Psychological Bulltin, 84, 1977. pp. 888-918.

[3] Al-Khaldi, M.A.; Al-Jabri, I.M.: The relationship of attitudes to computer utilization: new evidence from a developing nation, Computers in Human Behavior 14, 1998, pp. 23–42

[4] Davids, F. D., Bagozzi, R.P., Warsaw, P.R.: User acceptance of computer technology: a comparison of two theoretical models. Management Science, 35, 1989

[5] French, T.: Using perceived ease of use and perceived usefulness to predict acceptance of the World Wide Web. Computer Networks and ISDN Systems,30,,1998, pp. 629–630

[6] Gressard, P., Loyd, B.H.: Validation studies of a new computer attitude scale, Association of Educational Data Systems Journal 18, 1986, pp. 295–301

[7] Harrison, A.W., Rainer, R.K.: An examination of the factor structures and concurrent validities for the computer attitude scale, the computer anxiety rating scale, and the computer self-efficacy scale, Educational & Psychological Measurement 52, 1992, pp. 735–745

[8] Igbaria, M.: User acceptance of microcomputer technology: an empirical test. International Journal of Management Science 21, 1993**,** pp. 73–90

[9] Kay, H.: An exploration of theoretical and practical foundations for assessing attitudes toward Computers: The computer attitude measure (CAM), Computer in Human Behavior 19, 1993, pp. 371–386

[10] Lederer, A.L.; Maupin, D.L.; Sena, M.P.; Zhuang, Y. (2000): The technology acceptance model and the World Wide Web. Decision Support Systems, 29, pp. 269–282.

[11] Loyd, B.H., Loyd, B.E.: The reliability and validity of instruments for the assessment of a computer attitudes, Educational and Psychological Measurement 45, 1985, pp. 903–908

[12] Nash, J.B., Moroz, P.A.: An examination of the factor structures of the computer attitude scale, Journal of Educational Computing Research 17, 1997, pp. 341–356

[13] Thompson, R.L., Higgins, C.A., Howell, J.M.: Personal computing: toward a conceptual model of utilization, MIS Quarterly 15, 1991, pp. 125–143.

[14] Triandis, H.C.: Attitude and attitude change, New York:, John Wiley, 1971

[15] Vankatesh, V.: Creation of favorable user perceptions: exploring the role of intrinsic motivation. *MIS Quarterly,* 23, 2, 1999, pp. 239–260.

[16] Woodrow, J.J.: A comparison of four computer attitude scale, Journal of Educational Computing Research 7,1991, pp. 165–187